ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

and

DOMINION TRANSMISSION, INC.
SUPPLY HEADER PROJECT

Supplemental Filing
March 10, 2017

APPENDIX B

Draft Biological Evaluation – Public

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket Nos. CP15-554-000
CP15-554-001

Biological Evaluation

Monongahela National Forest

and

George Washington National Forest

DRAFT

March 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
API	American Petroleum Institute
Atlantic	Atlantic Coast Pipeline, LLC
ATWS	additional temporary workspace
BA	Biological Assessment
BE	Biological Evaluation
BIC	Best in Class
BMP	best management practices
CFR	Code of Federal Regulations
COM Plan	Construction, Operations, and Maintenance Plan
DCR-DNH	Virginia Department of Conservation and Recreation Division of Natural Heritage
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
Dominion	Dominion Resources, Inc.
DTI	Dominion Transmission, Inc.
E&SC Plan	Erosion & Sediment Control Plan
ESA	Endangered Species Act of 1973
FERC	Federal Energy Regulatory Commission
FERC's Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
FERC's Procedures	Wetland and Waterbody Construction and Mitigation Procedures
FR	Federal Register
FSM	Forest Service Manual
FWS	U.S. Fish and Wildlife Service
GIS	geographic information systems
GWNF	George Washington National Forest
Karst Plan	Karst Terrain Assessment, Construction, Monitoring, and Mitigation Plan
KDFWR	Kentucky Department of Fish and Wildlife Resources
LRMP	MNF Land and Resource Management Plan
MNF	Monongahela National Forest
MP	milepost
NHD	National Hydrography Dataset
NHI	Natural Heritage Inventory
NHP	Natural Heritage Program
NLCD	National Land Cover Database
NNIS	Non-Native Invasive Species
OAR	Occurrence Analysis Results
PEM	Palustrine System Emergent Wetland
PFO	Palustrine System Forested Wetland
PJD	preliminary jurisdictional determination
PNHP	Pennsylvania Natural Heritage Program
Projects	Atlantic Coast Pipeline and Supply Header Project
PSS	Palustrine System Scrub-Shrub Wetland
RD	Ranger District
RFSS	Regional Forest Sensitive Species
SDS	safety data sheet
SPCC Plan	Spill, Prevention, Control, and Countermeasures Plan
USACE	U.S. Army Corps of Engineers

USDOT	U.S. Department of Transportation
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VaFWIS	Virginia Fish and Wildlife Information Service
VDCR	Virginia Department of Conservation and Recreation
VDGIF	Virginia Department of Game and Inland Fisheries
WVDNR	West Virginia Department of Natural Resources

1.0 INTRODUCTION

This Biological Evaluation (BE) examines potential impacts on Regional Forester Sensitive Species (RFSS) on U.S. Forest Service (USFS) lands from construction, operation, and maintenance of the Atlantic Coast Pipeline (ACP or Project; see Figure 1.1-1) proposed by Atlantic Coast Pipeline, LLC (Atlantic), in accordance with Forest Service Manual (FSM) BE standards 2672.42. Certain aspects of the draft BE will be updated in the final version based on comments from the USFS.

A portion of the Project crosses USFS lands within the Monongahela National Forest (MNF) and George Washington National Forest (GWNF) in West Virginia and Virginia, respectively. Accordingly, species under consideration in this BE are those listed by the USFS as sensitive species within the applicable USFS Regions for each forest (Region 9 for the MNF and Region 8 for the GWNF). As per USFS FSM 2670.5, sensitive species are defined as those plants and animals identified by a Regional Forester as those for which population viability is a concern as evidenced by the following:

- significant current or predicted downward trends in population numbers or density; and/or
- significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

Per FSM 2670.32, management of sensitive species "must not result in a loss of species viability or create significant trends toward federal listing." The purpose of this BE is to document the occurrence of RFSS and their habitats on USFS lands potentially affected by the Project; assess the nature and extent of potential Project impacts on RFSS; identify possible avoidance and minimization measures to reduce impacts to these species; and, in consultation with the USFS, identify potential mitigation measures to compensate for unavoidable impacts to these species.

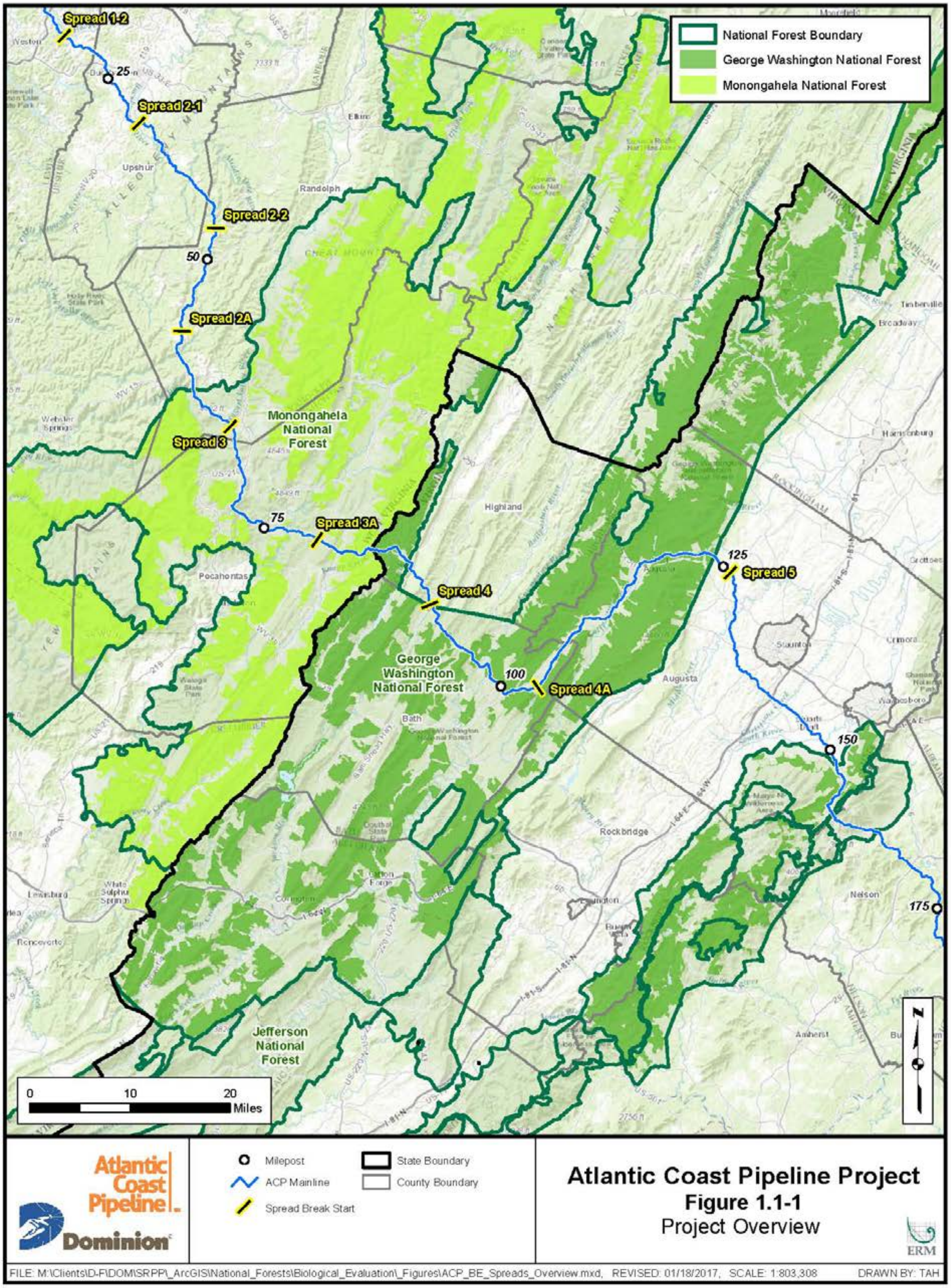
Federally-listed threatened and endangered species are addressed in detail in the Project's *Biological Assessment* (BA) and migratory birds are addressed in the Project's *Migratory Bird Plan*. The BA and *Migratory Bird Plan* were filed with the Federal Energy Regulatory Commission (FERC), the lead federal agency for the Project, on January 27, 2017. [1]

1.1 USFS COORDINATION AND COMMUNICATION

Atlantic has communicated with species specialists at the MNF and the GWNF throughout the Project planning process. Agency Correspondence can be found on the FERC Docket: Atlantic Coast Pipeline Project Docket No. CP15-554-000 and Supply Header Project Docket No. CP15-555-000.

---

[1] A listed species is a plant or animal that has been determined by the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service to be in the greatest need for federal protection. Once listed as a threatened or endangered species by the FWS or National Marine Fisheries Service, the species is protected and regulated under the Endangered Species Act of 1973 (ESA).



National Forest Boundary
George Washington National Forest
Monongahela National Forest
Spread 1-2
Spread 2-1
Spread 2-2
Spread 2A
Spread 3
Spread 3A
Spread 4
Spread 4A
Spread 5
25
50
75
100
125
150
175
Monongahela National Forest
George Washington National Forest
Jefferson National Forest
Highland
Pocahontas
Randolph
Upshur
Bath
Augusta
Staunton
Rockbridge
Nelson
Amherst
Harrisonburg
0
10
20
Miles
Milepost
ACP Mainline
Spread Break Start
State Boundary
County Boundary
Atlantic Coast Pipeline
Dominion
Atlantic Coast Pipeline Project
Figure 1.1-1
Project Overview
ERM
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\National_Forests\Biological_Evaluation_Figures\ACP_BE_Spreads_Overview.mxd, REVISED: 01/18/2017, SCALE: 1:803,308
DRAWN BY: TAH

2.0 PROPOSED ACTION

2.1 PROPOSED FACILITIES

For the ACP, Atlantic proposes to construct and operate approximately 600 miles of natural gas transmission pipelines and associated aboveground facilities in West Virginia, Virginia, and North Carolina (see Figure 1.1-1). Once constructed, the ACP will be capable of delivering up to 1.5 million dekatherms per day of natural gas that will be used to generate electricity, heat homes, and run local businesses. The Project will facilitate cleaner air, increase the reliability and security of natural gas supplies, and provide a significant economic boost in West Virginia, Virginia, and North Carolina. More information is provided at the company's website at www.dom.com/acpipeline. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion Resources, Inc. (Dominion), to permit, build, and operate the ACP on behalf of Atlantic. Atlantic is seeking authorization from FERC under Section 7(c) of the Natural Gas Act to construct, own, operate, and maintain the Project. [2]

The Project crosses approximately 5.15 miles of the MNF in the Marlinton Ranger District in Pocahontas County, West Virginia (see Figure 2.1-1), and approximately 15.98 miles of the GWNF in the Warm Springs, North River, and Glenwood-Pedlar Ranger Districts in Highland, Bath, and Augusta Counties, Virginia (see Figure 2.1-2). On USFS lands, the ACP will consist of a 42-inch-diameter buried steel pipeline. No above-ground facilities are proposed on USFS lands. Minor appurtenant facilities that would be placed on USFS lands consist of pipeline markers and cathodic protection test stations.

Atlantic proposes to utilize a 125-foot-wide construction right-of-way for installation of the 42-inch pipeline, which encompasses a 40-foot-wide spoil side and an 85-foot-wide working side. For most pipeline construction activities, a right-of-way width of 125 feet would accommodate large equipment, pipe stringing and set up, welding, trenching, and the temporary storage of trench spoil. In wetlands, the construction right-of-way width is proposed to be reduced to 75 feet in wetlands. Table 2.1-1 provides acreages impacted by temporary workspace, permanent right-of-way, and access roads.

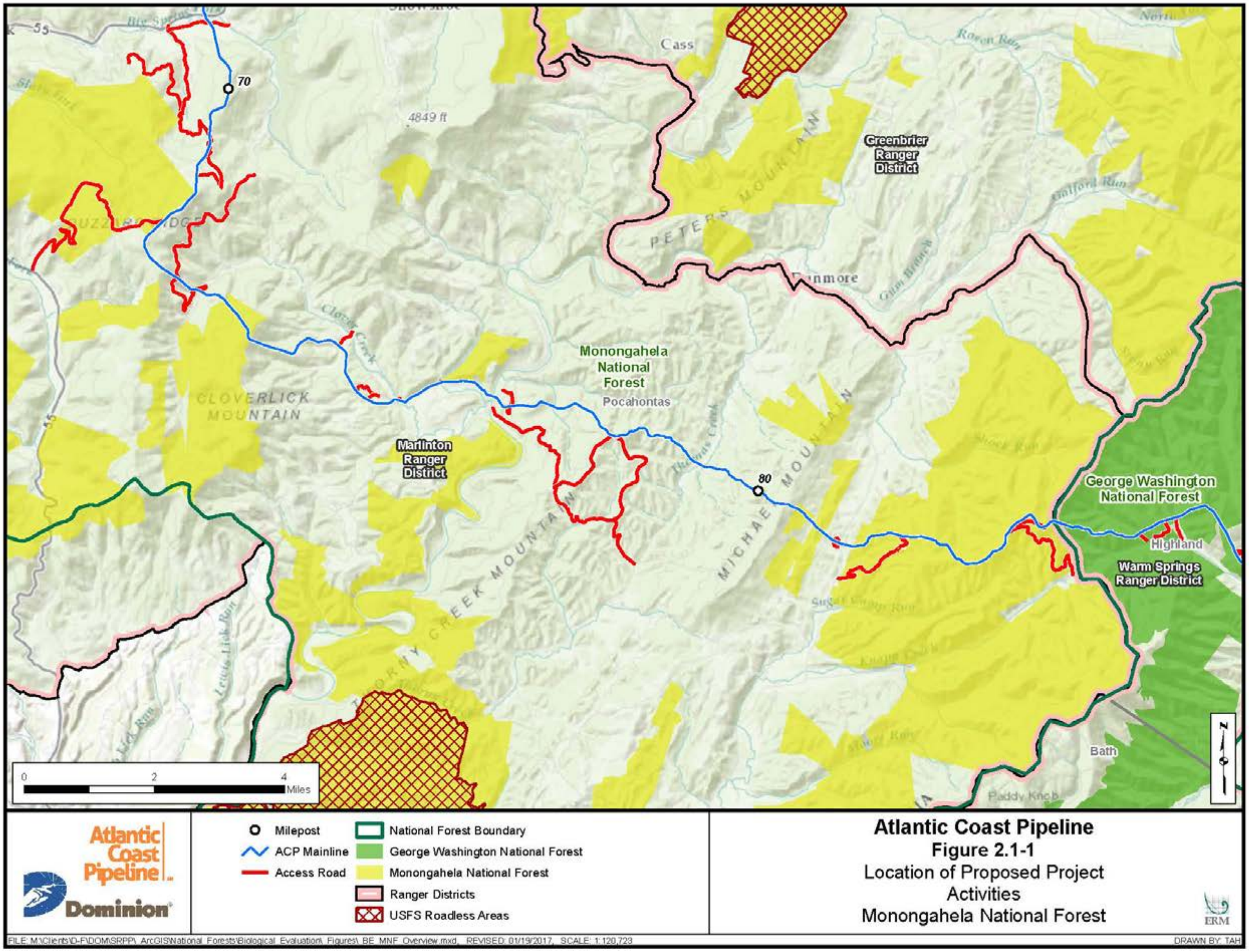
TABLE 2.1-1

Summary of National Forest Lands Affected by the Atlantic Coast Pipeline Project (acres)

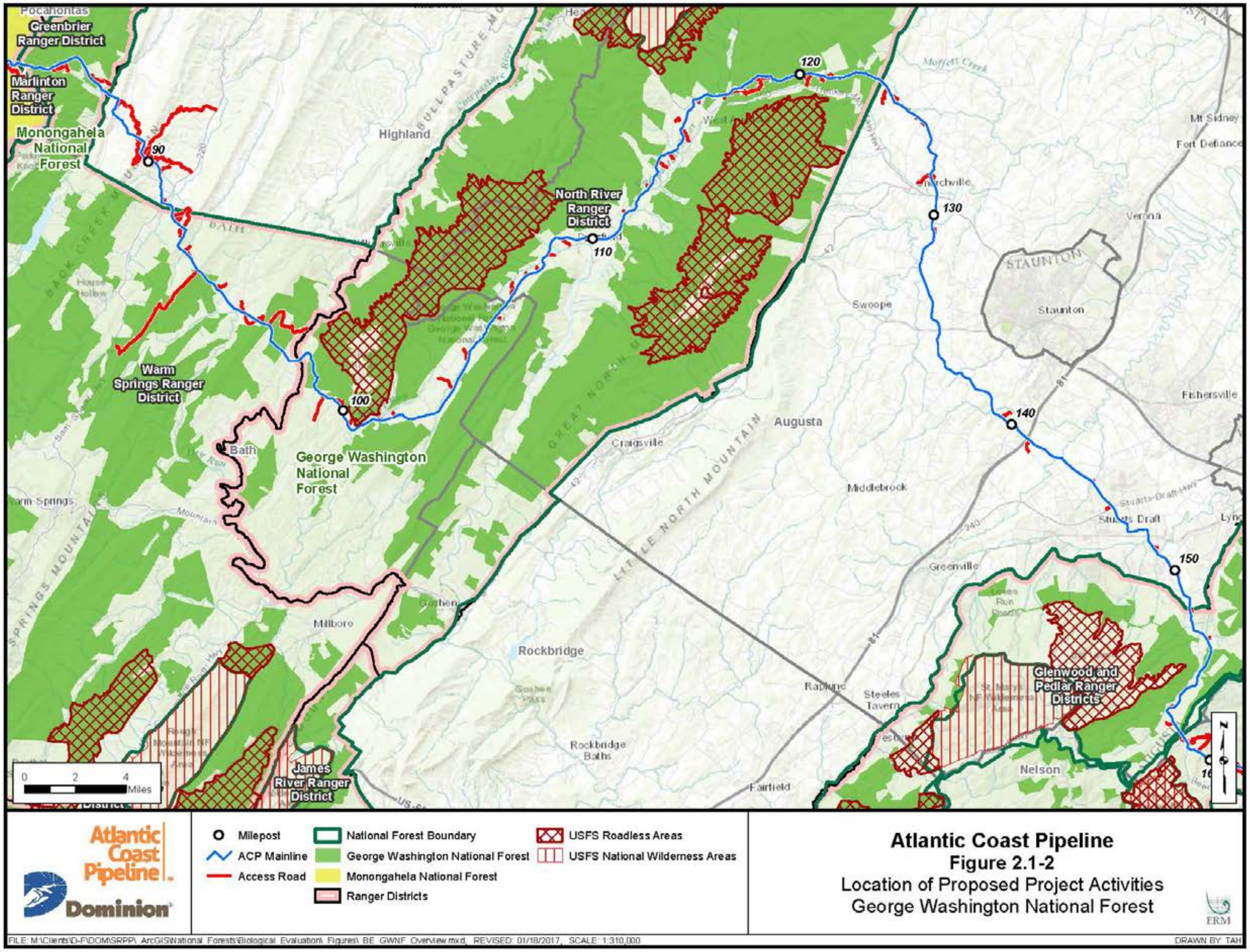
National Forest	Temporary Workspace	Permanent Right-of-Way	Existing Access Roads [a]	New Permanent Access Roads
Monongahela National Forest	47.0	33.1	29.06	1.5
George Washington National Forest	144.4	105.2	43.5	9.1
Total	**191.4**	**138.3**	**72.5**	**10.6**

[a] Existing access road acreages represent the existing road or trail footprint. No additional impacts outside of the road or trail prism are anticipated.

[2] Atlantic is also requesting a Blanket Certificate of Public Convenience and Necessity pursuant to Part 284, Subpart G, of the Commission's regulations authorizing open-access transportation of natural gas for others with pre-granted abandonment authority, and a Blanket Certificate of Public Convenience and Necessity pursuant to Part 157, Subpart F, of the Commission's regulations authorizing certain facility construction and operation, certain certificate amendments and abandonments.



Atlantic Coast Pipeline
Figure 2.1-1
Location of Proposed Project Activities
Monongahela National Forest



Atlantic Coast Pipeline
Figure 2.1-2
Location of Proposed Project Activities
George Washington National Forest

Additional temporary workspace (ATWS), which would extend outside of the construction right-of-way, is proposed for road, wetland, and waterbody crossings and places where additional spoil storage, log landings, or equipment staging is needed (see Table 2.1-1). Consultation with the USFS concerning areas needing topsoil segregation are ongoing, as topsoil segregation could increase the width of the construction right-of-way by 25 feet for any areas requiring additional temporary workspace to accommodate topsoil storage (see the *Construction, Operations, and Maintenance Plan* (*COM Plan*), Appendix C).

TABLE 2.1-2

Proposed Access Roads in the Monongahela and George Washington National Forests

Approximate Milepost	Access Road Number	Existing or New	Permanent or Temporary	Proposed Improvements	Road Length (miles)[a]	Road Acreage[a]
MNF						
71.7	05-001-C009.AR1	Existing	Permanent	Regrade and add gravel in select locations	3.9	14.1
71.7	05-001-C009.AR2	New	Permanent	New gravel road	0.1	0.4
81.8	05-001-E064.AR1	Existing	Permanent	Regrade and add gravel in select locations	1.8	6.3
81.8	05-001-E064.AR4	New	Temporary	To be determined (short spur)	<0.1	0.1
81.8	05-001-E064.AR5	New	Temporary	To be determined (short spur)	<0.1	<0.1
81.8	05-001-E064.AR6	New	Temporary	To be determined (short spur)	<0.1	0.1
83.3,83.8	05-001-E064.AR2	Existing	Permanent	Regrade and add gravel in select locations	2.7	9.4
				Total Existing	**8.3**	**29.8**
				Total New	**0.2**	**0.6**
GWNF				**TOTAL MNF**	**8.4**	**30.4**
84.9	06-001-B001.AR3	Existing	Permanent	Regrade and add gravel in select locations	0.2	0.6
85.5	06-001-B001.AR4	Existing	Permanent	Regrade and add gravel in select locations	0.1	0.4
85.3	06-001-B001.AR7	Existing	Permanent	Grade and add gravel to select portion	0.5	1.7
86.4	06-001-B001.AR5	Existing	Permanent	Grade and add gravel to select portion	0.1	0.1
117.0	07-001.AR1.AR 3	New [b]	Permanent	Existing Trail - add gravel surface	2.6	9.3
117.2	07-001.AR1-AR 4	New	Permanent	New gravel road	<0.1	<0.1
117.9	07-001.AR1-AR 6	New [b]	Permanent	Existing Trail - add gravel surface	0.3	0.9
121.2	07-001.AR1-AR 7	New	Permanent	New gravel road	0.4	1.4
120.2	07-001.AR1-AR 8	New [b]	Temporary	Existing Trail	0.3	1.0
120.4	07-001.AR1-AR 9	New [b]	Permanent	Existing Trail - add gravel surface	0.6	2.0
93.6	36-014.AR2	Existing	Permanent	Grade and add gravel to the entire road	5.3	19.2
96.3	36-016.AR1	Existing	Permanent	Regrade and add gravel in select locations	2.8	10.1
99.5	36-016.AR2	Existing	Permanent	Grade and add gravel to the entire road	0.6	2.1
				Total Existing	**9.5**	**34.1**
				Total New	**4.1**	**14.7**
				TOTAL GWNF	**13.6**	**48.8**

[a] Totals may differ slightly due to rounding.
[b] Currently shown as existing roads in Appendix A.

Construction of the ACP will require roads for access to the right-of-way (see Tables 2.1-1 and 2.1-2). In the MNF, seven access roads have been identified, including three existing USFS roads that would require regrading and new gravel, and four new access roads, one of which is permanent, and three of which are short road spurs off of an existing road (see Appendix A for locations). In the GWNF, thirteen access roads have been identified, including seven existing USFS roads that would require grading and gravel, three existing trails that would be permanently converted to access roads, one existing trail that would be temporarily converted to an access road for construction, and two new permanent access roads.

Roadwork will conform to the design standards of the USFS. New roads will be approximately 30 feet wide and graveled. Typical improvements to existing roads will include regrading and graveling of existing road prisms and trimming of overhead vegetation. Dominion will provide the USFS proposed design details for access road construction and improvements after civil surveys have been completed. Use of USFS access roads not identified in the final *COM Plan*, or the undertaking of improvements to existing USFS roads not identified in the final *COM Plan*, will not occur unless approved in writing by the USFS Authorized Officer (AO) and FERC (see Section 2.1.1.4 in the *COM Plan* [Appendix C]). New roads will include short spurs ranging from less than approximately 0.01 to 0.4 mile long that are needed to connect existing roads with the proposed right-of-way. Once the pipeline is installed, permanent access roads will be used to access the right-of-way for operations and maintenance purposes. Temporary roads will be restored to pre-existing conditions.

The ACP proposes to utilize a 53.5-foot-wide permanent right-of-way for operating purposes and a 75-foot-wide easement for pipeline maintenance on USFS lands. The permanent right-of-way will be maintained in an herbaceous state in non-cultivated uplands to allow for maintenance access along the right-of-way, except for the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—which will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan* (Appendix C). The mix of tree and shrub species will be determined in consultation with the MNF. In wetland and riparian areas, a reduced 10-foot-wide corridor centered over the pipeline will be maintained in an herbaceous state, while trees greater than 15 feet tall within 15 feet of the pipeline will be cut and removed from the right-of-way. Atlantic notes that additional discussions with the USFS concerning pipeline maintenance are ongoing and could impact the width of the maintained easement.

2.2 PROPOSED PROJECT SCHEDULE

2.2.1 Construction Schedule

Subject to receipt of the required permits and regulatory approvals, Atlantic and DTI anticipate that vegetation pre-clearing (tree felling and mowing) in both the MNF and GWNF will commence in November 2017. Other pre-construction activities (e.g., timber removal, preparation of contractor yards and access roads) are also expected to begin in November 2017. Atlantic anticipates that pipeline construction will commence in April of 2018. The ACP pipeline will be built along 17 spreads with construction (clearing (removal of vegetation from the right of way), grading, trenching, etc.) occurring over an approximate 2-year period beginning in February through April 2018, depending on spread.[3] Five of the 17 spreads occur within the MNF and/or GWNF. It is anticipated that all facilities for the Project will be placed in service by the fourth quarter of 2019.

Construction on the MNF will span two spreads. Spread 3A crosses the MNF for approximately 4.39 miles between Michael Mountain and the Virginia border, with pre-clearing scheduled for November 2017 and construction for April 2018 (see Table 2.2.1-1). Spread 3 crosses the MNF for approximately 0.76 mile, north of Cloverlick Mountain, with pre-clearing scheduled for November 2018 and construction for April 2019.

Construction on the GWNF will span four spreads. Spread 3A crosses the GWNF for approximately 4.06 miles just east of the West Virginia-Virginia border, where the GWNF abuts the MNF. As indicated above, pre-clearing and construction on this spread are scheduled for November 2017

[3] The number and definition of spreads could change depending on the needs of construction.

and April 2018, respectively. In Bath and Augusta Counties, Virginia, Spread 4 and 4A cross the GWNF for approximately 4.12 and 6.51 miles, respectively. For Spread 4, pre-clearing and construction are scheduled to begin November 2018 and April 2019, respectively; for Spread 4A, pre-clearing and construction and are scheduled for November 2017 and April 2018, respectively. Spread 5 crosses the GWNF for approximately 1.29 miles in the vicinity of Mt. Torrey Furnace and the Appalachian National Scenic Trail in Augusta County. Pre-clearing on Spread 5 is scheduled to begin in November 2018, with pipeline construction commencing in February 2019.

Figure 1.1-1 depicts the spread breaks along the proposed ACP pipeline system.

(Note: This BE was prepared based on the schedule identified in the August 12, 2016 Notice of Schedule issued by FERC for the Project.)

TABLE 2.2.1-1

Construction Schedule by Spread for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Spread	Approximate Mileposts (USFS)	Counties/Cities and States/Commonwealths	Begin Activity	Finish Activity [d]
ATLANTIC COAST PIPELINE				
Initial Construction Activities				
Initial Site Preparation (2018 spreads)	By spread	See below	November 2017	1Q 2018
Tree Clearing (2018 spreads) [b, c]	By spread	See below	November 2017	1Q 2018
Initial Site Preparation (2019 spreads)	By spread	See below	September 2018	1Q 2019
Tree Clearing (2019 spreads) [b, c]	By spread	See below	November 2018	1Q 2019
Construction of Pipeline				
Spread 3 (AP-1)	65.4–79.2 (MNF)	Randolph and Pocahontas Counties, WV	April 2019	4Q 2019
Spread 3A (AP-1) [e]	79.2–91.3 (MNF,GWNF)	Pocahontas County, WV and Highland County, VA	April 2018	4Q 2018
Spread 4 (AP-1) [e]	91.3–103.1 (GWNF)	Bath and Augusta Counties, VA	April 2019	4Q 2019
Spread 4A (Ap-1) [e]	103.1–125.9 (GWNF)	Highland, Bath, and Augusta Counties, VA	April 2018	4Q 2018
Spread 5 (AP-1) [f]	125.9–183.3 (GWNF)	Augusta and Nelson Counties, VA	February 2019	4Q 2019

[a] The number and timing of the construction spreads are subject to change dependent upon construction and permit requirements: the schedule presented in this table is based on information from September 2016.
[b] The start of tree clearing is dependent upon the results of the environmental surveys and agency consultations.
[c] Including tree clearing for aboveground facilities, access roads, and contractor yards. Tree clearing for construction spreads 1-1, 1-2, 3, 4, Blue Ridge Parkway HDD and James River HDD will take place in 2018.
[d] The finish construction date refers to the end of mechanical construction; additional restoration and post construction activity is expected to occur in the Project area beyond the timeframe reflected here. 1Q = first quarter; 2Q = second quarter; 3Q = third quarter; 4Q = fourth quarter.
[e] Hydrostatic test and remaining cleanup will be completed by the 3rd quarter of 2019.
[f] Blue Ridge Parkway and James River HDDs will be constructed in 2018.

2.2.2 Seasonal Restrictions

2.2.2.1 Tree Removal/Clearing

Based on consultations to date with the FWS, timing restrictions for tree clearing in West Virginia and Virginia for the migratory bird nesting season and the federally listed Indiana bat Summer season are as follows:

- West Virginia:
    - migratory birds: April 1–August 30
    - Indiana bats: April 1–November 14 (to be implemented within 5 miles of an Indiana bat mist net capture or known Indiana bat hibernacula)
- Virginia:
    - migratory birds: March 15–August 30
    - Indiana bats
        - If a site is within 5 miles of a known hibernacula: April 1–November 15
        - If a site is not within 5 miles of a known hibernacula: April 15–September 15

Atlantic plans to comply with these time-of-year restrictions by clearing trees outside of the migratory bird nesting season, and outside of the Indiana bat Summer season in occupied habitat. Habitat occupied by Indiana bats was found in portions of the MNF and GWNF Project areas (5-mile buffers of known Indiana bat hibernacula). Currently, tree clearing for the MNF and GWNF is scheduled to begin after the Indiana bat clearing restriction ends in November.

2.2.2.2 Stream and Wetland Crossings

Stream crossings will be scheduled to comply with the applicable in-water work timing restrictions (see Appendix B). Relevant seasonal timing restrictions are listed below. No waterbody crossings are planned for waterbodies in the MNF or GWNF for the following time periods, unless there is no flow in the streams (see Appendix B):

- West Virginia Coldwater Fisheries: October 1−June 1;
- West Virginia Trout Streams and Adjacent Waters: September 15–March 31;
- Virginia Trout Streams and Adjacent Waters: October 1–March 31;
- Roughhead shiner (Virginia): March 15–June 30; and
- Yellow lance (Virginia): May 15-July 31.

2.3 CONSTRUCTION PROCEDURES

This section provides a description of pipeline construction methods for the Project. Construction of the proposed pipeline system will follow industry-standard practices and procedures as described below. In a typical scenario, construction involves a series of discrete activities conducted in a linear sequence. These include survey and staking; clearing and grading; trenching; pipe stringing, bending, and welding; lowering-in and backfilling; hydrostatic testing; final tie-in; commissioning; and right-of-way cleanup and restoration. A description of each step in the process is provided below.

During construction, FERC requires the implementation of its *Upland Erosion Control, Revegetation, and Maintenance Plan* (FERC's Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (FERC's Procedures) (FERC 2013a, 2013b). The FERC's Plan and Procedures identify a variety of measures designed to minimize erosion, enhance revegetation, and minimize impacts on waterbodies and associated aquatic resources, such as the installation and maintenance of sediment and erosion controls. Atlantic will adopt and implement the most recent (2013) versions of FERC's Plan and Procedures with proposed Project-specific modifications in accordance with State/Commonwealth erosion and sediment control requirements. Atlantic additionally will implement a Best-in-Class (BIC) method program for construction activities in steep slope areas (i.e., slopes equal to or greater than 30 percent), as discussed in the draft *Construction, Operations, and Maintenance Plan* (*COM Plan*) prepared for the Project. The BIC program will augment the Plan and Procedures with additional, specialized measures for erosion and sediment control and surface stabilization in steep slope areas.

Atlantic has identified roads which will be used to provide access to the Project construction right-of-way, permanent easement, and other facilities during construction and operation of the ACP. Atlantic will utilize existing roads to the extent practicable, but some new roads will need to be built in remote areas. Some existing roads may require improvements, such as grading, gravelling, replacing or installing culverts, minor widening, and/or clearing of overhead vegetation. Replacement of existing access road waterbody crossings, if needed, will be designed to satisfy standards for stream simulation (as specified in Forest Plan Standard RF04 and Guideline WF21). No new permanent access road waterbody crossings are currently planned. Temporary access road crossings of waterbodies will be designed to the same design standards as permanent access road crossings if they will remain in place during periods of essential aquatic species migration or for an extended period of time.

A sufficient number of access roads with regular spacing is needed to minimize congestion of construction vehicles and equipment on the right-of-way, which otherwise would increase the duration of construction and create unsafe work conditions for workers. If any existing roads are damaged during construction, Atlantic will restore these roads to preconstruction condition or better.

Access road locations have been identified based on the needs of construction and operations to provide sufficient ingress and egress to and from the proposed pipeline right-of-way and aboveground facility sites. Along temporary access roads, temporary timber construction mats, temporary bridges, culverts, or temporary rip rap over geotextile fabric will be utilized as a temporary means to stabilize access roads for use during construction. Existing permanent access roads will require grading and gravel (see Table 2.1-2). For new roads, a 30-foot-wide corridor along new access roads has been assumed for the impact analysis. As noted in Section 2.1 and the *COM Plan* (Appendix C), Dominion will provide the USFS proposed design details for access road construction and improvements after civil surveys have been completed. The roads and associated drainage structures will be designed and constructed in accordance with USFS requirements. Methods and locations for disposal of any excess fill created by road construction will also be identified. Permanent access roads utilized for construction will also be used to access the permanent right-of-way for operation and maintenance purposes. Use of USFS access roads not identified in the *COM Plan*, or the undertaking of improvements to existing USFS roads not identified in the *COM Plan*, will not occur unless approved in writing by the USFS AO and FERC (see Section 2.1.1.4 in the *COM Plan* [Appendix C].

2.3.1 Survey and Staking

Atlantic's survey contractor will stake the pipeline centerlines and limits of the construction right-of-way and ATWS areas. Wetland boundaries and other environmentally sensitive areas will also be marked, mapped, and staked at this time.

2.3.2 Clearing and Grading

Prior to beginning ground-disturbing activities, Atlantic's construction contractors will coordinate with the One-Call systems in each State/Commonwealth to have existing underground utilities (e.g., cables, conduits, and pipelines) identified and flagged. Once this process is complete, the clearing crew will mobilize to the construction areas. Fences along the right-of-way will be cut and braced, and temporary gates and fences will be installed to contain livestock, if present. The clearing crew will then clear the work area of vegetation and other obstacles, including trees, logs, brush, and rocks. Tree clearing will follow the general mitigation measures described in Atlantic's *Timber Removal Plan*, which includes conservation measures for waterbodies.

To the extent feasible, Atlantic has minimized plans for tree removal during construction. Cleared vegetation and stumps will be burned, chipped (except in wetlands), ground below the surface and left in place, hauled offsite to a commercial disposal facility, or removed and sold for other uses, such as biomass fuel (for USFS lands, cleared vegetation will be removed and disposed of as directed by the Authorized Officer). Burning would only be used when it is infeasible to haul chips off of the right-of-way, generally due to safety and accessibility constraints. Only the tops would be burned where merchantable timber is permitted to be stacked along the edge of the workspace or removed from the site. Burning would be conducted in uplands in accordance with state/commonwealth, local burning requirements, and as directed by the USFS. Burning will not be conducted in wetlands.

Following clearing, the construction right-of-way and ATWS will be graded where necessary to provide a level work surface to allow safe passage of construction equipment and emergency vehicles. More extensive grading will be required in steep side slope or vertical areas and where necessary to make a safe and level workspace and prevent excessive bending of the pipelines. In areas determined in consultation with the USFS to need topsoil segregation, graded topsoil will be segregated from the subsoil. Typically, topsoil is segregated from subsoil in agricultural fields, non-saturated wetlands, and other areas as specified in the Plan or as requested by a landowner or land managing agency, including the USFS. In accordance with FERC's Plan, and in areas where topsoil segregation is required, Atlantic will segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil) and the entire topsoil layer in shallow soils (less than 12 inches of topsoil). Excavated topsoil will be placed on the edge or edges of the construction right-of-way. In some areas, the construction right-of-way width may need to be widened by 25 feet to accommodate topsoil storage.

In areas disturbed by grading, and as required by the Plan and Procedures, temporary erosion and sediment controls will be installed immediately after initial disturbance within the construction right-of-way to minimize erosion. The erosion and sediment controls will be inspected and maintained throughout the construction and restoration phases of the Project, as appropriate, and as required by the Plan and Procedures.

Portions of the AP-1 mainline route extend across steep, mountainous terrain in West Virginia and Virginia along and in the vicinity of the Allegheny, Shenandoah, and Blue Ridge Mountain ranges, including areas within the MNF and GWNF. In mountainous areas, pipelines are typically routed along ridges and hills running perpendicular to the slope (i.e., along the natural fall of the slope) to provide a relatively level surface for vehicles and other equipment during construction. Except for short distances and in unique circumstances, pipelines are not typically routed laterally along the sides of ridges and hills (i.e., on side slopes). As described in more detail below, construction on side slopes requires cut-and-fill grading to create a flat surface for construction vehicles and equipment. Relative to construction along the natural fall of a slope, cut-and-fill grading typically requires more workspace and is more challenging to restore.

Special construction techniques will be required in areas where the slope exceeds 30 percent and/or where the proposed pipeline crosses side slopes. A licensed geotechnical expert will be actively involved in the design of steep terrain crossings to minimize impacts, and this technical oversight will continue into the construction phase of the Project. Additionally, as noted above, Atlantic will implement a BIC program for construction activities in steep slope areas, as discussed in the draft *COM Plan* prepared for the Project. The BIC program will augment the Plan and Procedures with additional, specialized measures for erosion and sediment control and surface stabilization in steep slope areas.

In areas with steep terrain, temporary sediment barriers, such as reinforced silt fence and straw bales (weed-free and where permitted), will be installed during clearing to prevent the movement of disturbed sediment off the construction right-of-way. Temporary slope breakers will be installed during grading in accordance with the Plan to reduce runoff velocity and divert water off of the construction corridor onto stable, well-vegetated areas or through energy dissipation devices.

In addition to the general construction measures described above, Atlantic will develop and implement additional measures in areas where slopes exceed 30 percent to address land movement, surface erosion, backfill erosion, and general stability when backfilling the trench and restoring the right-of-way. The following are some of the special design and construction mitigation measures that will be implemented during construction:

- Targeted management and diversion of surface water around potential landslide sites, including the use of ditches, berms, slope breakers, and/or grading;
- Mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydro seeding, mulching, and/or tracking;
- Targeted management of water sources along the trench, including the use of trench breakers and/or added drainage piping in the trench;
- Targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- Engineering of the backfill around or within steep slope areas to dry the backfill, add compaction, improve backfill soil strength, and reduce saturation;
- Installation of targeted structures to stabilize backfill using engineered fill, retaining walls, Sakrete placements, key trenches, and/or shear trenches; and
- Reduction in surcharge on steep slope areas by reducing excess or saturated backfill.

2.3.3 Trenching

The pipe trench will be excavated by rotary trenching machines, track-mounted backhoes, or other similar equipment. Trench spoil will be deposited adjacent to the trench within the construction right-of-way. The trench for each pipeline will be excavated to a depth that provides sufficient cover over the pipeline after backfilling. The typical dimensions of the pipeline trench will vary depending on a number of factors, such as the substrate in the vicinity of the trench. The bottom width of the trench will be sufficient to accommodate the diameter of the pipeline and sufficient pad material around it (typically approximately 1 foot on either side of the pipeline). The top width will vary to allow the sides of the trench to be adapted to local soil conditions at the time of construction. For the proposed 42-inch-diameter pipeline, the typical dimensions of the trench will be as follows:

- a top width of 10 to 15 feet in non-agricultural uplands and agricultural lands and 15 to 20 feet in wetlands;
- a depth of 7.5 feet in non-agricultural uplands and wetlands and 8.5 feet agricultural lands; and
- a depth of cover of 3 feet in non-agricultural uplands and wetlands and 4 feet in agricultural lands.

If trench dewatering is required within or off of the construction right of way, that process will be conducted in accordance with the Plan and Procedures and applicable permits in a manner that will minimize erosion and prevent silt-laden water flowing into a wetland or waterbody.

In areas where topsoil segregation is required, subsoil from trench excavations will be placed adjacent to the topsoil in a separate pile to allow for proper restoration of the soil during backfilling and restoration. Gaps will be left between the topsoil and subsoil piles to prevent storm water runoff from backing up or flooding and to prevent risk of mixing. Mixing of topsoil and subsoil piles will be prevented by separating them physically or with a mulch or silt fence barrier, where necessary, to accommodate reduced workspace.

When rock or rocky formations are encountered, tractor-mounted mechanical rippers, hydraulic hoe rams, or rock trenchers will be used for breaking up the rock prior to excavation. In areas where mechanical equipment or other means cannot be used to break up or loosen boulders or hard bedrock within 60 inches of the ground surface, including at waterbody crossings, blasting will be required.

The act of blasting can be conducted in several forms: mass rock blasting typical in building of roadways or construction sites for grading large areas; production blasting (open pit) typical in quarry and strip mining; and trench blasting typical in construction of pipelines, water lines, and sewer lines. Trench blasting is the least impactful to the environment around the blast location. Atlantic will be conducting trench blasting for this project. When trenches are excavated for pipeline installation, blasting will be used to break any rock encountered before the required depth is achieved. A trench blast is more confined than a normal open pit blast; open pit blasts result in higher explosives consumption per cubic feet of blasted rock. The diameter of the blast holes is normally smaller, which provides better distribution of the explosive in the rock and avoids excessive over break outside the width of the trench and will help avoid high peak overpressure (noise) and high peak particle velocities (vibration) readings. Trench blasting is controlled with a “precision blast design” by a certified blasting professional. Blasting will produce a one-time vibration and peak overpressure and is very short in duration. An alternative method to blasting is mechanical rock removal using tractor-mounted mechanical rippers, hydraulic hoe rams, or rock trenchers, which break up the rock prior to excavation. However, mechanical rock removal would produce a repeating vibration with a consistent frequency, peak overpressure, and persistent and irritating noise. The vibration frequency tends to be 18 and 45 Hertz, depending on rock formation and structure. These effects could persist for longer periods of time (days to weeks, depending on the site conditions). Thus, there is a potential for increased impacts from vibrations and noise with mechanical rock removal compared to blasting. Blasting produces a higher vibration for a shorter period of time (milliseconds) and frequency can be adjusted through timing of the blast. Therefore, blasting is less impactful to the environment because of the shorter duration and ability to adjust frequencies for each blast.

Blasting may occur in areas where surface or near-surface rock may be encountered in both upland areas and in the trenchline of waterbodies where RFSS species could be present. Mitigation measures regarding blasting are discussed for RFSS bats and cave-obligate species (see Sections 5.5.1, 5.5.2, 5.6.1, and 5.6.2). Stream crossing locations where blasting is required will be confirmed shortly ahead of construction based on site-specific conditions (see currently proposed blasting locations for waterbody crossings in Appendix B). A general Blasting Plan specific to USFS lands is included in the *COM Plan* (Appendix C), and site-specific blasting plans developed by the construction contractor will be submitted to the MNF and GWNF prior to the execution of blasting.

2.3.4 Pipe Stringing, Bending, and Welding

Individual joints of pipe (40 to 80 feet long) will be transported to the construction right-of-way and strung along the trench in a single, continuous line. Individual sections of pipe will be bent, where necessary, to allow for a uniform fit with the contours at the bottom of the trench and horizontal points of inflection. Typically, a track-mounted, hydraulic pipe-bending machine will tailor the shape of the pipe to conform to these contours. After the pipe sections are bent, they will be welded together into long sections and placed on temporary supports. Welding of pipe sections will primarily occur on the right-of-way. There may be some situations where terrain requires that pipe be bent in nearby workspaces and transported to its intended location.

Welding is a crucial phase of pipeline construction because the integrity of the pipeline depends on this process. Each weld must exhibit the same structural integrity with respect to strength and ductility. Welding will be conducted in compliance with 49 Code of Federal Regulations (CFR) 192 and American Petroleum Institute (API) Standard 1104, *Welding of Pipelines and Related Facilities*. Completed welds will be visually and radiographically inspected. Welds that do not meet established specifications will be repaired or removed. Following welding and after inspection, pipe weld joints will be coated with an epoxy coating in accordance with required specifications. Field welds will be coated on the right-of-way immediately adjacent to the ditch or within the ditch at the tie-in location.

The pipeline coating will consist of a two-part epoxy that will be mixed in an upland area. Splash pads, plastic or other material will be placed on the ground in the mixing area to contain potential spills. Coating activities will be conducted in accordance with the *Spill, Prevention, Control, and Countermeasures Plan* (SPCC Plan) prepared for the Project. Dominion girth weld-coatings will be spray or brush applied, depending on the manufacturer’s instructions. Dominion-approved field girth weld-coatings will be limited to 3M Scotchkote 323, SPC SP-2888, SPC SP-3888, Denso Protal 7200, and Denso Protal 7125. Safety data sheets (SDS) for these coatings are available on each manufacturer’s website; the SDS sheets additionally will be appended to the final BE and *COM Plan* for the Project and/or or otherwise provided to the USFS. The coating will be inspected for defects, and repaired, if necessary, prior to lowering the pipe into the trench.

2.3.5 Lowering-In and Backfilling

Prior to lowering-in, the trench will be inspected to confirm it is free of rocks and other debris that could damage the pipe or its protective coating (unless the pipe is rock shielded). Dewatering may be necessary to inspect the bottom of the trench in areas where water has accumulated. If dewatering is required, it will be conducted in accordance with the Plan and Procedures and applicable permits in a manner that will minimize erosion and heavily silt-laden water from flowing into a wetland or waterbody.

The pipe will be lifted from the temporary supports and lowered into the trench using side-boom tractors. Pipe supports, either sandbags or soil, will be sifted in the bottom of the ditch to support the pipe. As necessary, trench breakers (stacked sand bags, Sakrete, or foam) will be installed in the trench around the pipe to prevent the movement of subsurface water along the pipeline. After lowering-in, the pipe will be padded and the trench will be backfilled with native materials using bladed equipment or backhoes. If the excavated material is rocky, the pipeline will be protected with a rock shield or covered with other suitable fill. In appropriate circumstances, excavated rock may be crushed with a rock pulverizer and incorporated into fill or used as gravel to upgrade access roads. Excavated material that is not required for backfill will be removed and disposed of at approved disposal sites. Alternatively, excess material could be stacked along the edge of the temporary workspace for habitat enhancement (e.g., for salamanders).

2.3.6 Hydrostatic Testing

After backfilling the trench, but prior to returning work areas to original contours, each pipeline will be hydrostatically tested in sections to verify that the pipeline is free from leaks and will provide the required margin of safety at operating pressures. Individual sections of pipeline to be tested will be determined by water availability, pipe classification, and terrain conditions. Water for hydrostatic testing will be obtained from surface sources or municipal water sources in accordance with State/Commonwealth regulations and required permits. No water will be withdrawn from sources on either the MNF or GWNF. As practicable, water will be transferred from one test section to another to reduce the amount of water required for testing. No water impoundment structures are proposed to be located on USFS lands.

During hydrostatic testing, internal pressures and durations will be conducted in accordance with 49 CFR 192. If a leak in the pipeline is found during testing, the pipeline section will be dewatered, the leak will be repaired, and the section of pipe will be retested until the required specifications are met.

Once hydrostatic testing is complete, the test water will be discharged in accordance with the Plan and Procedures and applicable permits through an approved discharge structure to remove turbidity or suspended sediments (i.e., dirt left in the pipe during construction). There are no chemicals within the pipe that will present contamination concerns for the discharge of the test water. The pipe will be internally coated at the pipe mill with a material that is not water soluble and will not contaminate the test water. There are no hydrostatic discharge locations within the MNF or GWNF.

2.3.7 Final Tie-In and Commissioning

After hydrostatic testing, the final tie-ins on each pipeline will be completed and commissioning will commence. Commissioning involves activities to verify that equipment is properly installed and working; controls and communications systems are functional; and the pipeline is ready for service.

After hydrostatic testing, the pipeline will first be cleaned and dried utilizing compressed air and dry foam pig(s).[4] The pig(s) will be continuously run through the pipeline between designated launching and receiving points located within the construction corridor until the desired moisture content within the pipeline is achieved. After this, in-line inspection tools (telemetry pigs) will be utilized to detect anomalies within the pipe that may have been introduced during construction. In the event that any anomalies are identified, they will be located and excavated for field verification; then cut out and

---

[4] Pigs are internal pipeline inspection tools.

replaced with pre-tested pipe in accordance with all Project environmental permits and guidelines. Once all anomaly repairs (if any are identified) are addressed, final-tie(s) will be completed and commissioning of the line will begin.

During the commissioning, operational equipment associated with the pipeline (e.g., mainline valves) will be inspected and verified for proper installment and functionally working controls, including communication systems, and the initial start-up of compressor facilities will begin. The line and associated facilities will be slowly purged and loaded with natural gas until brought into operation.

2.3.8 Clean-Up and Restoration

Final cleanup and restoration will be carried out according to the Restoration and Rehabilitation Plan in Section 10.0 of the *COM Plan* for construction activities on USFS property (see Appendix C). Atlantic will continue to work with the USFS on selecting seed mixes for restoration.

2.4 OPERATIONS AND MAINTENANCE

Pursuant to a Construction, Operation, and Maintenance Agreement with Atlantic, DTI will operate and maintain the new ACP interstate pipeline system and all aboveground facilities. Operations and maintenance will take place in accordance with all applicable federal, state/commonwealth and local requirements, including the minimum federal safety standards identified in Transportation of Natural and Other Gas by Pipeline, 49 CFR 192. Within the MNF and GWNF, the permanent easement for the pipeline way will be 53.5 feet wide.

The ACP pipelines will be inspected periodically from the air and on foot, as required by applicable regulatory requirements. These surveillance activities will provide information on possible encroachments and nearby construction activities, erosion, exposed pipe, and other potential concerns that could affect the safety and operation of the system. Pipeline markers and signs will be inspected and maintained or replaced, as necessary, to assure that pipeline locations are clearly identified. Aerial surveys of the pipeline system will be performed in accordance with the requirements of 49 CFR 192. Field personnel will advise the appropriate operations personnel of new construction along or near the pipeline system. Line patrol of highway and railroad crossings will be completed as required by the USDOT. During maintenance activities, if a stream is encountered, the feature will be avoided by going around the feature and accessing the right-of-way from the other side; if it is not possible to go around the feature, a temporary bridge will be used to avoid in-stream impacts.

To maintain accessibility of the permanent right-of-way and accommodate pipeline integrity surveys, vegetation along the permanent right-of-way will be cleared periodically, and as necessary, in accordance with the Plan and Procedures (except in areas crossed by horizontal directional drill, where vegetation maintenance will not be required). The FERC’s Plan and Procedures do not allow routine vegetation maintenance clearing to occur more frequently than every 3 years in wetlands, with the exception of a 10-foot-wide corridor centered over the pipeline, which can be mowed at a frequency necessary to maintain the corridor in an herbaceous state to facilitate periodic corrosion and leak surveys.

Routine vegetation mowing or clearing will not occur during the migratory bird nesting season. In Virginia, clearing for operations activities will occur outside the primary migratory bird nesting season, which runs from March 15 through August 30. In West Virginia, clearing for operations activities will occur outside the primary migratory bird nesting season, which runs from April 1 through August 30.

In non-cultivated uplands, the permanent easement for each pipeline will be maintained for herbaceous or scrub/shrub vegetation: no trees will be allowed to develop in the 53.5-foot-wide right-of-way. In wetlands and riparian areas, the Procedures allow for a 10-foot-wide corridor centered over the pipeline to be permanently maintained in an herbaceous state. Additionally, the Plan and Procedures allow trees with roots that could compromise the integrity of the pipeline coating to be cut and removed from wetlands within 15 feet of the pipeline.

Where necessary and when required, Atlantic will use mechanical mowing or cutting along the permanent right-of-way way for normal vegetation maintenance. Equipment will cross waterbodies at existing crossings, or by timber mats that span the banks.

Atlantic will monitor the permanent right-of-way way for infestations of invasive species that could have been created or exacerbated by the construction activities, and will treat such infestations in consultation with landowners and applicable agencies, including land managing agencies, in accordance with the Project Non-Native Invasive Plant Species Management Plan, as described in the *COM Plan*. Atlantic will consult with the USFS to determine the appropriate methods to control invasive plant species spread, particularly in areas with known occurrences of RFSS.

Operations and maintenance activities, including record keeping, will be performed in accordance with USDOT requirements.

The proposed ACP pipelines will be inspected by qualified personnel from the air (quarterly) and on foot (annually) in accordance with applicable regulations. Pipeline integrity surveys and vegetation maintenance may identify areas along the permanent right-of-way where permanent erosion control devices need to be repaired or additional erosion control devices may be needed. If problem areas are identified, erosion control devices will be repaired or installed, as necessary, and the right-of-way way will be stabilized to prevent future degradation.

During operations, rock barriers, gates, fences, non-drivable berms, logs, or locked gates will be installed at or near pipeline road crossings within forested areas of the ACP on USFS lands; site-specific locations and methods are specified in the *COM Plan*.

2.5 CONSERVATION MEASURES

2.5.1 Conservation Procedures and Mitigation Measures

Atlantic will adhere to the operations and maintenance procedures described in the FERC's Plan and Procedures, subject to modifications approved by FERC and the USFS. Additionally, crossings of federal lands require identification of construction procedures and mitigation measures to be implemented on federally managed lands; for these crossings, Atlantic has prepared a *COM Plan*, which describes these procedures and measures. Consultations with the USFS on the *COM Plan* are ongoing; appropriate conservation measures included in the final version of the *COM Plan* will be incorporated into the final BE for the Project.

Atlantic has developed resource-specific conservation measures specific to activities on the MNF and GWNF. The proposed conservation measures will be implemented during the planning, construction, and operation phases of the Project, as applicable. The conservation measures are organized into the following plans contained within the broader *COM Plan* (Appendix C):

- Timber Removal Plan;
- Fire Prevention and Suppression Plan;
- Blasting Plan;

- Upland Erosion Control Plan (conforms to FERC's Plan and Procedures, Stormwater Pollution Prevention Plan [SWPPP], state guidance manuals, pipeline standards and specifications, and Dominion's Slope Stability Policy and Procedure), ;
- Stream and Wetland Crossing Procedures (based on FERC's Procedures and USFS LRMPs);
- Restoration and Rehabilitation Plan;
- Non-Native Invasive Plant Species Management Plan;
- Spill, Prevention, Control, and Countermeasures Plan (SPCC Plan);
- Contaminated Media Plan;
- Fugitive Dust Control and Mitigation Plan;
- Water Quality Monitoring Plan; and
- Visual Resources Plan.

In addition, the following Project-wide conservation plans and procedures will also be applied during Project planning, construction, and operation on USFS lands, as applicable:

- *Migratory Bird Plan* (Atlantic and Dominion Transmission, Inc. [DTI], 2017a)*;*
- *Protected Snake Conservation Plan (*ACP and DTI*, 2016a*);
- *Karst Terrain Assessment, Construction, Monitoring, and Mitigation Plan (Karst Plan)* (ACP and DTI, 2017b); and
- *West Virginia Myotid Bat Conservation Plan* (anticipated in spring 2017).

Conservation measures relevant to the protection and conservation of specific RFSS and RFSS habitats are detailed in the Sections 5.4 and 5.5.

2.5.2 Planning and Design

Atlantic has consulted and continues to work with agencies to determine how best to avoid or minimize impacts on RFSS and their habitats through optimized routing and design. Atlantic has and will continue to incorporate information from habitat analyses and surveys into the Project design.

2.5.3 Routing

Atlantic has utilized routing as a tool to avoid impacts on discrete habitats and environmental features. Specifically, Atlantic has identified alternative route segments to optimally design and locate the proposed facilities in a manner that minimizes their environmental footprint while adhering to the purpose and need of the Project. Atlantic's route review process consists of an assessment of technical and economic feasibility; constructability; impacts on environmental/natural resources; and coordination with the MNF and GWNF to identify and, where feasible, avoid sensitive habitats or resources on USFS property.

Atlantic has reviewed the route and analyzed the feasibility and potential impacts of alternative routes. Many of the routing decisions made to date have minimized impacts on environmentally sensitive features, cultural resources, or historic areas, and/or have improved safety and constructability. For example, alternative routes have been identified that minimize, shorten, or avoid wetland or waterbody crossings; avoid sensitive lands, such as USFS Roadless Areas; avoid known sensitive habitats; minimize crossings of USFS property; and minimize forest clearing. Additionally, in routing the pipeline and selecting crossing methods for waterbodies, Atlantic minimized, to the extent practicable, the number and lengths of crossings, as well as potential impacts on wildlife, vegetation, and water quality. Examples of route alternatives and variations identified and evaluated to date can be found in the Project Draft Environmental Impact Statement (FERC, 2016), which was filed on December 30, 2016. In addition, two Project reroutes have been adopted in order to avoid or minimize impacts to RFSS, including cow knob salamander and West Virginia northern flying squirrel.

2.5.4 Workspace Configuration

Atlantic has configured construction workspace and ATWS to minimize clearing and reduce impacts on resources, such as high quality wetland habitats. For example, as required by the Procedures, Atlantic has designed the construction corridor to limit clearing in wetlands to a 75-foot-wide corridor, which will minimize impacts on wetland vegetation. Additionally, on USFS lands, ATWS has been positioned 100 feet from the edge of waterbodies where feasible.

2.5.5 Surveys

Species-specific surveys for potential habitat and/or the presence of RFSS have and continue to be conducted within appropriate timing windows for each species. Information gathered from these surveys has been and continues to be used to develop measures for avoiding and minimizing impacts on RFSS and RFSS habitat on USFS property.

3.0 ANALYSIS AREA AND APPROACH

3.1 ANALYSIS AREA

A portion of the Project crosses USFS lands within the MNF and the GWNF in West Virginia and Virginia, respectively (see Figure 1.1-1). The MNF, which is an administrative unit of the Eastern Region (Region 9) of the USFS, comprises approximately 921,000 acres of federal land in West Virginia. The GWNF, which is an administrative unit of the Southern Region (Region 8) of the USFS, comprises over a million acres of federal land in West Virginia and Virginia.

The proposed ACP pipeline route crosses approximately 5.15 miles of USFS lands within the Marlinton Ranger District of the MNF (see Figure 2.1-1) and approximately 15.98 miles within the Warm Springs, North River, and Glenwood-Pedlar Ranger Districts of the GWNF (see Figure 2.1-2). The proposed route does not cross lands designated by the USFS as Roadless Areas or National Wilderness Areas. Recommended Wilderness Study Areas were not found in the Project area of either National Forest.

The Analysis Area for this BE includes the Project area (i.e., the Pipeline right-of-way, access roads, and temporary work spaces) and adjacent habitats within MNF and GWNF lands in which RFSS or their habitats could be directly or indirectly affected by the Project. The Analysis Area varied depending on the species, ranging from a 300-foot-wide corridor (e.g., small mammals), to a 2-mile corridor (e.g., bald eagles). The Analysis Areas for each species is described in the species survey reports (as cited in Sections 5.5 and 5.6). The Analysis Area is determined not only by the direct impacts on species and habitat from the physical project footprint, but by the effects of the action on the environment, which can extend outside the Project area. Sources of disturbance that could potentially influence RFSS or their habitats outside the Project area include ground-disturbing activities, visual disturbance, construction noise, and turbidity. For aquatic habitats, the Analysis Area includes the Hydrologic Unit Code (HUC)12 subwatersheds that could receive downstream or overland flow from the Project construction area (see Section 4.3).

For cumulative effects, the spatial boundary of the analysis for the GWNF is the GWNF Glenwood-Pedlar, Warm Springs and North River Ranger Districts, through which the proposed ACP route passes. For the MNF, the cumulative effects spatial boundary is the MNF Proclamation Boundary according to the National Forest Management Act's species diversity and viability requirements. The temporal boundary for direct and indirect effects on RFSS is 120 years from the beginning of Project implementation, which is the time frame within which effects to forested habitat, the predominant habitat in the Project area, could persist. This temporal boundary is also used for the cumulative effects analysis because the contribution to cumulative effects ends when the direct and indirect effects no longer exist.

3.2 ANALYSIS APPROACH

Information sources for this BE include the following: data gathered through consultation with MNF and GWNF staff; data collected during field surveys; data from desktop sources such as digital data sets obtained from the USFS and other publicly available sources; data from peer-reviewed literature; and data from other Project-specific baseline and impact studies as documented in Atlantic's FERC Application for the ACP (Resource Reports) and the Project BA.

The assessment of potential impacts was conducted by considering the proposed activities associated with the Project relative to the presence of sensitive species and their use of habitat in the Analysis Area. The characteristics of potential impacts on sensitive species, including magnitude or intensity, geographic extent, and duration or frequency, were used to make impact determinations in accordance with USFS standards (FSM 2672.42). The impact determination categories for this study include: *Beneficial impact*; *No Impact*; *May Impact Individuals but is Not Likely to Cause a Trend toward Federal Listing or Loss of Viability*; or *Likely to Result in a Trend to Federal Listing or Loss of Viability*. These impact determination categories are defined in Section 5.1.

The analysis of impacts on species incorporates an assessment of all permanent facilities as well as temporary laydown and construction areas associated with the Project where it crosses the MNF and GWNF.

3.3 SPECIES ASSESSED IN THIS ANALYSIS

The MNF and GWNF maintain, as mandated by FSM 2670.5, a list of RFSS within their jurisdiction (see appendices D and E). The MNF uses the Region 9 RFSS list, and the GWNF uses the Region 8 RFSS list. All RFSS were initially assessed through desktop analysis of known occurrences, habitat preferences, and consultation with MNF and GWNF staff (see Sections 3.3.1 and 3.3.2). Species determined through consultation with USFS staff and/or field assessment to occur or have suitable habitat in the Analysis Area were carried forward for additional analysis in this BE. The additional analysis involved field survey for habitat and/or individuals as recommended by USFS staff or a desktop analysis to determine likely presence/absence, both followed by a potential impact analysis (see Section 5.0). Through this process, it was determined that 14 presence/absence or suitable habitat field surveys were needed (see Sections 5.4 and 5.5).

An Order 1 Soil Survey (soil survey) was carried out in the MNF and GWNF Project areas in 2016 to confirm Natural Resources Conservation Service Soil Survey Geographic Database soil types. The soil survey followed the requirements for soil surveys in the MNF and GWNF, as outlined in the

USFS Special Use Permits #GBR205003, dated April 22, 2015 (MNF) and #GWP433201T, dated March 31, 2015 (GWNF), along with amendment #1 to USFS SUP GWP433202T, dated May 20, 2016.[5]

3.3.1 Species Assessed – Monongahela National Forest

The MNF uses a likelihood of occurrence table to rank RFSS in terms of their likelihood of occurrence in a given area based on MNF knowledge of the species and habitat occurrences. Appendix D includes the MNF RFSS list and likelihood of occurrence table.

In total, there are 136 species on the MNF likelihood of occurrence table that have the potential to occur in the Project area. Of these, 72 species were eliminated from further consideration based on known species ranges occurring outside of the Analysis Area, or because suitable habitat was not identified in the Analysis Area. The remaining 64 species were determined to warrant further analysis due to detection during field surveys, the presence of suitable habitat documented in the Analysis Area, or a lack of sufficient survey data. These species are further discussed in Section 5.5.

3.3.2 Species Assessed – George Washington National Forest

Species in the GWNF were reviewed with a "step down" process to eliminate species from further analysis and focus on those species that may be affected by proposed project activities. Species not eliminated in this process were analyzed in greater detail. The results of this step down analysis process are displayed in the Occurrence Analysis Results (OAR) column of the table in Appendix E.

To complete the analysis, the range of a species was considered first. Species' ranges in the Forest were determined based on correspondence with the GWNF and records from such resources as the Atlas of the Virginia Flora, scientific literature, and the Natural Heritage databases. Many times, range information clearly indicated a species will not occur in the project area due to the restricted geographic distribution of most sensitive species. When the Project area is outside a known species range, that species was eliminated from further consideration by being coded as OAR code "1" in Appendix E. For the remaining species, after the initial consideration of range, a desktop or field survey was conducted to determine if suitable habitat or the species could be present in the project area.

In total, there are 141 species on the GWNF sensitive species list. Of these, 74 were eliminated from additional analysis in this BE based on known ranges occurring outside of the Analysis Area. Of the 67 remaining species, 46 species were eliminated from further consideration because suitable habitat for the species was not found in the Analysis Area. The remaining 21 species were determined to warrant further analysis due to their detection during field surveys; or because suitable habitat is present but field surveys could not be done; or because field surveys were negative, but the species is difficult to detect. These species are further discussed in section 5.6

.

3.4 SURVEY OVERVIEW

For RFSS animal species considered to be potentially present in the Project area and for which USFS staff recommended field survey, species-specific presence/absence and/or habitat field surveys were conducted according to MNF and GWNF survey protocols. MNF staff provided Atlantic with recommendations for surveys on April 11, 2016, and GWNF staff provided Atlantic with recommendations for surveys on April 7, 2016 (appendices F and G). Special Use Permits

---

[5] The USFS Special Use Permits #BGR205003 and #GWP433202T were renewed as #MAR205001 and #GWP433202T, respectively, on April 11, 2016.

#GWP433202T and MAR205001 were issued to Atlantic for surveys on USFS lands in the GWNF and MNF, respectively. Surveys were conducted within suitable timing windows for each species using standard, scientifically robust methods performed by qualified biologists. Survey methods were reviewed and approved by MNF and GWNF biologists prior to survey implementation. For animal species that were not surveyed in the field, the potential presence of the species in the Project area was evaluated through desktop analysis by qualified biologists. Further survey details are provided for RFSS animal species in the MNF and GWNF in Sections 5.4 and 5.5, respectively.

To determine the presence/absence and potential habitat of RFSS plants in the Project area, botanical field surveys were conducted in 2016 between June and September in the MNF (see the botany survey report [Atlantic, 2016r]) and between April and August in the GWNF (see the botany survey report [Atlantic, 2016q]). As requested by USFS staff, all plants and plant communities encountered during the botanical surveys were documented. Survey recommendations provided by the MNF were reviewed and incorporated into the USFS-approved botanical survey methodology, as described in the botanical survey reports. Further survey details are provided for RFSS plant species in the MNF and GWNF in Sections 5.4 and 5.5, respectively.

As of the date of this document, approximately 1.3 miles in the GWNF remains to be surveyed in 2017 for areas that were not accessible in 2015 or 2016. Results will be provided to the GWNF as they become available, and the determination of impacts for each RFSS and their habitats will be updated in the BE accordingly. In addition, if any minor route adjustments are made in the MNF or GWNF, they will be surveyed in coordination with the USFS and the results incorporated into the BE.

4.0 ENVIRONMENTAL BASELINE

4.1 TERRESTRIAL HABITAT

The Analysis Area within the MNF and GWNF lies within the U.S. Environmental Protection Agency Central Appalachians, Ridge and Valley, and Blue Ridge Level III Ecoregions of the United States, which encompass six different Level IV Ecoregions. Table 4.1-1 presents a description of the Level IV Ecoregions crossed by the Project within the Forests.

TABLE 4.1-1

Ecoregions Crossed in the Monongahela and George Washington National Forests

	MNF		GWNF		
Level III/IV Ecoregion	Mileposts [a]	Centerline Length (miles)	Mileposts [a]	Centerline Length (miles)	Topography/Climate
CENTRAL APPALACHIANS					
Forested Hills and Mountains	73.1–73.6	0.76	—	—	This region occupies the highest and most rugged parts of the Central Appalachians Level III Ecoregion. It contains highly dissected hills, mountains, and ridges with steep grades and narrow valleys. Elevations range from 1,800 to 4,600 feet. Mean annual precipitation ranges between 38 to 60 inches. Historical natural vegetation was Appalachian oak forest, northern hardwood forests, mixed mesophytic forests, and scattered northeastern spruce/fir forests.
RIDGE AND VALLEY					

TABLE 4.1-1

Ecoregions Crossed in the Monongahela and George Washington National Forests

Level III/IV Ecoregion	MNF Mileposts [a]	MNF Centerline Length (miles)	GWNF Mileposts [a]	GWNF Centerline Length (miles)	Topography/Climate
Northern Sandstone Ridges	80.5	0.13	93.7–94.3 96.1–96.3 96.5–96.6 96.9–97.4	2.06	This region consists of high, steep, forested ridges with narrow crests. Crestal elevations range from 1,000 to 4,300 feet, and local relief ranges from 500 to 1,500 feet. Compared to the Central Appalachians, this region experiences less severe Winters, warmer Summer temperatures, and lower annual precipitation due to a rain shadow effect. Annual precipitation varies between 36 to 50 inches. Natural vegetation historically included Appalachian oak and oak-hickory-pine forest.
Northern Shale Valleys	80.5–80.7 80.7–80.9 81.2–81.3	0.54	98.25–99.0 99.3–99.6 105.9–106.1 113.2 115.8–116.2 116.4–116.5 116.8–117.0	4.52	This region consists of rolling valleys and low hills. Crestal elevations range from 50 to 500 feet. Compared to the Central Appalachians, this region experiences less severe Winters, warmer Summer temperatures, and lower annual precipitation due to a rain shadow effect. Annual precipitation varies between 36 to 50 inches. Natural vegetation historically included Appalachian oak, oak-hickory-pine, and bottomland forests.
Northern Dissected Ridges and Knobs	81.3–83.9	3.72	83.9–86.9 117.0–120.6 121.1–121.5	8.11	This region consists of broken, dissected, almost hummocky ridges. Crestal elevations range from approximately 800 to 4,150 feet, and local relief varies from about 200 to 1,150 feet. Compared to the Central Appalachians, this region experiences less severe Winters, warmer Summer temperatures, and lower annual precipitation due to a rain shadow effect. Annual precipitation varies between 36 to 50 inches. Natural vegetation historically included Appalachian oak forest, oak-hickory-pine forests, and shale barrens.
BLUE RIDGE					
Northern Sedimentary and Metasedimentary Ridges	—	—	154.0–155.1	1.16	This region is composed of high, steeply sloping ridges and deep, narrow valleys. Crestal elevations vary between approximately 1,300 to 3,500 feet. Annual precipitation ranges between 39 to 49 inches. Soil characteristics include stoniness, steepness, low fertility, and acidity. Natural vegetation was historically Appalachian oak forest.
Northern Igneous Ridges	—	—	158.0–158.1	0.13	This region consists of pronounced ridges separated by high gaps and coves. Elevations range between 1,000 to 3,750 feet. Annual precipitation ranges between 39 to 49 inches. Soil characteristics in the ecoregion include low fertility, acidity, stoniness, and steepness. Natural vegetation was historically Appalachian oak forest.

Source: Woods et al., 1999.

[a] The milepost range is not equivalent to the actual length of the pipeline. Mileposts have been adjusted based on three-dimensional modelling of terrain and the adoption of route alternatives and variations. The mileposts are used as reference points only.

4.1.1 Vegetation Types

Vegetation community types present in the MNF and GWNF Project areas are described below and locations are included in the survey maps in Appendix A.

4.1.1.1 Monongahela National Forest

Monongahela National Forest Property—General Habitats

There are 19 land cover types in the MNF based on GAP data, including nine types of forests as well as wetlands (herbaceous marsh, swamps, and baygalls); floodplain and riparian areas; grasslands (sand prairie, coastal grasslands, and lomas); and cliffs, canyons, and talus, among others. The most prevalent land cover types are mixed deciduous/coniferous forest and woodland (xeric-mesic) at approximately 54 percent of MNF land, followed by mixed deciduous/coniferous forest and woodland (mesic-wet) at approximately 19 percent, deciduous dominated forest and woodland (xeric-mesic) at 15 percent, and conifer dominated forest and woodland (mesic-wet) at approximately 7 percent. The remaining land cover types make up less than 2 percent of the MNF each. While these land cover types do not directly correspond with the Project area upland vegetation community types provided by the analysis below, they provide an overview of the general habitats present on MNF land and context for the impact analysis.

Project Area

Upland vegetation community types in the MNF Analysis Area were delineated in the field based on the protocols provided by the MNF (Atlantic, 2016r), and those vegetation community types are listed below in order of most to least abundant in the Project area (Table 4.1.1-1). A summary of community conditions and characteristic vegetation assemblages observed by the plant survey team is provided in the forest-specific botany report (Atlantic, 2016r). The acreage for each vegetation community in the survey area is provided in Tables 5.2-1 and 5.2-2.

TABLE 4.1.1-1

Estimated Acreage of Plant Communities [a] in the Project Survey Area
Monongahela National Forest

Vegetation Community Type	Acreage in the Project Survey Area [b]
Mixed Oak	83
Mixed Mesophytic/Cove Hardwoods	47
Oak-Pine	36
Mixed Northern Hardwoods	17
Oak-Hickory	8
Pine Plantation	2

Source: ACP MNF Botany Survey (Atlantic, 2016r)

[a] Plant Communities are based on the MNF Land and Resource Management Plan (USFS, 2011).

[b] The Project Survey Area consisted of a 300-foot-wide survey corridor centered on the Project right-of-way.

<u>Mixed Oak Forest</u>

The most dominant community within the Project area is mixed oak forest, which consists of predominantly oak species. A few non-oak species were found within this forest type, but did not constitute a significant portion. Oak species included red oak (*Quercus rubra*), chestnut oak (*Quercus montana*), scarlet oak *(Quercus coccinea*), white oak (*Quercus alba*), and black oak (*Quercus velutina*). The mixed oak forest type was found mostly on ridgetops within the study area.

<u>Mixed Mesophytic/Cove Hardwood Forest</u>

The second most abundant community within the MNF Analysis Area is mixed mesophytic/cove hardwoods forest, which was found mainly on cool ridgetops and damp hillsides with northern-facing aspects in the eastern portion of the Analysis Area. Dominant canopy species found within this forest type included maples (*Acer* spp.), birches (*Betula spp*.), American basswood (*Tilia americana*), and cucumber magnolia (*Magnolia acuminata*).

Oak Pine Forest

Oak-pine forest is close to mixed mesophytic/cove hardwood forest in abundance. Dominant oak species found within this forest type included red oak, chestnut oak, scarlet oak, white oak, and black oak. Dominant pine species included eastern white pine (*Pinus strobus*) and a few shortleaf pine (*P. echinata*).

Mixed Northern Hardwood Forest

Mixed northern hardwood forest was found in the Project area near Gibson Knob and Cloverlick Mountain. Associated tree species included maples, oaks, birches, and black cherry (*Prunus serotina*).

Oak-Hickory Forest

Oak-hickory forest covers a relatively small amount of the Project area. Oak-hickory forest within the MNF consisted of several oak species, including red oak, chestnut oak, scarlet oak, white oak, and black oak. Hickory species identified within the study area included shagbark hickory (*Carya ovata*), mockernut hickory (*C. tomentosa*), pignut hickory (*C. glabra*), and bitternut hickory (*C. cordiformis*). This forest type was found on a southeast slope of Michael Mountain.

Pine Plantation

An area that was specifically planted to pine species is referred to as a pine plantation. Pine plantations are the least abundant plant community in the Project area.

4.1.1.2 George Washington National Forest

George Washington National Forest Property—General Habitat

There are 23 land cover types in the GWNF based on GAP data, including 10 types of forest as well as wetlands (bogs, fens, herbaceous marsh, swamps, and baygalls); floodplain and riparian areas; grasslands (sand prairie, coastal grasslands, and lomas); and cliffs, canyons, and talus, among others. The most prevalent land cover types are deciduous dominated forest and woodland (xeric-mesic) at approximately 77 percent of GWNF land, followed by mixed deciduous/coniferous forest and woodland (xeric-mesic) at approximately 10 percent, and mixed deciduous/coniferous forest and woodland (mesic-wet) at 8 percent. The remaining land cover types make up less than 2 percent of the GWNF each. While these land cover types do not directly correspond with the Project area upland vegetation community types provided by the analysis below, they provide an overview of the general habitats present on MNF land and context for the impact analysis.

Project Area

Upland vegetation community types in the GWNF Project area were described based on the Natural Communities of Virginia: Ecological Groups and Community Types classification system from the Virginia Department of Conservation and Recreation's Division of Natural Heritage (Fleming and Patterson, 2013), in accordance with the survey protocols approved by the GWNF (Atlantic, 2016q) (wetlands and waterbodies are discussed in Section 4.3). During field investigations, six terrestrial ecological classes were observed within the GWNF, including: 1) Low-Elevation Dry and Dry Mesic Forests and Woodlands; 2) Low-Elevation Mesic Forests; 3) Low-Elevation Outcrops and Barrens; 4) High Elevation Mountain Communities; 5) Alluvial Floodplain Communities; and 6) Non-Alluvial Wetlands of the Mountains (see descriptions in Atlantic, 2016q). In addition, a number of modified successional habitats were identified based on the National Land Cover Database (Multi-Resolution Land Characteristics Consortium, 2015). Landscapes falling into this habitat category have been subjected to some level of human-induced disturbance related to recent or ongoing land use practices such as agriculture, silviculture development, etc., and lack the natural characteristics necessary for inclusion in the natural community classification.

Upon field identification, each ecological class was further classified to determine the ecological community group, a more specific designation that is "…based on combinations of topographic, edaphic, physiognomic, and gross floristic similarities" (Fleming et al., 2016). The 11 resulting ecological groups (including one modified successional habitat) are described in the botany report (Atlantic, 2016q), and listed below in order of most to least abundant in the Analysis Area (Table 4.1.1-2).

TABLE 4.1.1-2

Estimated Acreage of Ecological Community Groups [a] in the Project Analysis Area
George Washington National Forest

Ecological Community Group	Acreage in the Project Survey Area [b,c]
Acidic Oak Hickory Forest	370
Pine-Oak/Heath Woodlands	41
Montane Mixed Oak and Oak Hickory Forest	40
Oak/Heath Forest	28
Modified Successional Terrestrial Forest [d]	17
Piedmont Mountain Small Stream Alluvial Forest	10
Acidic Cove Forest	8
Low-Elevation Boulderfield Forest and Woodlands	7
Dry-Mesic Calcareous Forest	5
Rich Cove and Slope Forest	3
Piedmont Mountain Floodplain Forest	1

Source: ACP GWNF Botany Survey (Atlantic, 2016q)

[a] Plant Communities based on the Natural Communities of Virginia Classification of Ecological Community Groups classification system from the Virginia Department of Conservation and Recreation's Division of Natural Heritage (Atlantic, 2016q).

[b] The Project Survey Area consisted of a 300-foot-wide survey corridor centered on the Project right-of-way.

[c] Approximately 80 percent of the GWNF Project area has been surveyed in 2016. The remaining 20 percent of the Project area will be surveyed in 2017; updates to impacted habitat acreages will be included in the final BE.

[d] Modified successional habitat lacking the attributes of the natural communities classifications described by Fleming et al, 2016.

Atlantic coordinated the delineation of wetlands and waterbodies with the USACE prior to initiating field surveys. Atlantic and the USACE agreed that a preliminary jurisdictional determination (PJD) would be used to determine the wetlands and or waterbodies along the route that would require Section 404, Clean Water Act permits. Under a PJD, Atlantic would assume jurisdiction of wetlands and waterbodies without conducting a nexus determination on each and every feature.

4.2 KARST

Karst is a landscape type or terrain characterized by the presence of sinkholes, caverns, and a highly irregular, pinnacled bedrock surface. Karst terrain develops from the dissolution of soluble bedrock, such as limestone, dolomite, marble, or gypsum. Karst terrain often has unique hydrology and highly productive aquifers, which can be more susceptible to contamination. Landscapes underlain by soluble bedrock have the potential to develop karst terrain.

Sinkholes, which are a major feature of karst terrain, fall into two broad categories: vault-collapse sinkholes and cover-collapse sinkholes. Vault-collapse sinkholes are characterized by the sudden catastrophic failure of a subterranean cavern vault (i.e., a roof), causing the rapid displacement of surface materials into the resulting void. Vault-collapse sinkholes are present, but rare, in the areas crossed by the Projects. The more common sinkhole type, a cover-collapse sinkhole, forms from the transport of soil materials from the surface into the bedrock through pre-existing voids or conduits. The resulting voids from this process are filled with the surrounding soil materials (a process called piping), and over time, form a noticeable depression on the land surface. This natural process can be exacerbated by impacts such as:

- an increase or redirection of overland or subsurface hydrology (i.e., surficial grading), which could accelerate the transportation of soil materials;
- removal of vegetative cover and topsoil (e.g., stripping or grubbing), which can reduce the cohesive strength of soils; and
- sudden changes in the elevation of the water table (e.g., due to drought, over-pumping of wells, or quarry dewatering), which removes the natural buoyancy of the water supporting a soil plug in a bedrock channel.

[redacted] The remaining areas crossed by the Projects were determined not to have the geologic conditions necessary for significant karst formation (Atlantic and DTI, 2017b).

Atlantic has conducted studies to identify sinkholes and other karst features along the proposed pipeline routes between the mileposted areas discussed above. The study included a desktop assessment to identify known karst features along and near the proposed pipeline routes and a field survey where access has been granted to locate and delineate the following:

- surface karst features (e.g., sinkholes, karst related subsidence, cave entrances, closed depressions, and sinking and losing streams) with an emphasis on features with a direct connection to the phreatic zone of the karst (i.e., groundwater), such as "open throat" sinkholes, karst windows, cave entrances, abandoned wells, and sinking streams; and
- areas that could affect the integrity of the pipeline, such as actively forming cover collapse sinks, areas of soil subsidence, or caves which have passages that extend below the proposed right-of-way at elevations less than 15 feet below the surface.

The results of the study were used to delineate zones of karst terrain, subsidence, and drainage along the proposed pipeline routes. As individual karst features or zones of karst terrain were identified, each was evaluated by Atlantic. Where warranted, minor route adjustments have been or will be made to avoid these features.

Currently, field surveys have identified sinks, dissolution features, throats, stream collapses, caves, and spring within 300 feet of the proposed pipeline right-of-way in Virginia and West Virginia (Atlantic and DTI, 2017b). These karst features could indicate the presence of subterranean vaults or caves that could provide habitat for certain RFSS, such as subterranean (cave) obligates. In addition to the desktop assessment and field survey, Atlantic and DTI have prepared and will implement a *Karst Plan* (Atlantic and DTI, 2017b), which identifies measures for avoiding, minimizing, and mitigating impacts on karst, including impacts on the subterranean karst environment (see Section 2.5.1).

4.3 AQUATIC HABITAT

Atlantic was authorized to perform site surveys of wetlands and waterbodies on USFS lands within the proposed pipeline and access road construction corridor (Analysis Area) on the MNF and the

GWNF. The MNF and GWNF are both located in the HUC8 Upper James Sub-basin. In the MNF, the proposed pipeline crosses three HUC12 subwatersheds and has the potential to affect streams in an additional seven HUC12 subwatersheds based on modeling of flow paths in the Soil Erosion and Sedimentation Modeling Report (Erosion and Sedimentation Report) (Appendix H) (Table 4.3-1). In the GWNF, the proposed pipeline crosses nine HUC12 subwatersheds and has the potential to affect streams in an additional eight HUC12 subwatersheds.

TABLE 4.3-1

Subwatersheds in the Analysis Area for Wetlands and Waterbodies in the Monongahela and George Washington National Forests

County	State	Watershed ID (HUC12)	Watershed Name
Pocahontas [a]	WV	50500030202	Headwaters Knapp Creek
Pocahontas [a]	WV	50500030401	Sitlington Creek
Pocahontas [a]	WV	50500030402	Clover Creek-Greenbrier River
Pocahontas	WV	50500070101	Old Field Fork
Pocahontas	WV	50500030404	Thorny Creek-Greenbrier River
Pocahontas, Randolph	WV	50500070102	Dry Fork-Elk River
Augusta [b]	VA	20700050103	Jennings Branch
Augusta [b]	VA	20700050105	Moffett Creek
Augusta [b]	VA	20700050703	Inch Branch-Back Creek
Bath, Highland	VA	20802010102	Bolar Run-Jackson River
Bath	VA	20802010103	Warm Springs Run-Jackson River
Bath, Highland [b]	VA	20802010202	Jim Dave Run-Back Creek
Bath [b]	VA	20802010701	Scotchtown Draft-Cowpasture River
Bath [b]	VA	20802010702	Dry Run
Bath [b]	VA	20802010704	Lick Run-Stuart Run
Augusta [b]	VA	20802020101	Chair Draft-Calfpasture River
Augusta	VA	20802020102	Ramseys Draft
Augusta	VA	20802020103	Holloway Draft-Calfpasture River
Augusta, Bath, Rockbridge [b]	VA	20802020106	Cabin Creek-Mill Creek
Augusta	VA	20700050102	Buffalo Branch-Middle River
Augusta	VA	20802020104	Hamilton Branch
Augusta, Rockbridge	VA	20802020402	Upper South River
Randolph, Webster	WV	50500070103	Abb Run-Elk River
Randolph	WV	50200010101	Ralston Run-Tygart Valley River
Randolph	WV	50200010102	Elkwater Fork-Tygart Valley River
Randolph	WV	50200010104	Becky Creek-Tygart Valley River
Augusta	VA	20700050702	Canada Run-South River
Nelson	VA	20802030902	South Fork Rockfish River

[a] HUC12 subwatersheds directly crossed by the proposed pipeline on MNF property.
[b] HUC12 subwatersheds directly crossed by the proposed pipeline on GWNF property.

Analysis of wetlands and waterbodies was facilitated by USFS recommendations and specific authorizations under Special Use Permits issued by each forest. To comply with the requirements of the Special Use Permits, Atlantic's ecologists utilized the *U.S. Army Corps of Engineers 1987 Wetlands Delineation Manual* (1987 Manual) (U.S. Army Corps of Engineers [USACE], 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)* (USACE, 2010), the *USACE Regulatory Guidance Letter regarding Ordinary High Water Mark Identification* (USACE, 2005), and other applicable USACE guidance documents in completing the field investigations. If any minor route adjustments are made, they will be surveyed in coordination with the USFS and the results incorporated into the BE.

4.3.1 Wetlands

Based on the National Wetland Inventory database, approximately 5,817 acres of MNF land and 4,359 acres of GWNF lands are wetlands, including riverine wetland types. Based on the estimated acreage of the two National Forests, wetlands constitute approximately 0.63 and 0.24 percent of the MNF and GWNF, respectively.

The analysis of identified wetlands in the Project area utilized methods described in the 1987 Manual, along with the E*astern Mountains and Piedmont Regional Supplement* to the manual. Wetland boundaries were delineated using the routine onsite determination method described in the Regional Supplements and utilizing *the National Wetland Plant List: 2014* (Lichvar et al., 2012; Federal Register, 2012) for determining wetland plant indicator status; and the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979) for classifying wetlands. In accordance with the 1987 Manual, three criteria or parameters were considered during wetland delineations: the presence and predominance of hydrophytic vegetation; indications of wetland hydrology; and the presence of hydric soils under normal circumstances (i.e., where naturally problematic conditions or disturbances are absent).

The Cowardin Classification was used to classify wetland habitats. This classification divides wetlands into five system types, including: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. These represent the five major landscape settings. The classification further divides wetlands systems into classes. Wetlands within the Palustrine system, which occur in the MNF and GWNF Analysis Area, commonly fall within the following three classes:

- <u>Palustrine System Emergent Wetland Class (PEM):</u> A PEM wetland is defined as a non-tidal wetland characterized by erect, rooted, hydrophytic herbaceous species. These wetland habitats are often dominated by perennial plants, where the vegetation is present for the majority of the growing season (Cowardin et al., 1979).

- <u>Palustrine System Forested Wetland Class (PFO):</u> A PFO wetland is defined as a non-tidal wetland characterized by dominant woody vegetation that is greater than 20 feet tall, with an understory of small trees and shrubs, as well as an herbaceous layer (Cowardin et al., 1979).

- <u>Palustrine System Scrub-Shrub Wetland Class (PSS):</u> A PSS wetland is defined as a non-tidal wetland consisting of woody vegetation that is less than 20 feet tall, including shrubs, young trees, and stunted trees or shrubs (Cowardin et al., 1979).

During survey, each delineated wetland was assigned a Cowardin class. For wetland complexes, or wetlands that are comprised of more than one wetland plant community, observations were recorded to document each community. Unique wetland IDs and separate polygons were established based on the wetland community present within the complex. Wetlands identified during the field survey included PEM, PFO, and PSS types.

The field delineation survey on USFS lands identified 18 wetlands in the Analysis Area of the MNF, and 11 wetlands in the Analysis Area of the GWNF. A list of the numbers of wetlands and waterbodies identified during survey is provided as Table 4.3.2-1 (see Section 4.3.2 for a discussion of waterbodies). This table categorizes wetlands by Cowardin classification and waterbodies by flow regime.

TABLE 4.3.2-1

Wetland and Waterbody Inventory Within the Monongahela and George Washington National Forests Project Areas [a]

Wetland Cowardin Classification	MNF	GWNF
Palustrine Emergent	14	3
Palustrine Scrub-shrub	0	0
Palustrine Forested	4	8
Waterbody Flow Regime	MNF	GWNF
Ephemeral	4	5
Intermittent	21	16
Perennial	5	16

[a] Includes wetlands and waterbodies crossed by both the proposed pipeline and access roads: most access roads are existing with no work planned outside of the existing road prism except for an existing trail to be upgraded to an access road in the GWNF (see Table 2.1-2 and Appendix B).

4.3.2 Waterbodies

Waterbodies documented during field survey were categorized as linear or flowing waterbodies, such as streams and rivers, and non-flowing open waterbodies, such as ponds and lakes. Linear or flowing waterbodies were identified as landscape features with a channel that include a bed and a bank in a concave landscape position where water flow has resulted in a feature that possesses an ordinary high water mark. Based on evidence of flow regime at the time of survey, linear waterbodies were assigned a flow regime, according to definitions in the USACE's Nationwide Permit Program (77 Federal Register [FR] 10184; 77 FR 16021; and 77 FR 58532). Non-flowing, open waterbody features were assigned a Cowardin hydrology regime based on observations recorded at the time of survey.

Water regimes for each delineated waterbody were defined by flow characteristics and duration as follows:

- Perennial Stream: A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

- Intermittent Stream: An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow.

- Ephemeral Stream: An ephemeral stream has flowing water during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.

The field delineation survey on USFS lands identified 30 waterbodies in the Analysis Area of the MNF, and 37 waterbodies in the Analysis Area of the GWNF. A list of the waterbodies by flow regime that were identified during survey is provided as Table 4.3.2-1 (see Table B-1 in Appendix B for details). Of the waterbodies identified in the MNF Analysis Area, two will be affected by Project activities (i.e., pipeline waterbody crossings) (see Section 5.4.2.1 for a discussion of impacts). Of the waterbodies in the GWNF Analysis Area, 30 will be affected by Project activities (i.e., by pipeline waterbody crossings and an access road improvement) (see Section 5.4.2.2 for a discussion of impacts).

The two waterbodies that would be affected by Project activities in the MNF were described as being high quality streams based on attributes assessed during field surveys (see Table B-2 in Appendix B). The riparian areas consisted of a diverse assemblage of overstory and understory species with an average tree diameter at breast height (dbh) of 12.0 inches. Of the 30 waterbodies that would be affected by Project activities in the GWNF, 16 were described as being high quality streams and 14 as moderate quality streams during field surveys. The riparian areas generally consisted of a diverse assemblage of overstory and understory species with an average tree dbh ranging between 6.0 and 22.0 inches. A description of the streambed substrates, bank stability, and other attributes for affected waterbodies in both the MNF and GWNF are included in Table B-2 in Appendix B.

5.0 ANALYSIS AND REVIEW

5.1 OVERVIEW OF EFFECTS

Based on the proposed Project activities and conservation measures discussed in Section 2 of this BE, construction, operation, and maintenance of the ACP will involve several activities that have the potential to affect sensitive species, including:

- construction of the pipeline along the proposed AP-1 mainline route;
- truck traffic related to equipment and supply delivery during construction and operations;
- construction of new access roads; and
- operation and maintenance of the pipeline.

The primary potential impact mechanisms from these activities include aquatic and terrestrial habitat loss and degradation; generation of terrestrial noise and vibration; terrestrial vehicle strike; introduction of exotic and invasive plant species; and water quality impacts potentially resulting from in-water work associated with stream crossings. These activities could have the following types of direct and indirect effects on sensitive species:

- direct injury or mortality – the loss of a sensitive species (either an individual or a population) due to physical injuries, extreme stress, or death;

- indirect effects from disturbance or displacement – changes in habitat use or life history pattern (individual or population) due to disturbance from increased noise, vibration, lighting, human activity, visual disturbance, or transportation activity; increased competition for resources or habitat due to displacement of individuals from affected areas into the territory or habitat of other animals, or due to the spread of non-native invasive weeds; or other indirect effects that cause mortality, decreased fitness, or reduced breeding and recruitment in the future population; and

- direct or indirect effects on habitats for sensitive species – physical disturbances that result in alterations in the amount or quality of a habitat, such as the spread of non-native invasive weeds; indirect habitat loss by preventing an animal from accessing an optimal habitat (e.g., breeding, forage, or refuge habitat), by physically preventing use of a habitat or by causing an animal to avoid a habitat, either temporarily or long-term.

Any of the sensitive species with individuals, populations, or habitat that overlap with or occur in the Analysis Area could be subject to one or more of the above impacts from the Project. Implementation of the management plans, procedures, and conservation measures described in this BE, however, will reduce or avoid the likelihood that impacts will occur and reduce the magnitude and significance of impacts that do occur. Examples of sources that could potentially influence sensitive species or suitable habitat in the Analysis Area include ground disturbance, visual disturbance, construction noise, and water turbidity.

Construction and operation of the Project could result in short- and long-term impacts on certain sensitive species and their existing habitats in the Project area. The extent and duration of impacts will vary depending on the species present in each affected habitat type and individual life histories of these species. Construction activities may displace certain sensitive species from within and areas adjacent to the right-of-way, but the impact is expected to be short-term and limited to the period of construction. After construction is complete, Atlantic will restore the right-of-way as near as practicable to preconstruction contours and conditions in accordance with the Plan and Procedures and the other plans developed for the Project. New permanent access roads will have a long-term effect on habitat loss and species displacement.

Clearing and grading will occur within the pipeline construction corridor and associated ATWS, associated facilities, and for access roads. Access roads are estimated at a 30-foot-wide road width. The standard construction right-of-way will vary in width from 75 to 125 feet, depending on land type, with an additional 25 feet of workspace required in some areas for topsoil segregation. Following construction, a 53.5-foot-wide permanent right-of-way will be maintained within the MNF and GWNF for operation of the pipeline, along with a 75-foot-wide easement. After construction, the permanent right-of-way will be maintained, which will convert forested land within the right-of-way into meadow, scrub-shrub, and forest edge habitat. This could have a potential impact on species that rely on forested habitat. Outside the permanent easement, the remainder of the construction corridor and associated workspace will be allowed to revert to preconstruction uses and cover types.

The visual effects of construction activities within the Analysis Areas are variable due to differing landscapes and existing land uses. In general, visual disturbance (i.e., increased activity, including vehicles/equipment and workers "on-foot," or artificial lighting) has the potential to temporarily impact some species in the Analysis Area during construction. Some species, such as aquatic or ground dwelling species, however, have a much narrower visual window to perceive disturbance (e.g., salamanders, isopods, mussels, fishes, and other aquatic species).

Noise from heavy equipment is expected to increase terrestrial noise locally above ambient and background sound levels for short periods of time spread out over wide areas. The ambient sound level is the total of all sound sources excluding anthropogenic sources. The background sound level is a composite of sound from all sources including anthropogenic sources. The operation of construction equipment, such as excavators, generally runs continuously at relatively constant power and speeds. Noise from blasting is typically infrequent and of short duration, and generally occurs below the ground level, where directivity occurs, thereby lessening the impact. For each area determined to require blasting, a blasting plan will be implemented (see Section 2.3.3). With the addition of noise reduction factors including vegetation, topography, and atmospheric conditions, the extent of the noise from the Projects is expected to attenuate to background sound levels within 0.25 mile of the Project area.

In-water activities may cause a temporary increase in turbidity. Atlantic anticipates that in-water work activities will not exceed State or Commonwealth water quality standards and will comply with all federal and state/commonwealth permit conditions. The aquatic zone of the Project area is established by the maximum extent that sediment may travel or re-suspend into the water column as a result of in-water activities, and is variable based on the flow within the waterbody.

The sections below describe how each of the RFSS with potential to occur in the Analysis Area could be exposed to Project activities and their anticipated response from potential exposure. The likely effects of impacts, and avoidance and mitigation measures to be applied by Atlantic are also discussed and considered in determining the likelihood, magnitude, and significance of potential impacts on RFSS.

Impact determinations are provided for each species in accordance with USFS guidance. There are four potential impact determinations (presented here in decreasing magnitude):

- *Likely to Result in a Trend to Federal Listing or Loss of Viability*: This determination applies if any adverse effect to sensitive species at the sub-population or population level may occur as a direct or indirect result of the Project or its interrelated or interdependent actions and the effect is not discountable, insignificant, or beneficial.

- *May Impact Individuals but is not likely to Cause a Trend toward Federal Listing or Loss of Viability*: This determination applies if effects on sensitive species are expected to be discountable or insignificant at the population level. Impacts to individuals may occur, but only to a degree that would not affect the future viability of the species or result in a downward population trend. Insignificant effects relate to the size of the impact and should never reach the scale where a population or subpopulation is adversely affected. Discountable effects are those extremely unlikely to occur. Based on best judgment, an observer would not be able to meaningfully measure, detect, or evaluate insignificant effects; or expect discountable effects to occur.

- *No Impact*: This determination applies if the Project and its interrelated and interdependent actions will not affect sensitive species.

- *Beneficial Impact*: This determination applies if the Project will result in contemporaneous positive effects without any adverse effects to the species.

As of the date of this document, all of the Project area in the MNF and 80 percent of the Project area in the GWNF have been surveyed. The remaining survey area in the GWNF, extending for approximately 1.3 miles between MP 96 to 97.5, is scheduled to be surveyed in 2017. Data from this survey will be incorporated into the BE once it becomes available, and the determination of impacts for each species and habitat will be updated accordingly.

5.2 TERRESTRIAL HABITAT IMPACTS

5.2.1 Monongahela National Forest

Six upland plant community types were documented in the MNF Project area during 2016 field surveys (see Table 5.2.1-1 and Atlantic, 2016r) (wetland and aquatic impacts are provided in Section 5.4). A portion of the Project area remains to be surveyed in 2017 due to route modifications. As such, plant community impacted acreages may not exactly match the Project's overall impacted acreages, including new permanent access roads (Tables 2.1-1 and 2.1-2). Results will be provided to the MNF as they become available, and appropriate avoidance, minimization, and/or conservation measures will be implemented.

The Project will temporarily affect upland habitat as a result of the temporary construction right-of-way, ATWS, a new temporary access road, and construction yards; and permanently affect upland habitat within the MNF as a result of the permanent pipeline right-of-way and one new permanent access road (see Table 5.2.1-1). Mixed oak forest will have the largest combined temporary and permanent impacts at 36.70 acres, followed by mixed mesophytic/cove hardwood forests and oak-pine forests at 17.33 and 15.98 acres, respectively. Each of these upland plant community types found in the survey area adjacent to the Project workspace will persist following construction (see survey acreages in Table 4.1.1-1).

Botanical surveys conducted during the summer of 2016 identified mid-to-late, and late successional mixed mesophytic/cove forest in the Project right-of-way from MP 73.2 to 73.4, 82.6 to 82.7, and 83.0 to 83.8. The segment at MP 73.4 was identified as old growth in timber stand data provided by the MNF that cited a 1995 Environmental Assessment; however, the 2016 botanical surveys documented it as late successional. In addition, the MNF LRMP notes that old growth has only been identified in Management Prescription Areas 8.2, 8.3, and 8.4, which are not crossed by the Project (USFS, 2011). Based on the botanical surveys, a total of approximately 7.91 acres of mid-late and late successional mixed mesophytic/cove forest would be permanently impacted by the permanent right-of-way, while 9.42 acres would be cleared temporarily for construction and allowed to revert to preconstruction conditions following Project completion. However, abundant suitable habitat will remain in adjacent areas. Preconstruction timber surveys will also document old growth trees to help further identify old growth stands that will be impacted by construction activities. This information will be shared with the MNF prior to tree removal.

Most Project access roads will use existing USFS roads for access to the pipeline right-of-way. No impacts from the existing access roads are anticipated. Typical improvements will involve adding gravel and grading within the existing road prism and trimming of overhead vegetation. As stated above and in Section 2.1.1.4 of the *COM Plan*, Atlantic will provide the USFS with the proposed design details for access road construction and improvements after civil surveys have been completed.

TABLE 5.2.1-1

Estimated Project Impacts to Plant Communities [a] in the Monongahela National Forest (acres) [b]

Vegetation Community Type	New Permanent Access Roads [c]	Permanent Right-of-Way	Total Permanent Impacts [d]	Total Temporary Impacts [e]	Total Temporary and Permanent Impacts
Mixed Oak	TBD	14.66	**14.66**	**22.04**	**36.70**
Mixed Mesophytic/ Cove Hardwoods	TBD	7.91	**7.91**	**9.42**	**17.33**
Oak-Pine	TBD	6.45	**6.45**	**9.53**	**15.98**
Mixed Northern Hardwoods	TBD	2.28	**2.28**	**4.23**	**6.51**
Oak-Hickory	TBD	1.43	**1.43**	**1.87**	**3.30**
Pine Plantation	TBD	0.38	**0.38**	**0.66**	**1.04**
Total:	TBD	33.07	**33.13**	**47.00**	**80.13**

Source: ACP Botany Survey (Atlantic, 2016r)

[a] Plant Communities are based on the MNF Land and Resource Management Plan (USFS, 2006).

[b] The acreages in this table have been rounded for presentation purposes. As a result, the totals may not reflect the exact sum of the addends in all cases.

[c] To be determined: the plant community type affected by the one new permanent access road is unknown at this time: survey will be completed in 2017, and the results incorporated into the final BE.

[d] Total Permanent impacts do not include existing access road acreages.

[e] Temporary impacts includes ATWS, construction yards (CY), temporary construction right-of-way, and one new temporary access road.

5.2.2 George Washington National Forest

Fifteen upland ecological community groups were documented in the GWNF Project area during 2016 field surveys (see Table 5.2.2-1 and Atlantic, 2016q) (wetland and aquatic impacts are provided in Section 5.4). Approximately 20 percent of the Project area remains to be surveyed in 2017 due to lack of access and route modifications. As such, plant community impacted acreages may not exactly match the Project's overall impacted acreages, including new permanent access roads (Tables 2.1-1 and 2.1-2).

Results will be provided in the final BE, and appropriate avoidance, minimization, and/or conservation measures will be implemented.

TABLE 5.2.2-1

Estimated Project Impacts to Ecological Community Groups [a] in the George Washington National Forest (acres) [b,c]

Ecological Community Group	New Permanent Access Roads	Permanent Right-of-Way	Total Permanent Impacts [d]	Total Temporary Impacts [e]	Total Temporary and Permanent Impacts
Acidic Oak Hickory Forest	0.25	67.00	**67.25**	**97.68**	**164.93**
Pine-Oak/Heath Woodlands	0	7.62	**7.62**	**10.87**	**18.48**
Montane Mixed Oak and Oak Hickory Forest	0	7.32	**7.32**	**7.97**	**15.29**
Oak/Heath Forest	0	5.12	**5.12**	**7.63**	**12.76**
Modified Successional Terrestrial Forest	0.08	3.61	**3.69**	**5.18**	**8.87**
Piedmont Mountain Small Stream Alluvial Forest	0.01	1.96	**1.97**	**2.67**	**4.64**
Acidic Cove Forest	0	1.42	**1.42**	**2.30**	**3.72**
Dry-Mesic Calcareous Forests	0	1.29	**1.29**	**1.23**	**2.53**
Low-Elevation Boulderfield Forest and Woodlands	0	1.57	**1.57**	**1.45**	**3.03**
Rich Cove and Slope Forest	0	0.54	**0.54**	**1.19**	**1.74**
Piedmont Mountain Floodplain Forest	0	0.20	**0.20**	**0.28**	**0.48**
Modified Successional Terrestrial Herbaceous Vegetation	0.03	0.20	**0.23**	**0.22**	**0.45**
Northern Red Oak Forests	0	0.03	**0.03**	**0.27**	**0.30**
Montane Woodland Seeps	0	0.02	**0.02**	**0.08**	**0.10**
Total:	0.37	97.90	**98.27**	**139.02**	**237.32**

Source: ACP Botany Survey (Atlantic, 2016q)

[a] Plant Communities based on the Natural Communities of Virginia Classification of Ecological Community Groups classification system from the Virginia Department of Conservation and Recreation's Division of Natural Heritage.

[b] Approximately 80 percent of the GWNF Project area has been surveyed in 2016. The remaining 20 percent of the Project area will be surveyed in 2017. Therefore, acreages will not match up to overall project impacts for GWNF at this time. Updates to impacted habitat acreages will be included in the final BE.

[c] The acreages in this table have been rounded for presentation purposes. As a result, the totals may not reflect the exact sum of the addends in all cases.

[d] Total Permanent impacts do not include existing access road acreages.

[e] Temporary impacts includes ATWS, construction yards, temporary construction right-of-way, and temporary access roads.

The Project will temporarily affect upland habitat in the GWNF as a result of the temporary construction right-of-way, ATWS, construction yards, and a new temporary access road, and permanently affect upland habitat as a result of the permanent pipeline right-of-way and new permanent access roads (see Table 5.2.2-1). Acidic oak hickory forest will have the largest combined temporary and permanent impacts at 164.93 acres, followed by pine-oak/heath woodlands, montane mixed oak and oak hickory forest, and oak/heath forest at 18.48, 15.29, and 12.76 acres, respectively. Each of these upland plant community types found in the survey area adjacent to the Project workspace would persist following construction (see survey acreages in Table 4.1.1-2).

No old growth forest is known to occur in the Project area based on a review of the GWNF Management Plan and Region 8 Guidelines for GWNF South Half GIS data (VHB, 2017). However, areas that are considered by the GWNF as suitable areas for management as possible old growth or future old growth are present in the Project area at MP 93.7 through 94.0 and MP 116.7 through 119.25. The GWNF preconstruction timber surveys will also document old growth trees to help further identify if old growth stands occur in areas to be impacted by construction activities. This information will be shared with the GWNF prior to tree removal.

Most Project access roads will use existing USFS roads for access to the pipeline right-of-way. No impacts from use of the existing access roads are anticipated. Typical improvements will involve adding gravel and grading within the existing road prism and trimming of overhead vegetation. As stated above and in Section 2.1.1.4 of the *COM Plan*, Atlantic will provide the USFS with the proposed design details for access road construction and improvements after civil surveys have been completed.

5.3 KARST

No caves were found in the Project area on MNF lands during the 2016 karst field survey. Two sinkholes were found near [redacted] on the centerline and in the construction right-of-way (adjacent to a third sinkhole off MNF property and outside of the Project area). Sinkholes are a major feature of karst terrain, and can provide surface drainage into the subsurface environment. However, the sinkholes near [redacted] are described as senescent, mature sinkholes that lack throats or other openings, exposed bedrock, and tension cracks, and have no evidence of soil raveling. In addition, no throats or caves were found within 300 feet of these sinkholes. Therefore, there is no evidence indicating the presence of cave habitat suitable for cave-obligate RFSS within the Project area.

No caves were found in the Project area on GWNF property during the 2016 karst field survey. The closest karst feature to the Project area was a cave found during field surveys outside of the GWNF located approximately [redacted]t from the Project centerline at [redacted] This cave occurs in an area referred to as Poplar Hollow Karst, which is an area of concern to the USFS (FERC, 2016). Another segment of the pipeline near Brushy Creek between [redacted] is also of concern to the USFS as having karst terrain. Karst features were found in this area; however, they occurred in the Project area outside of GWNF property. Although no karst features were found in the Project area on GWNF property, the extent of potential subterranean underground features is not known, and connectivity of these subterranean systems can be extensive. Therefore, while caves are not likely to be present based on field surveys, the potential exists for caves to be present and affected if a subterranean system extends into the Project area at [redacted]

5.4 AQUATIC HABITAT IMPACTS

Aquatic habitat could be affected as a result of pipeline waterbody crossings, new access road waterbody crossings (from upgrading an existing trail in the GWNF), and aquatic habitat will be affected as a result of pipeline waterbody crossings, new access road waterbody crossings, and downstream or overland flow from the construction area.. The Analysis Area for aquatic habitat impacts therefore encompasses both the portions of aquatic habitats that will be crossed by the Project, as well as the potential aquatic habitat in the subwatersheds that could receive downstream or overland flow from the Project construction area.

5.4.1 Wetlands

Wetland delineations were carried out in the MNF and GWNF in 2016. Wetlands in both the MNF and GWNF will be crossed by the temporary construction right-of-way and permanent right-of-way. The delineated wetlands crossed by the proposed route are shown in Appendix A. Atlantic and DTI have coordinated with the USACE and will seek a PJD, assuming jurisdiction, for the wetlands and waterbodies identified during field surveys. Wetland crossings by the pipeline have been avoided to the extent feasible, and no new access roads will be located in wetlands.

Temporary construction impacts on wetlands will include temporary vegetation removal and ground disturbance from vegetation clearing, pipeline installation (trenching or horizontal directional drill), and vehicle movement. Impacts to wetlands will be reduced through the implementation of the conservation measures in the Stream and Wetland Crossing Procedures, Timber Removal Plan, Blasting Plan, Upland Erosion Control Plan, SPCC Plan, Contaminated Media Plan, Restoration and

Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). The plans will help mitigate potential impacts to wetlands by preventing or reducing the release of sediments and contaminants during and after construction and maintaining wetland function. Examples of conservation measures include the use of timber riprap, prefabricated equipment mats, or terra mats for vehicles to avoid rutting in wet soils; the installation of devices such as silt fencing and sediment traps; revegetation of disturbed ground, and placement of temporary workspaces and tree clearing operation landings outside of wetlands. Following construction, wetlands in the construction and permanent right-of-way will be restored following the Restoration and Rehabilitation Plan. Vegetation will be allowed to return to its natural state, except that trees greater than 15 feet tall growing within 15 feet of the pipeline will be removed, and vegetation in the 10-foot-wide corridor centered over the pipeline will be maintained as herbaceous vegetation. Therefore, right-of-way maintenance will permanently convert PSS wetland to PEM and/or PSS wetland in a 30- to 50-foot-wide corridor within the pipeline right-of-way. Measures to reduce or prevent the transport and introduction of invasive plants into disturbed wetlands will be applied according to the Non-Native Invasive Plant Species Management Plan.

Monongahela National Forest

Based on wetland delineations, the Project crosses 14 PEM wetlands and 4 PFO wetlands totaling 0.20 acre in the MNF (Table 5.4.1-1). Impacts to 0.05 acre would be temporary as a result of the construction right-of-way. The permanent right-of-way would have negligible impacts to 0.08 acre of PEM wetlands, since these herbaceous wetlands would be allowed to return to their pre-existing state in the permanent right-of-way. In addition, 0.07 acre of PEM wetland in the MNF will be crossed by permanent access roads, all of which are existing roads and will have no new impacts outside of the existing road prism. .

George Washington National Forest

Based on wetland delineations, the Project crosses 12 wetlands totaling 0.15 acre in the GWNF (Table 5.4.1-2). Impacts to 0.06 acre of wetland would be temporary affected as a result of the construction right-of-way. Following construction, this area would be allowed to return to its natural state, although the 0.05 acre of PFO would take longer to re-establish. The permanent right-of-way will permanently convert most of the 0.08 acre of PFO wetland to PEM or PSS wetland due to permanent tree removal in a 30-foot-wide corridor centered on the right-of-way. An existing permanent access road crosses 0.01 acre of PFO wetland and will have no new impacts outside of the existing road prism.

TABLE 5. 4.1-1

Impacted Wetland Acreages [a] Within the Monongahela National Forest

Wetland Cowardin Classification	Temporary [b]	Permanent ROW	Permanent Access Roads [d] New	Permanent Access Roads [d] Existing	Total Wetland Acreage Impacted
PEM	0.05	0.08	0	0.07	0.20
PSS	0	0	0	0	0
PFO	0	0	0	0	0
Total:	**0.05**	**0.08**	**0**	**0.07**	**0.20**

[a] Wetland acreages based on 2016 wetland delineations.
[b] Temporary impacts include temporary construction right-of-way.
[c] Permanent impacts include permanent right-of-way and permanent access roads.
[d] Existing permanent access road acreages represent the existing road footprint: no impacts are anticipated based on use of existing access roads.

TABLE 5. 4.1-2

Impacted Wetland Acreages [a] Within the George Washington National Forest

Wetland Cowardin Classification	Temporary impacts [b]	Permanent Right-of-Way	Permanent Access Roads [d]		Total Wetland Acreage Impacted
			New	Existing	
PEM	0.01	<0.001	0	0	0.01
PSS	0	0	0	0	0
PFO	0.05	0.08	0	0.01	0.14
Total:	**0.06**	**0.08**	**0**	**0.01**	**0.15**

[a] Wetland acreages based on 2016 wetland delineations.
[b] Temporary impacts include temporary construction right-of-way.
[c] Permanent impacts include permanent right-of-way and permanent access roads.
[d] Existing permanent access road acreages represent the existing road footprint: no impacts are anticipated based on use of existing access roads.

5.4.2 Waterbodies

Atlantic will use dry stream crossing methods, including either the flume or dam-and-pump method, to construct the proposed pipelines across waterbodies in the MNF and GWNF. Ten proposed access roads are existing and not anticipated to impact waterbodies. One new temporary access road is proposed to cross a waterbody (see below). Temporary construction “bridges” may be used during all phases of construction to cross waterbodies where permanent access roads are not available or planned. Temporary construction bridges will be installed across the dry waterbodies in accordance with the FERC’s Procedures to allow construction equipment and personnel to cross. The bridges may include clean rock fill and culverts, equipment pads and culverts, equipment pads or railroad car bridges without culvers, and flexi-float or portable bridges (see the *COM Plan*, Appendix C). The Procedures allow clearing equipment and equipment necessary for the installation of temporary bridges to cross each waterbody once prior to bridge installation. Temporary bridges will be needed from initial right-of-way clearing through final restoration, so the bridges will remain in place outside recommended in-stream work periods.

A graveled temporary access road will be constructed from an existing trail across two streams in the GWNF. Minor temporary impacts to water quality through turbidity and temporary fill will occur as a result of placing gravel. If other existing access roads need to be widened or culverts installed or replaced within the streambed, temporary impacts to water quality could occur. No widening of existing access roads or new culverts is currently anticipated to be needed (see Section 2.1).

During pipeline installation and road construction through or adjacent to waterbodies, activities such as clearing and grading of stream banks, removal of riparian vegetation, addition of roadbed material, culvert installation, blasting, in-stream trenching, trench dewatering, and backfilling will result in the temporary modification of aquatic habitats. Since the riparian areas along the affected waterbodies in the MNF and GWNF are forested and typically include a diverse assemblage of plant species, impacts on the riparian area and adjacent aquatic habitat will persist for at least 10 years in the temporary workspace while the forested riparian habitat reestablishes (Vesipa et al., 2016). A number of plans detailed in the *COM Plan* will help reestablish riparian habitat, including the Restoration and Rehabilitation Plan and Non-Native Invasive Plant Species Management Plan (Appendix C). However, approximately 30 feet of existing forested riparian habitat on either side of waterbody crossings will be permanently converted to herbaceous or scrub-shrub riparian habitat within the pipeline right-of-way since trees will not be allowed to develop within 15 feet of the pipeline adjacent to a waterbody, and vegetation will be limited to herbaceous plants and shrubs in this area.

Stormwater runoff from vegetation clearing, exposed soils, and soil compaction in construction areas upslope, and erosion from disturbed stream banks, could also temporarily affect stream water quality. Impacts could include increased sedimentation, turbidity, and flow; increased temperature from reduced shade; decreased dissolved oxygen concentrations; releases of existing chemical and nutrient pollutants from disturbed sediments; and introduction of contaminants, such as chemicals, fuels, and lubricating oils, from incidental spills. Potential sedimentation impacts on potential RFSS downstream aquatic habitats have been further assessed in the Analysis of Downstream Transport of Sedimentation on USFS Regional Forester's Sensitive Aquatic Species report (Downstream Sedimentation Analysis) in Appendix I and in Sections 5.5.5 and 5.6.5.

Potential impacts to aquatic habitat during pipeline installation will be reduced through the use of dry crossing methods (e.g. dam-and-pump and flume) in place of open trenching. Dry crossings involve isolating and temporarily diverting the flow of water around or across the trenching area. The methods allow trenching activities to occur within a relatively dry stream or riverbed, thereby reducing the introduction of sediment and turbidity into the waterbody during construction. Following a brief pulse of turbidity following the removal of flumes or dams, stream flow and turbidity levels would return to normal shortly after stream restoration activities are completed.

Potential impacts to water quality will also be minimized through the implementation of the conservation measures in the Timber Removal Plan, Blasting Plan, Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, SPCC Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, and Water Quality Monitoring Plan, as specified in the *COM Plan* (see Appendix C). These plans will help mitigate potential impacts to water quality by preventing or reducing the release of sediments and contaminants during and after construction. Examples of conservation measures include the use of proper road design, development of water control structures such as cross-drainage culverts and water bars; installation of erosion and sediment control devices such as silt fencing and sediment traps; restoration of streambanks and channels; revegetation of disturbed ground; and control of non-native invasive plant species. In-water work restrictions will also be followed, as described in the FERC Procedures and the *COM Plan*.

Monongahela National Forest

The waterbodies crossed by the proposed route and the method of crossing are listed in Appendix B, and shown in the field survey maps in Appendix A. In the MNF, there will be two waterbody crossings that will be affected by pipeline construction, including one perennial stream and one intermittent stream. Project access roads are not anticipated to affect waterbodies since they are using existing roads, and no widening or expansion is planned.

George Washington National Forest

In the GWNF, there will be 30 waterbody crossings (see Appendix B). Twenty-eight of these waterbody crossings will be affected by pipeline construction, including 12 perennial streams, 12 intermittent streams, and 4 ephemeral streams. Two of these waterbody crossings (one perennial, one ephemeral) will be affected by a new permanent access road being developed from an existing trail. Other Project access roads are not anticipated to affect waterbodies since they are using existing roads, and no widening or expansion is planned.

5.4.3 Erosion Rate Estimates

In addition to the wetlands and waterbodies crossed by the proposed Project, the Analysis Area for aquatic habitat includes the 28 HUC12 subwatersheds that have the potential to be indirectly affected by the Project based on flow paths identified in the Soil Erosion and Sedimentation Modeling Report (Erosion and Sedimentation Report) (see Section 4.3 and Appendix H). Altogether, potential RFSS aquatic habitats that could be affected by the Project include waterbodies and wetlands crossed by the pipeline or a temporary access road (see above), aquatic habitats downstream from waterbody crossings, and aquatic habitats downslope from construction areas. These aquatic habitats may be affected through downstream or overland flow of sediments and potential contaminants from the construction area. The Erosion and Sedimentation Report developed for the MNF and GWNF applied modeling to provide estimates of sheet and rill overland erosion (erosion rates) at the edge of the construction area, including new access roads, from initial clearing through restoration, although the model does not provide estimates of the amount of sediment that is likely to end up in aquatic habitats (e.g., sediment delivery). A summary of the findings of the Erosion and Sedimentation Report is provided here: see the full report in Appendix H for additional details.

Erosion rate estimates were based on a number of variables associated with Project construction that could influence erosion rates and subsequent sediment delivery into aquatic habitat, including the use of erosion control devices (ECDs), slope, construction season, and time. The ECDs currently planned to mitigate soil erosion from the construction activities include silt fences, water diversion bars, mulching, and seeding. Model simulations found that these ECDs have a high degree of effectiveness, reducing soil erosion by approximately 95 to 98 percent (see the Erosion and Sedimentation Report, Appendix H).

The majority of the lands in the study area have moderate slopes (10 to 30 percent): about 25 percent have slopes steeper than 30 percent (see Appendix H). In addition to the standard ECDs, Atlantic will employ Best-in-Class design and operational measures for construction in slopes greater than 30 percent to minimize or eliminate landslides during construction and operations. These measures include an abbreviated construction timeframe of 2 weeks for a 0.05-mile segment of pipeline (the typical construction method will take approximately 3 months across a 0.05-mile segment of pipeline). The expedited construction timeline for steep slopes will limit the bare soil exposure duration. Overall, the modeling indicated that predicted erosion rates on slopes greater than or equal to 30 percent would generally be lower than on shallower slopes in the first year due to the expedited construction sequencing along these slopes, although revegetation on steep slopes is anticipated to evolve more slowly and would therefore result in slightly higher predicted erosion rates than on shallower slopes in the second and third years after construction. Construction at waterbody crossings segments was also found to result in lower erosion rates than in similarly sized subwatershed segments due to the increased ECDs at waterbody crossings, including additional sediment barriers on either side of the stream.

As outlined in the Erosion and Sedimentation Report, predicted erosion rates due to disturbed soils in the Project area, summarized by subwatershed, ranged from 2.2 to 8.0 tons/acre·year during the initial year of disturbance, which equates to about 19 to 71 yd^3/acre/year or 0.4 to 1.3 mm of soil loss over the entire segment.[6] The predicted erosion rates at segments representing stream crossings in the initial year were similar at 1.3 to 8.6 tons/acre/year, or an estimated 11 to 76 yd^3/acre/year or 0.2 to 1.4 mm of topsoil loss. These values can be compared to estimated baseline (pre-construction) erosion rates of less than 1 ton/acre/year.

While some stream crossings show up to 28 tons leaving the construction site during the first year of disturbance, not all of the sediment runoff from the construction area, based on the predicted erosion rates, is anticipated to reach the stream due to filtration by vegetation and infiltration into the soil. However, even if all of the sediment were to reach the waterbody, it would not likely result in an appreciable increase in turbidity. To put this amount of sediment in context, 1 ton/year of soil entering a stream with a flow of 1 cubic foot per second (cfs) only represents an average concentration increase of 1 milligram/liter (mg/l) of suspended solids. For example, average annual stream flow for Back Creek near Sunrise (approximately 3.2 miles from the ACP) is 92 cfs (USGS, 2017). Even if 28 tons of soil per year

---

[6] These values were calculated using a soil bulk density of 1.34 g/cm^3, which is the weighted average of the bulk densities identified for the upper mineral horizons of the SSURGO map units crossed by the Project within the MNF and GWNF.

entered this stream at the pipeline crossing during the first year of disturbance, which is not expected, it would only result in an average increase of 0.3 mg/l in suspended solids. While the U.S. Environmental Protection Agency (EPA) has not set numeric water quality criteria for suspended solids, it has published a water quality criteria recommendation for solids and turbidity that is based on light reduction (EPA, 2003). This criterion is summarized in the 1986 EPA Quality Criteria for Water as:

> *Solids (Suspended, Settleable) and Turbidity − Freshwater fish and other aquatic life: Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life.*

Although the existing suspended solids and turbidity concentrations (and compensation depth) are not available at this location, an increase of 0.3 mg/l would not be likely to appreciably reduce light attenuation (i.e., Secchi) depth. A total suspended solids concentration between approximately 25 to 80 mg/l is considered to represent moderate water quality, while research suggests an average concentration of 25 mg/l is in indicator of unimpaired water quality (Georgia Environmental Protection Division, 2001). In addition, Project-related sediments or contaminants in a waterbody will be continuously reduced and diluted downstream as suspended sediments drop out of the water column and the water volume increases. Therefore, impacts will diminish further downstream from the Project area.

Model results showed that the predicted erosion dropped dramatically in years subsequent to construction as the sites become revegetated. In the second year after construction, the growth of vegetation substantially reduced the erosion rates regardless of the slope or whether the Segment crossed a waterbody. By the third year, after two full growing seasons, erosion rates were comparable to pre-construction levels for 94 percent of all Segments. After the third full growing season, all areas were predicted to yield less than or equal to than 1 ton/acre/year, which approximates pre-construction erosion rates.

The applicability of the model (RUSLE2) used in the Erosion and Sedimentation Report to assess potential real-life impacts to aquatic habitat in the Analysis Area is limited due to the inability of the model to estimate actual sediment load into specific waterbodies; the sediment load will be lower than the estimated erosion rates coming off of the construction area due to filtration and infiltration. In addition, the model estimates provided above should be viewed relative to the confidence of the model, which varies depending on the magnitude of the estimate. When sediment delivery based on model output is between 4 and 30 tons/acre/year, confidence in the model is approximately ±25 percent. At values less than 4 and greater than 30 tons/acre/year, the confidence is ±50 percent (see Appendix H). As a result, the estimates developed based on the model results in the Erosion and Sedimentation Report should not be considered to be representative of actual sediment load increases, but instead can be used to help pinpoint aquatic habitats at greater risk of erosion and sedimentation, guide the use of ECDs and other conservation measures, and provide a range of potential erosion rates at the edge of the construction area based on the confidence intervals of the model.

5.5 DETAILED ANALYSIS OF IMPACTS BY SPECIES—MONONGAHELA NATIONAL FOREST

Impacts are assessed below for the RFSS listed in Appendix D that have been confirmed through consultation with the USFS, field survey, and/or other analysis to have individuals or suitable habitat present within the MNF Analysis Area. Resources utilized in the desktop analysis included:

- RTE Biodiversity shapefile, provided by the West Virginia Department of Natural Resources (WVDNR) Natural Heritage Program (NHP);
- Natural Heritage Inventory (NHI) data, provided by the WVDNR NHP in 2016 (WVDNR NHP NHI data);

- FWS Virginia *spiraea* modeled potential habitat;
- U.S. Geological Survey (USGS) National Hydrography Dataset (NHD) streams;
- USGS West Virginia Geologic Units shapefile;
- USGS topographic maps;
- ESRI aerial imagery;
- MNF plant species occurrence data;
- communications with WVDNR and MNF staff; and
- other articles and resources as cited.

Surveys (not including follow-up and multi-part surveys) were conducted on MNF lands for various species and/or sensitive habitats, including the following:

- Allegheny woodrat and timber rattlesnake;
- green salamander;
- bats;
- botanical resources;
- karst;
- small mammals;
- wetlands and waterbodies (see Section 5.3);
- Bald Eagle; and
- Northern Goshawk and Golden-Winged Warbler.

An overview of species and habitats found in the MNF during those surveys are presented in Figure 5.5-1: more detailed maps of survey findings are provided in Appendix A. The following sections provide an analysis of the remaining species found in the survey area and/or with potential suitable habitat in the survey area. Species are analyzed according to major taxonomic groupings.

[redacted]

5.5.1 Cave Obligate Species

Twenty-three species on the RFSS list require cave habitat, including one spider, nine crustaceans, one gastropod, ten insects, and two planarians (see Appendix D). Of these, 13 could occur in the Project area based on range and habitat (see Table 5.5.1-1). No evidence of caves was found in the Project area on MNF lands during the 2016 karst field survey. The two sinkholes found near [redacted] the centerline and in the construction right-of-way (adjacent to a third sinkhole off MNF property and outside of the Project area) did not have characteristics such as an open throat that would provide direct surface drainage into the subterranean environment. In addition, in areas of mature karst, such as the Project area, the majority of solution fissures (that would be underlying sinkholes) are sediment-filled (see *Karst Plan*, Atlantic and DTI, 2017b). The soil filling the sinkhole and underlying fissures acts as a biologically and chemically active filter for surface water (Denton, 2017). Therefore, there is no evidence indicating that suitable cave habitat occurs in the Project area, or that surface water from the Project area will adversely affect suitable cave habitats that could be connected through subterranean systems.

Due to the known presence of karst terrain in the Project area, particularly between [redacted] if any karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, such as open throat sinkholes, cave entrances, sinking streams, or losing stream segments, should develop during Project activities, mitigation measures will be applied to avoid and minimize any impact of pipeline construction and/or operation and maintenance activity that could present a risk to environmental receptors, particularly cave-obligate species (see *Karst Plan*, Atlantic and DTI, 2017b).

5.5.1.1 Potential Impacts to RFSS Cave Obligate Species

Species Description

The four crustaceans and one gastropod cave-dependent species with the potential to occur in the Project area are subterranean aquatic species, while the seven insects and one planarian are described as obligate subterraneans. All 13 species have a conservation status of at least vulnerable at the state level: six are vulnerable (S3), four are imperiled (S2), and three are critically imperiled (S1) (see Appendix D). The conservation status at the global level is similar, with only one species listed as apparently secure (G4).

Potential Presence in Project Area

Seven of the species have been documented in WVDNR NHP NHI data within 2 miles of the centerline or Project access roads (see Table 5.5.1-1). No surveys were recommended for cave-obligate RFSS based on consultation with the MNF (see Appendix F). There is no evidence of suitable cave habitat in or within 300 feet of the Project area in the MNF.

Impact Evaluation

If karst features that allow the unfiltered and unimpeded flow of surface drainage into the subsurface environment should form during construction, construction activities have the potential to indirectly affect cave obligate RFSS in the MNF. Vegetation removal could weaken the cohesive strength of the soils overlying a cave or conduit, which could exacerbate sinkhole development (see *Karst Plan*, Atlantic and DTI, 2017b). Blasting has the potential to create openings to subsurface karst features, and an alteration in overland flow resulting from ground disturbance during construction could also exacerbate sinkhole development. Surface water could carry sediment and contaminants, such as leaked oil or herbicides, through such "open" karst features into the subterranean system, which could eventually lead to suitable cave habitat. Increased sedimentation could alter cave habitat or make it unsuitable, and contaminants could have a detrimental effect on cave-obligate RFSS, particularly aquatic species. The potential for adverse impacts is low, however, since no potential cave habitat was found within 300 feet from where the pipeline crosses MNF property.

TABLE 5.5.1-1

Cave-Obligate Regional Forester Sensitive Species with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
INVERTEBRATES – CRUSTACEANS and GASTROPODS		
Caecidotea holsingeri	Holsinger's Cave Isopod	Subterranean streams in cave and karst habitats, shelters under rocks in areas of moving water; Found in Barbour, Greenbrier, Monroe, Pocahontas, Randolph Counties, WV. Four NHI documented occurrences within 1.5. miles of the Project area.
Cambarus nerterius	Greenbrier Cave Crayfish	Subterranean streams in cave formations; in Greenbrier, Pocahontas, Webster, WV. One NHI documented occurrence on MNF property within 1.5 miles of the Project area.
Stygobromus emarginatus	Greenbrier Cave Amphipod	Subterranean pools and streams in cave formations. Found in Barbour, Greenbrier, Monongalia, Monroe, Pocahontas, Randolph, and Tucker Counties, WV. Three NHI documented occurrences within 1.5 miles of the Project area.
Stygobromus nanus	Pocahontas Cave Amphipod	Endemic to subterranean pools in a single cave formation; in Pocahontas County, WV.
Fontigens tartarea	Organ Cavesnail	Subterranean streams in cave formations, shelters under flat rocks; in Barbour, Greenbrier, Monroe, Pocahontas, Preston, Randolph, Tucker Counties, WV. One NHI documented occurrence within 1 mile of the Project area.
INVERTEBRATES – INSECTS		
Pseudanophthalmus fuscus	A Cave Beetle	A subterranean species found in cave formations; in Greenbrier, Monroe, Pocahontas, WV.
Pseudanophthalmus hypertrichosis	A Cave Beetle	A subterranean species found in cave formations; in Pocahontas and Randolph Counties, WV. Two NHI documented occurrences wtihin 1.5 miles of the Project area.
Pseudanophthalmus hypertrichosis	Dry Fork Valley Cave Beetle	A subterranean species found in cave formations; in Pocahontas and Randolph Counties, WV.
Pseudosinella gisini	A Springtail	A subterranean species found in cave formations; in Greenbrier, Monroe, Pocahontas, Randolph County, WV.
Sinella agna	A Springtail	A subterranean species found in cave formations; in Barbour, Pocahontas, Randolph, and Tucker Counties, WV. Three NHI documented occurrences within 1 mile of the Project area.
Pseudotremia fulgida	Greenbrier Valley Cave Millipede	An obligate subterranean species found in cave and karst formations; in Greenbrier and Pocahontas Counties, WV
Zygonopus weyeriensis	Grand Caverns Blind Cave Millipede	An obligate subterranean species found in cave and karst formations; in Greenbrier, Monroe, Pendleton, Pocahontas, and Randolph County, WV. Two NHI documented occurrences within 1 mile of the Project area.
INVERTEBRATES - PLANARIANS		
Macrocotyla hoffmasteri	Hoffmaster's Cave Planarian	An obligate subterranean flatworm species found in cave formations; in Greenbrier, Pendleton, Pocahontas, Randolph and Tucker Counties, WV.

Sources: See Appendix D

Conservation Measures

Potential impacts on cave-obligate RFSS and potential habitat will be minimized through the implementation of the conservation measures in the *Karst Plan*, as well as the Upland Erosion Control Plan, Blasting Plan, Restoration and Rehabilitation Plan, SPCC Plan, and Contaminated Media Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures that will help minimize potential impacts to cave-obligate RFSS and potential cave habitat include the following:

- The conservation measures in the *Karst Plan* (Atlantic and DTI, 2017b) will be implemented for any karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, including (but not limited to): open throat sinkholes, caves which receive surface drainage, sinking streams, and losing stream segments in order to avoid impact on the karst environment, including:

    - No insecticides, herbicides, or refueling will be allowed within 300 feet of those features.

    - Erosion and sediment controls will be used to minimize impacts on downslope karst features within 300 feet of the workspace.

    - No activities will be allowed within 25 feet of these karst features except where that feature falls within 25 feet of the trenchline; the buffer will be fenced in the field for construction activities, including vegetation pre-clearing and clearing activities.

    - Blasting will be conducted in a manner that will not compromise the structural integrity or hydrology of the feature.

    - HDD will not be used in karst terrain.

- The right-of-way will be restored in accordance with the conservation measures in the Restoration and Rehabilitation Plan, including

    - methods for erosion control;

    - erosion control monitoring;

    - methods for soil restoration (e.g., removal of excavated rock, distribution of rock on the work area, grading to preconstruction contours to the extent practicable, and testing and treatment for soil compaction where requested by the MNF);

    - topsoil segregation, replacement, and conditioning to help re-establish native plant communities in areas determined in consultation with the MNF and according to the *COM Plan*;

    - special procedures for steep slope areas (e.g., the use of additional structural materials and targeted mitigation of seeps, springs, or other subsurface water encountered);

    - additional restoration measures for the MNF (e.g., no clearcutting on high risk soils, use of a seed mix with greater than 50 percent annuals, with reseeding to perennials in 1.5 years, and successful revegetation within 5 years);

    - restoration monitoring and maintenance (e.g., assessment of the effectiveness of erosion control measures, assessment—through quantitative analysis of ground cover in monitoring plots—revegetation success for years 3 and 5, monitoring of vegetation for the life span of the pipeline operations);

  - implementation of a restoration goal of reseeded/replanted species is equal to or greater than 80 percent ground cover, with implementation of remedial actions where goals are not met,

  - reporting restoration status and remedial actions to the USFS and FERC through summary reports; and

  - training for environmental inspectors regarding the USFS Restoration and Rehabilitation Plan, including techniques specific to the USFS, seeding techniques on steep slope sites, emergency contacts and numbers, and erosion minimization and control measures.

- The Project's Spill Prevention, Control, and Countermeasures Plan (SPCC) (Atlantic and DTI, 2016b), Storm Water Pollution Prevention Plan (SWPPP) (filing anticipated in March 2017), and/or West Virginia Stormwater Management Program requirements will be implemented, as described in the *COM Plan* (Appendix C), to establish preventative and mitigation measures to prevent fuel and other hazardous materials from entering subsurface environments through unfiltered and unimpeded flow of surface drainage during pipeline construction and operation.

Preliminary Determination of Effect

Based on field survey, there is a low likelihood that suitable cave habitat for cave-obligate RFSS occurs in the Project area or would be affected through subterranean systems underlying the Project area. Although there is a possibility for karst features to form during construction and operation, particularly over known karst terrain [redacted] the implementation of the conservation measures described above will avoid or minimize the risk of adverse effects, and Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability of* RFSS cave-obligate species.

5.5.2 Mammals

The RFSS list for the Project within the MNF contains 10 mammals (see Appendix D). An assessment of known range and habitat requirements determined that all of these species could occur in the Project area, although no suitable habitat was found for southern bog lemming (*Synaptomys cooperi*) in the Analysis Area based on a desktop assessment, and therefore this species is not assessed further here (see Table 5.5.2-1). There were three documented occurrences of one species—Allegheny woodrat (*Neotoma magister*)—in WVDNR NHP NHI data within 2 miles of the centerline (2016 data). Surveys were conducted for Allegheny woodrat; West Virginia northern flying squirrel habitat; roosting habitat for the eastern small-footed bat, as well as for hibernacula for the little brown bat and tri-colored bat. Field surveys for potential habitat identified through desktop analysis for southern rock vole (*Microtus chrotorrhinus carolinensis*), long-tailed shrew (*Sorex dispar*), southern water shrew (*Sorex palustris punctulatus*), and eastern spotted skunk (*Spilogale putorius*), were conducted in February 2017.

Potential habitat for Allegheny woodrat within a 300-foot-wide Analysis Area was identified based on desktop analysis and surveyed for signs of presence and habitat suitability in May 2016 (see the survey report in Atlantic [2016a]). Surveys were conducted on approximately 6 miles of the survey corridor and 8.2 miles of access roads. No Allegheny woodrats were found, but signs of use by

Allegheny woodrats were found along two rock formations within [redacted] within the MNF [redacted]. Another rock formation near the northern extent of Cloverlick Mountain contained potentially suitable Allegheny woodrat habitat; however, a trapping survey at this site in October 2016 did not capture Allegheny woodrats (Atlantic, 2016b). No evidence of use was found at the site, and it was considered low quality due to limited foraging potential, isolation, and aspect.

TABLE 5.5.2-1

Regional Forester Sensitive Species Mammals with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
Glaucomys sabrinus fuscus	West Virginia northern flying squirrel	Mature red spruce forests and high elevation (above 3300 feet) spruce and mixed conifer northern hardwood forests with an abundance of snags.
Microtus chrotorrhinus carolinensis	Southern rock vole	Cool, moist, mossy talus in cool, damp, coniferous, and mixed coniferous forests in the Appalachian Mountains, usually in or near riparian areas or undersurface water, in relatively old forests and typically dominated by yellow birch. Other species may include sugar maple, basswood, American beech, and red spruce. Found in Pocahontas County in WV.
Myotis leibii	Eastern small-footed bat	Roosts in trees and snags with peeling bark and in crevices of rocky habitats (e.g., talus slopes, rock fields, cliff faces) within eastern deciduous and coniferous forests, as well as man-made structures (e.g., bridges, etc.) throughout the MNF; generally hibernates in caves and mines, but also may hibernate in box culverts and deep crevices in rocky habitats across the landscape. Forages in forested and open habitat in ridges, valleys, and around water; in Fayette, Grant, Greenbrier, Hardy, Mercer, Monongalia, Monroe, Morgan, Nicholas, Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties, WV.
Myotis lucifugus	Little brown bat	Roosts in buildings and other man-made structures as well as trees, rocks, and wood piles during summer; generally hibernates in large numbers in caves and mines.
Neotoma magister [a]	Allegheny woodrat	Rock areas, caves, large boulders, rock slides, mountains, woods, and swamps; in Pocahontas County, WV. There are three WVDNR NHP NHI documented occurrences 3,916, 2,933, and 3,839 feet from the Project centerline (2016 data; 2004 and 2006 occurrences).
Perimyotis subflavus	Tri-colored bat	Associated with forested landscapes, where foraging occurs near trees (including forest perimeters) and along waterways; in summer, generally roost in tree foliage in forest/woodlands; generally winter (hibernate) in caves/mines.
Sorex dispar	Long-tailed shrew	In damp soil and under fallen logs; damp deciduous or coniferous forests with loose talus substrate, abundant leaf litter, and deep crevices on level areas and moderate to steep slopes, riparian areas along rocky mountain streams. Artificial talus created by road and mine construction may also be used. In Fayette, Mercer, Nicholas, Pocahontas, Preston, Raleigh, Randolph, Upshur, and Webster Counties, WV.
Sorex palustris punctulatus	Southern Water Shrew	Semi-aquatic; High elevation mountain bogs, fens, and edges of cold headwater and streams, mixed coniferous-deciduous forests with a mostly closed canopy. Found in Pendleton, Pocahontas, Preston, Randolph, and Tucker, WV.
Spilogale putorius	Eastern spotted skunk	Dry oak-pine forests and mixed mesophytic forests with a dense understory, recent clear-cuts and successional fields; rock outcrops, cliffs, caves, talus hollow trees, stumps, logs, and underground burrows as den sites; high suitability habitat occurs in upper ridgelines. In Pocahontas County, WV.

Sources: See Appendix D

[a] Evidence for occurrence found during 2016 field surveys (Atlantic, 2016a,b).

Field surveys for bats, including the RFSS bats listed in Table 5.5.2-1, were conducted in 2015 and 2016; however, the 2015 surveys were completed on a route that has been superseded and thus the 2015 surveys no longer apply (see the 2016 survey report Atlantic [2016s, 2016t]). Potential hibernacula sites (caves) were identified through a combination of desktop analysis, roadside surveys, and pedestrian surveys within an approximately 2,000-foot-wide Analysis Area along the proposed centerline. At the request of MNF biologists, sites within the MNF received mist net surveys rather than acoustic surveys, in order to increase the likelihood of capture to determine species presence/probable absence. Mist net surveys were conducted following the FWS *Guidelines* for Phase 2 Presence/Probable Absence Surveys (FWS, 2016). Each kilometer of suitable habitat along the proposed route within the MNF received six net nights of survey effort (three net sets deployed for two nights). In May 2016, pedestrian surveys were conducted within 2,000 feet on each side of the proposed ACP centerline to survey for potential cave hibernacula for RFSS bats and roosting habitat for eastern small-footed bat (*Myotis leibii*). This 2,000 foot buffer was the maximum allowed under the Special Use Permit granted by the MNF. A roadside hibernacula survey was also conducted within 3,281 feet (1 kilometer) of proposed access roads.

No RFSS bats were caught during mist net surveys, and no suitable hibernacula were found in the survey area. However, suitable rocky roosting habitat for eastern small-footed bat was found. In addition, forested foraging habitat is present for all three RFSS bats based on general habitat conditions.

February 2017 field habitat assessments found low- to high-quality suitable habitat in the Analysis Area within the MNF for southern rock vole, long-tailed shrew, southern water shrew, and eastern spotted skunk. Survey sites were selected based on a desktop analysis that identified preferred habitats in the Analysis Area.

The following sections provide an analysis of potential impacts, conservation measures, and a preliminary determination of effect for mammals on the RFSS list with documented occurrences or suitable habitat in the Project area within the MNF.

5.5.2.1 West Virginia Northern Flying Squirrel (*Glaucomys sabrinus fuscus*)

<u>Species Description</u>

The West Virginia northern flying squirrel (also referred to as the Virginia northern flying squirrel) has a global conservation ranking of G5T2 (subspecies imperiled) and a state conservation ranking of S2 (imperiled) in West Virginia (WVDNR, 2016). While the species has a broad distribution across North America, this subspecies of northern flying squirrel only occurs in the Allegheny Mountains of Virginia and West Virginia (Handley, 1991). The West Virginia northern flying squirrel was listed as a federally endangered subspecies in 1985. The squirrel has since been removed from the endangered species list in 2008, but a court ruling following a lawsuit in 2011 ordered the FWS to restore ESA protections to the species. The squirrel remained an endangered species until the U.S. Court of Appeals reversed the initial court decision in 2012, and the subspecies was officially delisted in 2013 (FWS, 2013b).

The West Virginia northern flying squirrel eats mostly lichens and fungi but will also eat nuts, flower and leaf buds, fruits, seeds, and insects. This subspecies forages mostly on the ground but can also be found forging along tree trunks and in smaller trees under the canopy. Breeding occurs in early spring with young being born in March, April, and May. West Virginia northern flying squirrels live in family groups consisting of several adults and juveniles. This species' microhabitat preferences include cavities in mature trees and snags but small stick/twigs nests are sometimes used. Flying squirrels are nocturnal and most active when moonlight is dim or absent.

<u>Potential Presence in Project Area</u>

Historically, West Virginia northern flying squirrels inhabited mature red spruce forests that once dominated the Allegheny Highlands. Significant loss of these forests occurred from extensive logging that began in the 1880s and lasted until the 1940s (FWS, 1990). Today, the recovery of this subspecies can be attributed to the regeneration of high-elevation spruce-northern hardwood forests in the decades since the cessation of industrial logging. West Virginia northern flying squirrels are associated with red spruce and mixed conifer-northern hardwood forests in the central Appalachians. Observations of West

Virginia northern flying squirrels have also occurred in stands with eastern hemlock, Norway spruce, and red pine.

Within the MNF, spruce and spruce-hardwood are considered key habitat for the West Virginia flying squirrel and are typically located at elevations above 3,900 feet and in acidic soils. Presence/absence surveys for West Virginia flying squirrel were not carried out. Based on modeled potential habitat from the MNF and field assessment provided by MNF staff, suitable habitat for West Virginia flying squirrel is present near the proposed route at [redacted] and an access road segment ([redacted], which is at an elevation of approximately 3,900 feet. A row of mature red spruce trees was located just beyond the MNF boundary at the edge of a clearing, and regenerating red spruce and hemlock trees were scattered throughout the area; as such, the area falls into the regenerating northern hardwood and spruce habitat community type. Other areas of West Virginia northern flying squirrel habitat were also found on both sides of [redacted] All of these areas provide the high elevation northern hardwood/spruce forest that squirrels would occupy, though some of the habitat appeared to be marginal.

Impact Evaluation

According to the modeled suitable habitat data provided by the MNF, one new 530-foot-long permanent access road (proposed spur off of [redacted]) would traverse across approximately 0.24 acre of suitable West Virginia northern flying squirrel northern hardwood and spruce habitat. Construction workspace may temporarily impact up to approximately 0.03 acre of suitable habitat along the right-of-way, pending MNF property boundary survey confirmation. If MNF ownership is confirmed within the 0.03-acre area, trees will be allowed to regenerate. Because the affected area only contains regenerating forest, West Virginia northern flying squirrel would not be present in the Project area during construction. Therefore, individual squirrels will not be directly affected by Project construction. Additional suitable habitat is located within approximately 0.5 mile of [redacted]. Therefore, West Virginia northern flying squirrels could be present adjacent to the Project area during construction. Potential impacts could include temporary noise disturbance, which could displace individuals, disrupt normal activities, and increase stress. In addition, see section 6.1 for potential cumulative impacts on this species.

Conservation Measures

Impacts to West Virginia northern flying squirrel will be minimized and mitigated in the MNF through the implementation of the conservation measures in the Upland Erosion Control Plan, Timber Removal Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures specific to West Virginia northern flying squirrel will also be applied. Relevant conservation measures include the following:

- A segment of access road at [redacted] has been removed to minimize the loss of regenerating northern hardwood and spruce habitat and to avoid removal of mature spruce and hemlock trees.

- Prior to clearing, red spruce saplings present in the construction area will be transplanted outside of the construction area and onto MNF land.

- Atlantic will not widen the access road that approaches Gibson Knob in order to avoid removing red spruce trees adjacent to the road.

- Side trimming will be utilized to retain mature spruce trees along the clearing approximately [redacted].

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to West Virginia northern flying squirrel by re-establishing or retaining suitable forest habitat:

  - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

  - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Measures to reduce erosion in potential habitat will be implemented both during and after construction per the Upland Erosion Control Plan, including:

  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- The conservation measures in the Restoration and Rehabilitation Plan will be applied following construction to restore or create suitable forest habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

- o mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
- o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
- o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
- o monitoring to assess all restored areas on USFS lands in years 1 and 5;
- o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
- o reporting of restoration status following field inspections

<u>Preliminary Determination of Effect</u>

Since potential impacts to individual West Virginia northern flying squirrels, if present adjacent to the Project area, will be temporary and minor, and since Atlantic will implement conservation measures to reduce impacts to and preserve suitable northern hardwood and spruce habitat, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of West Virginia northern flying squirrels in the MNF.

5.5.2.2 Eastern Small-Footed Bat (*Myotis leibii*)

<u>Species Description</u>

The eastern small-footed bat has a global conservation ranking of G3 (vulnerable) and a state conservation ranking of S1 (critically imperiled) (WVDNR, 2016). The range of the eastern small-footed bat extends from southeastern Canada throughout much of the eastern United States, with the bulk of known occurrences for the species within New York, Pennsylvania, West Virginia, and western Virginia (Amelon and Burhans, 2006). The species is not protected at the federal level, and a recent review by the FWS found that the species did not warrant listing as an endangered or threatened species (FWS, 2013a).

During the winter months, the species hibernates in caves or mines. Eastern small-footed bats appear to prefer cooler and drier microclimates within hibernacula than other hibernating bats and are often the last to enter winter sites and the first species to leave in the spring (Amelon and Burhans, 2006). Hibernacula include caves, mines, box culverts, and deep crevices in rocky habitats.

During the summer months, eastern small-footed bats roost in rocky habitats (e.g., rock outcrops, talus slopes, ledges, etc.) in eastern deciduous and coniferous forests. Eastern small-footed bats have also been found roosting in a variety of man-made structures, including buildings and expansion joints of bridges (Amelon and Burhans, 2006; FWS, 2013a). The species forages in forested and open habitats in ridges, valleys, and around water. Radio-tracking studies of the species are sparse, but available studies suggest these bats occupy small home ranges and typically do not travel large distances from winter to summer roosts (FWS, 2013a). Johnson et al. (2011) tracked small-footed bats and found a total of 57 roosts; roost locations were found 415 ± 49.0 meters from capture sites for males and 368 ± 24.0 meters for females.

The major threats to the species include loss of habitat and disturbance of hibernating bats during the winter (FWS, 2013a). Loss of winter habitat could include the destruction of suitable hibernacula, which could include outright destruction of cave or mine sites (for example, through mining activities) as well as modifications to cave or mine interiors or entrances that affect airflow or microclimates and make a hibernaculum unsuitable to bats. Loss of summer habitat could include the modification or destruction of summer roost sites or foraging habitat. Disturbance of bats during their hibernation period is a known concern for many species, and the eastern small-footed bat may be particularly at risk for disturbance due to their tendency to roost near entrances (FWS, 2013a). The fungal disease known as White-Nose Syndrome (WNS) [7] has decimated populations of multiple eastern bat species, but it appears that eastern small-footed bats are less susceptible to the disease than are other bats and at this time, eastern small-footed bats have not shown a significant decline from the disease (FWS, 2013a).

Potential Presence in Project Area

The MNF requested habitat surveys in rocky areas that could provide roosting habitat for the species (see Appendix F). Field surveys for eastern small-footed bat consisted of pedestrian surveys to identify potential roost habitat and presence/absence within the 2,000-foot-wide permitted survey area in the MNF between April and August in 2016. Two suitable roosting locations consisting of rock faces receiving adequate solar exposure and crevices were found downslope of the Project area: one approximately [redacted] from the temporary construction right-of-way near [redacted] and the other approximately [redacted] from the temporary construction right-of-way near [redacted].

Investigations for RFSS bats in general included hibernacula (cave) surveys and mist netting surveys to determine the species' presence or absence (see Atlantic, 2016s and 2016t). No portals/caves were found within the MNF that would provide hibernacula for eastern small-footed bats, and no eastern small-footed bats were captured at any of the mist net sites sampled within the MNF.

Although no eastern small-footed bat individuals were found during field surveys, the abundance of forest habitat could provide potential roosting habitat, habitat for maternity colonies in the Project area, and foraging habitat. In addition, two suitable roosting locations were identified near the project. Therefore, Atlantic will assume presence of the eastern small-footed bat in the Project area.

Impact Evaluation

Since no eastern small-footed bats were found during surveys, and no suitable hibernacula were found within 300 feet of the Project centerline, direct impacts to the species are unlikely to occur. However, given the two areas with suitable potential roosting habitat identified near the Project area and abundance of forest foraging habitat, the possibility exists for eastern small-footed bats to utilize the

---

[7] White-Nose Syndrome is a disease affecting hibernating bats. Named for the white fungus that appears on the muzzle and other parts of hibernating bats, white-nose syndrome is associated with extensive mortality of bats in eastern North America. A newly discovered fungus, *Pseudogymnoascus destructans*, has been demonstrated to cause white-nose syndrome (FWS, 2016).

Project area for foraging during construction and for indirect impacts to occur. The two potential roosting habitat locations are outside of the Project area and would not be directly affected by the Project.

Indirect impacts to eastern small-footed bat from general construction noise, including blasting, could displace bats, increase stress, and disrupt normal activities. However, potential blasting and other construction noise would be temporary in the scope of construction and the life cycle of the eastern small-footed bat, and no adverse long-term effects are expected. Noise disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance will be brief and occur infrequently (approximately every 3 years). Although relatively little research has been done, the available literature suggests that bats are generally not disturbed by low-level vibrations due to blasting near hibernacula. A study of an Indiana bat hibernaculum in New York suggests vibration levels measured at the entrance to hibernacula at 0.2 inch/second did not disturb Indiana bats (Besha, 1984). Furthermore, bats are often protected within the cave environment from ground-level disturbances. Underground measurements at bat roost locations in Hellhole Cave, West Virginia suggested that vibrations where bats roosted were 1.33 to 2.76 times less than surface measurements (WVDEP, 2006). Blasting associated with construction of the ACP will be significantly less than blasting associated with the quarrying or construction operations described in the literature. No negative long-term population effects are expected due to blasting from construction of the ACP. Blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or inferred subsurface karst structures.

Construction of the pipeline and new access roads will result in the removal of potential forested foraging habitat. While a portion of this forest habitat would be allowed to redevelop following construction, new permanent access roads and the 53.5-foot-wide permanent right-of-way would result in the long-term loss of forest habitat. This long-term reduction in potential forested foraging habitat would be offset, however, since the eastern small-footed bat could still utilize the permanent right-of-way and road corridor as foraging habitat. Additionally, the creation and maintenance of a permanent right-of-way may create additional roosting habitat for the species, by creating clearings that provide solar exposure near forest edges. One study of eastern small-footed bat roosting locations in West Virginia found a high number of roosts in rock fields within transmission line clearings (Johnson et al., 2011).

<u>Conservation Measures</u>

Potential impacts to eastern small-footed bats and potential habitat will be minimized and mitigated through the implementation of the conservation measures in the Upland Erosion Control Plan, *Karst Plan*, Timber Removal Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures relevant to eastern small-footed bat include the following:

- Atlantic will avoid clearing forested habitat occupied by Indiana bats (defined as a 5-mile radius from a mist net capture or known Indiana bat hibernacula) during the active season from April 1 to November 14 to avoid impacts on roosting or foraging bats, which will also avoid disturbance of foraging and roosting eastern small-footed bats in these areas. Outside of forested habitats occupied by Indiana bats, tree clearing will be avoided during the migratory bird nesting season between April 1 and August 30, which could also help protect foraging and roosting eastern small-footed bats, although during a shortened time frame.

- A *West Virginia Myotid Conservation Plan* (anticipated in spring 2017), which could also benefit eastern small-footed bats, is being developed for the FWS and will be applied throughout the Project area in West Virginia, including the MNF.

- Burning activities will be prohibited within 500 feet of hibernacula occupied by federally listed species, which could also benefit eastern small-footed bats.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to eastern small-footed bats by re-establishing or retaining suitable forest foraging habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including:

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Conservation measures in the Upland Erosion Control Plan will be implemented to ensure that excavated soil and sediment remains within the construction area and does not impact potential rocky habitat adjacent to the construction area, including:

    - installation of all perimeter erosion control measures immediately after any bulk earth-moving activity;

    - stabilization of access road surfaces by grading and installing stone where needed;

    - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and

    - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the *Karst Plan* will be implemented to avoid or minimize impacts to potential bat (cave) hibernacula if a karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, including (but not limited to) open throat sinkholes, caves which receive surface drainage, sinking streams, and losing stream segments in order to avoid impact on the karst environment, including:

  - prohibition of insecticides, herbicides, or refueling within 300 feet of those features;

  - use of erosion and sediment controls to minimize impacts on downslope karst features within 300 feet of the workspace;

  - no activities will be allowed within 25 feet of these karst features except where that feature falls within 25 feet of the trenchline; the buffer will be fenced in the field for construction activities, including vegetation pre-clearing and clearing activities.

  - Blasting will be conducted in a manner that will not compromise the structural integrity or hydrology of the feature.

  - HDD will not be used in karst terrain.

- The conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable habitat, including:

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7)

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

- o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
- o reporting of restoration status following field inspections.

Preliminary Determination of Effect

No eastern small-footed bats were found during field surveys; however, since two areas of potential eastern small-footed bat rocky roosting habitat were located near the Project right-of-way and the potential foraging forest habitat in the Project area, eastern small-footed bats could be present in the Project area during construction. However, since no occupied habitat was found during field surveys, the likelihood of the presence of substantial numbers of eastern small-footed bat in the Project area within the MNF is low. Potential impacts would likely be limited to temporary noise disturbance and permanent conversion of forest foraging habitat to meadow and edge foraging habitat. In addition, abundant forest foraging habitat would persist adjacent to the Project area and throughout the MNF, and the right-of-way could facilitate the development of additional roosting habitat. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of eastern small-footed bats in the MNF.

5.5.2.3 Little Brown Bat (*Myotis lucifugus*)

Species Description

The little brown bat has a global conservation ranking of G5 (secure) and a state conservation ranking of S2 (imperiled) (WVDNR, 2016). The little brown bat is found in abundance throughout the northern United States, from central Alaska and Canada, south through much of California, central Arizona, through the Rocky Mountains into Mexico, and most of the southeastern United States (Kentucky Department of Fish and Wildlife Resources [KDFWR], 2016). It is rarer in the southern states and completely absent from the southern Great Plains. Historically, this species was one of the most common bat species in West Virginia, but is now seldom found in the State as populations have been impacted by WNS (WVDNR, 2014). The current population trend for the species is decreasing, particularly in the eastern portion of its range, where there are more hibernacula infected with white-nose syndrome (Kunz and Reichard, 2010; NatureServe, 2015). White-nose syndrome was first observed in West Virginia in 2009, and the state has reported declines exceeding 90 percent for little brown bats (Turner et al., 2011).

Habitats associated with the little brown bat include hardwood and mixed forests, grasslands, old fields, and shrubland/chaparral (NatureServe, 2015). Little brown bats roost in buildings, under rocks and wood, and in cavities and under bark of decaying trees in the summer; and hibernate in mines and caves during the winter (Adirondack Ecological Center, 2016a; Crampton and Barclay, 1998; Fenton and Barclay, 1980). Habitat for maternity sites can include warm locations in buildings and hollow trees, particularly near water (NatureServe, 2015; Wisconsin Department of Natural Resources, 2013). When not hibernating, these bats emerge at dusk to hunt for mosquitoes, mayflies, and aquatic insects (Virginia Department of Game and Inland Fisheries [VDGIF], 2016). Foraging occurs over water, along the margins of lakes and streams, or in woodlands near water (NatureServe, 2015). This species spends most of the winter in hibernation, though individuals may exhibit brief periods of arousal, especially if disturbed. Winter hibernation sites, which include caves, tunnels, abandoned mines, and similar sites, generally have a relatively stable temperature of about 2−12 degrees Celsius (Kunz and Reichard, 2010).

Mating usually occurs in September and October. Ovulation and fertilization are delayed until spring as females leave hibernation to form nursery colonies. The gestation period generally lasts 50 to

60 days with reproductive females annually giving birth to one young in the late spring-early summer (Adirondack Ecological Center 2016a). Maternity colonies commonly are found in warm sites in buildings (e.g., attics) and other structures, and infrequently in hollow trees. Microclimate conditions suitable for raising young are relatively narrow, and availability of suitable maternity sites may limit the species' abundance and distribution (NatureServe, 2015). During spring and summer, non-reproductive females and adult males usually inhabit separate roosts, individually or in small groups (Kunz and Reichard, 2010).

Potential Presence in Project Area

Investigations for little brown bat included habitat assessments, hibernacula surveys, and mist netting surveys (see Atlantic, 2016s and 2016t). No portals/caves were found that would provide hibernacula or nighttime roosts, and no little brown bats were captured at any of the mist net sites sampled within the MNF.

Although no little brown bat hibernacula or individuals were found during field surveys, the abundance of forest habitat could provide potential roosting habitat, habitat for maternity colonies in the Project area, and foraging habitat. Therefore, Atlantic will assume presence of little brown bat in the Project area in the MNF.

Impact Evaluation

Since no little brown bats or hibernacula were found during surveys, direct impacts are unlikely to occur. However, given the abundance of potential forest habitat, the potential exists for little brown bats to utilize the Project area for foraging and roosting during construction. Direct impacts could include injury to or mortality of individual bats—including non-volant young at maternity sites. Construction noise, including potential blasting, could also displace bats, increase stress, and disrupt normal activities. However, potential blasting and other construction noise would be temporary in the scope of construction and the life cycle of the little brown bat and no adverse long-term effects are expected. As described for the eastern small-footed bat, blasting is not expected to result in significant disturbance to bats. Noise disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years).

Construction of the pipeline and new access roads through potentially suitable habitat could also result in impacts to the species even if the habitat is not occupied during construction. These impacts could include the removal of potential roost trees and trees for maternity colonies in forest habitat. While a portion of this forest habitat would be allowed to redevelop following construction, the new permanent access roads and 53.5-foot-wide permanent right-of-way would result in the long-term loss of forest habitat. This long-term reduction in potential roosting habitat would be offset, however, since the little brown bat could still utilize the permanent right-of-way and road corridor as foraging habitat.

Conservation Measures

Potential impacts to little brown bats will be minimized through the implementation of the conservation measures in the Upland Erosion Control Plan, *Karst Plan*, Timber Removal Plan; Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures specific to bats will also be applied. Conservation measures include the following:

- A *West Virginia Myotid Bat Conservation Plan,* which could also benefit little brown bats, is being developed for the FWS and will be applied throughout the Project area in West Virginia, including the MNF (anticipated in spring 2017).

- Atlantic will avoid clearing forested habitat occupied by Indiana bats (defined as a 5-mile radius from a mist net capture or known Indiana bat hibernacula) during the active season from April 1 to November 14 to avoid impacts on roosting or foraging bats, which will also avoid disturbance of foraging and roosting little brown bats in these areas. Outside of forested habitats occupied by Indiana bats, tree clearing will be avoided during the migratory bird nesting season between April 1 and August 30, which could also help protect foraging and roosting little brown bats, although during a shortened time frame.

- Burning activities will be prohibited within 500 feet of hibernacula occupied by federally listed species, which could also benefit little brown bats.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to little brown bats by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging and roosting habitat, including:

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and

    - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.

- Conservation measures in the *Karst Plan* will be implemented to avoid or minimize impacts to potential bat (cave) hibernacula if a karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, including (but not limited to) open throat sinkholes, caves which receive surface drainage, sinking streams, and losing stream segments in order to avoid impact on the karst environment, including:

    - prohibition of insecticides, herbicides, or refueling within 300 feet of those features;

    - use of erosion and sediment controls to minimize impacts on downslope karst features within 300 feet of the workspace;

- no activities will be allowed within 25 feet of these karst features except where that feature falls within 25 feet of the trenchline; the buffer will be fenced in the field for construction activities, including vegetation pre-clearing and clearing activities.

- Blasting will be conducted in a manner that will not compromise the structural integrity or hydrology of the feature.

- HDD will not be used in karst terrain.

- Conservation measures in the Upland Erosion Control Plan will be implemented to reduce stormwater runoff from upland construction areas and stabilize foraging habitats, including:

    - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - stabilization of access road surfaces by grading and installing stone where needed;

    - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and

    - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable habitat, including:

    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7)

    - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
- regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
- monitoring to assess all restored areas on USFS lands in years 1 and 5;
- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
- reporting of restoration status following field inspections.

Preliminary Determination of Effect

Potential little brown bat roosting and foraging forest habitat would be affected by the Project. However, since no occupied habitat was found during field surveys, the likelihood of the presence of substantial numbers of little brown bats in the Project area is low. In addition, abundant forest habitat would persist adjacent to the Project area and throughout the MNF, and the development of the permanent right-of-way would provide foraging habitat. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of little brown bats in the MNF.

5.5.2.4 Tri-Colored Bat (*Perimyotis subflavus*)

Species Description

The tri-colored bat conservation status is listed as secure (G5) and state imperiled (S2) (WVDNR, 2016). The range of this species extends from Nova Scotia, New Brunswick, southern Quebec, Michigan, Minnesota, and South Dakota; south to eastern and southern Mexico, Honduras, Texas, the United States Gulf Coast, and Florida; and west to Wyoming, Colorado, western Texas, and New Mexico. The total adult population size is unknown but estimated to be between 10,000 and 1,000,000 individuals. The overall population is distributed over a large number of sites; however, counts are not available for most of the sites. Since 2006, the abundance of tri-colored bats in northeastern North America has greatly declined due to WNS (Francl et al., 2012; NatureServe, 2015). Declines due to WNS in West Virginia in 2009 have exceeded 90 percent for tri-colored bats (Turner et al., 2011).

The tri-colored bat is associated with forested landscapes, where they forage near trees (including forest perimeters) and along waterways. Habitats associated with the tri-colored bat include hardwood and mixed forests, grasslands, old fields, and shrubland/chaparral (NatureServe, 2015). Roosting habitat and habitat for maternity colonies includes dead or live tree foliage in live trees, including oaks and pine (Perry and Thill, 2007). The species generally hibernates in caves, rock crevices, and mines (Tennessee Wildlife Resources Agency, 2016; NatureServe, 2015), which are also used as night roosts in summer

(Tennessee Bat Working Group, 2016). Tri-colored bats usually appear to be solitary as they typically hang singly in warmer parts of the cave. However, occasionally in late summer, the species may be found in groups of four or five around a single tree (Tennessee Bat Working Group, 2016).

Mating usually occurs in the fall. Ovulation and fertilization are delayed until spring as females leave hibernation to form small nursery colonies of fewer than 12. The gestation period generally lasts 44 to 45 days, with reproductive females annually giving birth to one to three (usually two) young in the late spring-early summer (Adirondack Ecological Center, 2016b; Tennessee Wildlife Resources Agency, 2016).

Potential Presence in Project Area

Investigations for tri-colored bats included habitat assessments, hibernacula surveys, and mist netting surveys (see Atlantic, 2016s and 2016t for the survey reports). No portals/caves were found that would provide hibernacula or nighttime roosts, and no tri-colored bats were captured at any of the mist net sites sampled within the MNF.

Although no tri-color bat hibernacula or individuals were found during field surveys, the abundance of forest habitat could provide potential roosting habitat, habitat for maternity colonies, and foraging habitat in the Project area. Therefore, Atlantic will assume presence of tri-colored bat in the Project area in the MNF.

Impact Evaluation

Since no tri-colored bats were identified during surveys, direct impacts from the Project are unlikely to occur. However, given the abundance of potential forest habitat, the potential exists for tri-colored bats to utilize the Project area for roosting and foraging during construction and for impacts to occur. Direct impacts could include injury to or mortality of individual bats—including non-volant young at maternity sites. Construction noise, including potential blasting, could displace bats, increase stress, and disrupt normal activities. As described for the eastern small-footed bat, blasting is not expected to result in significant disturbance to bats. Noise disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years).

Construction of the pipeline and new access roads through potentially suitable habitat could also result in impacts to the species even if the habitat is not occupied during construction. These impacts could include the removal of potential roost trees and trees for maternity colonies in forest habitat. While a portion of this forest habitat would be allowed to redevelop following construction, the new permanent access roads and 53.5-foot-wide permanent right-of-way would result in the long-term loss of forest habitat. This long-term reduction in potential roosting habitat would be offset, however, since the little brown bat could still utilize the permanent right-of-way and road corridor as foraging habitat.

Conservation Measures

Potential impacts to tri-colored bat will be minimized through the implementation of the conservation measures in the Upland Erosion Control Plan, *Karst Plan*, Timber Removal Plan; Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures specific to bats will also be applied. Conservation measures relevant to tri-colored bat include the following:

- A *West Virginia Myotid Bat Conservation Plan,* which could also benefit tri-colored bats, is being developed for the FWS and will be applied throughout the Project area in West Virginia, including the MNF (anticipated in spring 2017).

- Atlantic will avoid clearing forested habitat occupied by Indiana bats (defined as a 5-mile radius from a mist net capture or known Indiana bat hibernacula) during the active season from April 1 to November 14 to avoid impacts on roosting or foraging bats, which will also avoid disturbance of foraging and roosting tri-colored bats in these areas. Outside of forested habitats occupied by Indiana bats, tree clearing will be avoided during the migratory bird nesting season between April 1 and August 30, which could also help protect foraging and roosting tri-colored bats, although during a shortened time frame.

- Burning activities will be prohibited within 500 feet of hibernacula occupied by federally listed species, which could also benefit tri-colored bats.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to tri-colored bats by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging and roosting habitat, including:

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and

    - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.

- Conservation measures in the *Karst Plan* will be implemented to avoid or minimize impacts to potential bat (cave) hibernacula if a karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, including (but not limited to) open throat sinkholes, caves which receive surface drainage, sinking streams, and losing stream segments in order to avoid impact on the karst environment, including:

    - prohibition of insecticides, herbicides, or refueling within 300 feet of those features;

    - use of erosion and sediment controls to minimize impacts on downslope karst features within 300 feet of the workspace;

  - no activities will be allowed within 25 feet of these karst features except where that feature falls within 25 feet of the trenchline; the buffer will be fenced in the field for construction activities, including vegetation pre-clearing and clearing activities.

  - Blasting will be conducted in a manner that will not compromise the structural integrity or hydrology of the feature.

  - HDD will not be used in karst terrain.

- Conservation measures in the Upland Erosion Control Plan will be implemented to reduce stormwater runoff from upland construction areas and stabilize foraging habitats, including

  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - stabilization of access road surfaces by grading and installing stone where needed;

  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and

  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- The conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7)

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

- o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

- o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

- o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

- o monitoring to assess all restored areas on USFS lands in years 1 and 5;

- o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and

- o reporting of restoration status following field inspections.

Preliminary Determination of Effect

Potential tri-colored bat roosting and foraging forest habitat would be affected by the Project. However, since no tri-colored bat hibernacula or individuals were found during field surveys, the likelihood of the presence of substantial numbers of tri-colored bat in the Project area is low. In addition, abundant forest habitat would persist adjacent to the Project area and throughout the MNF, and the development of the permanent right-of-way would provide foraging habitat. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of tri-colored bats in the MNF.

5.5.2.5 Southern Rock Vole (*Microtus chrotorrhinus carolinensis*)

Species Description

The southern rock vole has a global conservation ranking of G4T3 (*Microtus chrotorrhinus* apparently secure; *M. chrotorrhinus carolinensis* vulnerable), and a state conservation ranking of S2 (imperiled) (WVDNR, 2016). Species distribution includes eastern Canada; northeastern Minnesota; higher elevations in New England, New York, and northeastern Pennsylvania; and the southern Appalachian Mountains in Virginia, West Virginia, North Carolina, and Tennessee (Cassola, 2016). Its preferred habitat includes deep talus in cool, damp, coniferous and mixed forests at higher elevations, particularly habitat containing fern- and moss-covered talus near flowing water in coniferous forests (Cassola, 2016). Rock voles in Virginia were found to occupy cool, moist talus slopes and rocky areas above 976 meters (3,200 feet) within forested streamside riparian areas dominated by rocks greater than 0.2 meter (7.9 inches) in diameter and with abundant woody debris, herbaceous vegetation, and moss (Orrock et al., 1999). Southern rock voles have been associated with moderate to steep slopes within areas containing a variety of herbaceous cover, recent clear-cuts, old growth forests, grassy balds near forest edges, and rocky road-fills (Cassola, 2016). The species develops small isolated colonies, with home ranges likely less than 1 acre (Cassola, 2016). A consistent feature of four areas where suitable habitat was analyzed was the presence of yellow birch (*Betula alleghaniensis*) (Orrock and Pagels, 2003). Southern rock voles often utilize a network of subsurface runs among rocks and boulders

(Kirkland and Jannett, 1982). This species can be found anytime throughout the day or night and does not hibernate.

Southern rock voles are herbivores, and principally graze on forbs (Kirkland and Jannet, 1982). Suitable food sources include bunchberry (*Cornus canadensis*), Clinton's lily (*Clintonia borealis*), Canada mayflower (*Maianthemum canadense*), false miterwort (*Tiarella cordifolia*), wood sorrel (*Oxalis montana*), blueberry (*Vaccinium* spp.), raspberry (*Rubus* spp.) (Banfield, 1974; Christian and Daniels, 1985; Hamilton, 1943; Timm et al., 1977).

Nesting habitat likely requires logs or similar protected sites under which shallow burrows and runways are excavated, and moss or grass for lining nests (Cassola, 2016). The breeding season occurs from March to mid October. A female can produce one to three litters that contain one to seven young each breeding season, and spring progeny are reproductive in their first summer. Potential predators include bobcats, rattlesnakes, weasels, foxes, and short-tailed shrews. Food sources include foliage, stems, fruits, and fungi. The southern rock vole is active year-round and does not hibernate. It has been reported as a primarily diurnal species, and is most active in the morning. Threats to the southern rock vole include loss of intact forest habitat, and while colonies have been found to tolerate and even thrive in recent clearcuts, the species is generally absent from young forests (Kirkland, 1977).

Potential Presence in Project Area

There are no known documented occurrences of southern rock vole within 2 miles of the Project Area based on a review of WVDNR NHP NHI data, and its distribution within the MNF is not known. A desktop analysis was completed to identify potential southern rock vole habitat within the Analysis Area in the MNF. Two areas with potential habitat for southern rock vole (Survey Areas 1 and 2), were identified along [redacted] see Appendix A). Both areas also contain potential suitable habitat for long-tailed shrew. and one contains a population of Allegheny woodrat (see Sections 5.5.2.7 and 5.5.2.6). A field survey habitat assessment was carried out for the two sites in February 2017. Survey Area 1 was located at 3,920 feet in elevation and contained a boulder field on a northwest-facing slope with numerous crevices, ledges, and overhangs. Understory species included *Ribes* and *Rubus* species. Survey Area 2 was located at 4,000 feet on either side of [redacted] at a rocky site (surface rock equaled 75 percent) approximately [redacted] from the Project right-of-way. The site contained abundant moss covered rocks and coarse woody debris. Rock sizes ranged from 12 to 24 inches in length and 3 to 6 inches in diameter. Overstory species included spruce, hemlock, birch, and maple. Both areas were determined to contain moderate-quality potential habitat for southern rock voles.

Impact Evaluation

If present along [redacted] near the Project right-of-way, impacts to southern rock voles could include noise disturbance from construction activities, which could increase stress and disrupt normal activities. Since this species has limited mobility, it is unlikely to be present in the construction workspace, and therefore direct impacts from construction are unlikely.

Nevertheless, the use of [redacted] for access to the Project area could result in direct and indirect impacts on southern rock vole, if present, at both Survey Areas. Collisions with construction vehicles that could result in mortality are possible, particularly at Survey Area 2, which is located immediately adjacent to the road. Since the species is diurnal, restricting construction or vehicle use to daylight hours will not help avoid active individuals, if present.

Indirect impacts would include noise from construction vehicles. Vehicles are expected to range from light pick-up trucks to large-pipe-hauling trucks. The noise generated from these vehicles will vary; however, they will increase terrestrial noise locally above the ambient sound levels for short bursts, which could startle southern rock voles and increase stress and disrupt normal activities. In addition, southern rock vole habitat includes subsurface tunnels that could be filled by sediment transported by stormwater runoff from the access road. The use of heavy vehicles that could impact the integrity of the road would therefore be of concern. Impacts to adjacent potential habitat are not anticipated, however: [redacted] is an existing road, and there are no plans to widen or extend the road for the Project. Based on a field discussion with MNF staff on November 4, 2016, no expansion, blasting, or other construction is planned along existing [redacted] [redacted] will receive maintenance, as needed, but will not require any improvements that are likely to fragment or impact potential adjacent southern rock vole habitat.

Conservation Measures

Potential impacts to the southern rock vole and its habitat will be minimized through the implementation of the conservation measures in the Upland Erosion Control Plan, as specified in the *COM Plan* (see Appendix C). Relevant conservation measures include the following:

- Conservation measures in the Upland Erosion Control Plan will be implemented to ensure that potential habitat adjacent to [redacted], including subsurface tunnels that could shelter southern rock vole, is not affected by sediment transport both during and after construction, including
    - Stabilization of access road surfaces by grading and installing stone where needed; and
    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water.

Preliminary Determination of Effect

Because only two areas were found to contain potential moderate-quality habitat for southern rock vole in the Analysis Area, the likelihood of substantial numbers of southern rock voles being present in the Project area and affected by the Project is low. Since potential southern rock vole habitat will not be directly affected, and with the implementation of the conservation measures listed above, Atlantic determines that Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of southern rock vole in the MNF.

5.5.2.6 Allegheny Woodrat (*Neotoma magister*)

Species Description

The Allegheny woodrat has a global conservation ranking of G3G4 (vulnerable to apparently secure) and a state conservation ranking of S3 (vulnerable) (WVDNR, 2016). The species is known to occur from western Connecticut, southeastern New York, northern New Jersey, and northern Pennsylvania southwestward through western Maryland, Tennessee, Kentucky, West Virginia, and northern and western Virginia (from the Blue Ridge westward), to northeastern Alabama and northwestern North Carolina, with isolated populations north of the Ohio River in southern Ohio. Although the range of this species is fairly large in the eastern United States, the population is extirpated or declining over about 35 percent of the range in the northeastern United States (Kennedy and Harvey, 2001; NatureServe, 2015). The population decline has been rapid and the cause is not fully understood, although habitat degradation; deforestation; a reduction in the abundance of hard mast crops due to the effects of the chestnut blight on American chestnut (*Castanea dentate*) and of the gypsy moth (*Lymantria dispar*) and fire suppression on oak tree decline; increases in tree species with low food value (e.g., white pine [*Pinus strobus*]; increased competition for food resources from other mammals such as deer and black bear; and human disturbance have been implicated in the population decline (Ford et al., 2006; KDFWR, 2014b). Allegheny woodrat populations tend to be small and isolated, making them vulnerable to local extirpation. Forest fragmentation and deforestation make it difficult for woodrats to disperse, further isolating populations, as well as eliminating important food sources (NatureServe, 2015).

Allegheny woodrats are forest obligates that have a strong reliance on acorns as a food source, although their diet can also include buds, twigs, leaves, ferns, holly (*Ilex* spp.), fruits, seeds, and fungi (as summarized in Ford et al., 2006 and Clair, 2015). Suitable den sites include forested areas with rock outcrops, cave entrances, and large colluvial talus slopes, particularly those on a steep slope, and with southern exposure, numerous overhangs, rocks below the surface that contain deep crevices, and at least 1 hectare (2.5 acres) of rocks and boulders (Ford et al., 2006; Clair, 2015). A habitat site has been defined as having a contiguous span (greater than 200 meters [656 feet]) of surface rock within the forest interior (Clair, 2015). Allegheny woodrats forage in the forest around a habitat or den site, with home ranges estimated at 6.5 hectares (16 acres) during the breeding season (Monty and Feldhamer, 2002). Typically, Allegheny woodrats forage within approximately 23 meters (75 feet) of their den sites, but have been found to move up to 329 meters (1,079 feet) away (as summarized in Monty and Feldhamer, 2002). Based on an analysis of the influence of different landscape variables on the presence of active colonies by Ford et al. (2006), sustainable populations most likely include those that occupy areas with numerous rock outcrops or cliffs surrounded by unfragmented forest and separated by less than 2.5 kilometers (1.55 miles), which is considered to be the maximum dispersal distance for the species.

Potential Presence in Project Area

A study of Allegheny woodrats found 252 active den sites in the mid-Atlantic Highlands of Maryland, Virginia, and West Virginia (Ford et al., 2006). There are three occurrences of Allegheny woodrat documented within 2 miles of the centerline within the MNF based on WVDNR NHP NHI data. A field survey for potential presence of Allegheny woodrat habitat and signs was conducted for the Project within the MNF in May 2016. Field surveys were conducted in areas determined as potential habitat through desktop review on approximately 6 miles of a 300-foot-wide study corridor along the proposed right-of-way, and on approximately 8.2 miles of access roads (see Atlantic, 2016a). Trapping surveys were completed at the request of the MNF of Rock Outcrop 06 (see below) on October 3−5, 2016 (Atlantic, 2016b).

Signs of Allegheny woodrats were documented along two rock formations within the vicinity of [redacted] within the MNF near [redacted] (see Appendix A), which also provide potential habitat for southern rock vole, long-tailed shrew, and eastern spotted skunk (Sections 5.5.2.5, 5.5.2.7, and 5.5.2.9). Allegheny woodrat latrines were observed within the two rock outcrops and a possible food cache was documented in the same outcrop as one of the latrines. The area was dominated by mixed northern hardwood forest and contained two large rock formations (Rock Outcrop 01 and 02).

Rock Outcrop 01 is a boulder field on a northwest-facing slope with numerous ledges and overhangs. A single Allegheny woodrat latrine was observed, as well as a possible food cache consisting of mountain maple leaves in the same location. The scat found within the latrine contained recent (less than one year old) and decayed fecal pellets. The habitat was considered moderate quality for Allegheny woodrat due to the single latrine observed, the limited amount of underground crevices, limited food availability, and the close proximity to other rock formations. Rock Outcrop 01 is located 26 feet west of the proposed access road.

Rock Outcrop 02 contained large (>50 foot) boulders with deep recesses and numerous overhanging ledges within mature hardwood forest. Multiple Allegheny woodrat latrines were observed within the rock outcrop. These latrines contained fresh (still moist) and decayed fecal pellets. Habitat was considered high quality for Allegheny woodrat due to the multiple latrines observed, the presence of numerous deep crevices, food availability, and the close proximity to other rock formations. Rock Outcrop 02 is located 25 feet north of the proposed access road.

Per recommendations from the MNF, live-trapping for Allegheny woodrats was conducted in potential habitat at Rock Outcrop 06 in the Project area near the northern extent of Cloverlick Mountain ([redacted] (Atlantic, 2016b). This rock outcrop was on a steep slope and contained crevices that appeared to extend below ground, as well as numerous ledges and overhangs. However, the site was found to contain low-quality habitat for the Allegheny woodrat due to limited foraging potential (few mature oak species) and location on a north-facing slope. No woodrats were captured during the two nights of live-trapping conducted October 3 to 5, 2016. Furthermore, no evidence of use by woodrats was observed in this area; therefore, Rock Outcrop 06 is assumed to be unoccupied.

<u>Impact Evaluation</u>

Given that the one area found to have potential habitat along the proposed pipeline right-of-way at [redacted] did not have signs of Allegheny woodrats and was of low quality, Atlantic anticipates no impacts on Allegheny woodrat from pipeline construction. In addition, the use of [redacted] as a Project access road would not result in the loss of suitable denning habitat or in the loss or fragmentation of forest habitat. Based on a field discussion with MNF staff on November 4, 2016, Atlantic committed to making no adjustments and conducting no blasting or other construction along existing [redacted] will be regraded with gravel added in select locations, but will not require expansion that could further fragment or impact adjacent Allegheny woodrat habitats at Rock Outcrops 1 and 2. However, construction vehicles traveling on the road would create an increase in local traffic and could directly impact Allegheny woodrat. Vehicles are expected to range from light pick-up trucks to large-pipe-hauling trucks. The noise generated from these vehicles will vary; however, they will increase terrestrial noise locally above the ambient sound levels for short bursts, which could startle Allegheny woodrat and disrupt sleep or other normal activities. Alleghany woodrat mortality from vehicle collisions would be unlikely since the species is nocturnal and most construction would take place during daylight hours. Indirect impacts to Allegheny woodrat could also occur as a result of the use of [redacted]. Allegheny woodrat habitat includes underground crevices that could be filled by sediment transported by stormwater runoff from the access road. The use of heavy vehicles that could impact the integrity of the road would therefore be of concern.

<u>Avoidance and Minimization</u>

Atlantic has considered the feasibility of avoidance and minimization of impacts to the Allegheny woodrat population at [redacted], as required for RFSS by the MNF Land and Resource Management Plan (LRMP). Atlantic has committed to avoiding direct damage to or loss of Allegheny woodrat occupied habitat found adjacent to [redacted] by not widening the road and avoiding blasting or other construction along the road. Mitigation measures for noise impacts along [redacted] are discussed below.

<u>Conservation Measures</u>

Impacts to Allegheny woodrats found adjacent to [redacted] will be mitigated through the implementation of the following site-specific conservation measures:

- Atlantic will not widen [redacted] or conduct blasting or other construction along [redacted] in order to avoid damage to and loss of adjacent occupied Allegheny woodrat habitat.
- A biological monitor will be on site during road improvement activities to ensure Allegheny woodrat habitat at [redacted] is avoided and undisturbed.
- Road usage along [redacted] where it is adjacent to the potential eastern spotted skunk rocky outcrop habitat will be minimized to avoid dawn and dusk high activity periods for Allegheny woodrat to minimize potential injury or mortality from vehicle collisions.

<u>Preliminary Determination of Effect</u>

Since no Allegheny woodrats were found along the pipeline right-of-way, impacts would be limited to the Allegheny woodrat population documented adjacent to [redacted]. With the use of the existing road and limitations on road use during periods of higher woodrat activity, impacts to Allegheny woodrat would likely be limited to temporary noise disturbance. Given these impacts, and with implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of this species in the MNF.

5.5.2.7 Long-Tailed Shrew (*Sorex dispar*)

<u>Species Description</u>

This species has a global conservation ranking of G4 (apparently secure) and a state conservation ranking of S2S3 (imperiled to vulnerable) (WVDNR, 2016). The species is known to occur from Nova Scotia and southeastern New Brunswick, south through the Appalachians, ending in the mountains of North Carolina and Tennessee (Scott, 1987). The long-tailed shrew is a small to medium size shrew ranging from 4 to 5.5 inches in total length. Individuals do not hibernate and are diurnal, being constantly active both day and night, and feeding mainly on arthropods including insects, spiders, and centipedes (Reid, 2006).

The long-tailed shrew typically inhabits damp deciduous or coniferous forests with loose talus substrate, abundant leaf litter, and deep crevices on level areas and moderate to steep slopes. Artificial talus created by road and mine construction may also be used. The long-tailed shrew also inhabits riparian areas along rocky mountain streams (Kirkland, 1981; NatureServe, 2015; Woolaver et al., 1998).

Trapping results suggest the long-tailed shrew spends most time in the spaces between rocks and about a foot below ground (Richmond and Grimm, 1950). Breeding occurs in the spring and summer between April and August, and nest sites are typically associated with natural subterranean tunnels and boulder crevices (Kirkland and Van Deuen, 1979). Although very little is known of territoriality or home range size, it is estimated that the long-tailed shrew is more common than captures would indicate due to the difficulty of trapping in a subterranean talus microhabitat.

Potential Presence in Project Area

There are no known documented occurrences of long-tailed shrew within 2 miles of the Project Area based on a review of WVDNR NHP NHI data, and its distribution within the MNF is not known. A desktop analysis was completed to identify potential long-tailed shrew habitat within the Analysis Area in the MNF. Two areas with potential habitat for long-tailed shrew (Survey Areas 1 and 2) were identified along [redacted]. Both areas also contain potential suitable habitat for southern rock vole, and one contains a population of Allegheny woodrat (see Sections 5.5.2.5 and 5.5.2.6). A field survey habitat assessment was carried out for the two sites in February 2017. Survey Area 1 was located at 3,920 feet in elevation and contained a boulder field on a northwest-facing slope with numerous crevices, ledges, and overhangs. Understory species included *Ribes* and *Rubus* species. Survey Area 2 was located at [redacted] at a rocky site (surface rock equaled 75 percent) approximately 200 feet from the Project right-of-way. The site contained abundant moss-covered rocks and coarse woody debris. Rock sizes ranged from 12 to 24 inches in length and 3 to 6 inches in diameter. Overstory species included spruce, hemlock, birch, and maple. Both areas were determined to contain moderate-quality potential habitat for long-tailed shrew.

Impact Evaluation

If present along [redacted] near the Project right-of-way, impacts to long-tailed shrew could include noise disturbance from construction activities, which could increase stress and disrupt normal activities. Since this species has limited mobility, it is unlikely to be present in the construction workspace, and therefore direct impacts from construction are unlikely.

The use of [redacted] for access to the Project area could result in direct and indirect impacts on long-tailed shrew, if present, at both Survey Areas. Collisions with construction vehicles that could result in mortality are possible, particularly at Survey Area 2, which is located immediately adjacent to the road. Since the species is diurnal, restricting construction or vehicle use to daylight hours will not help avoid active individuals, if present.

Indirect impacts would include noise from construction vehicles. Vehicles are expected to range from light pick-up trucks to large-pipe-hauling trucks. The noise generated from these vehicles will vary; however, they will increase terrestrial noise locally above the ambient sound levels for short bursts, which could startle long-tailed shrews and increase stress and disrupt normal activities. In addition, long-tailed shrew habitat includes deep crevices in the ground that could be filled by sediment transported by stormwater runoff from the access road. The use of heavy vehicles that could impact the integrity of the road would therefore be of concern. Impacts to adjacent potential habitat are not anticipated, however: [redacted] is an existing road, and there are no plans to widen or extend the road for the Project. Based on a field discussion with MNF staff on November 4, 2016, no expansion, blasting, or other construction is planned along existing [redacted] [redacted] will receive maintenance, as needed, but will not require any improvements that are likely to fragment or impact potential adjacent long-tailed shrew habitat.

Conservation Measures

Potential impacts to the long-tailed shrew and its potential habitat will be minimized through the implementation of the conservation measures in the Upland Erosion Control Plan, as specified in the *COM Plan* (see Appendix C). Relevant conservation measures include the following:

- Conservation measures in the Upland Erosion Control Plan will be implemented to ensure that potential habitat adjacent to [redacted] including subsurface tunnels that could shelter long-tailed shrews, is not affected by sediment transport both during and after construction, including:

- Stabilization of access road surfaces by grading and installing stone where needed; and
- Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water.

Preliminary Determination of Effect

Because only two areas were found to contain potential moderate-quality habitat for long-tailed shrew in the Analysis Area, the likelihood of substantial numbers of long-tailed shrew being present in the Project area within the MNF and affected by the Project is low. Since potential long-tailed shrew habitat will not be directly affected, and with the implementation of the conservation measures listed above, Atlantic determines that Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of long-tailed shrew in the MNF.

5.5.2.8 Southern Water Shrew (*Sorex palustris punctulatus*)

Species Description

The southern water shrew has a global conservation ranking of G5T3 (*Sorex palustris* secure; *S. palustris punctulatus*, vulnerable), and a state conservation ranking of S1 (critically imperiled) (WVDNR, 2016). Its range extends north from the boreal and montane regions of Canada from Labrador and Nova Scotia to southeastern Alaska, and south in the Appalachian Mountains to Tennessee and North Carolina, in the Rocky Mountains to Utah and New Mexico, and in the Sierra Nevada to California (Linzey, 1998).

The southern water shrew is a large semi-aquatic shrew that attains a length of approximately 6 inches from snout to tail tip. The hind feet are slightly webbed and fringed. The species is mostly nocturnal and does not hibernate (Linzey, 1998). It primarily feeds on aquatic organisms, including macroinvertebrates, small fish, amphibians, and amphibian eggs that it captures while swimming. Reproduction likely occurs from late winter through late summer (Conaway, 1952). Southern water shrews produce two to three litters of up to six young per year.

The southern water shrew is most abundant along rocky, rapidly running, cold mountain streams at 2,500 to 6,000 feet in elevation with a low to high gradient, an abundance of aquatic organisms, and thick overhanging riparian growth (Conaway, 1952; Linzey, 1998; NatureServe, 2015). These streams are typically found within mixed coniferous-deciduous forests with a mostly closed canopy (Butchkoski, 2014). Rhododendron, mountain laurel, and yellow birch are noted as vegetation typically associated with southern water shrew habitat (Linzey, 1998; NatureServe, 2015). The species can also be found alongside lakes, ponds, marshes, bogs, fens, and other lentic habitats (NatureServe, 2015). The southern water shrew makes its nest sites near water in underground burrows, under hollow logs, beaver lodges, and other areas that provide adequate shelter (NatureServe, 2015). Home ranges are described as linear, extending along the banks of streams: the range for a related species was found to extend for approximately 65 to 305 feet along a stream (NatureServe, 2015). However, individuals have been found more than 300 feet from streams in northern hardwood stands (DeGraaf and Rudis, 1986).

Predators include fish, minks, weasels, snakes, and hawks and owls (NatureServe, 2015). Pollution is the major threat to the southern water shrew. Logging, agriculture, mining, road-building, acid rain, and insecticide use have degraded the high-quality streams the southern water shrew inhabits (NatureServe, 2015).

Potential Presence in Project Area

There are no known documented occurrences of southern water shrew within 2 miles of the Project Area based on a review of WVDNR NHP NHI data, and its distribution within the MNF is not known. Linzey (1998) notes five documented occurrences in Virginia. Potential moderate-quality habitat was identified at the [redacted] waterbody crossing of [redacted] (Survey Area 1: near [redacted]) and at the pipeline crossing of an [redacted] (Survey Area 2; [redacted]) based on a desktop assessment and field habitat assessments (see Appendix A). Field habitat assessments were conducted in February 2017. Survey Area 1 occurred at 4,000 feet in elevation. Potential habitat included undercut banks and overhanging roots and vegetation. The area was determined to provide moderate-quality habitat. Survey Area 2 was located at 3,000 feet in elevation. Potential habitat consisted of several areas with undercut banks near pools and included a log jam with a rock mound. The area was determined to provide moderate-quality habitat.

Impact Evaluation

If present in the Project area in the potential habitat, impacts to southern water shrew could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. The likelihood of impacts may be greater at the two areas identified as having moderate-quality habitat for southern water shrew, including the pipeline waterbody crossing at [redacted] and the existing access road waterbody crossing near [redacted] Since this species has limited mobility, construction vehicles and equipment at the pipeline waterbody crossing could also cause physical injury or mortality. Sound pressure waves from blasting could cause injury or mortality to individuals. Disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way, which would occur approximately every 3 years. Because the access road is existing and no expansion or widening is proposed, direct impacts on southern water shrew are not anticipated to occur as a result of access road use for the Project, although intermittent impacts from vehicle noise disturbance could occur.

Construction activities at the pipeline waterbody crossing could also alter riparian habitat and make the area unsuitable through vegetation removal, streambank alteration, loss of a duff layer, and loss of nest sites and burrows. Impacts to water quality could also occur as a result of increased turbidity during pipeline installation across the stream. Stormwater runoff from upslope construction areas could temporarily affect stream water quality through increased sedimentation, turbidity, and flow; decreased dissolved oxygen concentrations; releases of existing chemical and nutrient pollutants from disturbed sediments; and introduction of contaminants, such as chemicals, fuels, and lubricating oils, from incidental spills (also see Section 5.4.2). Impacts could involve both southern water shrew and invertebrate prey species. Water quality impacts could have adverse effects on southern water shrew aquatic prey, including aquatic invertebrates (Natural Resources Conservation Service, 2001). Furthermore, the use of pesticides could also result in bioaccumulation in prey species and indirectly affect southern water shrew.

The long-term loss of forest cover in the permanent 53.5-foot-wide right-of-way would have a detrimental effect through habitat loss, forest fragmentation, increased pathways for predators, and creation of an edge effect through reduced moisture levels adjacent to the right-of-way through a reduction in shade. Approximately 30 feet of riparian area on either side of waterbody crossings will be permanently converted from forested riparian habitat to herbaceous and scrub/shrub riparian habitat since trees will not be allowed to develop within 15 feet of the pipeline adjacent to a waterbody, and vegetation will be limited to herbaceous plants and shrubs in this area. In addition, soils disturbed by construction activities can also facilitate the spread of non-native invasive plant species such as Japanese knotweed (*Polygonum cuspidatum*), which can degrade riparian and aquatic habitat by displacing native plant species, destabilizing streambanks, and creating dense stands of vegetation that can adversely affect water quality and riparian and aquatic habitat (Potomac Highlands Cooperative Weed and Pest Management Area, 2011).

<u>Conservation Measures</u>

Potential impacts to southern water shrew riparian and aquatic habitat will be minimized through the implementation of the conservation measures in the Timber Removal Plan, Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, SPCC Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, Visual Resources Plan, and Water Quality Monitoring Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures specific to southern water shrew will also be applied. Relevant conservation measures include:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to southern water shrew by re-establishing or retaining suitable forested riparian habitat:
    - The outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF, including species suitable for riparian areas.
    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Atlantic will coordinate with the MNF to include potential food sources and other beneficial riparian shrubs for southern water shrew in the revegetation plan for riparian areas if commercially available, such as silky willow, rhododendron, mountain laurel, and yellow birch.
- Felled woody debris will be retained along the edge of the right-of-way for den sites and shelter.
- A dry stream crossing method, including either the flume or dam-and-pump method, will be implemented for pipeline construction across waterbodies, which will help reduce the introduction of sediment and turbidity into potential southern water shrew habitat during construction.
- No pesticides will be used on MNF property in order to avoid potential harm to southern water shrew and its invertebrate prey species.
- Blasting will be used for rock removal as needed in the pipeline waterbody crossing of the UNT to Shock Run where there is potential habitat for southern water shrew, since it is the least environmentally impactful method for rock removal.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to southern water shrew riparian and aquatic habitat, including:
    - employment of least-intrusive tree removal methods to reduce damage to adjacent forested riparian habitat;
    - avoiding altering existing surface drainage patterns by the placement of timber or brush piles at the edge of the construction right-of-way;
    - logs and slash will not be yarded across perennial streams unless fully suspended;
    - logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment; and
    - any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.
- Conservation measures will be implemented to reduce impacts on aquatic habitat both during and after construction per the Project's Stream and Wetland Crossing Procedures, including:
    - completing construction across streams as quickly as possible.
    - limiting in-water work to seasonal restrictions where applicable, as specified in Section 2.2.2.2 and Appendix B;
    - locating spoil from waterbody crossings at least 10 feet from the water's edge;
    - locating all extra work areas (such as staging areas) at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land;
    - installation of sediment barriers along the entire construction right-of-way within the waterbody immediately after initial disturbance of the waterbody or in adjacent upland, and continued maintenance throughout construction to prevent the flow of sediments into the waterbody;
    - maintenance of a clearly marked 100-foot-wide vegetative buffer between a waterbody and the pipeline right-of-way where it runs parallel to the waterbody;
    - maintenance of adequate waterbody flow rates to prevent the interruption of existing downstream uses;
    - stabilization of waterbody banks and installation of temporary sediment barriers within 24 hours of completing instream construction activities;
    - restoration of steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces);

- o restoration of all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI;
- o restricting the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric; and
- o revegetation of disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

- Conservation measures to reduce stormwater runoff from upland construction areas to aquatic habitat will be implemented both during and after construction per the Upland Erosion Control Plan, including:
  - o prohibiting the use of herbicides in or within 100 feet of a stream or wetland, except as allowed by the USFS;
  - o installation of all perimeter BMPs immediately after any bulk earth-moving activity;
  - o stabilization of access road surfaces by grading and installing stone where needed;
  - o installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and
  - o removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to stabilize streambanks and reduce upland stormwater runoff to aquatic habitat both during and after construction, including:
  - o completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
  - o installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
  - o mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
  - o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
  - no use of lime or fertilizer within 100 feet of wetlands or waterbodies;
  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
  - monitoring to assess all restored areas on USFS lands in years 1 and 5;
  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
  - reporting of restoration status following field inspections.

- Inspection and monitoring will be carried out to ensure conservation measures at waterbody crossings and adjacent upland areas are properly employed and maintained to reduce stormwater runoff to riparian and aquatic habitat both during and after construction per the Project's Water Quality Monitoring Plan, including:
  - monitoring turbidity at all stream crossings that are state-designated as coldwater fisheries four times per day during active construction both 50 feet upstream and downstream from the construction area, and one time per day for four days following the completion of restoration activities;
  - implementation of remediation measures, should the chronic turbidity reading exceed standards.

- Atlantic will adhere to the Spill Prevention, Control, and Countermeasure Plan to prevent hazardous materials from entering aquatic habitat, including:
  - restricting equipment refueling and lubricating and storage of hazardous materials to upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants into riparian areas that could degrade southern water shrew habitat (also see Section 5.5.7), including:
  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

Because only two areas were found to contain potential moderate-quality habitat for southern water shrew in the Analysis Area, the likelihood of substantial numbers of southern water shrew being present in the Project area within the MNF and affected by the Project is low. In addition, most impacts will be temporary with the implementation of the conservation measures listed above. Since potential forested aquatic and riparian habitat will persist upstream and downstream of the Project area, and with the implementation of the conservation measures, Atlantic determines that Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of southern water shrew in the MNF.

5.5.2.9 Eastern Spotted Skunk (*Spilogale putorius*)

Species Description

The eastern spotted skunk has a global conservation rating of G5 (secure) and a state conservation ranking of S2 (imperiled) (WVDNR, 2016). Spotted skunks, which are nocturnal, are smaller than striped skunks and have a more weasel-like appearance. On average, spotted skunks reach between 16.5 and 22 inches from nose to tail tip, and weigh between 1.0 to 1.5 pounds (VDGIF, 2016). The eastern spotted skunk has a distinct white spot on its forehead, one white spot on the front of each ear, and white stripes on the anterior of its body (Grzmek, 1972). Mating occurs by April each spring and two to six young are born between May and June. Spotted skunks excavate underground dens or occupy underground dens abandoned by other animals. The dens usually have between two to five entrances and one to three nesting chambers (VDGIF, 2016). Eastern spotted skunks do not have a hibernation period, but instead go through short inactive periods during the winter to conserve body fat. The species is crepuscular and nocturnal. Home ranges may be quite large, ranging between approximately 54 and 866 hectares (133 to 2,139 acres) based on a study in the Ouachita Mountains in Arkansas (Lismeister et al., 2007), although average home ranges in Missouri are reported at 0.25 square mile (160 acres) (Schwartz and Schwartz, 1981).

The eastern spotted skunk is typically found in the eastern United States. It has been known to occur in several areas of the Appalachian Mountains since the early 1900s (Howell, 1906); however, its current abundance in the southern Appalachian region is unclear. Although once an abundant species, populations have declined from 50 to 90 percent in many parts of its range. Causes for the decline are not well understood, but could include habitat conversion, mid-twentieth century overharvesting for furs, mortality from collisions with vehicles, urbanization, herbicides, and pathogenic diseases (Gompper and Jachowski, 2016; NatureServe, 2015). It is known to inhabit mixed mesophytic forests with a closed canopy and dense, complex understory that will provide cover from predators: dry oak-pine forests are also used but are considered to provide mid- to low-suitability habitat (DeVault, 2017; Lesmeister, 2007). Recent clear-cuts and successional fields, including open brushy areas and outcrops in woodlands and prairies, may also provide suitable habitat (Cuarón et al, 2008; NatureServe, 2015). Habitat attributes include rock outcrops, cliffs, caves, or talus, and the species will use hollow trees, stumps, logs, and underground burrows as den sites (Gompper & Jachowski, 2016). High-quality habitat in the region may include upper ridgelines, which may be used as travel corridors (DeVault, 2017). Predators include owls, coyote, bobcat, hawks, and fox (DeVault, 2017). The species is an opportunistic omnivore, with food sources including insects and small rodents (Gompper and Jachowski, 2016).

Potential Presence in Project Area

There are no known documented occurrences of eastern spotted skunk within 2 miles of the Project Area based on a review of WVDNR NHP NHI data, and its distribution within the MNF is not known. Five areas were identified through desktop analysis and field surveys for other species as having potentially suitable habitat. Field habitat assessments conducted in February 2017 found that four of the sites contain moderate to high-quality habitat and one contained low-quality habitat for eastern spotted skunk based on elevation, ridgeline proximity, forest composition, and the availability of species-preferred ground cover and denning or foraging habitat (see Appendix A). No presence/absence surveys were carried out.

Survey Area 01 included a large rock outcrop at 3,920 feet in elevation adjacent to [redacted] that contained many large cavities and crevices and also supports Allegheny woodrat populations and potential habitat for southern rock vole and long-tailed shrew (see Sections 5.5.2.5, 5.5.2.6, and 5.5.2.7). Overstory species included maple, hickory, and birch. Habitat quality was described as moderate. Survey Area 02 ([redacted]) was located at 3,000 feet in elevation on a southeast-facing slope along Michael Mountain and was dominated by oak-pine forests with a dense understory and few snags, cavities, and coarse woody debris. There was no surface rock, but the site was adjacent to a high ridge with large rock outcrops. The habitat quality was described as moderate. Survey Area 03 [redacted] was located at 2,990 feet in elevation on a ridge near [redacted] within an oak-pine forest with a scattered understory and few snags, cavities, and coarse woody debris. There was no surface rock present, and habitat quality was described as low. Survey Area 04 ([redacted]) was located at 3,200 feet in elevation on a west-facing hillside near [redacted] within an oak-pine forest adjacent to an UNT to Shock Run. Many large snags and live trees with cavities were present, and the habitat was described as moderate. Survey Area 05 ([redacted]) is located at 3,875 feet in elevation along a ridgetop just west of the West Virginia/Virginia border within a transitional area of clearcut (approximately 8 to 10 years in age) to mid- to late-successional mixed oak and mixed mesophytic/cove hardwoods. Habitat characteristics included an herbaceous opening, rock outcrop, and abundant coarse woody debris with large snags and live trees with cavities. Habitat quality was described as high.

Impact Evaluation

If present in the Project area, potential impacts on eastern spotted skunk could include disturbance from temporary construction impacts, including noise from large vehicles and machinery, vegetation removal, and ground disturbance, which could displace skunks, increase stress, and disrupt normal activities. Given the species' large home ranges, however, individuals would be able to move away from the disturbance if not rearing young. The likelihood of impacts may be greater at the five areas identified as having moderate- to high-quality habitat for eastern spotted skunk: adjacent to [redacted] and at [redacted]. Collisions with construction vehicles are possible, particularly along [redacted] near the two rock formations that could provide suitable habitat. [redacted] is an existing road, and there are no plans to widen or extend the road for the Project. Based on a field discussion with MNF staff on November 4, 2016, no expansion, blasting, or other construction is planned along existing [redacted] will receive maintenance, as needed, but would not require any improvements that are likely to fragment or impact potential adjacent eastern spotted skunk habitats. Vehicles are expected to range from light pick-up trucks to large-pipe-hauling trucks. The noise generated from these vehicles will vary; however, they will increase terrestrial noise locally above the ambient sound levels for short bursts, which could startle eastern spotted skunks and disrupt sleep or other normal activities. Eastern spotted skunk mortality from vehicle collisions would be unlikely since the species is nocturnal and most construction would take place during daylight hours. Indirect impacts to eastern spotted skunks could also occur as a result of the use of [redacted]. Eastern spotted skunk habitat includes underground dens that could be filled by sediment transported by stormwater runoff from the access road. The use of heavy vehicles that could impact the integrity of the road would therefore be of concern.

Construction activities could also destroy dens, if present, and degrade habitat along the proposed right-of-way. Den sites and individuals within the dens, including adults and young, could be destroyed during construction. Oak-pine forests and mixed mesophytic forests, which provide suitable habitat for the species, will be among the top three forest types affected by the Project (see Table 5.2.1-1): oak-pine forests and mixed-oak forest are present at the potential denning habitat locations described above. The adverse effect from the long-term loss of forest habitat would be limited, however, since the conversion of the right-of-way from forest to grassland and scrub-shrub habitat would not likely permanently displace the species. Eastern spotted skunks can use open and brushy areas as foraging habitat, and abundant oak-pine and mixed mesophytic forest habitat will remain adjacent to the Project area.

<u>Conservation Measures</u>

Potential impacts to the eastern spotted skunk will be minimized and mitigated through the implementation of the conservation measures in the Upland Erosion Control Plan, Timber Removal Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures specific to the eastern spotted skunk will also be applied. Relevant conservation measures include the following:

- Road usage along [redacted] where it is adjacent to the potential eastern spotted skunk rocky outcrop habitat will be minimized to avoid dawn and dusk high activity periods for eastern spotted skunks to minimize potential injury or mortality from vehicle collisions (also see Allegheny woodrat).

- Excess rock from construction will be piled along the edge of the temporary workspace for den sites and shelter, as practicable and where it would not impede routine pipeline inspection and maintenance.

- Felled woody debris will be retained along the edge of the right-of-way for den sites and shelter.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including:

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and

  - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to eastern spotted skunk by re-establishing or retaining suitable forest habitat:

  - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

  - o Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Upland Erosion Control Plan will be implemented to ensure that excavated soil and sediment remains within the construction area and that the network of subsurface crevices that could shelter eastern spotted skunk in areas adjacent to the construction area are not affected by sediment, including:

  - o installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - o installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water away from adjacent habitat; and

  - o removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish habitat, including:

  - o use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

  - o completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - o installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - o mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

  - o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - o monitoring to assess all restored areas on USFS lands in years 1 and 5;

- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
- reporting of restoration status following field inspections.

- The Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could degrade eastern spotted skunk habitat (also see Section 5.5.7), including
  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

With four areas containing potential moderate- to high-quality habitat for eastern spotted skunk, direct and indirect impacts on the species could occur as a result of the Project, including damage to rock features and modification of foraging habitat from forest to herbaceous and scrub-shrub habitat. If individuals are present during construction, potential impacts could include damage to underground dens, potential mortality of adults and young, and disturbance from construction activities that could increase stress, displace individuals, and disrupt normal activities. With the implementation of the conservation measures listed above, most habitat impacts would be temporary or benign. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of eastern spotted skunk in the MNF.

5.5.3 Birds

The RFSS list for the Project within the MNF contains 10 birds (see Appendix D). An assessment of known range and habitat requirements found that seven of these species could occur in the Project area (see Table 5.5.3-1). There were no documented occurrences of RFFS birds in WVDNR NHP NHI data within 2 miles of the centerline.

Aerial helicopter surveys were conducted for bald eagles in a 2-mile-wide corridor along the proposed centerline in the MNF in March of 2016 (see the survey report in Atlantic, 2016c). Surveys consisted of four parallel helicopter passes, with an increased survey effort near preferred habitats such as large waterbodies and river corridors. No bald eagles were observed, although three unoccupied, unknown stick nests were found within approximately 4,000 feet of the proposed centerline.

Surveys for Northern goshawk (*Accipiter gentilis*) and golden-winged warbler (*Vermivora chrysoptera*) were carried out in June 2016 (see the survey report in Atlantic, 2016j). The broadcast acoustical call method was used for Northern goshawk at 330 call stations in the MNF. During these surveys, biologists searched for suitable golden-winged warbler nesting habitat and listened for golden-winged warbler territorial calls. In addition, surveys verified that the Project area contains suitable forest habitat for Northern goshawk. No signs of Northern goshawk or golden-winged warbler were heard; however, two areas with suitable nesting habitat for golden-winged warbler were found.

The following sections provide an analysis of potential impacts, conservation measures, and a preliminary determination of effect for RFSS birds with suitable habitat in the Project area within the MNF.

5.5.3.1 Northern Goshawk (*Accipter gentilis atricapillus*)

Species Description

The Northern goshawk is a federal species of concern with a global conservation status of secure (G5), and a state conservation status of critically imperiled (S1B, S1N) (WVDNR, 2016). The species breeds throughout North America, but its range generally includes Alaska, Canada, the eastern United States, and the more northerly mountains of the west (NatureServe, 2015; Stone, 2013). Population trends for this species are difficult to determine due to a scarcity of data (Pennsylvania Natural Heritage Program [PNHP], 2016e).

Northern goshawks are partially migratory and primarily live in large, coniferous forests, but may also inhabit deciduous hardwood forests. The species prefers mature forests with an intermediate canopy cover consisting of a combination of mature trees and small open areas for foraging (PNHP, 2016e). Their nests are found in high tree canopies. Individuals have at least two to three nesting areas and will alternate between the different sites (Stone, 2013; PNHP, 2016e). Northern goshawks usually breed between early April and mid-June. The female lays between 2 to 4 eggs, which hatch in 28 to 38 days (PNHP, 2016e).

TABLE 5.5.3-1

Regional Forester Sensitive Species Birds with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
REQUIRES FORESTED HABITAT		
Accipiter gentilis	Northern Goshawk	Mainly occurs in coniferous forests, but may occur in deciduous hardwood forest; in Pocahontas County, West Virginia.
REQUIRES OR IS TOLERANT OF OPEN OR EDGE HABITAT		
Asio otus	Long-Eared Owl	Dense trees for nesting and roosting and open country for hunting; inhabits forests with extensive meadows, groves of conifers or deciduous trees in prairie country, and streamside groves.
Falco peregrinus anatum	American Peregrine Falcon	Nests on ledges or cliffs, buildings, bridges, and quarry walls; non-breeding habitat includes farmland, open country, lakeshores, broad river valleys, airports, and cities. In Pocahontas County, West Virginia.
Haliaeetus leucocephalus	Bald Eagle	Areas close to coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water for food sources. Nests are found in tall trees except where only cliff faces or ground sites are available. Preference is for tall, sturdy conifers including pine, spruce, and fir, but can also nest in cottonwood, willow, oak, beech, and others. In Berkeley, Cabell, Grant, Hampshire, Hancock, Hardy, Jackson, Jefferson, Marion, Mineral, Monongalia, Morgan, Pendleton, Pocahontas, Putnam, Raleigh, Taylor, Tucker, Tyler, and Wood Counties, West Virginia.
Lanius ludovicianus migrans	Migrant Loggerhead Shrike	Open areas with short vegetation and well-spaced thorny shrubs or low trees. In Berkeley, Grant, Greenbrier, Hampshire, Hardy, Jefferson, Mineral, Monroe, and Pocahontas Counties, West Virginia.
Melanerpes erythrocephalus	Red-Headed Woodpecker	Habitats include oak savanna and mature open bottomland forest, as well as upland forests, woodlots, shelterbelts along agricultural fields; herbaceous habitats, stands with high canopy cover, and dense, mid-story habitat are not typically used; prefers edge habitat from the breeding season through fall. In Pocahontas County, West Virginia.
Vermivora chrysoptera	Golden-Winged Warbler	Brushy edge habitats, openings with saplings, forbs and grasses; also uses forested habitat adjacent to openings/scrubby habitat; in Pocahontas County, West Virginia.

Sources: See Appendix D

Potential Presence in Project Area

Northern Goshawk is known to be present in the West Virginia. There are known Northern Goshawk nesting locations near Rocky Run adjacent to the Kumbrabow State Forest in Randolph County, and the Gauley Mountain area in Pocahontas County is a known concentration area for Northern

Goshawks. Rocky Run is approximately 2 miles east of the proposed right-of-way, and Gauley Mountain is approximately 50 miles west of the proposed right-of-way.

Field surveys confirmed that suitable habitat, such as mixed northern hardwood forest, occurs in the Project area. In June 2016, surveys for Northern Goshawks were conducted using a broadcast acoustical method, following protocols established in the *Northern Goshawk Inventory and Monitoring Technical Guide* (Woodbridge and Hargis, 2006) with modifications suggested by MNF biologists. The field survey included call playback acoustic surveys in suitable habitat, which were conducted at 330 call stations in six distinct areas within the Analysis Area along the proposed ACP Project corridor. In addition, call playback acoustic surveys were conducted on suitable private land adjacent to the MNF along the proposed pipeline route. Northern Goshawk activity was not detected at any call station or by surveyors navigating on foot between the call stations. No Northern Goshawks or signs of species presence were observed.

Although Northern Goshawks were not found during field surveys, Northern Goshawks may be present in the Project area. Given the presence of suitable forest habitat, Atlantic will assume presence of Northern goshawk in the Project area.

<u>Impact Evaluation</u>

Since no Northern goshawks were found during field surveys in the Project area, direct impacts from the Project are not anticipated. However, given the presence of suitable habitat in the Project area, impacts to Northern Goshawks are possible. If present during Project construction, impacts to Northern Goshawks could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. In particular, if tree clearing takes place during the nesting season, nests and young could be harmed by construction equipment or abandoned by the parents if construction disturbance is too prolonged or frequent. Noise disturbance from vegetation maintenance of the permanent right-of-way could also occur; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years), and would not occur during the nesting season. Vegetation clearing of deciduous forest habitat for the right-of-way and new permanent access roads would have the indirect effect of removing nesting and foraging habitat. Although forest habitat in the temporary construction workspace corridor would be allowed to redevelop following construction, the creation of the 53.5-foot-wide permanent right-of-way would result in the long-term conversion of forest habitat to meadow, scrub-shrub, and edge habitat, while new permanent access roads would result in the long term loss of habitat. These impacts would be offset: since Northern Goshawks hunt in forest openings, they could utilize the permanent right-of-way and road corridors for hunting.

<u>Conservation Measures</u>

Potential impacts to the Northern Goshawk will be avoided or mitigated through the implementation of the *Migratory Bird Plan*. In addition, conservation measures in the Upland Erosion Control Plan, Timber Removal Plan; Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C), will help protect the species and/or stabilize and re-establish disturbed habitats. Conservation measures relevant to Northern Goshawk include the following:

- To avoid disturbance to nesting migratory birds, including Northern Goshawk, vegetation clearing will occur outside of the migratory bird nesting season between April 1 and August 30.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Northern Goshawk by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including:

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and

    - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.

- Instituting conservation measures in the Upland Erosion Control Plan to reduce stormwater runoff and stabilize habitats, including:

    - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - stabilization of access road surfaces by grading and installing stone where needed;

    - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and

    - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable foraging, roosting, and nesting habitat, including:

    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

    - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within

20 days after backfilling the trench, seasonal or other weather conditions permitting;

- installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
- mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
- regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
- monitoring to assess all restored areas on USFS lands in years 1 and 5;
- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
- reporting of restoration status following field inspections.

<u>Preliminary Determination of Effect</u>

The Project has the potential to cause temporary indirect impacts on Northern Goshawk through disturbance from construction and vegetation maintenance and long-term indirect impacts through removal of potential nesting and roosting forest habitat in the permanent right-of-way. Since no Northern Goshawk were found during field surveys, the presence of substantial numbers of Northern Goshawk that would be affected by the Project is unlikely. In addition, although forest habitat would be removed for the permanent right-of-way, abundant suitable habitat is present adjacent to the Project area. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of Northern Goshawk in the MNF.

5.5.3.2 Long-Eared Owl (*Asio otus*)

<u>Species Description</u>

The Long-Eared Owl has a global conservation status of secure (G5), but a state conservation status of critically imperiled (S1B, S1N) (WVDNR, 2016). The species is a migratory bird and occurs throughout the northern hemisphere (Kirschbaum and Ivory, 2016), although it is a rare, local, permanent resident in early successional coniferous and deciduous forests of West Virginia. Suitable Long-Eared Owl habitat consists of edge habitat, shrublands, open tree belts along streams and farmland, small tree groves, wetland thickets, grasslands, and marshes (Audubon, 2016c; Kirschbaum and Ivory, 2016; NatureServe, 2015). It typically avoids large tracts of unbroken forest (Audubon 2016c). The species is strictly nocturnal and tends to be solitary; however, roost communities made up of 2 to 20 individuals and small nesting colonies can occur (Kirshcbaum and Ivory, 2016). In West Virginia, nests are typically found at elevations above 2,000 feet.

Long-eared owls typically nest in trees. The breeding season for Long-Eared Owls occurs from February to July (Kirschbaum and Ivory, 2016). Females typically lay 5 to 6 eggs once per season. Eggs are incubated for approximately 26 to 28 days, and the young become independent at 10 to 11 weeks old. Long-Eared Owls can breed when they are 1 year old.

The species hunts primarily in open areas for small mammals, along with small birds, snakes, and insects (Kirschbaum and Ivory, 2016; NatureServe, 2015). Predators include raccoons, snakes, and porcupines, along with other owls, Golden Eagles, hawks, Northern Goshawks, and Peregrine Falcons.

Threats to Long-Eared Owls likely include alteration and loss of habitat (Kirschbaum and Ivory, 2016).

Potential Presence in Project Area

The species could be present based on its known range and the presence of potentially suitable nesting, foraging, and wintering habitat in the MNF. Based on desktop review, suitable habitat is present in the Project area for this species; therefore, Atlantic assumes presence.

Impact Evaluation

Since suitable habitat occurs in the Project area, impacts to Long-Eared Owls could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt sleep and other normal activities. Vegetation clearing of forest habitat for the right-of-way and new permanent access roads could remove nesting habitat, particularly where the right-of-way and road corridor occur near open areas. Should clearing take place during the nesting season, nests and young could be harmed or killed. Noise disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years). The conversion of the permanent right-of-way from forest to grassland and scrub-shrub habitat and creation of new road corridors could provide suitable foraging habitat for Long-Eared Owls adjacent to nesting and roosting habitat in the MNF.

Conservation Measures

Potential impacts on the long-eared owl will be avoided or mitigated through the implementation of the *Migratory Bird Plan*. In addition, conservation measures in the Upland Erosion Control Plan, Timber Removal Plan; and Restoration and Rehabilitation Plan, as specified in the *COM Plan* (see Appendix C), will help protect the species and/or stabilize and re-establish disturbed habitats. Conservation measures relevant to long-eared owl include the following:

- For tree clearing that occurs during the winter months, a qualified biological monitor searching for Golden Eagles and Bald Eagles will also monitor for Long-Eared Owl nests or activity, since the nesting season begins in February.

- To avoid disturbance to nesting birds, vegetation clearing will occur outside of the migratory bird nesting season between April 1 and August 30, which will overlap with the start of the Long-Eared Owl nesting season, avoiding the egg laying and nestling stages.

- Atlantic will notify the MNF if occupied Long-Eared Owl nests are found in the Project area during tree clearing and other construction activities, and a 25-foot protection buffer will be established around the active nests until the young have fledged in order to minimize human disturbance and ensure the nest is not abandoned, with weekly monitoring until the young have fledged or construction is completed.

- If a nest tree or shrub is to be removed for construction following fledging, an artificial nest (e.g., open-fronted nest boxes or baskets appropriate for Long-Eared Owl) will be installed adjacent to the right-of-way where the suitable nesting habitat is removed;

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to the Long-Eared Owl by re-establishing or retaining suitable forest habitat:

  - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

  - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and

  - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.

- Conservation measures in the Upland Erosion Control Plan will be implemented to reduce stormwater runoff and stabilize habitats, including

  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - stabilization of access road surfaces by grading and installing stone where needed;

  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and

  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable foraging, roosting, and nesting habitat, including
  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7)
  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
  - monitoring to assess all restored areas on USFS lands in years 1 and 5;
  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
  - reporting of restoration status following field inspections.

<u>Preliminary Determination of Effect</u>

Construction and right-of-way maintenance have the potential to cause temporary adverse impacts to long-eared owl through disturbance, nest tree removal, and injury to or loss of nests and young. However, impacts would be primarily temporary or infrequent, and implementation of the *Migratory Bird Plan* and *Restoration and Rehabilitation Plans* would help minimize impacts. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of Long-Eared Owl. In addition, the creation of grassland and scrub-shrub habitat in the permanent right-of-way and new road corridors adjacent to nesting and roosting habitat could have a long-term *beneficial impact* on the species by creating foraging habitat in the MNF.

5.5.3.3 American Peregrine Falcon (*Falco peregrinus anatum*)

Species Description

The American Peregrine Falcon (Peregrine Falcon) has a global conservation status of apparently secure (G4) and a state conservation status of imperiled (S2N) (WVDNR, 2016). The Peregrine Falcon is a medium-sized diurnal falcon that occurs globally in a wide variety of habitats, from the arctic tundra to deserts, to continental forests and others (Luensmann, 2010; NatureServe, 2015). In the eastern United States, habitats include cliff systems, valley slopes with mixed-mesophytic and northern hardwood forests, and ridgetops with pine species, oak, and/or a variety of other deciduous species.

Peregrine Falcons typically nest on broad, open cliff ledges, deep cliff recesses or rock cavities, or in shallow caves (Luensmann, 2010). An average clutch size for Peregrine Falcon is 3 to 4 eggs. The nesting season typically begins in late March or early April, although nesting has been recorded as early as February 12, and young fledge at 35 to 53 days old. The species is carnivorous and hunts any small to medium-sized prey such as birds, fish, bats, and other mammals. Large raptors and owls can kill Peregrine Falcons, although adults are typically safe from predation. Other predators of young Peregrine Falcons include other Peregrine Falcons and mammals such as bears, weasels, and ground squirrels.

The primary threat to the species has been past exposure to organochlorine herbicides, particularly dichlorodiphenyltrichloroethane (DDT) and dichlorodiphenyldichloroethylene (DDE), resulting in complications in reproduction prior to the ban of these herbicides in 1972 (Luensmann, 2010). Other pressures on this species may include reductions in wetland habitat, which provide abundant prey, poaching, climate change, and disturbance from recreational or other human activities. Frequent or prolonged disturbance can lead to nest desertion.

Potential Presence in Project Area

There are no known occurrences of Peregrine Falcon within 2 miles of the Project centerline based on WVDNR NHP NHI data, and no Peregrine Falcons or nests were observed within a 2-mile-wide aerial survey area conducted during Bald and Golden Eagle nest surveys (see Atlantic, 2016c). No surveys were requested by the MNF. However, given the topography of the area, suitable cliff or shallow cave habitat could occur in the vicinity of the Project, and presence is assumed in these areas.

Impact Evaluation

Cliff and shallow cave habitat would not be crossed by the pipeline; therefore, direct impacts to potential habitat are not likely. However, given the likely presence of suitable habitat in the vicinity of the Project area, indirect impacts to Peregrine Falcon are possible. If present during Project construction, impacts to Peregrine Falcon could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. In particular, should construction take place during the nesting season, nests and young could be abandoned if construction disturbance is too prolonged or frequent. Similar impacts could occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years), and would be less likely to result in nest abandonment. An adverse effect from the long-term loss of forest habitat for the permanent right-of-way and permanent new access roads is not anticipated since Peregrine Falcon can hunt in open areas and may use the maintained right-of-way for hunting.

<u>Conservation Measures</u>

Potential impacts to the Peregrine Falcon will be avoided or mitigated through the implementation of the *Migratory Bird Plan*. In addition, conservation measures in the Upland Erosion Control Plan, Timber Removal Plan; Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C), will help protect the species and/or stabilize and re-establish disturbed habitats. Conservation measures relevant to Peregrine Falcon include the following:

- For tree clearing that occurs during the winter months and prior to the migratory bird nesting season, a qualified biological monitor searching for Golden Eagles and Bald Eagles will also monitor for Peregrine Falcon nests or activity, since the nesting season for the species begins in March.

- Atlantic will notify the MNF if occupied Peregrine Falcon nests are found in the Project area, and a 25-foot protection buffer will be implemented around the active nests until the young have fledged in order to minimize human disturbance and ensure the nest is not abandoned, with weekly monitoring until the young have fledged or construction is completed.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Peregrine Falcon by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Upland Erosion Control Plan will be implemented to help stabilize foraging habitats and ensure that excavated soil and sediment remains within the construction area and does not impact potential cliff nesting habitat that could occur downslope, including:

    - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - stabilization of access road surfaces by grading and installing stone where needed;

    - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water away from the rock outcrops; and

    - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore foraging habitat, including:
    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7)
    - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
    - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
    - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
    - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
    - monitoring to assess all restored areas on USFS lands in years 1 and 5;
    - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
    - reporting of restoration status following field inspections.

<u>Preliminary Determination of Effect</u>

Construction has the potential to cause temporary adverse impacts to the Peregrine Falcon through disturbance and potential abandonment of nests and young if construction should take place during the nesting season. Because impacts would be temporary and/or intermittent, and with the implementation of the *Migratory Bird Plan* and *Restoration and Rehabilitation Plans* to minimize impacts, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of Peregrine Falcon in the MNF.

5.5.3.4 Migrant Loggerhead Shrike (*Lanius ludovicianus migrans*)

<u>Species Description</u>

The Migrant Loggerhead Shrike is a medium-sized perching bird that measures approximately 7 inches in length. This species is identified by its black facial mask, black lower wings and tail, dark grey on the upper body, with white on the lower body (Environment Canada, 2010). The bill is black with a distinctive hook. The Migrant Loggerhead Shrike is a subspecies of the Loggerhead Shrike. Loggerhead Shrikes are found throughout North America and Canada and are more common in the west (Pennsylvania Natural Heritage Program, 2007). The *migrans* subspecies is found throughout eastern North America from southeast Canada to Texas (Environment Canada, 2010). The global rank for the species is considered apparently secure to vulnerable (G4T3Q) and critically imperiled for both breeding and non-breeding populations (S1B, S1N) (WVDNR, 2016).

Migrant Loggerhead Shrikes occupy open habitats such as grasslands, hayfields, utility corridors, and residential yards with dense shrubs or trees available for nesting and perches (Environment Canada, 2010). The species is carnivorous, feeding mostly on insects and small vertebrates (Environment Canada, 2010). Only about five percent of prey items are vertebrate species such as small rodents. A characteristic feeding behavior is impaling prey on tree thorns or barbed wire fences (Pruitt, 2000).

The breeding season begins in late winter or early spring, with clutches initiated later in mountainous areas and at higher latitudes (Pruitt, 2000). Both sexes assist in territory defense, nest building, and young rearing. Nesting sites are often placed in isolated trees or clumps of trees rather than a continuous stand. Pairs build a bulky, open cup nest of fine grasses, hair, and root material.

Historically an abundant bird, Migrant Loggerhead Shrikes are in decline and have disappeared from parts of the northeast (NatureServe, 2015; Pennsylvania Natural Heritage Program, 2007). The main threat is inconclusive. However, researchers postulate that habitat loss, along with increased herbicides use, decreased prey availability, collisions with vehicles, intraspecific competition, and climate and warming trends, among other causes, may be contributing to the species' decline (Pruitt, 2000; USFS, 2003; Environment Canada, 2010). Conversion of open land to forest (e.g. farm abandonment) may result in declines (Pruitt, 2000; USFS, 2003). Unoccupied breeding habitat is present in West Virginia; however, in Virginia, habitat loss may be more of a factor (USFS, 2003). Flight characteristics and habitat choice put Loggerhead Shrikes at risk for collisions with automobiles. Favorable open habitat is often associated with roads, and paralleling powerlines provide suitable perching sites. Juveniles are the most susceptible to vehicular collisions (Pruitt, 2000; USFS, 2003).

<u>Potential Presence in Project Area</u>

No surveys were recommended for the Migrant Loggerhead Shrike based on consultation with the MNF. There is little open habitat in the survey area that would support this species (see Section 4.1.1 and the botany report in Atlantic, 2016r). A small area with potentially suitable open habitat occurs near [redacted], based on field surveys for Golden-Winged Warbler habitat (see Section 5.5.3.7). Because surveys were not carried out, presence of Migrant Loggerhead Shrike is assumed in this area.

<u>Impact Evaluation</u>

If Migrant Loggerhead Shrike occurred in the area where suitable habitat was found, impacts would include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. Vegetation clearing for the right-of-way could remove potential nesting habitat. Should construction take place during the nesting season, nests and young could be harmed or killed. Similar impacts could occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years). The conversion of the permanent right-of-way from forest to grassland and scrub-shrub habitat would have a long-term beneficial impact on Migrant Loggerhead Shrike by increasing the amount of suitable habitat in the MNF.

Conservation Measures

Atlantic will restore the permanent right-of-way and temporary workspaces to help establish potential open and scrub-shrub habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to Migrant Loggerhead Shrike will also be applied. Relevant conservation measures include the following:

- To avoid disturbance to nesting migratory birds, including Migrant Loggerhead Shrike, vegetation clearing for construction and vegetation maintenance for operation will occur outside of the migratory bird nesting season between April 1 and August 30.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Migrant Loggerhead Shrike by re-establishing suitable shrub habitat adjacent to the open habitat of the permanent right-of-way:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

- Atlantic will coordinate with the MNF to include thorny shrubs or other suitable plants beneficial to the species in the revegetation plan to enhance suitable hunting and nesting habitat for Migrant Loggerhead Shrike in and adjacent to the permanent pipeline right-of-way.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Application of the conservation measures in the Restoration and Rehabilitation Plan following construction to restore or create suitable open and scrub-shrub habitat, including
    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);
    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
    - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
    - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
    - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
    - monitoring to assess all restored areas on USFS lands in years 1 and 5;
    - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
    - reporting of restoration status following field inspections.

Preliminary Determination of Effect

Construction has the potential to cause temporary adverse impacts to the Migrant Loggerhead Shrike through disturbance, temporary loss of nesting habitat, and injury to or loss of nests and young in one area at Gibson Knob with potential habitat. The small amount of potentially suitable habitat present in the Project area makes the presence of substantial numbers of Migrant Loggerhead Shrike that would be affected by the Project unlikely. In addition, because adverse impacts would primarily be temporary and infrequent, and with the implementation of the *Migratory Bird Plan* and *Restoration and Rehabilitation Plan* to help minimize impacts, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of Migrant Loggerhead Shrike. In addition, the creation of grassland and scrub-shrub habitat in the permanent right-of-way could have a *beneficial impact on* the species in the MNF.

5.5.3.5 Bald Eagle (*Haliaeetus leucocephalus*)

Species Description

The Bald Eagle has a global conservation status of secure (G5) and a state conservation status of vulnerable s (S3B, S3N) (WVDNR, 2016). The species has a breeding range that extends from central

Alaska, northern Yukon, northwestern and southern Mackenzie, northern Saskatchewan, northern Manitoba, central Ontario, central Quebec, Labrador, and Newfoundland, south locally to the Commander and Aleutian Islands, southern Alaska, Baja California, New Mexico, Arizona, the Texas Gulf Coast, and Florida (NatureServe, 2015). In the nonbreeding season, Bald Eagles occur generally throughout the breeding range, most commonly from southern Alaska and southern Canada southward (NatureServe, 2015).

Bald Eagle breeding habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, reservoirs, or other large bodies of water that reflect the general availability of primary food sources, including fish and waterfowl (NatureServe, 2015). Nests are found in tall trees except where only cliff faces or ground sites are available. The species tends to use tall, sturdy conifers for nesting, but tree species used vary regionally and may include pine, spruce, fir, cottonwood, poplar, willow, sycamore, oak, beech, and others (Cornell Lab of Ornithology, 2015; NatureServe, 2015). An important habitat attribute is the presence of mature forests with an abundance of comparatively large trees near large bodies of water (Snyder, 1993). The Bald Eagle nesting season is between January and September. The clutch size is typically 2 eggs, and the young fledge around 10 to 12.5 weeks (NatureServe, 2015).

The population of Bald Eagles has historically undergone dramatic fluctuations. Bald Eagles became rare in the contiguous United States as a result of being hunted by humans in combination with the use of DDT as a pesticide, which significantly lowered their reproduction rates. The species was listed for protection under the Bald Eagle Protection Act in 1940, and in 1978, the entire Bald Eagle population in the contiguous United States was listed for protection under the ESA. Since 1980, Bald Eagle populations have increased dramatically as DDT levels dropped, breeding productivity recovered, and hunting decreased (Buehler, 2000) and the Bald Eagle has been removed from the ESA. However, it remains protected under the federal Bald and Golden Eagle Protection Act.

Potential Presence in Project Area

Aerial surveys for Bald Eagle nests were completed in the MNF Project area from March 5 to 8, 2016. No Bald Eagles or nests were observed in the MNF Project area although three stick nests of unknown origin were observed approximately 4,000 feet from the centerline near [redacted] (see the *Bald and Golden Eagle Report* in Atlantic, 2016c). Nests were unoccupied and appeared to be inactive based on nest appearance and a lack of fresh branches in the nest. Suitable nesting and roosting habitat is present in numerous areas in or near the Project area based on the presence of mature forests and large rivers and other bodies of water. Therefore, the presence of Bald Eagles in the Project area within the MNF is assumed.

Impact Evaluation

Since no Bald Eagles were confirmed in the Project area, direct impacts from the Project are not anticipated. However, given the potential for nests in the survey area, and suitable nesting and roosting habitat that occur in other portions of the Project area, impacts on Bald Eagle are possible. If present during Project construction, impacts to Bald Eagle could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. In particular, should construction take place during the nesting season, nests and young could be harmed by construction equipment or abandoned by the parents if construction disturbance is too prolonged or frequent. Noise disturbance from vegetation maintenance of the permanent right-of-way could also occur; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years), and would be less likely to result in nest abandonment. Vegetation clearing of forest habitat for the right-of-way and new permanent access roads could remove potential nesting and roosting habitat, particularly near large bodies of water. Although forest habitat in the temporary construction workspace corridor would be allowed to redevelop following construction, the creation of the 53.5-foot-wide permanent right-of-way and permanent new access roads would result in the long-term loss of forest habitat.

Conservation Measures

Potential impacts to the Bald Eagle will be avoided or mitigated through the implementation of the *Migratory Bird Plan*, which includes implementation of the *National Bald Eagle Management Guidelines*. In addition, conservation measures in the Upland Erosion Control Plan, Timber Removal Plan; Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C), will help protect the species and/or stabilize and re-establish disturbed habitats. Conservation measures relevant to Bald Eagle include the following:

- For tree clearing that occurs during the Winter roosting or nesting season, a qualified biological monitor will walk ahead of the clearing crews and search for roosting bald eagles and nesting bald eagles.
- Atlantic will adhere to the *National Bald Eagle Management Guidelines* and *MNF Forestwide Standards* to minimize or avoid impacts to individual Bald Eagles, including 1,500-foot no activity buffers for inactive or active nests.
- Atlantic will coordinate with MNF staff to determine an appropriate buffer based on the work activity, visibility to nest, and stage of nesting if the recommended buffers in the Guidelines cannot be implemented.
- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Bald Eagle by re-establishing or retaining suitable forest habitat:
    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.
    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including:
    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and
    - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.
- Conservation measures in the Upland Erosion Control Plan will be implemented to reduce stormwater runoff and stabilize habitats, including:

  - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - Stabilization of access road surfaces by grading and installing stone where needed;

  - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and

  - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable foraging, roosting, and nesting habitat, including:

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7)

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and

  - reporting of restoration status following field inspections.

Preliminary Determination of Effect

The Project has the potential to cause temporary direct adverse impacts on the Bald Eagle through disturbance from construction and vegetation maintenance and long-term indirect impacts through removal of potential nesting and roosting forest habitat in the permanent right-of-way and permanent new access roads. Since no confirmed occurrences of Bald Eagle nests were found during field surveys, the presence of substantial numbers of Bald Eagle that would be affected by the Project is unlikely, and since the *National Bald Eagle Management Guidelines* and Forest Service Standards would be implemented, potential impacts would be minimized or avoided. In addition, although forest habitat would be removed for the permanent right-of-way, abundant suitable habitat adjacent to the right-of-way and road corridors would remain. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the Bald Eagle in the MNF.

5.5.3.6 Red-Headed Woodpecker (*Melanerpes erythrocephalus*)

Species Description

The Red-Headed Woodpecker has a global conservation status of secure (G5), and a state conservation status of vulnerable (S3B, S3N) (WVDNR, 2016). The species' range extends from southern Quebec and Ontario, south to Florida and west to the Rocky Mountains, and includes 37 states (Luensmann, 2006). The species is a temperate migrant that will migrate in fall if local seed sources are not sufficient. Red-Headed Woodpeckers nest in tree cavities typically beginning in early May to mid-June, and as early as February in the southeastern portion of their range. Birds fledge between about the second week of June and the first week of September at 24 to 30 days old.

The species prefers oak savanna and mature open bottomland forest, but can also use upland forests, woodlots, agricultural (tree) shelterbelts, residential areas, and other habitats that provide mature open hardwood trees with dead limbs or snags. During the breeding season and through summer and fall, the Red-Headed Woodpecker utilizes edge habitat or savannas. Red-Headed Woodpeckers are omnivores: food sources include berries, cherries, nuts, seeds, and animals such as bugs, spiders, mice, and small lizards. Predators of the Red-Headed Woodpecker include snakes, mammals, such as raccoons, and raptors such as Peregrine Falcon and red-tailed hawks.

The Red-Headed Woodpecker has experienced a global and national population decline since at least 1966. Since 1966, the national population has declined on average by 2.6 percent a year. Causes for the decline primarily include habitat loss, but may also include collisions with automobiles, competition with European starlings and other woodpeckers for nesting cavities, and being shot as pests.

Potential Presence in Project Area

There were no documented occurrences of Red-Headed Woodpecker in WVDNR NHP NHI data within 2 miles of the centerline. However, suitable habitat for Red-Headed Woodpecker may occur in the Project area based on forest habitat described in the botany report (see Atlantic, 2016r), so presence is assumed, although available edge habitat is limited to small openings in the forest and existing forest roads.

Impact Evaluation

Since suitable habitat occurs in the Project area, impacts on Red-Headed Woodpeckers could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. Vegetation clearing of forest habitat for the right-of-way and new permanent access roads could remove nest trees, particularly where the right-of-way occurs near agricultural fields and other open areas. Clearing could also remove food sources such as berries and seeds. Should clearing take place during the nesting season, nests and young could be harmed or killed. Noise disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years). The conversion of the permanent right-of-way from forest to grassland and scrub-shrub habitat and permanent new access roads would create habitat the red-headed woodpecker could use for foraging and breeding.

Conservation Measures

Potential impacts to the Red-Headed Woodpecker will be avoided or minimized through the implementation of the *Migratory Bird Plan*. In addition, conservation measures in the Upland Erosion Control Plan, Timber Removal Plan; and Restoration and Rehabilitation Plan, as specified in the *COM Plan* (see Appendix C), will help protect the species and/or stabilize and re-establish disturbed habitats. Relevant conservation measures include the following:

- To avoid disturbance to nesting migratory birds, including the Red-Headed Woodpecker, vegetation clearing will occur outside of the migratory bird nesting season between April 1 and August 30;

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Red-Headed Woodpecker by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and

    - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.

- Conservation measures in the Upland Erosion Control Plan will be implemented to reduce stormwater runoff and stabilize habitats, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

- o Stabilization of access road surfaces by grading and installing stone where needed;
- o Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and
- o Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable foraging, roosting, and nesting habitat, including
    - o use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7)
    - o completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
    - o installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
    - o mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
    - o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
    - o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
    - o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
    - o monitoring to assess all restored areas on USFS lands in years 1 and 5;
    - o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
    - o reporting of restoration status following field inspections.

Preliminary Determination of Effect

Construction and right-of-way maintenance have the potential to cause temporary adverse impacts on Red-Headed Woodpeckers through disturbance, loss of food sources, nest tree removal, and injury to or loss of nests and young. Because impacts largely will be temporary, and with the implementation of the conservation measures listed above, which includes clearing vegetation outside of the nesting season, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the Red-Headed Woodpecker. In addition, the creation of edge habitat along the permanent right-of-way could have a long-term *beneficial impact* on the species in the MNF.

5.5.3.7 Golden-Winged Warbler (*Vermivora chrysoptera*)

Species Description

The Golden-Winged Warbler conservation status for breeding populations is apparently secure at the global level (G4) and critically imperiled for breeding populations at the state level (S1B) (WVDNR, 2016). The species range extends from the eastern to the midwestern United States. Although the species is not federally listed as threatened or endangered, it remains one of the smallest populations of songbirds in the United States. Sub-populations are primarily isolated to the Great Lakes and the Appalachian Mountains (Cornell Lab of Ornithology, 2015). Nesting habitat can include open deciduous woodlands, secondary growth, brushy edge habitats, utility rights-of-ways, clear-cuts, and alder swamps, with nests hidden near or on the ground (BirdLife International, 2012; U.S. Department of Agriculture Natural Resources Conservation Service, 2016). A clutch of three to six eggs is laid between May and July, with young fledging within approximately 20 days (NatureServe, 2015). The species is an invertivore: food sources include insects and spiders (NatureServe, 2015).

The Golden-Winged Warbler is a species of concern due to loss of habitat for breeding and wintering (Cornell Lab of Ornithology, 2015), and it is listed as a sensitive species in the MNF. The warbler was petitioned to the FWS to be federally listed in 2011, but no further efforts have been made on the listing (FWS, 2016). The Cornell Lab of Ornithology published T*he Golden-Winged Warbler Conservation Plan* in 2013 to outline goals for repopulating the species. The goals include enlarging the total breeding habitat by one million acres, doubling the number of breeding adults, and growing the population by 50 percent by 2050 (Cornell Lab of Ornithology, 2015). Threats to the species include competition with the blue-winged warbler (*Vermivora pinus*), parasitism by the brown-headed cowbird (*Molothrus ater*), hybridization with *V. pinus*, reforestation, loss of wintering habitat— particularly forest edge habitat and open woodlands—and agricultural expansion (BirdLife International, 2012).

Potential Presence in Project Area

The majority of the Analysis Area is forested and not likely to provide a large amount of suitable habitat for the species (see Section 4.1.1). MNF staff also commented that suitable habitat does not exist in the Project area (USFS, 2016a). Field surveys completed in June 2016 along approximately 16.4 miles of the centerline found potentially suitable Golden-Winged Warbler habitat adjacent to the MNF near [redacted]. This habitat is a bald area with small red spruce trees growing in boulder fields dominated by large patches of *Rubus* spp. Acoustic broadcast calls did not elicit a response at two calling stations. Other potentially suitable habitat was identified on private lands, and the presence of Golden-Winged Warbler (singing males) was found on private land adjacent to the MNF near [redacted]. In addition, the WVDNR detected male Golden-Winged Warblers along the proposed centerline in 2012 and 2014, according to correspondence from the MNF, although this occurrence was not documented in WVDNR NHP NHI data. Atlantic will be coordinating with the WVDNR to obtain further details about

Golden-Winged Warbler habitat in this area. Any resulting updates to the impact analysis will be included in the final version of the BE.

Impact Evaluation

Although no Golden-Winged Warblers were found in the Project area as a result of Project surveys, there is evidence that the species occurs near the proposed centerline. Therefore, direct impacts from the Project are possible. Should construction take place during the nesting season, nests and young could be harmed or killed, and vegetation clearing for the right-of-way could remove potential nesting habitat. Impacts could also include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. Similar disturbance could occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years). The conversion of the permanent right-of-way from forest to grassland and scrub-shrub habitat could provide suitable habitat for the Golden-Winged Warblers in the MNF.

Conservation Measures

Atlantic will restore the permanent right-of-way and temporary workspaces to help stabilize disturbed habitat and establish potential open and scrub-shrub habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to Golden-Winged Warbler will also be applied. Relevant conservation measures include the following:

- To avoid disturbance to nesting migratory birds, including Golden-Winged Warbler, vegetation clearing will occur outside of the migratory bird nesting season between April 1 and August 30.

- The following conservation measures that will be implemented according to the Visual Resources Plan may also benefit Golden-Winged Warbler by re-establishing suitable shrub habitat adjacent to the open habitat of the permanent right-of-way:

  - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

- Atlantic will coordinate with the MNF to include low-growing shrubs or other suitable plants beneficial to the species in the revegetation plan to enhance suitable hunting and nesting habitat for Golden-Winged Warbler in and adjacent to the permanent pipeline right-of-way.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

  - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

- Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

- Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and scrub-shrub habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - reporting of restoration status following field inspections.

<u>Preliminary Determination of Effect</u>

Construction has the potential to cause temporary adverse impacts to Golden-Winged Warbler through disturbance, temporary loss of nesting habitat, and injury to or loss of nests and young. Since only two singing males and limited suitable habitat were found during field surveys, the likelihood of the presence of substantial numbers of Golden-Winged Warbler in the Project area is low. Because impacts will be temporary and infrequent, and with the implementation of the *Migratory Bird Plan,* which includes clearing vegetation outside of the nesting season, and other conservation measures listed above to avoid and minimize impacts, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the Golden-Winged Warbler. In addition, the creation of edge habitat along the permanent right-of-way could have a *beneficial impact on* the species in the MNF.

5.5.4 Reptiles and Amphibians

The RFSS list for the Project contains two reptiles and three amphibians (see Appendix D). One reptile, timber rattlesnake (*Crotalus horridus*), and one amphibian, green salamander (*Aneides aeneus*) have the potential to occur in the Project area based on known range and suitable habitat (see Table 5.5.4-1). There were no documented occurrences of timber rattlesnake or green salamander in WVDNR NHP NHI data within 2 miles of the centerline.

Potential habitat for timber rattlesnake within a 300-foot-wide corridor along the pipeline was identified based on desktop analysis and surveyed for presence/absence and habitat suitability in May 2016 (see the survey report in Atlantic, 2016a). Surveys were conducted on approximately 6 miles of the survey corridor and 8.2 miles of access roads. No timber rattlesnake or suitable denning or gestating habitat was observed within the survey area, although portions of the survey area could provide suitable gestating habitat with an increase in solar radiation.

Potential habitat for green salamander was identified through desktop analysis and surveyed in May−June and September−October in 2016 (see the survey report in Atlantic, 2016e). Surveys involved multiple diurnal and nocturnal visual searches of rock outcrops and arboreal habitats along approximately 6.5 miles of the survey corridor. No green salamanders were found. Three rock outcrops were found to be suitable habitat but were ranked as poor based on the lack of crevice depth and vertical width. Based on the results of the survey, the MNF concurred that no suitable habitat for green salamander occurs in the Project area (Thompson, 2016a), and no further analysis for green salamander will be completed. Since only low quality potential habitat for the green salamander was identified during survey, and based on consultation with the MNF that habitat for the species does not occur in the Project area, it is assumed that green salamander does not occur in the Project area and further analysis is not warranted. Atlantic determines that the Project will have *no effect* on the green salamander.

TABLE 5.5.4-1

Regional Forester Sensitive Species Reptiles and Amphibians with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
REQUIRES FOREST HABITAT		
Aneides aeneus	Green Salamander	Humid cliff faces with numerous crevices; wooded rock outcrops with moist and deep crevices throughout the Appalachian Mountain Region; in Pocahontas County, WV.
REQUIRES OR IS TOLERANT OF OPEN OR EDGE HABITAT		
Crotalus horridus	Timber Rattlesnake	Upland hardwood and mixed pine-hardwood forests, in areas where there are sunny, rocky slopes and ledges throughout the Appalachian Mountain Region; in Pocahontas County, WV.

Sources: See Appendix D

The following section provides an analysis of potential impacts, conservation measures, and a preliminary determination of effect for timber rattlesnake.

5.5.4.1 Timber Rattlesnake (*Crotalus horridus*)

<u>Species Description</u>

The timber rattlesnake is the only species of rattlesnake found in West Virginia. Individuals typically live 20 to 25 years in the wild and may den individually or communally (NatureServe, 2015).

Home ranges typically extend 1 to 2 miles from denning areas and rarely 4 to 5 miles. Summer-range snakes, both males and females, but not gestating females, may reach the highest elevations in West Virginia, which slightly exceed 4,800 feet (Martin, 2017). Overwintering dens are typically rocky upland areas such as ledges, outcrops, talus slopes, and rocky rights-of-way that contain deep crevices. These sites occur in relatively exposed areas or within close proximity to exposed areas and are usually located on slopes with a southern or western aspect. Timber rattlesnakes emerge from winter hibernation in April or May and retreat back to their hibernacula in September or October. Female timber rattlesnakes give birth to litters of five to nine young between August and October, approximately every two to five years. Timber rattlesnake dens have been found between 200 to 1,200 meters (656 to 3,937 feet) in elevation in the Appalachian Mountains (Ulev, 2008). Gestating and birthing occurs in open sunny areas and the maximum elevation for such activities varies with latitude. In northern West Virginia between latitude 39 and 39.25, gestation does not occur above 3,600 feet. Near latitude 38.5 on North Fork Mountain, gestation occurs at 3,800 feet, and in Highland County, Virginia, gestation occurs up to 3,900 feet (Martin, 2017).

Foraging areas include a wide variety of habitats. Timber rattlesnakes are ambush predators with small mammals making up the majority of their diet. Birds, bird eggs, and other animals are eaten on occasion (NatureServe, 2015). the timber rattlesnakes can be active at any time of day depending upon the time of year and weather conditions.

The majority of threats to timber rattlesnakes are human inflicted. These threats include habitat loss due to development, hunting for market and sport, logging, and roadway mortality. Loss of gestation and basking sites by increased shading from large trees may also be of concern to the welfare of the species (Hammerson, 2007). Timber rattlesnake is considered to be apparently secure at the global level (G4) and vulnerable at the state level (S3) (WVDNR, 2016).

Potential Presence in Project Area

A field survey for potential timber rattlesnake habitat and signs of timber rattlesnake presence within the MNF was completed in May 2016. Field surveys were conducted in areas determined as potential habitat through desktop review on approximately 6 miles of the 300-foot-wide study corridor along the proposed right-of-way and on approximately 8.2 miles of access roads (see Atlantic [2016a] for the full survey report). Eight areas were surveyed, including five locations along the proposed right-of-way and three along proposed access roads. Seven rocky outcrops were found. Field survey of these areas found no suitable habitat for timber rattlesnake due to lack of solar radiation as a result of aspect or a dense overhead canopy, elevational limitations, a lack of deep underground crevices, and/or a lack of exposed rock. However, the geology of the study corridor within portions of the MNF was found to have the potential to support timber rattlesnake denning and gestation if there was an increase in solar radiation in areas with rocky terrain. In addition, six timber rattlesnakes were observed in Seneca State Forest, adjacent to the MNF, approximately 1.5 miles from the Analysis Area. Once the Project is complete, timber rattlesnakes could colonize portions of the permanent right-of-way if any rock is exposed during construction.

Impact Evaluation

Since no timber rattlesnakes or suitable habitat were found during field surveys in the Project area, direct impacts from the Project are not anticipated. However, impacts to timber rattlesnake potential habitat could occur. If timber rattlesnakes are present in the Project area during construction, impacts could include noise disturbance from construction activities, which could displace snakes, increase stress, and disrupt normal activities. Construction vehicles and equipment could also cause physical injury or mortality. Timber rattlesnake overwintering dens could be indirectly impacted by construction activities, as stormwater runoff over exposed soils could transport sediment that could fill underground crevices. Noise disturbance and potential injury or mortality could also occur as a result of vegetation maintenance of the permanent right-of-way, which would occur approximately every 3 years. Tree removal in the permanent right-of-way, could expose rocky terrain to increased solar radiation, increasing the amount of suitable habitat for gestating and basking timber rattlesnakes.

Conservation Measures

Potential impacts to the timber rattlesnake and its potential habitat will be minimized through the implementation of Atlantic's *Protected Snake Conservation Plan,* along with conservation measures in the Upland Erosion Control Plan, and Restoration and Rehabilitation Plan, as specified in the *COM Plan* (see Appendix C). These conservation measures will help protect the species and stabilize and re-establish disturbed habitats. Relevant conservation measures that will protect timber rattlesnake and help create suitable forest openings for basking habitat include the following:

- The conservation measures in Atlantic's *Protected Snake Conservation Plan* (see Atlantic and DTI, 2016a) will be implemented in the MNF to protect timber rattlesnakes in construction areas, including
  - A "No Kill" policy will be instituted for the Project that includes all snake species.
  - Atlantic will provide training to contractors working within the boundaries of the NMF that includes the importance of snakes to natural ecosystems, identification of snakes in the area, and procedures to follow if a timber rattlesnake is encountered within the Project area.
  - A biological monitor will conduct visual inspections during the timber rattlesnake active season (April 1 through October 31) to search for timber rattlesnakes in the construction corridor within 2 miles of suitable habitat prior to initial tree clearing activities, staging or moving construction equipment and vehicles, and excavation of the pipeline trench.
  - Timber rattlesnakes found within the construction right-of-way will be relocated to suitable summer habitat (rock outcrop or talus slope) within 500 to 1,000 feet of where they were found.
- Conservation measures in the Upland Erosion Control Plan will be implemented to ensure that excavated soil and sediment remain within the construction area and do not affect potential adjacent rocky habitat, including:
  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;
  - stabilization of access road surfaces by grading and installing stone where needed;
  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water away from the rock outcrops; and

  - o removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to help establish suitable habitat, including:

  - o use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);
  - o completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
  - o installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
  - o mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
  - o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
  - o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
  - o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
  - o monitoring to assess all restored areas on USFS lands in years 1 and 5;
  - o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
  - o reporting of restoration status following field inspections.

<u>Preliminary Determination of Effect</u>

Construction and maintenance activities for the Project could have direct adverse impacts on timber rattlesnake through disturbance, injury, or mortality; however, these impacts would likely be temporary or intermittent, and would be avoided or minimized through implementation of the *Protected Snake Conservation Plan*. In addition, since no timber rattlesnake habitat or individuals were found during field surveys, the likelihood of the presence of substantial numbers of timber rattlesnake in the Project area is low. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of timber rattlesnake. Given the potential for an increase in habitat as a result of the Project, Atlantic determines that the Project could also have a *beneficial impact* on the species in the MNF.

5.5.5 Aquatic Species (Fish and Bivalves)

The RFSS list for the Project contains four fish and two bivalves (see Appendix D). No suitable habitat for these species was found at the two waterbodies that would be impacted by Project crossings, since one is an intermittent stream (Unnamed Tributary [UNT] to Sugar Camp Run), and the second is a perennial stream (UNT to Shock Run) determined to be unsuitable because it is a headwater with a steep gradient. Therefore, Atlantic determines that there would be no direct impacts to RFSS fish and bivalves. The Downstream Sedimentation Analysis (Appendix I) and the Erosion and Sedimentation Report (Appendix H) indicates that potential habitats downstream or downslope from the Project area could be indirectly affected by the Project (see Table 5.5.5-1 for a list of RFSS fish and bivalves with potential habitat in the Analysis Area).

The following sections provide an analysis of potential impacts, conservation methods, and a preliminary determination of effect for RFSS fish and bivalves with potential habitat in the Project area.

5.5.5.1 General Impacts to Fish and Bivalves

Since no known RFSS fish or bivalves are known to occur at Project waterbody crossings, and since the waterbodies crossed by the Project would not likely provide suitable habitat, direct impacts to RFSS fish and bivalves are not anticipated. However, should these species be present in potential habitat in the Analysis Area downstream from the pipeline crossing, or in streams adjacent to Project workspace, indirect impacts could occur. For the MNF, the Analysis Area for aquatic species includes aquatic habitat within 1 mile of the Project centerline (following the stream conveyance) that could occur upslope or downslope of the Project on MNF property to account for potential impacts from pipeline construction and ATWS, and within 0.5 mile of new access roads to account for potential impacts from access road construction (see Appendix I). The Analysis Area involves six HUC12 subwatersheds, three of which are crossed by the Project (see Table 4.3-1). The Erosion and Sedimentation Report found higher erosion rates would occur in these subwatersheds and in waterbodies crossed by the pipeline for approximately 4 years following construction, which could result in the delivery of sediments and contaminants from Project activities into waterbodies downstream or downslope from the Project through stormwater runoff and downstream flow. Indirect impacts would include temporarily reduced water quality, as discussed in Section 5.4.3. However, impacts to water quality are anticipated to be minimal based on estimates of suspended solids in the water column caused by predicted construction erosion rates with ECDs in place (see Section 9.0 in Appendix H). Therefore, any effects to RFSS fish and bivalves would likely be minimal, particularly downslope and downstream from construction areas since the effects from increased sediment or contaminant inputs will be diluted once the affected waters reached waterbodies supporting RFSS fish or bivalves. The discussion in Sections 5.5.5.3 through 5.5.5.8 includes an analysis of impacts within the Analysis Area for each species.

TABLE 5.5.5-1

Regional Forester Sensitive Species Fish and Bivalves with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
FISH		
Etheostoma osburni	Candy Darter	Endemic to WV and VA. Occupies riffles and runs of swift, rocky creeks in the New River Watershed, including Greenbrier and Gauley River Systems; in Pocahontas County, WV. Adults are usually found in large rubble to boulder substrates in the swiftest portions of their fast flowing habitat. Within the MNF the species has been reported in the East Fork Greenbrier River, West Fork Greenbrier River, Deer Creek, Sitlington Creek, Knapp Creek, Anthony Creek, Williams River, South Fork of Cherry River, Laurel Creek, Cherry River, Little River of East Fork, and Tea Creek.
Notropis scabriceps	New River Shiner	In the New River Watershed, including cool, clear tributaries and the upper main channel of the New River: in Pocahontas County, WV. Within the MNF, the species has been reported in the North Fork of Deer Creek, Deer Creek, Knapp Creek, Sitlington Creek, West Fork Greenbrier River, and East Fork Greenbrier River.
Percina gymnocephala	Appalachia darter	New River system above Kanawha Falls, North Carolina, Virginia, and West Virginia; fairly common in Pocahontas County, WV. Within the MNF the species has been reported in the East Fork Greenbrier River.
Phenacobius teretulus	Kanawha Minnow	Creeks to medium-sized rivers, with riffles over gravel and rubble substrate. New River drainage in North Carolina, VA, and WV. Within the MNF the species has been reported in the East Fork Greenbrier River, West Fork Greenbrier River, and Laurel Creek.
BIVALVES		
Alasmidonta marginata	Elktoe	Riffle species found in shallow to medium-sized creeks or rivers; in Pocahontas County, WV.
Lasmigona subviridis	Green Floater	Streams, small rivers, and canals of low to medium gradient with slow pools and eddies, fine gravel and sand bottom, and mid-range calcium concentrations: in Pocahontas County, WV. Within the MNF the species has been found in the West Fork Greenbrier River and Greenbrier River.

Sources: See Appendix D

5.5.5.2 General Conservation Measures

Potential impacts to water quality will be minimized through the implementation of the conservation measures in the Timber Removal Plan, Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, SPCC Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Visual Resources Plan, Non-Native Invasive Plant Species Management Plan, and Water Quality Monitoring Plan, as specified in the *COM Plan* (see Appendix C). Examples of conservation measures that will protect aquatic habitat for RFSS fish and bivalves include the following:

- A dry stream crossing method, including either the flume or dam-and-pump method, will be implemented for pipeline construction across waterbodies within the MNF to reduce the introduction of sediment and turbidity in the waterbody during construction.

- The following conservation measures that will be implemented according to the Visual Resources Plan may also help mitigate impacts to aquatic species by re-establishing or retaining the existing light and temperature regimes in aquatic habitat through re-establishing or retaining forested riparian habitat:

    - The outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF, including species suitable for riparian areas.

  - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures will be implemented to reduce impacts to aquatic habitat both during and after construction per the Project’s Stream and Wetland Crossing Procedures, including

  - completing construction across streams as quickly as possible.
  - limiting in-water work to seasonal restrictions where applicable, as specified in Section 2.2.2.2 and Appendix B;
  - locating spoil from waterbody crossings at least 10 feet from the water’s edge;
  - locating all extra work areas (such as staging areas) at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land;
  - installation of sediment barriers along the entire construction right-of-way within the waterbody immediately after initial disturbance of the waterbody or in adjacent upland, and continued maintenance throughout construction to prevent the flow of sediments into the waterbody;
  - maintenance of a clearly marked 100-foot-wide vegetative buffer between a waterbody and the pipeline right-of-way where it runs parallel to the waterbody;
  - maintenance of adequate waterbody flow rates to prevent the interruption of existing downstream uses;
  - stabilization of waterbody banks and installation of temporary sediment barriers within 24 hours of completing instream construction activities.
  - restoration of steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces);
  - restoration of all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI;
  - restricting the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.
  - revegetation of disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

- Conservation measures will be implemented to reduce impacts on aquatic habitat both during and after tree removal per the Project’s Timber Removal Plan, including:

  - avoiding altering existing surface drainage patterns by the placement of timber or brush piles at the edge of the construction right-of-way;
  - logs and slash will not be yarded across perennial streams unless fully suspended;
  - logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment; and
  - any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.

- Conservation measures will be implemented to reduce stormwater runoff from upland construction areas to aquatic habitat both during and after construction per the Upland Erosion Control Plan, including:

  - prohibiting the use of herbicides in or within 100 feet of a stream or wetland, except as allowed by the USFS;
  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;
  - stabilization of access road surfaces by grading and installing stone where needed;
  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;
  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to stabilize streambanks and reduce upland stormwater runoff to aquatic habitat both during and after construction, including:

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

- application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

- no use of lime or fertilizer within 100 feet of wetlands or waterbodies;

- regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

- monitoring to assess all restored areas on USFS lands in years 1 and 5;

- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

- reporting of restoration status following field inspections

* Inspection and monitoring will be carried out to ensure conservation measures at waterbody crossings and adjacent upland areas are properly employed and maintained to reduce stormwater runoff to aquatic habitat both during and after construction per the Project's Water Quality Monitoring Plan, including:

  - monitoring turbidity at all stream crossings that are state-designated as coldwater fisheries four times per day during active construction both 50 feet upstream and downstream from the construction area, and one time per day for four days following the completion of restoration activities;

  - implementation of remediation measures should the chronic turbidity reading exceed standards.

* Atlantic will adhere to the Spill Prevention, Control, and Countermeasure Plan to prevent hazardous materials from entering aquatic habitat, including

  - restricting equipment refueling and lubricating and storage of hazardous materials to upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

5.5.5.3 Candy Darter (*Etheostoma osburni*)

<u>Species Description</u>

The candy darter has a global status of vulnerable (G3) and a state conservation status of critically imperiled (S1) (WVDNR, 2016). The species is endemic to the New River drainage in West Virginia and a small portion of the New River drainage in Virginia. The New River drainage includes the Greenbrier and Gauley River drainages of West Virginia, where this species is primarily found (Beckman and Bross-Fregonara, 2016).

Candy darters prefer riffles and runs of swift, cool, montane rocky creeks (Beckman and Bross-Fregonara, 2016). Adults of the species are usually found in large rubble to boulder substrates in the swiftest portions of their fast flowing habitat (Interagency Coordination Tool, 2016).

The candy darter typically spawns in April or May, although the timing may be dependent on when the water temperatures range from 59-65 degrees Fahrenheit (15-18 degrees Celsius) (Interagency Coordination Tool, 2016; NatureServe, 2015). Food sources for the species include aquatic insect larvae and water mites (NatureServe, 2015).

The distribution and abundance of this species are thought to be declining as the suitable habitat within its small range has declined. In Virginia, the population appears to be declining as records of this species are rarer in recent years (Interagency Coordination Tool, 2016). A West Virginia Wildlife magazine article refers to declining populations of candy darter in the MNF (Beckman and Bross-Fregonara, 2016). Threats to the population include hybridization with an introduced darter species (*E. variatum*), stream turbidity and siltation resulting from human activities, effects of stocked trout (a predator of candy darter), and possibly habitat disturbance by anglers (Kuehne and Barbour, 1983). Conservation recommendations include obtaining better information on their current distribution, abundance, and population trends (WVDNR, 2003; NatureServe, 2015).

<u>Potential Presence in Project Area</u>

Candy darters are distributed throughout the Greenbrier river system. The Project traverses four subwatersheds in the Greenbrier river system in the MNF (Sitlington Creek, Headwaters Knapp Creek, Clover Creek-Greenbrier River, and Thorny Creek-Greenbrier River subwatersheds). Two studies have documented the candy darter in the MNF (Chipps et al., 1993; Burns, 2007), and the species is purported to occur in numerous waterbodies in the MNF (see Table 5.5.5-1). The species has also been documented by the WVDEP as occurring in the East Fork Greenbrier River in the MNF, the West Fork Greenbrier River in the MNF, and in Knapp Creek outside of the MNF. Although the candy darter has been found in the MNF, these occurrences are at least 4.0 miles from the Project area (see Appendix I). Within the MNF, candy darter has not been recorded at Project waterbody crossings, and suitable habitat for the species does not occur at Project waterbody crossings in the MNF based on a desktop assessment and field observations (see Section 5.5.5). However, suitable habitat is likely to occur in the Greenbrier River approximately [redacted] downslope of the Project area located between approximately [redacted] in the MNF (see Appendix I).

<u>Impact Evaluation</u>

No direct impacts to the candy darter will occur as a result of the Project on the MNF since habitats at the Project waterbody crossings were found unsuitable for the species. Temporary indirect impacts on potential habitat and individual candy darters in the Greenbrier River are possible as a result of the overland flow of sediments and potential contaminants from the construction area on MNF property between approximately [redacted], and of downstream flow from the crossing of the Greenbrier River at [redacted] (upstream from where the Greenbrier River borders the MNF) (see Section 5.4.3). Similar impacts may also occur in rocky creeks that could provide potential habitat within 1 mile of the Project in the subwatersheds affected by the Project. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively higher erosion rates along the construction workspace in the Sitlington Creek, Headwaters Knapp Creek, and Clover Creek-Greenbrier River subwatersheds where the candy darter can be found, which includes the construction workspace near the Greenbrier River (Clover Creek-Greenbrier River subwatershed) (see Table 8-1 in Appendix H). However, temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.5.5.1). In addition, see section 6.1 for potential cumulative impacts on this species.

Conservation Measures

Conservation measures to reduce potential impacts to candy darter and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.5.5.2.

Preliminary Determination of Effect

Since the waterbodies crossed by the Project area do not contain suitable habitat, the candy darter will not be directly affected by the Project. Any indirect water quality effects that could occur downstream or downslope of the Project area where candy darter may occur will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the candy darter in the MNF.

5.5.5.4 New River Shiner (*Notropis scabriceps*)

Species Description

The New River shiner has a global status of apparently secure (G4) and a state conservation status of imperiled (S2) (WVDNR, 2016). The species is restricted to the New River drainage in West Virginia, Virginia, and North Carolina. The species population size is unknown, but abundances appear to have declined in some locations (NatureServe, 2015).

New River shiners are typically found in pools and slow runs of cool to warm creeks and small to medium rivers, over rocks, gravel, sand, and occasionally moderate deposits of silt. Food sources for the species include insects and leeches (Helfrich et al., 2005). There is little information available about their life history, but it is speculated that they spawn in late spring to mid summer (NatureServe, 2015) with 362-1,930 eggs laid per female (Helfrich et al., 2005).

The New River shiner appears relatively secure in the Blue Ridge province of Virginia and North Carolina. Species occurrences are patchy in the New River system, including the Greenbrier River system, in West Virginia. The general scarcity of New River shiners in the Appalachian Plateau may be related to watershed damage from coal mining and logging. Declines are attributed to watershed degradation from extensive coal mining and logging, and stream warming caused by removal of riparian vegetation (Jenkins and Burkhead, 1994).

Potential Presence in Project Area

New River shiners are found in the Greenbrier river system, having been documented by the USFS in Knapp Creek, West Fork Greenbrier River, and Deer Creek. Based on documented occurrences, the species is likely to occur in the Headwaters Knapp Creek, Clover Creek-Greenbrier, Sitlington Creek, and Thorny Creek-Greenbrier River subwatersheds within the MNF. Two studies have documented the New River shiner in the MNF (Chipps et al., 1993; and Burns, 2007), and the species is purported to occur in numerous waterbodies in the MNF (see Table 5.5.5-1). Within the MNF, the New River shiner has not been documented at Project waterbody crossings, and suitable habitat for the species does not occur at Project waterbody crossings based on a desktop assessment and field observations (see Section 5.5.5). However, suitable habitat is likely to occur in the Greenbrier River approximately [redacted] downslope of the Project area located between approximately [redacted] in the MNF (see Appendix I).

Impact Evaluation

No direct impacts to the New River shiner will occur as a result of the Project on the MNF since habitats at the Project waterbody crossings were found unsuitable for the species. Temporary indirect impacts on potential habitat and individual New River shiners in the Greenbrier River are possible as a result of overland flow of sediments and potential contaminants from the construction area on MNF property between approximately [redacted] and of downstream flow from the crossing of the Greenbrier River at [redacted] (upstream from where the Greenbrier River borders the MNF) (see Section 5.4.3). Similar impacts may also occur in creeks that could provide potential habitat within 1 mile of the Project in the subwatersheds affected by the Project. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively higher erosion rates along the construction workspace in the Sitlington Creek, Headwaters Knapp Creek, and Clover Creek-Greenbrier River subwatersheds where New River shiner may be found, which includes the construction workspace near the Greenbrier River (Clover-Creek-Greenbrier River subwatershed) (see Table 8-1 in Appendix H). However, temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.5.5.1).

Conservation Measures

Conservation measures to reduce potential impacts to New River shiner and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.5.5.2.

Preliminary Determination of Effect

Since the waterbodies crossed by the Project area do not likely contain suitable habitat, the New River shiner will not be directly affected by the Project. Any indirect water quality effects that could occur downstream or downslope of the Project area where New River darter may occur will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the New River shiner in the MNF.

5.5.5.5 Appalachia Darter (*Percina gymnocephala*)

Species Description

The Appalachia darter has a global status of apparently secure (G4) and a state conservation status of imperiled (S2) (WVDNR, 2016). The species is endemic to the New River system above Kanawha Falls in North Carolina, Virginia, and West Virginia (NatureServe, 2015). The Appalachia darter is predominantly found within the Blue Ridge province in North Carolina and southern Virginia. There are fewer records of the species from the Ridge and Valley province, which includes the northern part of Virginia and most of the Greenbrier River in West Virginia. Populations have also been recorded in the Appalachia Plateau province, which includes the Gauley River in West Virginia (Beckham, 1980). The total adult population size of the Appalachia darter is unknown but thought to be relatively large and currently stable (Nature Serve, 2015; Warren et al., 2000 in NatureServe, 2015).

Appalachia darters display seasonal habitat preferences and are typically found in small to medium rivers, in gravel and rubble riffles and raceways in the spring and early summer, and in slower deeper waters the remainder of year (Beckham, 1980). There is little information available about their life history, but females from Little River, Virginia, appeared to have spawned by mid-May (Kuehne and Barbour, 1983 in NatureServe, 2015). Both adults and juveniles of the species eat insects (NatureServe, 2015).

Localized threats to Appalachia darter populations may exist, but on a range-wide scale there are no known major threats (NatureServe, 2015).

Potential Presence in Project Area

Appalachia darters are found in the Greenbrier river system, having been documented in the Greenbrier River in West Virginia (Stauffer, 2007). The species has also been documented in Deer Creek and the East Fork Greenbrier River by the WVDEP, as well as the East Greenbrier River and West Greenbrier River in the MNF. Although Appalachia darter has been found in the MNF, these occurrences are at least 14 miles from the Project area (see Appendix I). Based on documented occurrences, the species is likely to occur in the Clover Creek-Greenbrier and Thorny Creek-Greenbrier River subwatersheds within the MNF. Within the MNF, Appalachia darter has not been documented at Project waterbody crossings, and suitable habitat for the species does not occur at Project waterbody crossings based on a desktop assessment and field observations (see Section 5.5.5). However, suitable habitat is likely to occur in the Greenbrier River approximately [redacted] downslope of the Project area located between approximately [redacted] in the MNF (see Appendix I).

Impact Evaluation

No direct impacts to the Appalachia darter will occur as a result of the Project on the MNF since habitats at the Project waterbody crossings were found unsuitable for the species. Temporary indirect impacts on potential habitat and individual Appalachia darters in the Greenbrier River are possible as a result of overland flow of sediments and potential contaminants from the construction area on MNF property between approximately [redacted], and of downstream flow from the crossing of the Greenbrier River at [redacted] (upstream from where the Greenbrier River borders the MNF) (see Section 5.4.3). Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively higher erosion rates along the construction workspace in the Clover Creek-Greenbrier River subwatershed, which includes the construction workspace near the Greenbrier River (see Table 8-1 in Appendix H). A review of Appalachia darter preferred habitat parameters (medium to large rivers), documented occurrences, and the downstream sedimentation analysis indicates that no additional indirect impacts to the species will occur outside of the Greenbrier River mainstem (see Appendix I).

Conservation Measures

Conservation measures to reduce potential impacts to Appalachia darter and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.5.5.2.

Preliminary Determination of Effect

Since the waterbodies crossed by the Project area do not likely contain suitable habitat, the Appalachia darter will not be directly affected by the Project. Any indirect water quality effects that could occur downstream or adjacent to the Project area where Appalachia darter may occur in the Greenbrier River will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the Appalachia darter in the MNF.

5.5.5.6 Kanawha Minnow (*Phenacobius teretulus*)

Species Description

The Kanawha minnow has a global conservation status of apparently secure to vulnerable (G3G4), and a state conservation status of critically imperiled (S1) (WVDNR, 2016). The species is endemic to the New River drainage in North Carolina, Virginia, and West Virginia, where it is found in relatively low abundance (NatureServe, 2015). The species occurs mostly in the upper section of the New River drainage within the Blue Ridge Province (Jenkins and Burkhead, 1994).

Kanawha minnows are found in riffles and runs of gravel rubble and boulders in clear, rocky, cool to warm streams and small to medium rivers. There is little information available about their life history, but spawning is known to occur in late April to early June in water around 66.9 degrees F (19.4 degrees Celsius). The number of eggs laid by females is unknown. Kanawha minnows feed on insect larvae, worms, and snails (Helfrich et al., 2005).

Kanawha minnows are considered stable but rare in West Virginia (Jenkins and Burkhead, 1994). The total adult population size of Kanawha minnows is unknown, but the distribution and abundance of the species has declined over the long term in West Virginia and Virginia (Chipps et al. 1993; Cincotta, 1997 in NatureServe, 2015). The species is well established in the East Fork Greenbrier River, but may be disappearing from other sites in the MNF where it was found historically (Chipps et al. 1993). A population decline in some areas is thought to be due to pollution and habitat alteration resulting from development, agricultural runoff, and industrial activities (Chipps et al., 1993).

Potential Presence in Project Area

The Kanawha minnow is established in the East Greenbrier River and West Greenbrier River, with few documented specimens outside of these rivers, although there are occurrences in the mainstem Greenbrier River, the Gauley River, and the New River (Stauffer et al., 1995). Based on documented occurrences, the species is likely to occur in the Clover Creek-Greenbrier and Thorny Creek-Greenbrier River subwatersheds within the MNF. Two studies have documented the Kanawha minnow within the MNF (Chipps et al., 1993; and Burns, 2007). Kanawha minnow has not been documented at Project waterbody crossings, and suitable habitat for the species does not occur at Project waterbody crossings based on a desktop assessment and field observations (see Section 5.5.5). However, suitable habitat is likely to occur in the Greenbrier River approximately 0.1 mile downslope of the Project area located between approximately [redacted] in the MNF (see Appendix I).

Impact Evaluation

No direct impacts to the Kanawha minnow will occur as a result of the Project on the MNF since habitats at the Project waterbody crossings were found unsuitable for the species. Temporary indirect impacts on potential habitat and individual Kanawha minnows in the Greenbrier River are possible as a result of overland flow of sediments and potential contaminants from the construction area on MNF property between approximately [redacted] and of downstream flow from the crossing of the Greenbrier River at [redacted] upstream from where the Greenbrier River borders the MNF) (see Section 5.4.3). Similar impacts may also occur in streams that could provide potential habitat within 1 mile of the Project in the subwatersheds affected by the Project. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively higher erosion rates along the construction workspace in the Clover Creek-Greenbrier River subwatershed where Appalachia darter may be found, which includes the construction workspace near the Greenbrier River (see Table 8-1 in Appendix H). However, temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.5.5.1).

Conservation Measures

Conservation measures to reduce potential impacts to Appalachia darter and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.5.5.2.

Preliminary Determination of Effect

Since the waterbodies crossed by the Project area do not likely contain suitable habitat, the Kanawha minnow will not be directly affected by the Project. Any indirect water quality effects that could occur downstream or adjacent to the Project area where Kanawha minnows may occur will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the Kanawha minnow in the MNF.

5.5.5.7 Elktoe (*Alasmidonta marginata*)

Species Description

The elktoe has a global conservation status of apparently secure (G4) and a state conservation status of imperiled (S2) (WVDNR, 2016). The range of the elktoe extends from Ontario, Canada (Great Lakes and St. Lawrence drainage) south to Alabama (Tennessee drainage) and on the east from New York (Susquehanna and St. Lawrence drainages) to Virginia (Ohio drainage) and on the west from eastern North Dakota to northeastern Oklahoma (historic records only) (NatureServe, 2015). The elktoe is widely distributed but is never abundant at any particular site, often occurring as single individuals. In West Virginia, it occurs in the Greenbrier and New River drainages.

The Elktoe is a medium-sized mussel that grows to approximately 110 millimeters (4.33 in) in length. The species is typically found in small rivers or large creeks, preferring sand and cobble substrates and regularly inhabiting riffles or runs (Watters et al., 2009). The elktoe is a filter feeder that feeds on suspended organic material such as detritus, bacteria, and algae (NatureServe, 2015).

Elktoe adults are largely sedentary and, as with most unionid bivalves, the species requires a fish host during the larval portion of its life cycle. Fish hosts for this species include the white sucker (*Catastomus commersoni*), northern hog sucker (*Hypentelium nigricans*), shorthead redhorse (*Moxostoma nacrolepidotum*), rockbass (*Ambloplites rupestris*), and warmouth (*Lepomis gulosus*) (Howard and Anson, 1922 in NatureServe, 2015).

This species has been extirpated from certain parts of the outer edges of its range and although still fairly common, recently it has experienced some decline (around 10 to 20 percent overall) in several areas, including in parts of Virginia, although the population is considered secure throughout the main portion of its range (Ohio, Indiana, and Illinois) (NatureServe, 2015). Threats to the species include agricultural runoff, urban and industrial runoff, impoundments or altered hydrology, coal mining, oil and gas development, stream gravel removal, and clearcutting of riparian vegetation (Turgeon et al., 1998). Conservation recommendations include working with local, state and federal agencies on issues relating to development, water quality, and preservation and restoration of habitat (NatureServe, 2015).

Potential Presence in Project Area

The elktoe is known from the Greenbrier river system, including four sub-watersheds in the MNF: Clover Creek–Greenbrier River, Thorny Creek–Greenbrier River, Sitlington Creek, and Headwaters Knapp Creek. There are no documented occurrences of elktoe in the MNF based on WVDNR NHP NHI data. Presence/absence surveys were completed at two Project waterbody crossings within the Greenbrier river system outside of the MNF and for a previous route of the Project on the West Fork Greenbrier River, the Little River, and the East Fork Greenbrier River (see Appendix I). Live elktoe were observed at the West Fork Greenbrier River. Within the MNF, elktoe has not been documented at Project waterbody crossings, and suitable habitat for the species does not occur at Project waterbody crossings based on a desktop assessment and field observations (see Section 5.5.5). However, suitable habitat is likely to occur in the Greenbrier River approximately [redacted] mile downslope of the Project area located between approximately [redacted] in the MNF (see Appendix I).

Impact Evaluation

No direct impacts to the elktoe will occur as a result of the Project on the MNF since habitats at the Project waterbody crossings were found unsuitable for the species. Temporary indirect impacts on potential habitat and individual elktoes in the Greenbrier River are possible as a result of overland flow of sediments and potential contaminants from the construction area on MNF property between approximately [redacted], and of downstream flow from the crossing of the Greenbrier River at [redacted] (upstream from where the Greenbrier River borders the MNF) (see Section 5.4.3). Similar impacts may also occur in large creeks that could provide potential habitat within 1 mile of the Project in the subwatersheds affected by the Project, although no documented occurrences of the species occur within 1 mile of the Project. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively higher erosion rates along the construction workspace in the Sitlington Creek, Headwaters Knapp Creek, and Clover Creek-Greenbrier River subwatersheds where elktoe could be found, which includes the construction workspace near the Greenbrier River (Clover Creek-Greenbrier River subwatershed) (see Table 8-1 in Appendix H). However, disturbance to the elktoe or its habitat is not anticipated to occur within the MNF based on the current distribution of the species and results of freshwater mussel surveys (see Appendix I). Potential temporary impacts to aquatic habitat downstream or downslope from where the Project crosses the MNF are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.5.5.1).

Conservation Measures

Conservation measures to reduce potential impacts on the elktoe and its potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.5.5.2.

Preliminary Determination of Effect

Since the waterbodies crossed by the Project area do not likely contain suitable habitat, the elktoe will not be directly affected by the Project. Any indirect water quality effects that could occur downstream or adjacent to the Project area where elktoe may occur will be will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the elktoe in the MNF.

5.5.5.8 Green Floater (*Lasmigona subviridis*)

Species Description

The green floater has a global conservation status of vulnerable (G3) and a state conservation status of imperiled (S2) (WVDNR, 2016), and is under review for federal listing. Historically, this species was widespread in Atlantic drainages, but currently the range of the green floater extends from New York south to North Carolina and west to Tennessee and West Virginia (NatureServe, 2015). The green floater is found in the Kanawha drainage system above Kanawha Falls in Virginia, West Virginia, and North Carolina (Clarke, 1985). It occurs in clean streams of varying sizes with low current (i.e., pools, eddies) and sand or gravel substrate.

Adult green floaters are filter feeders that primarily consume plankton and detritus (NatureServe, 2015). Green floater adults are largely sedentary and, as with most unionid bivalves, the species was thought to require a fish host during the larval portion of its life cycle, although specific host species have not been identified. However, there is recent evidence that juveniles of this species can metamorphose without a host within the marsupia of the adult female (NatureServe, 2015). The green floater breeding season is bradytictic, meaning it is a long term breeder, and it broods eggs/glochidia from August to June.

Historically, the green floater was widespread in Atlantic drainages, but currently the range of the green floater is limited from New York south to North Carolina and west to Tennessee and West Virginia, with historical extirpations occurring in several states, including Georgia and Kentucky (NatureServe, 2015). The population decline has resulted from eutrophication and siltation, as well as pressure from introduced species such as the Asian clam and zebra mussel (NatureServe, 2015). Hydrologic regime alteration, pollution, increased sediment load, nutrient enrichment, and increased stream temperatures from agriculture and municipal development has also likely contributed to the reduction in green floater and other freshwater mussel populations (Strayer and Jirka, 1997). The green floater is found in the Kanawha drainage system above Kanawha Falls in Virginia, West Virginia, and North Carolina, as well as the Middle New River and Upper James River sub-basins (Clarke, 1985). One study documents the green floater in the New River Drainage within the adjacent MNF (Nature Conservancy, 2001), and the species is known to occur in the West and East Fork Greenbrier River in the MNF. Conservation recommendations include effective site and enforced species protection (Cummings and Cordeiro, 2012).

Potential Presence in Project Area

The green floater is found in the Kanawha drainage system above Kanawha Falls in Virginia, West Virginia, and North Carolina, as well as the Middle New River, Greenbrier River, and Upper James River sub-basins (Clarke, 1985), the latter of which contains the Project area in the MNF. The green floater is known from four subwatersheds in the MNF, including the Clover Creek–Greenbrier River, Thorny Creek–Greenbrier River, Sitlington Creek, and Headwaters Knapp Creek subwatersheds (see Appendix I). One study documented the green floater within the MNF (Nature Conservancy, 2001), and the species is purported to occur in the West and East Fork Greenbrier Rivers in the MNF. Within the MNF, green floater has not been documented at Project waterbody crossings, and suitable habitat for the species does not occur at Project waterbody crossings in the MNF based on a desktop assessment and field observations (see Section 5.5.5). Presence/absence surveys completed at two Project waterbody crossings within the Greenbrier river system outside of the MNF found no green floater (see Appendix I). Four perennial streams with potential habitat are traversed by the project, but none of these fall within MNF property. Surveys have been completed at two of the four crossings and did not yield evidence of live mussels. The remaining crossings are greater than 1.6 kilometers (1.0 miles) upstream of the MNF (see Appendix I). However, suitable habitat is likely to occur in the Greenbrier River approximately [redacted] downslope of the Project area located between approximately [redacted] in the MNF (see Appendix I).

Impact Evaluation

No direct impacts to green floater will occur as a result of the Project on the MNF since habitats at the Project waterbody crossings were found unsuitable for the species. Temporary indirect impacts on potential habitat and individual green floater in the Greenbrier River are possible as a result of overland flow of sediments and potential contaminants from the construction area on MNF property between approximately [redacted], and of downstream flow from the crossing of the Greenbrier River at [redacted] (upstream from where the Greenbrier River borders the MNF) (see Section 5.4.3). Similar impacts may also occur in low current streams that could provide potential habitat within 1 mile of the Project in the subwatersheds affected by the Project. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively higher erosion rates along the construction workspace in the Sitlington Creek, Headwaters Knapp Creek, and Clover Creek-Greenbrier River subwatersheds where green floater could be found, which includes the construction workspace near the Greenbrier River (Clover Creek-Greenbrier River subwatershed) (see Table 8-1 in Appendix H). However, disturbance to green floater or its habitat is not anticipated to occur within the MNF based on the current distribution of the species and results of freshwater mussel surveys (see Appendix I). Potential temporary impacts to aquatic habitat downstream or downslope from where the Project crosses the MNF are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.5.5.1). In addition, see section 6.1 for potential cumulative impacts on this species.

Conservation Measures

Conservation measures to reduce potential impacts to green floater and potential aquatic habitat including ECDs, are discussed in Sections 5.4.3 and 5.5.5.2.

Preliminary Determination of Effect

Since the waterbodies crossed by the Project area do not likely contain suitable habitat, the green floater will not be directly affected by the Project. Any indirect water quality effects that could occur downstream or adjacent to the Project area where green floater may occur will be will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the green floater in the MNF.

5.5.6 Invertebrates

5.5.6.1 Crustaceans, Gastropods, and Planarians

See Section 5.5.1 for a discussion of cave-dwelling species.

5.5.6.2 Insects and Spiders

The RFSS list for the Project contained 23 insects and one spider (see Appendix D). An assessment of known range and habitat requirements found that eight of these species could occur in the Project area based on general habitat conditions and botany surveys describing plant community types (see Table 5.5.6-1, and Atlantic, 2016r). However, there are no WVDNR NHP NHI documented occurrences of these eight species within 2 miles of the centerline (2016 dataset). Surveys for insects and spiders were not completed in the MNF based on consultations with MNF staff. Assessments of potential presence and suitable habitat were informed by input from the WVDNR (Olcott, 2016). The following sections provide an analysis of potential impacts, conservation measures, and a preliminary determination of effect for RFSS insects with potential habitat in the Project area.

TABLE 5.5.6-1

Regional Forester Sensitive Species Insects with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
REQUIRES FORESTED HABITAT		
Gomphus quadricolor	Rapids clubtail	Clear streams and brooks with a strong current over clean gravel, cobbles, or bedrock, on comparatively unproductive soils; larva develop in gravel and cobble areas and bedrock cracks; feeds on any aquatic invertebrate or fish fry they are able to capture and handle; adults feed on insects caught while flying or gleaned from vegetation. Occurs in Pocahontas County.
Euchlaena milnei	Milne's euchlaena moth	Mountainous areas in the Appalachians with hardwood forests; larval hostplant(s) is unknown; others members of the genus feed on members of the rose, oak, maple, ash, birch, and willow families. In Berkeley, Grant, Greenbrier, Hampshire, Hardy, Monroe, Morgan, and Pocahontas Counties.
Pieris virginiensis	West Virginia white	Mixed mesophytic and northern hardwood stands. Larval hosts are toothworts, most commonly cutleaf toothwort (*Cardamine concatenata*) and two-leaved toothwort (*Cardamine diphylla*). Documented broadly in 24 counties, but mostly likely found in the mountain areas in Preston, Tucker, Randolph, Pocahontas, Pendleton, Greenbrier, and Webster Counties and adjacent areas.
REQUIRES OR IS TOLERANT OF OPEN OR EDGE HABITAT		
Lycaena Hyllus	Bronze copper	Marshes, sedge meadows, moist to wet grassy meadows, ditches, fens, streamside or pondshore wetlands, or roads and rights-of-way through marshlands; primary larval host is water dock or curly dock, but will also use undocumented species of knotweeds. In Brooke, Cabell, Marion, Monongalia, Pocahontas, and Randolph Counties.
Erora laeta	Early hairstreak	A deciduous canopy species of hardwood forests or hardwood-northern conifer mixed forests, especially northern hardwood stands with mature beech. Larval hosts include American beech fruits, beaked hazelnut, and birch catkins. In Randolph, Pendleton, Hardy, Pocahontas, Greenbrier, Monroe, Summers, Raleigh, Kanawha, and Cabell Counties.
Hadena ectypa	A noctuid moth	Woodlands, old fields, and meadows. Larval food plant is starry campion (*Silene stellata*) flowers and seeds, and possibly other *Silene* species. In Pocahontas County.
Speyeria diana	Diana fritillary	Deciduous or mixed forest with abundant violets in the understory. It prefers moist, rich deciduous woodlands with small openings, trail, and roadways. Larval host plants are violets: food plants primarily include milkweeds and thistles, but *Monarda* spp. and composites near woodland edges are also used. In Pocahontas County.

Sources: See Appendix D

5.5.6.3 Dragonfly and Damselfly

Rapids Clubtail (*Gomphus quadricolor*)

<u>Species Description</u>

Rapids clubtail has a global conservation status of vulnerable to apparently secure (G3G4) and a state conservation status of vulnerable in West Virginia (S3) (WVDNR, 2016). The species is not migratory, and is broadly distributed in central and eastern North America (NatureServe, 2015). Their range extends from southwestern Maine, west to Minnesota, and south to Alabama. Rapids clubtails are typically associated with clean, rapidly flowing streams and rivers with sand, gravel, cobble, or bedrock substrate (Olcott, 2016). The surrounding habitat is usually well-forested (Evans, 2002). Adults are active from mid-May to late August, and larvae develop in areas with gravel and cobble and bedrock cracks (Olcott, 2016).

This species is green-black in color, with distinguishing yellow markings on segments eight and nine, and is typically about 4.5 centimeters long. Food sources for larvae include bloodworms, tadpoles, water fleas, and other larvae (Scottish Natural Heritage, 2013; Ramel, 1995). Dragonflies are carnivores: food sources include mosquitoes and other small insects. Predators of dragonflies include birds, spiders, frogs, and larger dragonflies. Larvae are consumed by fish, frogs, waterfowl, and other aquatic invertebrates.

The most significant threat to the species is from habitat destruction or fragmentation from activities that alter stream channels and water quality, invasive species, and collisions with motor vehicles (Pennsylvania Natural Heritage, n.d.).

Potential Presence in Project Area

There are no WVDNR NHP NHI documented occurrences of rapids clubtail within 2 miles of the centerline. The species has been documented from 13 counties in West Virginia, including Pocahontas County (Olcott, 2016). Suitable habitat could occur in the perennial stream crossed by the Project in the MNF (see Section 5.4.2 and Appendix B).

Impact Evaluation

Direct impacts to rapids clubtail could include temporary disturbance from construction activities, which could displace, harm, or kill individual dragonflies and dragonfly larvae. Indirect impacts would include the temporary loss of riparian vegetation which could provide shelter and provide food from insects found on the plants across the 125-foot-wide construction right-of-way. In addition, approximately 30 feet of riparian area on either side of waterbody crossings will be permanently converted from forested riparian habitat to herbaceous and scrub/shrub riparian habitat since trees will not be allowed to develop within 15 feet of the pipeline adjacent to a waterbody, and vegetation will be limited to herbaceous plants and shrubs in this area. Temporary water quality impacts may occur on dragonfly larvae aquatic habitat at the waterbody crossing, downstream from the waterbody crossing, and in waterbodies adjacent to the construction workspace, as described in Section 5.4. In addition, soils disturbed by construction activities can also facilitate the spread of non-native invasive plant species such as Japanese knotweed, which can degrade riparian and aquatic habitat by displacing native plant species, destabilizing streambanks, and creating dense stands of vegetation that can adversely affect water quality and riparian and aquatic habitat (Potomac Highlands Cooperative Weed and Pest Management Area, 2011).

Conservation Measures

Potential impacts to rapids clubtail aquatic and riparian habitat will be minimized through the implementation of the conservation measures in the Timber Removal Plan, Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, SPCC Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, Water Quality Monitoring Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to rapid’s clubtail will also be applied. Relevant conservation measures include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to rapids clubtail by re-establishing or retaining suitable forested riparian habitat:

  - o The outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF, including species for riparian areas.
  - o Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Atlantic will coordinate with the MNF to include potential beneficial riparian shrubs for rapids clubtail in the revegetation plan for riparian areas.

- A dry stream crossing method, including either the flume or dam-and-pump method, will be implemented for pipeline construction across waterbodies, which will help reduce the introduction of sediment and turbidity into potential rapids clubtail aquatic habitat during construction.

- No pesticides will be used on MNF property in order to avoid potential harm to rapids clubtail and other organisms.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to rapids clubtail forested riparian and aquatic habitat, including

  - o employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat;
  - o avoiding altering existing surface drainage patterns by the placement of timber or brush piles at the edge of the construction right-of-way;
  - o logs and slash will not be yarded across perennial streams unless fully suspended;
  - o logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment; and
  - o any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.

- Conservation measures will be implemented to reduce impacts to aquatic habitat both during and after construction per the Project's Stream and Wetland Crossing Procedures, including

  - o completing construction across streams as quickly as possible.
  - o limiting in-water work to seasonal restrictions where applicable, as specified in Section 2.2.2.2 and Appendix B;
  - o locating spoil from waterbody crossings at least 10 feet from the water's edge;

- o locating all extra work areas (such as staging areas) at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land;
- o installation of sediment barriers along the entire construction right-of-way within the waterbody immediately after initial disturbance of the waterbody or in adjacent upland, and continued maintenance throughout construction to prevent the flow of sediments into the waterbody;
- o maintenance of a clearly marked 100-foot-wide vegetative buffer between a waterbody and the pipeline right-of-way where it runs parallel to the waterbody;
- o maintenance of adequate waterbody flow rates to prevent the interruption of existing downstream uses;
- o stabilization of waterbody banks and installation of temporary sediment barriers within 24 hours of completing instream construction activities.
- o restoration of steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces);
- o restoration of all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI;
- o restricting the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.
- o Prohibition of herbicide use in or within 100 feet of a waterbody except as allowed by the MNF, per the Stream and Wetland Crossing Procedures.
- o revegetation of disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

- Conservation measures will be implemented to reduce stormwater runoff from upland construction areas to aquatic habitat both during and after construction per the Upland Erosion Control Plan, including
    - o Prohibiting the use of herbicides in or within 100 feet of a stream or wetland, except as allowed by the USFS;
    - o Installation of all perimeter BMPs immediately after any bulk earth-moving activity;
    - o Stabilization of access road surfaces by grading and installing stone where needed;
    - o Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

  - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to stabilize streambanks and reduce upland stormwater runoff to aquatic and riparian habitat both during and after construction, including

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

  - no use of lime or fertilizer within 100 feet of wetlands or waterbodies;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - reporting of restoration status following field inspections

- Inspection and monitoring will be carried out to ensure conservation measures at waterbody crossings and adjacent upland areas are properly employed and maintained to reduce stormwater runoff to aquatic habitat both during and after construction per the Project's Water Quality Monitoring Plan, including

  - monitoring turbidity at all stream crossings that are state-designated as coldwater fisheries four times per day during active construction both 50 feet upstream and downstream from the construction area, and one time per day for four days following the completion of restoration activities;

  - o implementation of remediation measures should the chronic turbidity reading exceed standards.

- Atlantic will adhere to the Spill Prevention, Control, and Countermeasure Plan to prevent hazardous materials from entering aquatic habitat, including

  - o restricting equipment refueling and lubricating and storage of hazardous materials to upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

- Conservation measures in the Non-Native Invasive Plant Species Management Plan to prevent the spread of non-native invasive plants that could degrade rapids clubtail riparian habitat (also see Section 5.5.7), including

  - o cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

<u>Preliminary Determination of Effect</u>

If present in the Project area, rapids clubtail would experience direct and indirect adverse effects as a result of the Project, including potential mortality and alteration of potentially suitable habitat. Since aquatic and riparian habitat will be restored following construction, since adjacent aquatic and riparian habitat will persist adjacent to the Project area and throughout the MNF, and with the implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of rapids clubtail in the MNF.

5.5.6.4 Moths and Butterflies

Milne's Euchlaena Moth (*Euchlaena milnei*)

<u>Species Description</u>

Milne's euchlaena moth is a medium sized moth that ranges from Illinois, North Carolina, Ohio, Virginia, Wisconsin, and West Virginia. The moth is identified as having dull yellow wings outlined in maroon or brown. Brown patches are present in the rear half of the hindwings and inner portion of the forewings. The species is very similar to the common *E. trigrinaria*, but color and slight pattern variations in the wings distinguish the two (ESI, 2016b). The species has a global conservation status of imperiled to apparently secure (G2G4), and a state conservation status of imperiled (S2) (WVDNR, 2016).

Known distribution of this species is widespread but spotty and disjunct. The States in which the species is known to occur include Illinois, Maryland, North Carolina, Ohio, Virginia, West Virginia, and Wisconsin. Definitive habitat is unknown due to the widespread distribution and rare occurrences of the species (ESI, 2016b). However, it is known that that this species prefer moist slopes in mixed pine/hardwood forests or oak woodlands with acidic soils. Food sources are unknown but may include rose, oak, maple, birch, and willows based on preferences by other members of the genus (Olcott, 2016). The moth is active in June and July (WVDNR, 2015; ESI, 2016b). Larva probably feed until a mid to late instar, then overwinter in leaf litter and complete development in the spring. Predators to the species include bats, owls, birds, and lizards.

Threats to the species include gypsy moth and Dimilin spraying. Additionally, the tree litter where the pupation period takes place is sensitive to fire.

Potential Presence in Project Area

There are no WVDNR NHP NHI documented occurrences of Milne's euchlaena moth within 2 miles of the centerline. The species has been documented from eight counties in West Virginia, including Pocahontas County (Olcott, 2016). Suitable forest habitat could occur in the majority of forest types found in the Project area (see Section 5.2).

Impact Evaluation

Direct impacts to Milne's euchlaena moth could occur if individuals are present in the Project area during construction. Adult moths and larvae could be crushed by construction equipment or displaced by construction disturbance. Habitat impacts would include the loss of varying types of oak and mixed pine-hardwood forest habitats, which would be cleared from the Project area during construction (see Table 5.2.1-1). A portion of these habitats would be allowed to revegetate in the temporary workspace following construction, although recovery would likely take approximately 20 years or more before the habitat would likely support Milne's euchlaena moth. Project maintenance and operations would result in the long-term loss of forest habitat in the permanent right-of-way and new permanent access road corridors.

Conservation Measures

Atlantic will restore the temporary workspaces to stabilize disturbed habitat and re-establish oak and mixed pine-hardwood forest habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Timber Management Plan; Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). A conservation measures specific to Milne's euchlaena moth will also be applied. Relevant conservation measures include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Milne's euchlaena moth by re-establishing or retaining suitable forest habitat:
    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.
    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Atlantic will coordinate with the MNF to include Milne's euchlaena moth host plants, if commercially available, in the revegetation plan to help create suitable habitat for the

species, such as rose, oak, maple, birch, and willows, adjacent to the permanent pipeline right-of-way.

- No pesticides will be used on MNF property in order to avoid potential harm to Milne's euchlaena moth and other organisms.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

  - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

  - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
  - o reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.5.7), including
  - o cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

If present in the Project area, Milne's euchlaena moth would experience direct and indirect adverse effects as a result of the Project, including potential mortality and alteration of potentially suitable habitat. Because a portion of forest habitat will be restored following construction and abundant suitable forest habitat will persist adjacent to the Project area and throughout the MNF, and with the implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of Milne's euchlaena moth in the MNF.

West Virginia White (*Pieris virginiensis*)

Species Description

The West Virginia white is a butterfly with a wingspan of 1.5 inches (Bess, 2005). Both sexes are largely unmarked with creamy white above and smoky gray scaling along the wing margins and wing bases (Brock and Kaufman, 2016). The female is often duskier than the male (Bess, 2005). Below the wings are white and the veins are typically a light brownish gray (Brock and Kaufman, 2003). The species is found north to New England and west to Wisconsin. The core range of this species is located in West Virginia, Kentucky, western North Carolina, and eastern Tennessee (Brock and Kaufman, 2003). The global conservation status is considered vulnerable to apparently secure (G3G4), and a state conservation status of vulnerable (S3) (WVDNR, 2016). The West Virginia white is considered a priority 1 species for conservation efforts in the state of West Virginia (WVDNR, 2015). West Virginia whites occur in populations that are isolated and variable in size (Bess, 2005).

Required habitat includes mature northern hardwood forest dominated by basswood (*Tilia americana)*, beech (*Fagus grandifolia*), birch (*Betula spp*.), and maple (*Acer spp.*) (Bess, 2005; WVDNR, 2015).

West Virginia white larvae feed on species in the toothwort genus (*Cardamine* spp., formerly *Dentaria*). Cutleaf toothwort (*C. concatinata*) and smooth rockcress (*Arabis laevigata*) are the most common larval food. West Virginia white adults nectar on a variety of early spring wildflowers including *Claytonia* species (spp.), *Cardamine* spp., and *Viola* spp. In wild populations, the West Virginia white only has one brood per year (Bess, 2005). Adults are active from March to late May. Successful individuals finish developing to a chrysalis before *Cardamine* plants die back in late May and June. Toothworts and adult nectar hosts are required (Bess, 2015).

Threats to this species are centered on the increasingly common exotic invasive garlic mustard (*Allaria officinalis*) plant. Females readily deposit eggs on this species, but larva quickly die after eating it leading to a significant core range contraction from the New York City suburbs to the North Carolina mountains. The problem is especially apparent where garlic mustard has spread into forest stands. Garlic mustard may become established in woodland edge habitats, such as right-of-ways. Seeds may be carried to a site from vehicles and other equipment. Additional threats include excessive deer browsing, and gypsy moth spraying.

<u>Potential Presence in Project Area</u>

In West Virginia, the species has been documented broadly in 24 counties, but is most likely found in the mountain areas in Preston, Tucker, Randolph, Pocahontas, Pendleton, Greenbrier, and Webster Counties and adjacent areas. The species would be most likely to occur in the mixed northern hardwoods forest found in the Project area, although this forest type isn’t as widespread as others in the Project area (see Section 5.2). The preferred host plant, cutleaf toothwort (*Cardamine concatenata*), was also found in the Project area (see Atlantic, 2016r).

<u>Impact Evaluation</u>

Direct impacts to West Virginia white could occur if individuals are present in the Project area during construction. Adult moths and larvae could be crushed by construction equipment or displaced by construction disturbance. Habitat impacts would include the loss of mature northern hardwood forest, which would be cleared from the Project area and new access roads during construction (see Table 5.2.1-1). A portion of the habitat would be allowed to revegetate in the temporary workspace following construction, although recovery would likely take approximately 20 years or more before the habitat would likely support the species. Project maintenance and operations would result in the long-term loss of forest habitat in the permanent right-of-way and new permanent access road corridors. Along with habitat loss, the permanent right-of-way could affect populations from forest fragmentation because the West Virginia white is considered a weak flyer that doesn’t disperse well and will not fly across open areas, including open roads and utility right-of-ways. In addition, this species may be particularly susceptible to the potential spread of invasive weeds, including garlic mustard, into the construction area, which could result in reduced reproductive success through larvae mortality.

<u>Conservation Measures</u>

Atlantic will restore the temporary workspaces to stabilize disturbed habitat and re-establish northern hardwood forest habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Timber Removal Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures specific to West Virginia white will also be applied. Relevant conservation measures include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to West Virginia white by re-establishing or retaining suitable forested habitat:
    - The outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.

  - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Atlantic will coordinate with the MNF to include West Virginia white host plants and suitable tree species, if commercially available, in the revegetation plan to help create suitable habitat for the species, such as cutleaf toothwort, smooth rockcress, *Claytonia* spp., *Cardamine* spp., and *Viola* spp., as well as basswood, beech, birch, and maple trees, in and adjacent to the permanent pipeline right-of-way.

- No pesticides will be used on MNF property in order to avoid potential harm to West Virginia white and other organisms.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

  - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

  - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
  - o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
  - o monitoring to assess all restored areas on USFS lands in years 1 and 5;
  - o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
  - o reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.5.7), including
  - o cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

If present in the Project area, West Virginia white could experience direct and indirect adverse effects as a result of the Project, including potential mortality and alteration of potentially suitable habitat. Since a portion of northern hardwood forest habitat will be restored following construction and abundant suitable northern hardwood forest habitat will persist in surrounding areas and throughout the MNF, and with the implementation of the *Invasive Plant Species Management Plan* to reduce the potential spread of garlic mustard and other conservation measures listed above, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of West Virginia white in the MNF**.**

Bronze Copper Butterfly (*Lycaena hyllus*)

Species Description

The bronze copper butterfly has a global conservation status of secure (G5) and a state conservation status of imperiled in West Virginia (S2) (WVDNR, 2016). The Bronze copper butterfly has a wingspan of 32 to 42 millimeters. The male forewing is bronze above with a purplish cast and scattered darker streaks; the hindwing has an orange margin with black dots. The female forewing is orange above with black dots and a brown margin; the hindwing is blackish brown with scattered black dots and a black spotted orange margin. Below the hindwing, the species is whitish with scattered black dots and a spotted orange margin; the forewing is pale orange with scattered black dots and a whitish tip.

The species is bivoltine/trivoltine. The first brood emerges in May and flies through June or early July. The second brood emerges in late July or early August and flies into early September. A third partial brood may be seen in late September to mid-October. Eggs are singly laid on plants, and the species overwinters as an egg. Predators of butterflies are typically wasps, ants, parasitic flies, birds, snakes, toads, rats, lizards and dragonflies.

The bronze copper distribution occurs from Maine south to Maryland, then west to Colorado and southern Manitoba and across southern Canada. The species prefers low, wet meadows and fields usually near streams, rivers, or ponds, staying in the vicinity of its host plant. Colonies are small and localized. Like many lycaenids, bronze butterflies have limited dispersal ability. The primary larval host is water dock (*Rumex verticillatus*) or curly dock (*R. crispis*), but the butterflies will also use undocumented species of knotweeds (*Polygonum* spp.). The species subsists (nectars) on a variety of wildflowers.

Once common, the bronze copper butterfly has only been observed a few times since the 1940s. Habitat loss from wetland drainage is the main cause of population decline (Conserve Wildlife, 2016). Herbicides and pesticides have also negatively affected the species population.

Potential Presence in Project Area

There are no WVDNR NHP NHI documented occurrences of bronze copper within two miles of the centerline. In West Virginia, the species has been documented in six counties, including Pocahontas County. If present, the species would be most likely to occur in or near the PEM wetlands found in the Project area (see Section 5.3.1). Preferred host plants, curly dock, were found in the Project area (see Atlantic, 2016r).

Impact Evaluation

If bronze copper should occur in the Project area, direct impacts could include temporary disturbance from construction activities, which could displace, harm, or kill individual butterflies and caterpillars. Habitat impacts could include the temporary disturbance of wetland habitat. However, the conversion of the permanent right-of-way from forest to grassland and scrub-shrub habitat could increase the availability of suitable habitat in the MNF.

Conservation Measures

Atlantic will restore the permanent right-of-way to stabilize disturbed habitat and establish or re-establish open wetland habitat following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, Restoration and Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to bronze copper butterfly will also be applied. Relevant conservation measures include the following:

- Atlantic will coordinate with the MNF to include bronze copper butterfly host plants, if commercially available, in the revegetation plan to help create suitable habitat for the species, such as water dock, curly dock, and knotweeds, in the permanent pipeline right-of-way.

- No pesticides will be used on MNF property in order to avoid potential harm to bronze copper butterflies and other organisms.

- Conservation measures will be implemented to reduce impacts to aquatic habitat both during and after construction per the Project's Stream and Wetland Crossing Procedures, including

- prohibition of herbicide use in or within 100 feet of a wetland except as allowed by the MNF, which will help reduce the risk of herbicide drift affecting native plants beneficial to bronze copper butterfly.
- using timber riprap, prefabricated equipment mats, or terra mats for vehicles to avoid rutting in wet soils;
- placement of temporary workspaces and tree clearing operation landings outside of wetlands;
- reducing the wetland construction right-of-way to 75 feet from the standard 125 feet in upland areas, thereby reducing impacts to wetland habitat;
- locating additional temporary workspaces in upland areas a minimum of 100 feet from the wetland edge; and
- equipment refueling and lubricating at waterbodies will typically occur in upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands.

- Conservation measures will be implemented to reduce stormwater runoff from upland construction areas to aquatic habitat both during and after construction per the Upland Erosion Control Plan, including
  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;
  - stabilization of access road surfaces by grading and installing stone where needed;
  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;
  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;
- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable habitat, including
  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);
  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands);

  - no use of lime or fertilizer within 100 feet of wetlands;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - reporting of restoration status following field inspections.

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.5.7), including

  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

<u>Preliminary Determination of Effect</u>

If present in the Project area, bronze copper could experience direct and indirect adverse effects as a result of the Project, including potential mortality and alteration of potentially suitable habitat. Because the small amount of potentially suitable habitat present in the Project area makes the presence of substantial numbers of bronze copper unlikely, and with the implementation of the conservation measures listed above, Atlantic determines that Project construction *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability of* bronze copper. In addition, because of the creation of potentially suitable open habitat in the permanent right-of-way, Project maintenance could have a *beneficial impact* on the species in the MNF.

Early Hairstreak (*Erora laeta*)

Species Description

The early hairstreak butterfly is unranked globally, but has a national conservation status of vulnerable to apparently secure (N3N4) and a state conservation status of imperiled in West Virginia (S2) (WVDNR, 2016). This particular species is unique in having no tail. The underside wing coloring is turquoise blue, and the upper side coloring is blue and black: the female has more blue (Butterflies and Moths of North America, 2016). The hindwings have two small orange spots with a total wingspan of between 2.2 and 2.4 centimeters.

The species habitat range is rare and localized, found west of northern Michigan and Wisconsin and south to Tennessee and North Carolina. Their preferred habitat is deciduous and mixed woodland, normally along open areas such as ridgetops or dirt roads. The flying season is between May and September.

Larvae food sources include American beech (*Fagus grandifolia)* and beaked hazel (*Corylus cornuta)*; adult food sources are nectar from fleabane, ox-eyed daisy, and hardtack.

Early hairstreak butterflies are mainly threatened by habitat destruction and lack of nectar sources. Currently, the biggest threat is a decline in mature beech trees due to beech canker. Additionally, food plant habitat fragmentation and deer overgrazing are affecting populations. Predators of butterflies are typically wasps, ants, parasitic flies, birds, snakes, toads, rats, lizards, and dragonflies.

Potential Presence in Project Area

There are no WVDNR NHP NHI documented occurrences of early hairstreak within 2 miles of the centerline. In West Virginia, the species has been documented in 10 counties, including Pocahontas County. Suitable deciduous and mixed woodland habitat is present in a majority of the Project area. In addition, preferred host plants, American beech, were found in the Project area during field surveys (see Atlantic, 2016r).

Impact Evaluation

If early hairstreak should occur in the Project area, direct impacts could include temporary disturbance from construction activities, which could displace, harm, or kill individual butterflies and caterpillars. Habitat impacts would include the removal of deciduous and mixed woodland habitat, which would be cleared from the Project area and new permanent access roads during construction (see Table 5.2.1-1). However, a portion of the forest habitat would be allowed to recover, and the creation of a permanent right-of-way and new road corridors would increase the amount of open and forest edge habitat available to early hairstreak in the MNF.

Conservation Measures

Atlantic will restore the temporary workspaces to re-establish mixed mesophytic and northern hardwood forest habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Timber Removal Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to early hairstreak will also be applied. Conservation measures relevant to early hairstreak include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to early hairstreak by re-establishing or retaining suitable forest habitat:
    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.
    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Atlantic will coordinate with the MNF to include early hairstreak host plants, if commercially available, in the revegetation plan to help create suitable habitat for the species, such as American beech, beaked hazel, fleabane, ox-eyed daisy, and hardtack, in and adjacent to the permanent right-of-way.
- No pesticides will be used on MNF property in order to avoid potential harm to early hairstreak and other organisms.
- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including
    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.
- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including
    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;
    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;
    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;
- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including
    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.5.7), including

  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

<u>Preliminary Determination of Effect</u>

If present in the Project area, early hairstreak could experience direct and indirect adverse effects as a result of the Project, including potential mortality and alteration of potentially suitable habitat. Because a portion of deciduous and mixed woodland habitat will be restored following construction and abundant deciduous and mixed woodland habitat will persist in surrounding areas and throughout the MNF, and with the implementation of the conservation measures listed above, Atlantic determines that Project construction *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability of* early hairstreak. In addition, because of the creation of potentially suitable open and forest edge habitat in the permanent right-of-way, Project maintenance could have a *beneficial impact* on the species in the MNF.

A Noctuid Moth (*Hadena ectypa*)

Species Description

Hadena ectypa, sometimes referred to as the starry campion moth, is a noctuid moth that ranges from Massachusetts to Iowa, and south to North Carolina. It is typically found in mountainous regions. In West Virginia, this moth occurs in Pocahontas and Preston Counties (NatureServe, 2015; WVDNR, 2015). This species of noctuid moth has a global conservation status of apparently secure (G4) and a state conservation status of possibly extinct (SH), and a priority 1 species for conservation efforts (WVDNR, 2016).

H. ectypa occur in open habitats, or forested areas with openings. In West Virginia, suitable habitat includes mixed mesphytic and northern hardwood forests, edges of wet meadows, agricultural areas, and anthropomorphic grasslands (WVDNR, 2015).

Starry campion (*Silene stellate)*, a native herbaceous plant with white flowers, is a specialist host of *H. ectypa*. Other *Silene* spp. may also be able to serve as host plants (Nelson, 2012). Larva feed on developing seeds of starry campion and adults consume nectar from the flowers (Kula et al., 2014). Kula et al. found that individual larva will feed on approximately 30 to 40 flowers or seeds before pupation occurs (2014). Adults fly from mid-July to late August (NatureServe, 2015).

The main threats to this species include loss of open habitat, invasive plant species, and destruction of host plants. Land development and natural forest succession of open grasslands reduce viable habitat (WVDNR, 2015). *H. ectypa* populations can also be impacted by mowing while the host flowers are in blossom. In addition, browsing by high deer populations can reduce *Silene* and impact populations of this moth. Invasive plants, especially garlic mustard, have also resulted in population declines by reducing the availability of host plant (NatureServe, 2015).

Potential Presence in Project Area

There are no WVDNR NHP NHI documented occurrences of *H. ectypa* within 2 miles of the centerline. In West Virginia, the species has been documented in Pocahontas County. Suitable mixed mesophytic and northern hardwood forest habitat is present in a majority of the Project area in the MNF, although meadow and other open habitats are not as common (see Section 4.1.1). However, the species preferred host plant, starry campion, was found in the Project area during field surveys (see Appendix F).

Impact Evaluation

If *H. ectypa* should occur in the Project area, direct impacts could include temporary disturbance from construction activities, which could displace, harm, or kill individual butterflies and caterpillars. Habitat impacts could include the removal of starry campion, which would be cleared if present in the construction area. However, the creation of a permanent right-of-way would increase the amount of potential open habitat adjacent to forest habitat available to the species in the MNF.

Conservation Measures

Atlantic will restore the permanent right-of-way to establish potential suitable open habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to *H. ectypa* will also be applied. Conservation measures relevant to *H. ectypa* include the following:

- Atlantic will coordinate with the MNF to include starry campion, if commercially available, in the revegetation plan to help create suitable habitat for the species in the permanent right-of-way.

- No pesticides will be used on MNF property in order to avoid potential harm to *H. ectypa* and other organisms.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

  - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way; and

  - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.5.7), including
    - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

If present in the Project area, *H. ectypa* could experience direct and indirect adverse effects as a result of the Project, including potential mortality and potential removal of its host plant. With the implementation of the conservation measures listed above, however, Atlantic determines that Project construction *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of *H. ectypa*. In addition, because of the creation of potential open habitat in the permanent right-of-way adjacent to forest habitat, the Project could have a *beneficial impact* on the species in the MNF.

Diana Fritillary (*Speyeria diana*)

Species Description

The Diana fritillary is a large butterfly that ranges from the Ozark Mountains of Missouri and Arkansas east to the Appalachians. In West Virginia, the species occurs in 17 counties, including the Project county of Pocahontas. The global conservation status is vulnerable to apparently secure (G3G4), and the state conservation status is imperiled (S2) (WVDNR, 2016). The male is brown with orange on the outer wing margins. Females are described as dark blue with white and lighter blue coloration on the wings (Brock and Kaufman, 2003). The wingspan is 3.5 inches (NatureServe, 2015).

The preferred habitat is fields and openings that are moist and rich, typically within forested mountains and valleys. Suitable habitat requires an abundance of violets, the larval host species for the Diana fritillary. In fall, females lay single eggs on the ground near detritus in close proximity to violets. The larva overwinter and, in spring, feed on the leaves and flowers of violets. Adult Diana fritillaries feed on flower nectar, moist soil, and animal feces (Rudolph et al., 2006).

Threats to the species are primarily due to fragmentation, loss, or degradation of habitat. Agriculture, urban development, road construction and maintenance, gravel mining, and wind generators are particularly harmful to this species (Selby, 2007). Herbicide application and threats of invasive species can be detrimental to this species. Natural predators of this butterfly include wasps, ants, parasitic flies, birds, snakes, toads, rats, lizards and dragonflies (NatureServe, 2015).

Potential Presence in Project Area

There are no WVDNR NHP NHI documented occurrences of Diana fritillary within 2 miles of the centerline. In West Virginia, the species has been documented in Pocahontas County. Suitable open habitat is uncommon in the Project area (see Section 4.1.1). However, 10 species of Diana fritillary preferred host plants, violets (*Viola* spp.), were found in the Project area during field surveys (see Appendix F).

Impact Evaluation

If Diana fritillary should occur in the Project area, direct impacts could include temporary disturbance from construction activities, which could displace, harm, or kill individual butterflies and caterpillars. Habitat impacts would include the temporary disturbance of open habitat and loss of host plants. However, disturbed meadow and other open habitats would be allowed to recover, and the creation of a permanent right-of-way would increase the amount of suitable habitat available to the species in the MNF.

Conservation Measures

Atlantic will restore the permanent right-of-way to establish potential suitable open habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to Diana fritillary will also be applied. Conservation measures relevant to Diana fritillary include the following:

- Atlantic will coordinate with the MNF to include the Diana fritillary host plants native violet species, if commercially available, in the revegetation plan to help create suitable habitat for the species in the permanent right-of-way.

- Conservation measures to reduce erosion will be implemented in potential habitat after construction per the Upland Erosion Control Plan, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.5.7);

    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
  - monitoring to assess all restored areas on USFS lands in years 1 and 5;
  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
  - reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.5.7), including
  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

<u>Preliminary Determination of Effect</u>

If present in the Project area, Diana fritillary could experience direct and indirect adverse effects as a result of the Project, including potential mortality and potential loss of host plants. However, the small amount of potentially suitable habitat present in the Project area makes the presence of substantial numbers of Diana fritillary that would be affected by the Project unlikely. Given this, and with the implementation of the conservation measures listed above, Atlantic determines that Project construction *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability of* bronze copper. In addition, because of the creation of potential open habitat in the permanent right-of-way, the Project could have a *beneficial impact* on the species in the MNF.

5.5.7 Plants

The RFSS list for the Project contained 60 plant species. Thirty-three of these species were determined to have potential habitat in the Project area based on known ranges and suitable habitat (see Table 5.5.7-1). There were no documented occurrences in WVDNR NHP NHI data of any of these species within 2 miles of the centerline. Fourteen of these species are documented as occurring in the MNF, based on MNF plant data. A survey/inventory of all plant species encountered along a 300-foot-wide study area centered on the Project corridor and access roads was carried out from June to September in 2016 (see the plant survey report in Appendix F). Descriptions of the plant communities in the survey area were also recorded and quantified (see Section 5.2 and Appendix F). Four RFSS species were found in the Project area during field surveys, including Roan Mountain sedge (*Carex roanensis*), Appalachian oak fern (*Gymnocarpium appalachianum*), white alumroot (*Heuchera alba*), and bristly black currant (*Ribes lacustre*) (see Appendix F). The following sections provide an analysis of potential impacts, conservation measures, and a preliminary determination of effect for RFSS plants with documented occurrences and potential habitat in the Project area. Species not documented in the Project area are analyzed according to groupings based on general habitat requirements.

TABLE 5.5.7-1

Regional Forester Sensitive Species Plants with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
FOREST DEPENDENT SPECIES		
Allium allegheniense	Allegheny Onion	Oak-pine and mixed oak forest with calcareous rocky outcropping: dry woods, calcareous rock outcroppings east of the Greenbrier River.
Botrychium lanceolatum var. *angustisegmentum*	Lanceleaf Grapefern	Appalachian hardwoods, northern hardwoods: moist shady woods, margins of swamps, on hummocks in swamps, and in cool to warm, mostly rich, subacid soils; Pocahontas, Preston, and Tucker Counties, WV.
Botrychium oneidense	Bluntlobe Grapefern	Mixed northern hardwoods, oak-pine forest, mixed oak: low, wet, acid, secondary woods and swamps; in Pocahontas County, WV. There are 32 documented occurrences in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.
Carex roanensisI [a]	Roan Mountain Sedge	Mixed oak, northern hardwoods, mixed mesophytic/cove hardwoods: rich soils of mid- to high-elevation mesic forests in the southern Appalachians, including rich cove and northern hardwood forests; Pendleton, Pocahontas, and Randolph Counties, WV. There are 19 documented occurrences in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.
Cornus rugose	Roundleaf Dogwood	Mixed northern hardwoods, mixed oak: well drained to normal moisture soil; Fayette, Mineral, and Pendleton Counties, WV.
Gaylussacia brachycera	Box Huckleberry	Mixed oak, oak-pine: acidic sandy soil, woodlands and slopes, frequently associated with pine and mountain laurel, often sourwood and black gum; Greenbrier, Hardy, Monroe, and Summers Counties, WV.
Gymnocarpium appalachianum [a]	Appalachian Oak Fern	Mixed mesophytic/cove hardwoods, mixed oak: primarily in maple-birch-hemlock woods on mountain slopes and summits, on moist sandstone, talus slopes, or bouldery colluvium; Greenbrier, Hampshire, Monongalia, Pendleton, Preston, Randolph, Tucker Counties, WV. There are nine documented occurrences in the MNF, including one within 1 mile of the Project area, based on MNF plant data.
Heuchera alba [a]	White Alumroot	Mixed oak, oak-pine: rocky or shaley wooded ridgetops; heath-grass barrens in Pocahontas County, WV. There are 24 documented occurrences in the MNF, including four within 2 miles of the Project area, based on MNF plant data.
Hexalectris spicata	Crested Coralroot	Mixed oak, oak-pine, mixed northern hardwoods: dry or mesic woods on basic soils; Grant, Pendleton, and Wayne Counties, WV.
Ophioglossum engelmannii	Limestone Adder's-tongue	Mixed northern hardwood forest: limestone related habitat; Hardy and Tucker Counties, WV.
Ribes lacustre [a]	Bristly Black (Prickly) Currant	Mixed mesophytic/cove hardwoods: damp soil on rocky slopes and talus areas, moist to seepy rock outcrops and cliffs, and in cool woods and swamps; in Pocahontas County, WV.
Scutellaria saxatilis	Rock Skullcap	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak: woods, hillsides, and moist cliffs in mountainous areas; in Pocahontas County, WV. There are 153 documented occurrences in the MNF, including 11 within 1 mile of the Project area, based on MNF plant data.
Taxus canadensis	Canada Yew	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak: gentle to somewhat steep slopes facing southeast, at elevations ranging from 613-650 feet; soils are usually sandy loams; in Pocahontas County, WV.
Tortula ammonsiana	Ammons' Tortula Moss	Mixed northern hardwoods, mixed oak, oak-pine forest on rock outcrops (often with southern aspect), preferring the backwalls and shelves of overhanging cliffs, although colonies of small plants have been located on exposed cliff-faces; in Pocahontas County, WV.
Trichomanes boschianum	Bristle-Fern	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak, oak-pine: deep shade on damp acid rocks, usually sandstone, of sheltered canyons, grottos and rock shelters at an altitude of 150 to 800 meters. The rock outcrops are generally found within mesic upland forests; in Pocahontas County, WV.
Woodwardia areolata	Netted Chainfern	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak, oak-pine: common on the coastal plain, but rare in the mountains, where it occurs in swamps and wet woods in acid soil; in Pocahontas County, WV.
SPECIES THAT OCCUR IN OPEN OR EDGE HABITAT		

TABLE 5.5.7-1

Regional Forester Sensitive Species Plants with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
Allium oxyphilum	Lillydale Onion	Oak-pine and mixed oak forest: shale barrens, but this species has been noted on sandstone outcroppings; Greenbrier, Mercer, Monroe, and Summers Counties, WV.
Amelanchier bartramiana	Bartram Shadbush	Mixed northern hardwoods and oak-pine; northern hardwood and mixed-deciduous forests, forest edges, opening in forests, and peatlands; in Pocahontas County, WV. There are six documented occurrences in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.
Clematis occidentalis var. *occidentalis*	Purple Clematis	Mixed northern hardwood, mixed oak, mixed Appalachian hardwoods: rocky alpine slopes and ridges, and openings in forested areas; in Pocahontas County, WV
Corallorhiza bentleyi	Bentley’s Coralroot	Mixed northern hardwood, mixed oak, mixed Appalachian hardwoods: Appalachian deciduous forest, often at edges of forest in somewhat disturbed sites; in Monroe and Pocahontas Counties, WV.
Delphinium exaltatum	Tall Larkspur	Mixed northern hardwoods, mixed mesophytic/cove hardwoods: woods (and edges of woods), rocky slopes, semi-open woodlands, glades, and prairie openings; Grant, Greenbrier, Hampshire, Hardy, Mercer, Mineral, Monroe, and Pendleton Counties, WV.
Platanthera shriveri	Shriver’s Frilly Orchid	Northern hardwoods: partial to full shade of damp, open, mixed deciduous and coniferous woods, often along seepage springs or streams, or on roadside banks amid mosses, ferns, grasses, sedges, and/or nettles in mountains; in Pocahontas County, WV.
Pycnanthemum beadle	Beadle’s Mountainmint	Northern hardwoods, mixed oak, oak-pine, mixed mesophytic/cove hardwoods: open forests, forest edges, and roadsides; in Pocahontas County, WV.
Taenidia montana	Mountain Pimpernel	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak: shale barrens (calcareous) and mesic and xeric open woods or dense hardwood forests; Grant, Greenbrier, Hampshire, Hardy, Mercer, Mineral, Monroe, Morgan, Pendleton, Summers, and Tucker Counties, WV. There are three documented occurrences in the MNF, including one within 1 mile of the Project area, based on MNF plant data.
WETLAND AND RIPARIAN SPECIES		
Arabis patens	Spreading Rockcress	Northern hardwoods, mixed mesophytic/cove hardwoods, riparian corridors: moist rocky woods, limestone outcrops, and shady riverbanks in Berkeley, Grant, Hampshire, Hardy, Jefferson, and Pendleton Counties, WV.
Cypripedium reginae	Showy Lady’s-Slipper	Mixed northern hardwoods, mixed oak associated with riparian corridors/wetlands: cold northern wetlands (e.g., mossy conifer swamps of *Thuja occidentalis*, *Picea mariana*, or *Larix laricina*), swampy thickets, bogs, woodland glades, ravines, stream and lake edges, seepages on limestone or sandstone bluffs, damp calcareous slopes or shores, limestone quarries, wet calcareous meadows, circumneutral seep springs, forested fens, shrub borders of fens, sandy shorelines, and algific talus slopes; Greenbrier and Tucker Counties, WV.
Hypericum mitchellianum	Blue Ridge St. John's-wort	Mixed northern hardwoods, Appalachian hardwoods, riparian corridors/wetlands: seepage slopes and spray areas near falls, at higher elevations (Radford, 1968); grassy balds, grassy openings, forests, seepages; in Pocahontas County, WV.
Ilex collina	Long-Stalk Holly	Herbaceous, northern hardwoods, Appalachian hardwoods, riparian corridors: high elevation oligotrophic wetlands along streams, and streamheads from 2,120-4,815 feet; In Greenbrier, Nicholas, Pocahontas, Randolph, Webster, WV. There are 74 documented occurrences in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.
Juglans cinerea	Butternut	Mixed mesophytic/cove hardwoods, riparian corridors: rich mesophytic forests, lower slopes, ravines, and various types of bottomland, including banks and terraces of creeks and streams, and floodplain forests; in Pocahontas County, WV. There are 112 documented occurrences in the MNF, including nine within 1 mile of the Project area, based on MNF plant data.
Pedicularis lanceolata	Swamp Lousewort	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak, oak-pine with riparian corridors/wetlands: periodically inundated habitats, such as wet meadows, prairies, swamps, freshwater tidal marshes, and stream sides and other early-successional habitats; in Pocahontas County, WV.
Poa paludigena	Bog Bluegrass	Northern hardwoods, mixed oak, oak-pine, mixed mesophytic/cove hardwoods: spring-fed swamps; in Pocahontas County, WV.
Ranunculus pennsylvanicus	Pennsylvania Buttercup	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak, oak-pine associated with riparian corridors/wetlands: open to filtered light; wet to periodically flooded, including marsh edges, vernal pools, seasonally flooded riverbanks; in Pocahontas County, WV.

TABLE 5.5.7-1

Regional Forester Sensitive Species Plants with Potential Habitat in the Monongahela National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
Viola appalachiensis	Appalachian Blue	Northern hardwoods, mixed mesophytic/cove hardwoods, mixed oak, oak-pine and would be associated with riparian corridors/wetlands: occurs on rich, moist soils found on stream banks, floodplains, glades, clearings, forest edges, roadsides, old railroad grades, old fields, and pastures; often associated with some form of human disturbance; in Pocahontas County, WV. There are 46 documented occurrences in the MNF based on MNF plant data, although none occur within 2 miles of the Project area

Sources: See Appendix D

[a] Found during 2016 field surveys (Appendix F)

5.5.7.1 Potential Impacts to RFSS Plants with Potential Habitat in the Project Area

<u>Potential Presence in Project Area</u>

Forest-Dependent Species

Sixteen RFSS plants with the potential to occur in the Project area were assessed as being forest-dependent species and largely intolerant of open or edge habitat. These species occur in plant communities such as mixed mesophytic/cove hardwoods, mixed oak, and oak pine, which were the most common plant community types found in the survey area (see Section 5.2). Five of these species—Appalachian oak fern, bluntlobe grapefern, Roan Mountain sedge, white alumroot, and rock skullcap—would have a higher likelihood of occurring in the Project area since they are known to occur in both the MNF and Pocahontas County (see Table 5.5.7-1). Appalachian oak fern, Roan Mountain sedge, and white alumroot were among the four species found during 2016 field surveys, which also included bristly black currant. A more detailed analysis for these four species is provided in Section 5.5.7.2.

Species that Occur in Open or Edge Habitats

Eight RFSS plants with the potential to occur in the Project area were assessed as typically occurring in open or edge habitat. These species were noted as occurring along forest edges, forest openings, and along roadsides. These types of habitats occur intermittently and in small areas in the survey area (see Appendix F). Two of these species—bartram shadbush and mountain pimpernel—would have a higher likelihood of occurring in the Project area since they are known to occur in both the MNF and Pocahontas County (see Table 5.5.7-1). However, none of the eight species were found during 2016 field surveys.

Wetland and Riparian Species

Nine RFSS plants with the potential to occur in the Project area were assessed as typically occurring in wetland or riparian habitat. These species could occur in the PEM wetlands that were found in the survey area or along streams (see Section 5.3). Three of these species—long-stalk holly, butternut, and Appalachian blue—would have a higher likelihood of occurring in the Project area since they are known to occur in Pocahontas County and there are numerous documented occurrences in the MNF (see Table 5.5.7-1). However, none of the nine species were found during 2016 field surveys.

<u>Impact Evaluation</u>

Impacts specific to the four species found in the Project area during field surveys, including Roan Mountain sedge, Appalachian oak fern, white alumroot, and bristly black currant, are discussed in

Section 5.5.7.2. Atlantic anticipates no direct impacts to the RFSS plants that were not found during field surveys. Impacts on potentially suitable habitat would occur during the clearing phase of construction. While a portion of this habitat would be allowed to redevelop following construction, the 53.5-foot-wide permanent right-of-way would be kept clear of trees and result in the long-term loss of forest habitat, while creating scrub-shrub or open habitat. The loss of trees and other vegetation would increase the amount of solar radiation, wind, and precipitation affecting plant habitat, which could alter the microclimate from the right-of-way and into the forest, creating an edge effect. Vehicle movement, supplies and equipment, and trenching during construction would also cause indirect effects through soil compaction and a loss of soil structure. Soil disturbance could secondarily contribute to indirect effects by facilitating the introduction or spread of invasive, non-native plant species, which could be brought to the Project area on vehicles and equipment. Both impacts to soils and competition from invasive species could inhibit establishment of RFSS plant populations following construction.

Forest-Dependent Species

Suitable habitat for RFSS plants requiring forest habitat is more likely to be present and experience impacts during construction since forests are the most common habitat type in the MNF (approximately 95 percent of the MNF) (see Section 4.1.1.1). RFSS plants requiring forest habitat would also experience the greatest long-term impacts. Habitat alteration would result in the loss of suitable forest habitat in the 53.5-foot permanent right-of-way and new permanent access roads. In addition, habitat alteration would cause indirect effects by altering the microclimate along the forest edge adjacent to the right-of-way and new road corridors, potentially reducing the chance of RFSS forest-dependent plants establishing in adjacent forested habitat. Establishment of these RFSS populations in the temporary workspace would depend on their tolerance of an altered microclimate and the redevelopment of forest habitat, which could take more than 20 years.

Meadow, Scrub-Shrub, and Forest Edge Species

Suitable habitat for RFSS plants requiring open or edge habitats are less likely to be present and experience adverse impacts given the relatively small amount of open habitats that occur in the MNF (see Section 4.1.1.1). RFSS plants requiring open or forest edge habitat would likely experience temporary direct impacts from construction through habitat disturbance, and intermittent impacts from maintenance activities such as mowing. However, the changes in microclimate from tree removal for the permanent right-of-way and new permanent access roads could create additional open and forest edge habitat for these RFSS plants. Therefore, for species that occur in open or edge habitats, long-term impacts could be beneficial or neutral for species tolerant of infrequent disturbance from maintenance activities.

Wetland and Riparian Species

Suitable habitat for RFSS plants requiring wetland or riparian habitat are less likely to be present and experience impacts given the relatively small amount of wetlands (including rivers and streams) that occur in the MNF (see Section 4.3.1). RFSS plants requiring PEM wetland or riparian habitat will experience minimal temporary impacts (less than 0.1 acre) from construction through habitat disturbance, and intermittent impacts from maintenance activities such as mowing. In addition, two streams and the associated riparian habitat will be temporarily affected during construction across the 125-foot-wide construction right-of-way. In addition, approximately 30 feet of riparian area on either side of waterbody crossings will be permanently converted from forested riparian habitat to herbaceous and scrub/shrub riparian habitat since trees will not be allowed to develop within 15 feet of the pipeline adjacent to a waterbody, and vegetation will be limited to herbaceous plants and shrubs in this area. The change in microclimate could prevent some riparian plant species from re-establishing in the right-of-way and into the adjacent forest edge. Species requiring PFO or PSS wetland habitat will not be affected by the Project since no PFO or PSS wetlands were found in the Project area.

Conservation Measures

Conservation measures specific to the four RFSS plants that were found during field surveys, Roan Mountain sedge, Appalachian oak fern, white alumroot, and bristly black currant, are discussed in Section 5.5.7.2.

Atlantic will restore the permanent right-of-way and temporary workspaces to stabilize disturbed habitat and establish or re-establish open habitat in the permanent right-of-way, and forest habitat in the temporary workspaces, through implementation of the Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, Timber Removal Plan, Restoration and Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures relevant to RFSS plants include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to forest-dependent RFSS plants by re-establishing or retaining suitable forest habitat:
  - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the MNF.
  - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest habitat, which could benefit forest-depended RFSS plants, including:
  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.
- The right-of-way will be restored in accordance with the Restoration and Rehabilitation Plan, including:
  - development of seed mixes in consultation with the MN, including use of local ecotypes (when possible) and West Virginia-certified seed or alternative seed sourced from approved distributors;
  - consultation with the USFS on the timing of seeding during the appropriate seasons and according to elevation (e.g., generally March 15th to June 1st and August 15th to October 15th);
  - methods for erosion control;
  - erosion control monitoring;

- methods for soil restoration (e.g., removal of excavated rock, distribution of rock on the work area, grading to preconstruction contours to the extent practicable, and testing and treatment for soil compaction where requested by the MNF);

- topsoil segregation, replacement, and conditioning to help re-establish native plant communities in areas determined in consultation with the MNF and according to the *COM Plan*;

- special procedures for steep slope areas (e.g., the use of additional structural materials; steep slope construction method with reduced construction times; and targeted mitigation of seeps, springs, or other subsurface water encountered);

- additional restoration measures for the MNF (e.g., restricted use of wheeled and/or tracked motorized equipment on soils susceptible to compaction, use of mulch on all disturbed soils);

- special procedures for riparian areas (e.g., use of native species for revegetation, and possible use of supplemental plantings of fast growing native tree seedlings and shrubs in forested riparian areas outside of the permanent easement);

- special procedures for wetland areas (e.g., clearing vegetation at ground level in non-forested wetland areas, use of equipment mats to prevent soil compaction, limiting the removal of stumps to the trench area in forested wetlands, where feasible);

- restoration monitoring and maintenance (e.g., assessment of the effectiveness of erosion control measures, quantitative assessment of revegetation status for years 3 and 5, monitoring of vegetation for the life span of the pipeline operations);

- implementation of a restoration goal of reseeded/replanted species equal to or greater than 80 percent ground cover, with implementation of remedial actions where goals are not met; and

- reporting of restoration status and remedial actions to the USFS and FERC through summary reports.

- training for environmental inspectors regarding the USFS Restoration and Rehabilitation Plan, including techniques specific to the USFS, seeding techniques on steep slope sites, emergency contacts and numbers, and erosion minimization and control measures.

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to minimize the spread of invasive plant species that could outcompete RFSS plants, including:

  - environmental training for Project personnel on the Project's USFS Invasive Plant Species Management Plan;

- identification of non-native invasive plant infestations through survey within a 300-foot-wide corridor along the ACP pipeline route and a preconstruction inspection (see the non-native invasive species list in the *COM Plan*);

- marking of non-native invasive plant infestations with color-coded flagging, staking, and/or signs on the construction right-of-way for possible avoidance and use of control measures during construction;

- establishment of herbicide and mechanical/hand pulling treatment methods in coordination with the USFS, including site-specific treatment methods in areas where treatments may be restricted (e.g., difficult topography, saturated soils, etc.);

- identification of sensitive features (e.g., RFSS plants) occurring near non-native invasive plant infestations, and implementation of recommendations for weed control near sensitive features from the West Virginia and Virginia Natural Heritage Program;

- implementation of measures to prevent the spread of non-native invasive plants during construction activities (e.g., cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials);

- monitoring of non-native invasive plant infestations along the construction right-of-way for the life of pipeline operations; and

- maintenance of a non-native invasive plant density and cover similar to nearby non-forested, undisturbed lands, with implementation of remedial actions where goal is not met.

- Vegetation will be cleared within a reduced construction right-of-way width of 75 feet in wetlands to reduce impacts to wetland vegetation (already factored into the affected acreages);

- Herbaceous vegetation will be maintained in a reduced permanent right-of-way width of 10 feet, centered on the pipeline, in wetlands, to reduce impacts to adjacent wetland vegetation (although trees developing within 15 feet of the pipeline will be removed).

Preliminary Determination of Effect

The preliminary determination of effect for the four species found during surveys is included in Section 5.5.7.2.

Forest-Dependent Species

Potential RFSS plant forest habitat would be permanently removed in the permanent right-of-way, and forest habitat in the temporary workspace would take over 20 years to re-establish. However, for the RFSS plants that rely on forest habitat that were not found during field surveys, the presence of substantial populations that will be affected by the Project is unlikely. Abundant forest habitat will remain adjacent to the permanent right-of-way. For these reasons, and with the implementation of conservation measures to minimize impacts on potential habitat, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of RFSS forest-dependent plants in the MNF that were not found during field surveys.

Species that Occur in Open or Edge Habitats

Potential temporary construction and intermittent maintenance activities could impact RFSS plants that occur in open or forest edge habitats. For the RFSS plants that could be present in the Project area and occur in open or edge habitats, a relatively small amount of potential habitat would be temporarily affected during Project construction. In addition, the development of a 53.5-foot permanent pipeline right-of-way through the Forest would create additional meadow, scrub-shrub, and forest edge habitats. While invasive species present a threat to the establishment of native RFSS plants, implementation of the *Restoration and Rehabilitation Plan* and *Invasive Plant Species Management Plan* will reduce this threat. Therefore, with mitigation, Atlantic determines that the Project will could have a *beneficial impact* on species in the MNF that occupy open or forest edge habitat.

Wetland and Riparian Species

Potential temporary and intermittent impacts could affect the RFSS plants with the potential to occur in the Project area in PEM wetlands and riparian habitats. However, the affected areas are relatively small when compared to the extent of wetlands (including rivers and streams) in the entire MNF. In addition, while invasive species present a threat to the re-establishment of native RFSS plants following construction, implementation of the *Restoration and Rehabilitation Plan* and *Invasive Plant Species Management Plan* would reduce this threat. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of RFSS wetland and riparian plants in the MNF.

5.5.7.2 Assessment of RFSS Plants Documented in the Analysis Area

Roan Mountain Sedge (*Carex roanensis*)

Species Description

Roan Mountain sedge (*Carex roanensis*) is currently known from 44 populations in the southern Appalachian Mountains. It is found in higher elevations in the Blue Ridge, Ridge and Valley, and Central Appalachian Ecoregions, reaching its northern limit in the Western Allegheny Plateau region of southwestern Pennsylvania. With the exception of one area, population census data have not been collected for this species (Smith et al., 2006). The conservation status of Roan Mountain sedge is imperiled to vulnerable at the global level, and imperiled at the state level (WVDNR, 2016).

The preferred habitat of this perennial sedge is rich soils of mid- to high-elevation mesic forests in the southern Appalachians, including rich cove and northern hardwood forests in Pendleton, Pocahontas, and Randolph Counties, West Virginia. The species is most abundant on moderate to steep, rocky, wooded but generally more sparsely vegetated slopes. This species often co-occurs with *C. aestivalis* and *C. virescens* (NatureServe, 2015).

Presence in the Project Area

Based on discussion with the MNF, it was determined that suitable habitat for the species could occur in the Project area. Habitat surveys during the 2016 field season were conducted along the proposed route within the MNF to identify suitable habitat for the species. Field surveys were conducted within potentially suitable habitat areas identified during desktop analysis. Visual reconnaissance and meandering methodologies were utilized to cover the survey areas. The field survey confirmed three Roan Mountain sedge populations in the Project area on MNF land [redacted] totaling approximately 3.22 acres and 523 individuals (see Appendix F).

Impact Evaluation

Impacts on Roan Mountain sedge would be the same as those for other species that require forest habitat, as discussed in Section 5.5.7.1. Specifically, direct impacts would include the loss of 2.86 acres from the three populations of Roan Mountain sedge along with the associated mesic forest habitat during the clearing phase of construction for an ATWS, the temporary workspace corridor, and the permanent right-of-way. The three populations together would be reduced by a total of 89 percent (or 83, 100, and 94 percent, respectively). In addition, the three populations would be adversely affected due to the long-term loss of at least 1.43 acres or 44 percent of the (currently populated) mesic forest habitat in the permanent right-of-way from vegetation maintenance. Indirect impacts to the microclimate, including changes in light and moisture regimes, from the reduction in shade, or potential changes to surface water hydrology, could extend into the forest from the edge of the right-of-way, reducing plant health and fecundity of individuals near the forest's edge. Furthermore, an invasive plant species has been identified in close proximity to the Roan Mountain sedge populations that could reduce the ability of Roan Mountain sedge to re-establish following construction should the invasive species spread into the disturbed area (see Appendix A). In addition, see section 6.1 for potential cumulative impacts on this species.

Avoidance and Minimization

As required by the MNF Land and Resource Management Plan (LRMP), Atlantic evaluated the feasibility of avoiding the three populations of Roan Mountain sedge and determined that avoidance is not feasible. The proposed pipeline was sited along ridge lines to minimize siting along steep slopes, side-sloping topography, and karst terrain. Adjusting the alignment to avoid the three populations of Roan Mountain sedge would require crossing steep slopes and side-sloping topography, which would require a larger construction footprint to create a safe and level workspace during construction and workspace needed for spoil storage. Reducing the construction right-of-way to minimize impacts on the three populations of Roan Mountain sedge would not be feasible. As described in Section 2.1, Atlantic will require a 125-foot-wide construction right-of-way to safely accommodate the large construction equipment and to temporarily store trench spoil. As such, Atlantic is not able to avoid or minimize impacts to these Roan Mountain sedge populations. However, mitigation measures to reduce impacts to Roan Mountain sedge will be implemented (see Conservation Measures below).

Conservation Measures

General conservation measures specific to forest-dependent species will be implemented to reduce impacts to Roan Mountain sedge potential habitat throughout the Project area (see Section 5.5.7.1). In addition, the following site-specific mitigation measures will be implemented to reduce impacts on the three Roan Mountain sedge populations found in the Project area:

- During the dormant season and prior to tree clearing, Atlantic will relocate all Roan Mountain sedge plants within the construction footprint to suitable habitat immediately adjacent to the existing population, to be determined in consultation with the MNF.

- The portions of the Roan Mountain sedge populations adjacent to the construction right-of-way will be visibly marked in order to avoid impacts by vehicles, equipment, and supplies.

- An EI will provide oversight during clearing, construction, and restoration activities to ensure conservation measures are followed and impacts are minimized to the extent feasible.

- On-site personnel will be trained regarding the mitigation measures to be implemented.

- Erosion control devices will be put in place to reduce runoff velocity and minimize sediment and erosion impacts to adjacent populations.

- The site will be restored to preconstruction contours to re-establish surface water hydrology.

- Atlantic will work with the MNF to include understory and overstory species associated with Roan Mountain sedge, if commercially available, in the revegetation plan for the temporary workspaces surrounding the existing populations.

- No herbicides will be used within 60 feet of the Roan Mountain sedge populations: only hand-pulling of non-native invasive plant species will be used as a control method within this area per the Non-Native Invasive Plant Species Management Plan.

<u>Preliminary Determination of Effect</u>

Roan Mountain sedge has a fairly widespread distribution, with 44 other populations of Roan Mountain sedge documented in the southern Appalachian Mountains, and 19 populations documented in the MNF. In addition, portions of two of the three affected populations would remain intact adjacent to the construction right-of-way and could persist following construction, depending on impacts from changes in light and moisture regimes. Approximately 44 percent of the previously occupied habitat could re-establish in the temporary workspaces following construction, although it would likely take approximately 20 years or more before the forest habitat in these areas would be suitable for Roan Mountain sedge. Given the species' widespread distribution, the portions of the population that would remain intact, and the potential for habitat and individual plants to recover with the implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of Roan Mountain sedge in the MNF.

Appalachian Oak Fern (Gymnocarpium appalachianum)

<u>Species Description</u>

The Appalachian oak fern (*Gymnocarpium appalachianum*) is a local perennial species endemic to the Appalachian region. It occurs in Virginia (the center of its range), West Virginia, North Carolina, Maryland, Pennsylvania, and historically in Ohio. In West Virginia, the Appalachian oak fern is primarily found in montane red oak forests in Greenbrier, Hampshire, Monongalia, Pendleton, Preston, Randolph, Tucker Counties (WVDNR, 2015; NatureServe, 2015), although it has also been noted in maple-birch-hemlock woods on mountain slopes and summits, moist sandstone, talus slopes, or boulder colluvium in these areas (eFloras, 2010; NatureServe, 2015; WVDNR, 2015). The global status is vulnerable (G3). In West Virginia, the Appalachian oak fern is a Priority 1 species that is imperiled (S2) (WVDNR, 2015).

Appalachian oak ferns have small triangular fronds that sporulate from June to August (Cobb et al. 2005; Cusick, 1994). The Appalachian oak fern is a clonal species, so it can be difficult to estimate the number of genetic individuals in a given population. The species is vulnerable to alterations of cool, moist microclimates of forest habitats on mountain slopes (NatureServe, 2015).

Presence in the Project Area

Based on discussion with the MNF, it was determined that suitable habitat for Appalachian oak fern could occur in the Project area. Habitat surveys subsequently were conducted for this species along the route within the MNF during the 2016 field season. The field surveys were conducted within potentially suitable habitat areas identified through desktop analysis and field review. Visual reconnaissance and meandering methodologies were utilized to cover the survey areas. The field surveys confirmed a population of Appalachian oak fern covering approximately 0.42 acre adjacent to the Project area between [redacted] (see Appendix F). The population had an estimated 10,000 individuals (stems) of Appalachian oak fern.

Impact Evaluation

The types of impacts to Appalachian oak fern would be the same as those for other species that occur in forest habitat, as discussed in Section 5.5.7.1. Specifically, direct impacts to Appalachian oak fern would include the loss of approximately 0.0007 acre (32 square feet) of individuals and associated forest habitat, or approximately 0.18 percent of the population identified during survey, in the temporary workspace corridor during the clearing phase of construction. The majority of the population occurs in the adjacent area outside of the Project footprint and would not be affected. Since the forested habitat in this temporary workspace corridor would be allowed to revegetate following construction, suitable habitat would recover, but with a recovery period of approximately 20 years or more. Indirect impacts to the microclimate, including light and moisture regimes, from the reduction in shade, or potential changes to surface water hydrology, could extend into the forest from the edge of the right-of-way, reducing plant health and fecundity of individuals near the forest's edge in the long term. Furthermore, an invasive plant species appears to be widespread in the area around the Appalachian oak fern population that could present a threat to the Appalachian oak fern through competition, particularly if the Appalachian oak fern population is disturbed and stressed from an altered edge habitat (see Appendix A). In addition, see section 6.1 for potential cumulative impacts on this species.

Avoidance and Minimization

As required by the MNF Land and Resource Management Plan (LRMP), Atlantic evaluated the feasibility of avoiding the population of Appalachian oak fern and determined that avoidance of direct impacts is feasible. The small portion of the Appalachian oak fern population present in the construction footprint will be avoided by necking down the adjacent construction right-of-way. In addition, potential indirect impacts to the population will be minimized and mitigated through the implementation of the conservation measures listed below.

Conservation Measures

General conservation measures specific to forest-dependent species will be implemented to reduce impacts to Appalachian oak fern potential habitat throughout the Project area (see Section 5.5.7.1). In addition, the following site-specific mitigation measures will be implemented to avoid and minimize potential impacts on the Appalachian oak fern population:

- The construction right-of-way will be necked down to avoid the Appalachian oak fern population, which will be visibly marked in order to avoid impacts by vehicles, equipment, and supplies.

- An EI will provide oversight during clearing, construction, and restoration activities to ensure conservation measures are followed and impacts are minimized to the extent feasible.

- On-site personnel will be trained regarding the mitigation measures to be implemented.

- Erosion control devices will be put in place to reduce runoff velocity and minimize sediment and erosion impacts to the adjacent population.

- The site will be restored to preconstruction contours to re-establish surface water hydrology.

- Atlantic will work with the MNF to include understory and overstory species associated with Appalachian oak fern, if commercially available, in the revegetation plan for the temporary workspace adjacent to the existing population.

- No herbicides will be used within 60 feet of the Appalachian oak fern population: only hand-pulling of non-native invasive plant species will be used as a control method within this area per the Non-Native Invasive Plant Species Management Plan.

Preliminary Determination of Effect

With avoidance and conservation measures, the Appalachian oak fern population found during survey would remain intact, although an edge effect to light and moisture regimes along with competition from invasive non-native plants could detrimentally affect the population. There are nine other populations of Appalachian oak fern known to occur in the MNF. Given the number of additional populations found in the MNF, and with the implementation of conservation measures that would avoid direct impacts to the Appalachian oak fern populations and minimize and mitigate potential indirect adverse effects, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of Appalachian oak fern in the MNF.

White Alumroot (*Heuchera alba*)

Species Description

White alumroot (*Heuchera alba*) is a perennial herb with small yellowish-white or cream-colored flowers on tall stems. Flowering occurs from July to September (NatureServe, 2015). The species is endemic to Virginia and West Virginia, specifically the Central Appalachian Ridge and Valley Region. In Virginia, the species has been documented in Augusta, Highland, and Rockingham Counties. In West Virginia, the species occurs in six counties: Grant, Hardy, Pendleton, Pocahontas, Preston, and Tucker (NatureServe, 2015). Globally, this species is considered imperiled (G2Q). The state status for this species is imperiled (S2) (WVDNR, 2015).

This plant grows on acidic rock outcroppings, calcareous cliffs, dry calcareous forests, dry oak-pine forests, heath-grass barrens, red oak forests, and northern hardwood forests (WVDNR, 2015). The species is usually found on east and northeast exposures at elevations ranging from 2,205 to 4,200 feet.

In West Virginia, white alumroot is usually associated with several other plants, including *Aquilegia* spp., *Asplenium ruta-muraria*, *A. trichomanes*, and *Pellaea atropurpurea* (NatureServe, 2015).

Presence in the Project Area

Based on discussion with the MNF, it was determined that suitable habitat for white alumroot could occur in the Project area. There are 25 known occurrences of white alumroot in the MNF, primarily located in the eastern region within the Potomac, Greenbrier, and Marlinton Ranger Districts. Surveys were conducted for this species along the route within the MNF during the 2016 field season to identify suitable habitat. Field surveys were conducted within potentially suitable habitat areas as identified through desktop analysis and field review. Visual reconnaissance and meandering methodologies were utilized to cover the survey areas. Field survey confirmed two occurrences of white alumroot: one stem was located on a sandstone rock outcrop outside of the Project area between [redacted]; the second occurrence was a population of approximately 75 individuals (stems) covering approximately 0.58 acre on a ridge in an oak-hickory forest between [redacted] (see Appendix F). The majority of the population, approximately 0.57 acre, was identified within the construction workspace, with approximately 0.01 acre located within the permanent rights-of-way.

Impact Evaluation

Impacts to white alumroot in this area would likely be the same as those for other species dependent on forest habitat, as discussed in Section 5.5.7.1: white alumroot can tolerate more open habitats in specific habitat types, such as heath barrens, which do not occur at the site. Specifically, direct impacts on white alumroot would include the loss of 0.44 acre of white alumroot individuals and associated forest habitat, or approximately 77 percent of the population identified during survey, during the clearing phase of construction. Following construction, approximately 98 percent of the previously occupied habitat could re-establish in the temporary workspace following construction, although it would likely take approximately 20 years or more before the forest habitat in these areas would be suitable for white alumroot. The remaining 2 percent of the currently populated forest habitat would be in the permanent right-of-way and would not be re-established due to right-of-way maintenance. In addition, indirect impacts to the microclimate, including changes in light and moisture regimes, from the reduction in shade, or potential changes to surface water hydrology, could extend into the forest from the edge of the right-of-way, reducing plant health and fecundity of individuals near the forest's edge in the long term. An invasive plant species has been identified in close proximity to the larger white alumroot population that could reduce the ability of the population to re-establish following construction, if the invasive species spread into the disturbed area (see Appendix A).

Avoidance and Minimization

As required by the MNF Land and Resource Management Plan (LRMP), Atlantic evaluated the feasibility of avoiding the population of white alumroot and determined that avoidance is not feasible. The proposed pipeline was sited along ridge lines to minimize steep slopes and side-sloping topography. Adjusting the alignment to avoid the population of white alumroot would require crossing steep slopes and side-sloping topography, which would require a larger construction footprint needed for spoil storage and to create a safe and level workspace during construction. Reducing the construction right-of-way (necking down) to minimize impacts on the population of white alumroot would not be feasible. As described in Section 2.1, Atlantic will require a 125-foot-wide construction right-of-way to safely accommodate the large construction equipment and to temporarily store topsoil and trench spoil. As such, Atlantic is not able to avoid or minimize impacts to the white alumroot population. However, mitigation measures to reduce impacts to white alumroot will be implemented (see Conservation Measures below).

Conservation Measures

General conservation measures specific to forest-dependent species will be implemented to reduce impacts to white alumroot potential habitat throughout the Project area (see Section 5.5.7.1). In addition, the following site-specific mitigation measures will be implemented to reduce impacts on the white alumroot population found in the Project area:

- During the dormant season and prior to tree clearing, Atlantic will relocate all white alumroot plants within the construction footprint to suitable habitat immediately adjacent to the existing population, to be determined in consultation with the MNF.
- The portions of the white alumroot population adjacent to the construction right-of-way will be visibly marked in order to avoid impacts by vehicles, equipment, and supplies.
- An EI will provide oversight during clearing, construction, and restoration activities to ensure conservation measures are followed and impacts are minimized to the extent feasible.
- On-site personnel will be trained regarding the mitigation measures to be implemented.
- Erosion control devices will be put in place to reduce runoff velocity and minimize sediment and erosion impacts to adjacent populations.
- The site will be restored to preconstruction contours to re-establish surface water hydrology.
- Atlantic will work with the MNF to include understory and overstory species associated with white alumroot, if commercially available, in the revegetation plan for the temporary workspaces surrounding the existing populations.
- No herbicides will be used within 60 feet of the white alumroot population: only hand-pulling of non-native invasive plant species will be used as a control method within this area per the Non-Native Invasive Plant Species Management Plan.

Preliminary Determination of Effect

White alumroot has a fairly widespread distribution, being found in numerous counties in both Virginia and West Virginia, including 24 populations in the MNF. In addition, a portion of the affected population would remain intact adjacent to the construction right-of-way and could persist following construction, depending on impacts from changes in light and moisture regimes. Approximately 98 percent of the previously occupied habitat could re-establish in the temporary workspaces following construction, although it would likely take approximately 20 years or more before the forest habitat in these areas would be suitable for white alumroot. Given the species' widespread distribution, the portions of the population that would remain intact, and the potential for habitat and individual plants to recover with the implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of white alumroot in the MNF.

Bristly Black Currant (*Ribes lacustre*)

Species Description

The bristly black currant (*Ribes lacustre*) is a deciduous shrub that can grow to 5 feet in height. This shrub is identified as having lobed leaves and very bristly twigs with somewhat flexible thorns. The flowers are small and greenish purple and occur from May to June. The purple berries ripen in July to August (Petrides, 1986). The range of this shrub extends throughout Canada, Alaska, northern California, Colorado, and east to the Appalachian Mountains (Carey, 1995). Globally, this species is ranked secure (G5). In West Virginia, the state status is imperiled (S2) (WVDNR, 2015).

In West Virginia, the bristly black currant is found in high Allegheny wetlands and mixed mesophytic forests (WVDNR, 2015), and is found on damp soil on rocky slopes and talus areas, moist to seepy rock outcrops and cliffs, and in cool woods and swamps (WVDNR, 2015; NatureServe, 2015). The bristly black currant is an understory species that occurs in riparian forests and shrublands. This species is found more often on northerly and easterly exposures (Carey, 1995).

Presence in the Project Area

Based on discussion with the MNF, it was determined that suitable habitat for bristly black currant could occur in the Project area. Habitat surveys subsequently were conducted for this species along the route within the MNF during the 2016 field season to identify suitable habitat. Field surveys were conducted within potentially suitable habitat areas as identified through desktop analysis. Visual reconnaissance and meandering methodologies were utilized to cover the survey areas. The field surveys found suitable early successional forest (crop tree) habitat and a potential bristly black currant occurrence at [redacted] (Appendix F); however, diagnostic characteristics (i.e., fruits) were not present at the time of the field surveys. A revisit to this occurrence was unable to verify the species since the plants did not fruit; therefore, presence is assumed. The potential bristly black currant was identified within the survey corridor but not within the Project footprint. The individual was located approximately [redacted] upslope from the temporary right-of-way.

Impact Evaluation

No direct or indirect impacts to the documented bristly black currant are anticipated since the potential individual found during field surveys is outside of the Project footprint and upslope from construction and maintenance activities. Indirect impacts to the microclimate, including changes in light and moisture regimes, from the reduction in shade, or potential changes to surface water hydrology, could extend into the forest from the edge of the right-of-way, reducing plant health and fecundity of the individual found outside of the workspace near the forest’s edge in the long term. Furthermore, an invasive plant species appears to be widespread in the area around the bristly black currant (see Appendix A) that could present a threat to the RFSS plant through competition, particularly if the bristly black currant is disturbed and stressed from an altered edge habitat. Since the plant would not be disturbed by construction activities, however, increased competition from the invasive species is less likely.

Avoidance and Minimization

Atlantic will avoid the bristly black currant plant found in the survey area since it is outside of the construction footprint. In addition, potential indirect impacts to the population will be minimized and mitigated through the implementation of the conservation measures listed below.

<u>Conservation Measures</u>

Conservation measures include those listed in Section 5.5.7.1. In addition, Atlantic will develop and implement a site-specific conservation plan in consultation with the MNF, including, but not limited to, the following conservation measures to avoid potential impacts to bristly black currant:

- The bristly black currant plant will be flagged in order to avoid impacts by vehicles, equipment, and supplies.
- An EI will provide oversight during clearing, construction, and restoration activities to ensure conservation measures are followed and impacts are minimized to the extent feasible.
- On-site personnel will be trained regarding the mitigation measures to be implemented.
- The site will be restored to preconstruction contours to re-establish surface water hydrology.
- Atlantic will work with the MNF to include understory and overstory species associated with bristly black currant, if commercially available, in the revegetation plan for the temporary workspace adjacent to the existing population.
- No herbicides will be used within 60 feet of the bristly black currant plant: only hand-pulling of non-native invasive plant species will be used as a control method within this area per the Non-Native Invasive Plant Species Management Plan.

<u>Preliminary Determination of Effect</u>

Although there are no other known populations of the species in the MNF, because the Project is not anticipated to directly or indirectly impact the one potential occurrence of the species, and with the implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the bristly black currant in the MNF.

5.6 DETAILED ANALYSIS OF IMPACTS BY SPECIES—GEORGE WASHINGTON NATIONAL FOREST

Impacts to species discussed in Section 5.6 have been confirmed through consultation with the USFS, field surveys, and/or other analysis to have documented habitat or individuals present within the GWNF Analysis Area. Resources utilized in the desktop analysis included:

- Virginia Department of Conservation and Recreation (VDCR) Natural Heritage Dataset provided in 2016 (VDCR NHD data);
- Flora of Virginia;
- USGS NHD streams;
- USGS Virginia Geologic Units shapefile;
- USGS topographic maps;
- ESRI aerial imagery;
- communications with GWNF staff, and
- other articles and resources as cited.

Surveys (not including follow-up and multi-part surveys) were conducted on GWNF lands for various species and/or habitats between 2015 and 2016, including

- cow knob salamander;
- fish and mussels;
- insects;
- myriapods and gastropods;
- plants;
- karst;
- wetlands and waterbodies (see Section 5.3);
- timber rattlesnake;
- bats;
- Bald Eagle, Loggerhead Shrike; and
- southern rock vole, southern water shrew, and American water shrew, and Allegheny woodrat.

As of the date of this document, approximately 1.3 miles in the GWNF remains to be surveyed in 2017 for areas that were not accessible in 2015 or 2016. Results will be provided to the GWNF as they become available, and the determination of impacts for each RFSS and their habitats will be updated in the BE accordingly.

An overview of species and habitats found during surveys are presented in Figure 5.6-1; more detailed survey maps of survey findings are available in Appendix A. The following sections provide an analysis of species found in the survey area and/or with potential suitable habitat in the survey area. Species are analyzed according to major taxonomic groupings. Species are analyzed according to major taxonomic groupings.

5.6.1 Cave Obligate Species

Fourteen species on the RFSS list for the GWNF require cave habitat: of these, six have the potential to occur in the vicinity of the Project based on range and habitat, including one amphipod, one isopod, and four insects (see Appendix E and Table 5.6.1-1). No caves were found in the Project area on GWNF property during the 2016 karst field survey. The closest karst feature to the Project area on GWNF property was a cave found during field surveys located approximately [redacted] from the Project centerline at [redacted] This cave occurs in an area referred to as Poplar Hollow Karst, which is an area of concern to the USFS (FERC, 2016). Another segment of the pipeline near Brushy Creek between [redacted] is also of concern to the USFS as having karst terrain. Karst features were found in this area; however, they occurred in the Project area outside of GWNF property.

Although no karst features were found in the Project area on GWNF property, undetected subterranean karst features could be present, and connectivity of these subterranean systems can be extensive (see *Karst Plan*, Appendix C). However, no features have been found in the Project area that could provide direct and unfiltered surface drainage into the subterranean environment. Therefore, there is no evidence indicating that suitable cave habitat occurs in the Project area, or that surface water from the Project area will adversely affect cave habitats that could be connected through subterranean systems.

Due to the known presence of karst terrain in the Project area, particularly between [redacted] if any karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, such as open throat sinkholes, cave entrances, sinking streams, or losing stream segments, should develop during Project activities, mitigation measures will be applied to avoid and minimize any impact of pipeline construction and/or operation and maintenance activity that could present a risk to environmental receptors, particularly cave-obligate species (see *Karst Plan*, Appendix C).

TABLE 5.6.1-1

Cave-Obligate Regional Forester Sensitive Species with Potential Habitat in the George Washington National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
INVERTEBRATES – AMPHIPODS and ISOPODS		
Stygobromus mundus	Bath County cave amphipod	Subterranean obligate – caves: Bath County.
Miktoniscus racovitzai	Racovitza's terrestrial cave isopod	Subterranean obligate – caves; Smyth, Washington, and Wythe Counties, VA
INVERTEBRATES – INSECTS		
Pseudotremia alecto	Mays mountain cave millipede	In caves and Leaf litter, deciduous forests: Alleghany and Bath Counties, VA
Nampabius turbator	A cave centipede	Subterranean obligate – caves: Alleghany County in VA and the Upper James Watershed.
Pygmarrhopalites carolynae	A cave springtail	Subterranean obligate – caves: Bath and Highland Counties, VA
Pygmarrhopalites sacer	A cave springtail	Subterranean obligate – caves: Bath County, VA. NHI documented occurrence within 1 mile of the Project area.

Sources: See Appendix E

[redacted]

5.6.1.1 Potential Impacts to RFSS Cave Obligate Species

Species Description

Five of the cave-obligate RFSS with the potential to occur in the Project area within the GWNF are subterranean obligate species, while one, the Mays mountain cave millipede, can also occur in leaf litter in deciduous forests. All six species have a conservation status of at least vulnerable at the state level: one is vulnerable (S3), two are imperiled (S2), two are critically imperiled (S1), and one is imperiled to critically imperiled (S2S3) (see Appendix E). The conservation statuses at the global level are similar, with only two species listed as vulnerable to apparently secure (G3G4).

Potential Presence in Project Area

Only one of the cave-obligate RFSS, a cave springtail (*Pygmarrhopalites sacer*) has been documented within 2 miles of the Project area in the GWNF based on VDCR NHD data (see Table 5.6.1-1). No surveys were recommended for cave-obligate RFSS based on consultation with the GWNF (see Appendix I). The cave found adjacent to the Project area on GWNF property at [redacted] could indicate the presence of suitable cave habitat for these species if subterranean habitat extends into the Project area, although the cave is approximately [redacted] away.

Impact Evaluation

If karst features that allow the unfiltered and unimpeded flow of surface drainage into the subsurface environment should form during construction, construction activities have the potential to indirectly affect cave obligate RFSS in the GWNF. Vegetation removal could weaken the cohesive strength of the soils overlying a cave or conduit, which could exacerbate sinkhole development (see *Karst Plan*, Appendix C). Blasting has the potential to create openings to subsurface karst features, and an alteration in overland flow resulting from ground disturbance during construction could also exacerbate sinkhole development. Surface water could carry sediment and contaminants, such as leaked oil or herbicides, through such "open" karst features into the subterranean system, which could eventually lead to suitable cave habitat. Increased sedimentation could alter cave habitat or make it unsuitable, and contaminants could have a detrimental effect on cave-obligate RFSS, particularly aquatic species. The potential for adverse impacts is low, however, since the closest potential cave habitat is approximately [redacted] from where the pipeline crosses GWNF property.

Conservation Measures

Potential impacts to cave-obligate RFSS and potential habitat will be minimized through the implementation of the conservation measures in the *Karst Plan*, as well as the Upland Erosion Control Plan, Blasting Plan, Restoration and Rehabilitation Plan, SPCC Plan, and Contaminated Media Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures that will help avoid or minimize potential impacts to cave-obligate RFSS and potential cave habitat include the following:

- The conservation measures described in the *Karst Plan* (see Appendix C) will be implemented for any karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, including (but not limited to): open throat sinkholes, caves which receive surface drainage, sinking streams, and losing stream segments in order to avoid impact on the karst environment, including:
    - No insecticides, herbicides, or refueling will be allowed within 300 feet of those features.

- Erosion and sediment controls will be used to minimize impacts on downslope karst features within 300 feet of the workspace.

- No activities will be allowed within 25 feet of these karst features except where that feature falls within 25 feet of the trenchline; the buffer will be fenced in the field for construction activities, including vegetation pre-clearing and clearing activities.

- Blasting will be conducted in a manner that will not compromise the structural integrity or hydrology of the feature.

- HDD will not be used in karst terrain.

- The right-of-way will be restored in accordance with the conservation measures in the Restoration and Rehabilitation Plan, including

  - methods for erosion control;

  - erosion control monitoring;

  - methods for soil restoration (e.g., removal of excavated rock, distribution of rock on the work area, grading to preconstruction contours to the extent practicable, and testing and treatment for soil compaction where requested by the GWNF);

  - topsoil segregation, replacement, and conditioning to help re-establish native plant communities in areas determined in consultation with the GWNF and according to the *COM Plan*;

  - special procedures for steep slope areas (e.g., the use of additional structural materials and targeted mitigation of seeps, springs, or other subsurface water encountered);

  - additional restoration measures for the GWNF (e.g., no clearcutting on high risk soils, use of a seed mix with greater than 50 percent annuals, with reseeding to perennials in 1.5 years, and successful revegetation within 5 years);

  - restoration monitoring and maintenance (e.g., assessment of the effectiveness of erosion control measures, assessment—through quantitative analysis of ground cover in monitoring plots—revegetation success for years 3 and 5, monitoring of vegetation for the life span of the pipeline operations);

  - training for environmental inspectors regarding the USFS Restoration and Rehabilitation Plan, including techniques specific to the USFS, seeding techniques on steep slope sites, emergency contacts and numbers, and erosion minimization and control measures.

  - implementation of a restoration goal of reseeded/replanted species is equal to or greater than 80 percent ground cover, with implementation of remedial actions where goals are not met; and

- o reporting restoration status and remedial actions to the USFS and FERC through summary reports.

- Implement the Project's SPCC Plan (Atlantic and DTI, 2016b), SWPPP (filing anticipated March 2017), and/or West Virginia Stormwater Management Program requirements, as described in the *COM Plan* (Appendix C), to establish preventative and mitigation measures to prevent fuel and other hazardous materials from entering subsurface environments through unfiltered and unimpeded flow of surface drainage during pipeline construction and operation.

Preliminary Determination of Effect

Based on field survey, there is a low likelihood that suitable cave habitat for cave-obligate RFSS occurs in the Project area or would be affected through subterranean systems underlying the Project area. Although there is a possibility for karst features to form during construction and operation, particularly over known karst terrain between [redacted] the implementation of the conservation measures described above will avoid or minimize the risk of adverse effects, and Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability of* RFSS cave-obligate species in the GWNF.

5.6.2 Mammals

The GWNF RFSS list contains three mammals: southern rock vole (*Microtus chrotorrhinus carolinensis*), southern water shrew (*Sorex palustris punctulatus*), and eastern small-footed bat (*Myotis leibii*) (see Appendix E). An assessment of known range and habitat requirements determined that all three species could occur in the Project area (see Table 5.6.2-1). There were no documented occurrences of these species in VDCR NHD data within 2 miles of the proposed centerline (2016 data).

Potential habitat for southern rock voles and southern water shrew was identified within a 300-foot-wide Analysis Area along the proposed centerline and a 25-foot-wide Analysis Area on either side of potential access roads through desktop analysis. Field surveys of potential habitat were performed to verify habitat suitability in May and August, 2016. Four streams have been identified as potentially suitable habitat for water shrew, while no southern rock vole habitat has been found. Field surveys did not detect either species.

Field surveys for bats, including the eastern small-footed bat, were conducted in 2015 and 2016. Presence/absence surveys were conducted using mist net traps, and potential hibernacula sites (caves) were assessed through a combination of desktop analysis and roadside and pedestrian karst surveys within a 300-foot-wide Analysis Area along the proposed centerline. No eastern small-footed bats were caught and no suitable habitat for hibernacula was found. Potentially suitable habitat is present in the Project area, and eastern small-footed bats can be difficult to survey due to low amplitude acoustic calls and their ability to avoid mist nets; therefore, presence of eastern small-footed bat is assumed.

The following sections provide an analysis of potential impacts, conservation measures, and a preliminary determination of effect for mammals on the RFSS list that could occur in the Project area.

TABLE 5.6.2-1

Regional Forester Sensitive Species Mammals with Potential Habitat in the George Washington National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
Microtus chrotorrhinus carolinensis	Southern rock vole	Cool, moist, mossy talus under oaks/northern hardwoods in Bath and Highland Counties in VA above 2,500 feet, usually in or near riparian areas or undersurface water, in relatively old forests and typically dominated by yellow birch. Other species may include sugar maple, basswood, American beech, and red spruce.
Myotis leibii	Eastern small-footed bat	Hibernates in caves and mines during winter, roosts in crevices of large rock outcrops, cliffs, and under large rocks. Roosting habitat may include trees and snags with peeling bark. Forages in forested and open habitat types in ridges, valleys, and around water in Augusta, Bath, and Highland Counties in VA.
Sorex palustris punctulatus	Southern water shrew	First and second order high elevation streams (above 2,500-3,000 feet) in cool, moist, forested areas. Stream banks often undercut with rock, root, or soil overhangs and vegetated with tree species such as yellow birch, sugar maple, American beech, black birch, eastern hemlock, and red spruce. Riparian areas are often moss covered rocks or other cover: in Bath and Highland Counties in VA.

Sources: See Appendix E

5.6.2.1 Southern rock vole (*Microtus chrotorrhinus carolinensis*)

Species Description

The southern rock vole has a global conservation ranking of G4T3 (*Microtus chrotorrhinus* apparently secure; *M. chrotorrhinus carolinensis* vulnerable), and a state conservation ranking of S1 in Virginia (critically imperiled) (VDCR, 2016). Species distribution includes eastern Canada; northeastern Minnesota; higher elevations in New England, New York, and northeastern Pennsylvania; and the southern Appalachian Mountains in Virginia, West Virginia, North Carolina, and Tennessee (Cassola, 2016). Its preferred habitat includes deep talus in cool, damp, coniferous and mixed forests at higher elevations, particularly habitat containing fern- and moss-covered talus near flowing water in coniferous forests (Cassola, 2016). Rock voles in Virginia were found to occupy cool, moist talus slopes and rocky areas above 976 meters (3,200 feet) within forested streamside riparian areas dominated by rocks greater than 0.2 meter (7.8 inches) in diameter and with abundant woody debris, herbaceous vegetation, and moss (Orrock et al., 1999). Southern rock voles have been associated with moderate to steep slopes within areas containing a variety of herbaceous cover, recent clear-cuts, old growth forests, grassy balds near forest edges, and rocky road-fills (Cassola, 2016). The species develops small isolated colonies, with home ranges likely less than 1 acre (Cassola, 2016). A consistent feature of four areas where suitable habitat was analyzed was the presence of yellow birch (*Betula alleghaniensis*) (Orrock and Pagels, 2003). Southern rock voles often utilize a network of subsurface runs among rocks and boulders (Kirkland and Jannett, 1982). This species can be found anytime throughout the day or night and does not hibernate.

Southern rock voles are herbivores, and principally graze on forbs (Kirkland and Jannet, 1982). Suitable food sources include bunchberry (*Cornus canadensis*), Clinton's lily (*Clintonia borealis*), Canada mayflower (*Maianthemum canadense*), false miterwort (*Tiarella cordifolia*), wood sorrel (*Oxalis montana*), blueberry (*Vaccinium* spp.), raspberry (*Rubus* spp.) (Banfield, 1974; Christian and Daniels, 1985; Hamilton, 1943; Timm et al., 1977).

Nesting habitat likely requires logs or similar protected sites under which shallow burrows and runways are excavated, and moss or grass for lining nests (Cassola, 2016). The breeding season occurs from March to mid October. A female can produce one to three litters that contain one to seven young each breeding season, and spring progeny are reproductive in their first summer. Potential predators include bobcats, rattlesnakes, weasels, foxes, and short-tailed shrews. Food sources include foliage, stems, fruits, and fungi. The southern rock vole is active year-round and does not hibernate. It has been reported as a primarily diurnal species, and is most active in the morning. Threats to the southern rock vole include loss of intact forest habitat, and while colonies have been found to tolerate and even thrive in recent clearcuts, the species is generally absent from young forests (Kirkland, 1977).

Potential Presence in Project Area

Throughout extensive sampling in the mountains of western Virginia, the southern rock vole has been found only at four locations (Orrock and Pagels, 2003). There are no known southern rock vole populations in the Project area based on analysis of the VDGIF and Virginia Fish and Wildlife Information Service (VaFWIS) web portal (searched June, 2016) (see Atlantic, 2016n). VDGIF's online database does, however, document potential southern rock vole habitat in Highland County in the vicinity of the Project. Areas of highest probability for southern rock vole habitat included the portion of the Project area between the West Virginia State line and Mill Gap Road ([redacted]) where high elevation northern forests co-occur with deep ravines and perennial streams. A field survey of potential habitat in May and June in 2016 in this area did not find any suitable rock vole habitat based on the absence of surface rocks within the cool, mesic areas found at the bottom of the ravines.

Impact Evaluation

Based on desktop and field surveys to date, there will be no impacts to southern rock vole from the Project since no southern rock vole populations or suitable habitat have been found in the Project area.

Conservation Measures

No conservation measures are proposed for the southern rock vole since no impacts are anticipated.

Preliminary Determination of Effect

Since no southern rock vole populations or suitable habitat have been found in the Project area, Atlantic determines that there would be *no impact on* southern rock voles in the GWNF.

5.6.2.2 Eastern small-footed bat (*Myotis leibii*)

Species Description

The eastern small-footed bat has a global conservation ranking of G4 (apparently secure) and a state conservation ranking of S2 in Virginia (imperiled) (VDCR, 2016). The range of the eastern small-footed bat extends from southeastern Canada throughout much of the eastern United States, with the bulk of known occurrences for the species within New York, Pennsylvania, West Virginia, and western Virginia (Amelon and Burhans, 2006). The species is not protected at the federal level, and a recent review by the FWS found that the species did not warrant listing as an endangered or threatened species (FWS, 2013a).

During the winter months, the species hibernates in caves or mines. Eastern small-footed bats appear to prefer cooler and drier microclimates within hibernacula than other hibernating bats and are often the last to enter winter sites and the first species to leave in the spring (Amelon and Burhans, 2006). Hibernacula include caves, mines, box culverts, and deep crevices in rocky habitats.

During the summer months, eastern small-footed bats roost in rocky habitats (e.g., rock outcrops, talus slopes, ledges, etc.) in eastern deciduous and coniferous forests. Eastern small-footed bats have also been found roosting in a variety of man-made structures, including buildings and expansion joints of bridges (Amelon and Burhans, 2006; FWS, 2013a). The species forages in forested and open habitats in ridges, valleys, and around water. Radio-tracking studies of the species are sparse but available studies suggest the species occupy small home ranges and typically do not travel large distances from winter to summer roosts (FWS, 2013a). Johnson et al. (2011) tracked small-footed bats and found a total of 57 roosts; roost locations were found 415 ± 49.0 meters from capture sites for males and 368 ± 24.0 meters for females.

The major threats to the species include loss of habitat and disturbance of hibernating bats during the winter (FWS, 2013a). Loss of winter habitat could include the destruction of suitable hibernacula, which could include outright destruction of cave or mine sites (for example, through mining activities) as well as modifications to cave or mine interiors or entrances that affect airflow or microclimates and make a hibernaculum unsuitable to bats. Loss of summer habitat could include the modification or destruction of summer roost sites or foraging habitat. Disturbance of bats during their hibernation period is a known concern for many species, and the eastern small-footed bat may be particularly at risk for disturbance due to their tendency to roost near entrances (FWS, 2013a). The fungal disease known as White-nose Syndrome has decimated populations of multiple eastern bat species, but it appears that eastern small-footed bats are less susceptible to the disease than other bats and at this time, eastern small-footed bats have not shown a significant decline from the disease (FWS, 2013a).

Potential Presence in Project Area

Field surveys for eastern small-footed bat consisted of potential hibernacula surveys and presence/absence acoustic surveys within suitable habitat within the 2,000-foot-wide permitted survey area in the GWNF between May and September in 2016 (see Atlantic [2016h and 2016p]). In 2016, presence/absence surveys were conducted using acoustic survey at 13 sites along the proposed right-of-way, and mist net surveys were conducted at 1 site. Potential hibernacula sites (caves) were assessed through a combination of desktop analysis and pedestrian karst surveys within a 300-foot-wide Analysis Area along the proposed centerline as well as roadside karst surveys. No eastern small-footed bats were detected during acoustic and habitat surveys, and no suitable hibernacula were found. In addition, the species is thought to have a limited range and to stay close to their roost sites (Johnson et al., 2011; FWS, 2013a). Given that no roosting habitat was found within 300 feet of the Project centerline, the species is not likely to be present in the Project area. However, because suitable forested foraging habitat is present in the Project area, and since eastern small-footed bats can be difficult to detect acoustically, presence of eastern small-footed bat is assumed.

Impact Evaluation

Since no eastern small-footed bats were found during presence/absence surveys, and no suitable hibernacula were found within 300 feet of the Project centerline, direct impacts to the species from the Project are not likely to occur. However, given the abundance of forest foraging habitat, the potential exists for eastern small-footed bats to utilize the Project area for foraging during construction and for indirect impacts on the species to occur.

Indirect impacts to eastern small-footed bat from general construction noise, including blasting, could displace bats, increase stress, and disrupt normal activities. However, potential blasting and other construction noise would be temporary in the scope of construction and the life cycle of the eastern small-footed bat, and no adverse long-term effects are expected. Noise disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance will be brief and occur infrequently (approximately every 3 years). Although relatively little research has been done, the available literature suggests that bats are generally not disturbed by low-level vibrations due to blasting near hibernacula. A study of an Indiana bat hibernaculum in New York suggests vibration levels measured at the entrance to hibernacula at 0.2 inch/second did not disturb Indiana bats (Besha, 1984). Furthermore, bats are often protected within the cave environment from ground-level disturbances. Underground measurements at bat roost locations in Hellhole Cave, West Virginia suggested that vibrations where bats roosted were 1.33 to 2.76 times less than surface measurements (WVDEP, 2006). Blasting associated with ACP construction will be significantly less than blasting associated with the quarrying or construction operations described in the literature. No negative long-term population effects are expected due to blasting from construction of the ACP. Blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or inferred subsurface karst structures.

Construction of the pipeline and new permanent access roads could also result in the removal of potential forested foraging habitat. While a portion of this forest habitat would be allowed to redevelop following construction, the 53.5-foot-wide permanent right-of-way and new permanent access roads would result in the long-term loss of forest habitat. This long-term reduction in potential forested foraging habitat would be offset, however, since the eastern small-footed bat could still utilize the permanent right-of-way and road corridors as foraging habitat. Additionally, the creation and maintenance of a permanent right-of-way may create additional roosting habitat for the species, by creating clearings that provide solar exposure near forest edges. One study of eastern small-footed bat roosting locations in West Virginia found a high number of roosts in rock fields within transmission line clearings (Johnson et al., 2011).

<u>Conservation Measures</u>

Potential impacts to eastern small-footed bat and potential habitat will be minimized and mitigated through the implementation of the conservation measures in the Upland Erosion Control Plan, *Karst Plan*, Timber Removal Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Relevant conservation measures include the following:

- Atlantic will avoid clearing forested habitat occupied by Indiana bats (defined as a 5-mile radius from a known Indiana bat hibernacula) during the active season from April 1 to November 15 to avoid impacts on roosting or foraging bats, which will also avoid disturbance of foraging and roosting eastern small-footed bats in these areas. Outside of forested habitats occupied by Indiana bats, tree clearing will be avoided between April 15 and September 15, which could also help protect foraging and roosting eastern small-footed bats, although during a shortened time frame.

- Burning activities will be prohibited within 500 feet of hibernacula occupied by federally listed species, which could also benefit eastern small-footed bat.

- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to eastern small-footed bat by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.

- Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- The following conservation measures specific to the GWNF will be implemented to protect eastern small-footed bats, when applicable:

  - prohibition of explosives within 200 feet of hibernacula, maternity colonies, or bachelor colonies unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat: explosives outside of this area shall not be used when such use has potential to damage the cave or disturb the bat (GWNF LRMP TE20);

  - permitting explosives within the primary range only if it can be demonstrated that this activity will not have an adverse effect on bat populations or habitat (GWNF LRMP TE39); and

  - prohibition of explosives within 200 feet of hibernacula, within key areas, or within 2.5 miles of active maternity sites, unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat: explosives outside of these areas shall not be used when such use has potential to damage the cave or disturb the bat (GWNF LRMP TE50).

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Conservation measures in the Upland Erosion Control Plan will be implemented to ensure that excavated soil and sediment remains within the construction area and does not impact potential rocky habitat adjacent to the construction area, including

  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - stabilization of access road surfaces by grading and installing stone where needed;

  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water away from the right-of-way; and

  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the *Karst Plan* will be implemented to avoid or minimize impacts to potential bat (cave) hibernacula if a karst feature that allows the unfiltered and unimpeded flow of surface drainage into the subsurface environment, including (but not limited to) open throat sinkholes, caves which receive surface drainage, sinking streams, and losing stream segments in order to avoid impact on the karst environment, including:
    - prohibition of insecticides, herbicides, or refueling within 300 feet of those features;
    - use of erosion and sediment controls to minimize impacts on downslope karst features within 300 feet of the workspace;
    - no activities will be allowed within 25 feet of these karst features except where that feature falls within 25 feet of the trenchline; the buffer will be fenced in the field for construction activities, including vegetation pre-clearing and clearing activities.
    - Blasting will be conducted in a manner that will not compromise the structural integrity or hydrology of the feature.
    - HDD will not be used in karst terrain.
- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable habitat, including
    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7)
    - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
    - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
    - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
    - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

- o monitoring to assess all restored areas on USFS lands in years 1 and 5;
- o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and
- o reporting of restoration status following field inspections.

Preliminary Determination of Effect

Potential eastern small-footed bat foraging forest habitat would be affected by the Project. However, since no eastern small-footed bat hibernacula or individuals were found during field surveys, the likelihood of the presence of substantial numbers of eastern small-footed bat in the Project area is low. Potential impacts would likely be limited to noise disturbance and conversion of forest foraging habitat to meadow and edge foraging habitat. In addition, abundant forest foraging habitat would persist adjacent to the Project area and throughout the GWNF, and the right-of-way could facilitate the development of additional roosting habitat. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of eastern small-footed bats in the GWNF.

5.6.2.3 Southern water shrew (*Sorex palustris punctulatus*)

Species Description

The southern water shrew has a global conservation ranking of G5T3 (*Sorex palustris* secure; *S. palustris punctulatus*, vulnerable), and a state conservation ranking of S1S2 (critically imperiled to imperiled) (VDCR, 2016). Its range extends north from the boreal and montane regions of Canada from Labrador and Nova Scotia to southeastern Alaska, and south in the Appalachian Mountains to Tennessee and North Carolina, in the Rocky Mountains to Utah and New Mexico, and in the Sierra Nevada to California (Linzey, 1998).

The southern water shrew is a large semi-aquatic shrew that attains a length of approximately 6 inches from snout to tail tip. The hind feet are slightly webbed and fringed. The species is mostly nocturnal and does not hibernate (Linzey, 1998). It primarily feeds on aquatic organisms, including macroinvertebrates, small fish, amphibians, and amphibian eggs that it captures while swimming. Reproduction likely occurs from late winter through late summer (Conaway, 1952). Southern water shrews produce two to three litters of up to six young per year.

The southern water shrew is most abundant along rocky, rapidly running, cold mountain streams at 2,500 to 6,000 feet in elevation with a low to high gradient, an abundance of aquatic organisms, and thick overhanging riparian growth (Conaway, 1952; Linzey, 1998; NatureServe, 2015). These streams are typically found within mixed coniferous-deciduous forests with a mostly closed canopy (Butchkoski, 2014). Rhododendron, mountain laurel, and yellow birch are noted as vegetation typically associated with southern water shrew habitat (Linzey, 1998; NatureServe, 2015). The species can also be found alongside lakes, ponds, marshes, bogs, fens, and other lentic habitats (NatureServe, 2015). The southern water shrew makes its nest sites near water in underground burrows, under hollow logs, beaver lodges, and other areas that provide adequate shelter (NatureServe, 2015). Home ranges are described as linear, extending along the banks of streams: the range for a related species was found to extend for approximately 65 to 305 feet along a stream (NatureServe, 2015). However, individuals have been found more than 300 feet from streams in northern hardwood stands (DeGraaf and Rudis, 1986).

Predators include fish, minks, weasels, snakes, and hawks and owls (NatureServe, 2015). Pollution is the major threat to the southern water shrew. Logging, agriculture, mining, road-building, acid rain, and insecticide use have degraded the high-quality streams the southern water shrew inhabits (NatureServe, 2015).

Potential Presence in Analysis Area

Linzey (1998) notes five documented occurrences in Virginia. There are no known southern water shrew populations within 2 miles of the Project area based on analysis of the VDGIF and VaFWIS web portal (searched June 2016) (see Atlantic, 2016n). VDGIF's online database does, however, document potential southern water shrew habitat in Highland County in the vicinity of the ACP pipeline. Areas of highest probability for water shrew habitat include the portion of the pipeline corridor between the West Virginia State line and Mill Gap Road ([redacted]) where high elevation northern forests co-occur with deep ravines and perennial streams (see Appendix A). A field survey conducted in this area in May and June of 2016 found that four UNTs to Warwick Run were first-order perennial streams channels with suitable southern water shrew habitat, including relatively steep stream flow gradients, northern hardwood forest, and suitable bank vegetative coverage. All four areas with suitable habitat occurred at waterbody crossings in the Project area between [redacted] (Atlantic, 2016n).

Impact Evaluation

Since no southern water shrew populations are known to occur in the Project area, direct impacts to southern water shrew are not anticipated. However, presence/absence surveys were not completed in areas with suitable habitat, and if these species are present at pipeline waterbody crossings during construction, impacts would occur. In-stream construction activities could displace southern water shrews, increase stress, and disrupt normal activities or cause physical injury to or mortality of individuals. Sound pressure waves from blasting could cause injury or mortality to individuals. Disturbance could also occur as a result of vegetation maintenance of the permanent right-of-way, which would occur approximately every 3 years. Existing USFS Roads (access roads 06-001-B001.AR3 and 06-001-B001.AR4) occur near the streams with suitable habitat for southern water shrew (see Appendix A). However, since these roads are existing and no road expansion is anticipated, no new impacts to southern water shrew aquatic habitat would occur due to use of these roads.

Construction activities at the pipeline waterbody crossings could also alter riparian habitat and make the area unsuitable through vegetation removal, streambank alteration, loss of a duff layer, and loss of nest sites and burrows. Impacts to water quality could also occur as a result of increased turbidity during pipeline installation across the stream. Stormwater runoff from upslope construction areas could temporarily affect stream water quality through increased sedimentation, turbidity, and flow; decreased dissolved oxygen concentrations; releases of existing chemical and nutrient pollutants from disturbed sediments; and introduction of contaminants, such as chemicals, fuels, and lubricating oils, from incidental spills (also see Section 5.4.2). Impacts could involve both southern water shrew and invertebrate prey species. The use of pesticides could also result in bioaccumulation in prey species and indirectly affect southern water shrew. Water quality impacts could have adverse effects on southern water shrew aquatic prey, including aquatic invertebrates (Natural Resources Conservation Service, 2001).

The long-term loss of forest cover in the permanent 53.5-foot-wide right-of-way would have a detrimental effect through habitat loss, forest fragmentation, increased pathways for predators, and creation of an edge effect through reduced moisture levels adjacent to the right-of-way through a reduction in shade. Approximately 30feet of the pipeline right-of-way on either side of a waterbody crossing will be permanently converted from forested riparian habitat to herbaceous and scrub/shrub riparian habitat since trees will not be allowed to develop within 15 feet of the pipeline, and vegetation will be limited to herbaceous plants and shrubs in this area. In addition, soils disturbed by construction activities can also facilitate the spread of non-native invasive plant species such as Japanese knotweed (*Polygonum cuspidatum*), which can degrade riparian and aquatic habitat by displacing native plant species, destabilizing streambanks, and creating dense stands of vegetation that can adversely affect water quality and riparian and aquatic habitat (Potomac Highlands Cooperative Weed and Pest Management Area, 2011)..

Conservation Measures

Potential impacts to southern water shrew riparian and aquatic habitat will be minimized and mitigated through the implementation of the conservation measures in the Timber Removal Plan, Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, SPCC Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, Visual Resources Plan, and Water Quality Monitoring Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures specific to southern water shrew will also be applied. Relevant conservation measures include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to southern water shrew by re-establishing or retaining suitable forested riparian habitat:
    - The outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF, including species suitable for riparian areas.
    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Atlantic will coordinate with the MNF to include potential food sources and other beneficial riparian shrubs for southern water shrew in the revegetation plan for riparian areas if commercially available, such as silky willow, rhododendron, mountain laurel, and yellow birch.
- Felled woody debris will be retained along the edge of the right-of-way for den sites and shelter.
- A dry stream crossing method, including either the flume or dam-and-pump method, will be used for pipeline construction across waterbodies in the GWNF, which will help reduce the introduction of sediment and turbidity into potential southern water shrew habitat during construction.
- No pesticides will be used on GWNF property in order to avoid potential harm to southern water shrew and its invertebrate prey species.
- Blasting will be used for rock removal as needed at the two pipeline waterbody crossing of the UNTs to Warwick Run where there is potential habitat for southern water shrew, since it is the least environmentally impactful method for rock removal.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to southern water shrew riparian and aquatic habitat, including
  - employment of least-intrusive tree removal methods to reduce damage to adjacent forested riparian habitat;
  - avoiding altering existing surface drainage patterns by the placement of timber or brush piles at the edge of the construction right-of-way;
  - logs and slash will not be yarded across perennial streams unless fully suspended;
  - logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment; and
  - any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.
- Conservation measures will be implemented to reduce impacts on aquatic habitat both during and after construction per the Project's Stream and Wetland Crossing Procedures, including
  - compliance with GWNF LRMP 11-048 (e.g., graveling of permanent and temporary roads on either side of stream crossings within the riparian corridor, stabilizing each road segment built prior to starting another segment);
  - completing construction across streams as quickly as possible.
  - limiting in-water work to seasonal restrictions where applicable, as specified in Section 2.2.2.2 and Appendix B;
  - locating spoil from waterbody crossings at least 10 feet from the water's edge;
  - locating all extra work areas (such as staging areas) at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land;
  - installation of sediment barriers along the entire construction right-of-way within the waterbody immediately after initial disturbance of the waterbody or in adjacent upland, and continued maintenance throughout construction to prevent the flow of sediments into the waterbody;
  - maintenance of a clearly marked 100-foot-wide vegetative buffer between a waterbody and the pipeline right-of-way where it runs parallel to the waterbody;
  - maintenance of adequate waterbody flow rates to prevent the interruption of existing downstream uses;
  - stabilization of waterbody banks and installation of temporary sediment barriers within 24 hours of completing instream construction activities.

  - restoration of steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces);
  - restoration of all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI;
  - restricting the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric; and
  - revegetation of disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

- Conservation measures will be implemented to reduce stormwater runoff from upland construction areas to aquatic habitat both during and after construction per the Upland Erosion Control Plan, including
  - prohibiting the use of herbicides in or within 100 feet of a stream or wetland, except as allowed by the USFS;
  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;
  - stabilization of access road surfaces by grading and installing stone where needed;
  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;
  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to stabilize streambanks and reduce upland stormwater runoff to aquatic habitat both during and after construction, including
  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

  - no use of lime or fertilizer within 100 feet of wetlands or waterbodies;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - reporting of restoration status following field inspections

- Inspection and monitoring will be carried out to ensure conservation measures at waterbody crossings and adjacent upland areas are properly employed and maintained to reduce stormwater runoff to riparian and aquatic habitat both during and after construction per the Project's Water Quality Monitoring Plan, including

  - monitoring turbidity at all stream crossings that are state-designated as coldwater fisheries four times per day during active construction both 50 feet upstream and downstream from the construction area, and one time per day for four days following the completion of restoration activities;

  - implementation of remediation measures should the chronic turbidity reading exceed standards.

- Atlantic will adhere to the Spill Prevention, Control, and Countermeasure Plan to prevent hazardous materials from entering aquatic habitat, including

  - restricting equipment refueling and lubricating and storage of hazardous materials to upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

- Conservation measures in the Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants into riparian areas that could degrade southern water shrew habitat (also see Section 5.5.7), including

    - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

Since there are no known populations in the Project area and only four areas were found to contain potential habitat for southern water shrew in the Analysis Area, the likelihood of substantial numbers of southern water shrew being present in the Project area and affected by the Project is low. In addition, most impacts will be temporary with the implementation of the conservation measures listed above. Since potential forested aquatic and riparian habitat will persist upstream and downstream of the Project area, and with the implementation of the conservation measures, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the southern water shrew in the GWNF.

5.6.3 Birds

The GWNF RFSS list contains four birds (see Appendix E). An assessment of species habitat requirements found that all four of these species have suitable habitat in the Analysis Area (see Table 5.6.3-1). There were no documented occurrences of RFFS birds in VDCR NHD data within 2 miles of the centerline.

Aerial helicopter surveys were conducted for Bald Eagles in a 2-mile-wide corridor along the proposed centerline in the GWNF in March of 2016 (see the survey report in Atlantic, 2016c). No Bald Eagles were observed, although one unoccupied, unknown stick nest was found. No surveys were carried out for Peregrine Falcon; therefore, presence is assumed.

Potentially suitable habitats for Migrant Loggerhead Shrike (*Lanius ludovicianus migrans*) within a 300-foot-wide Analysis Area along the proposed pipeline corridor, identified through desktop analysis, were surveyed in June and July, 2016 (see the survey report in Atlantic, 2016o). Surveys consisted of three rounds of visual, auditory, and acoustic playback surveys at nine survey points with suitable habitat. Presence/absence surveys found no evidence of Migrant Loggerhead Shrike.

The following sections provide an analysis of potential impacts, conservation measures, and a preliminary determination of effect for RFSS birds that could occur in the Project area.

TABLE 5.6.3-1

Regional Forester Sensitive Species Birds with Potential Habitat in the George Washington National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
REQUIRES FOREST HABITAT		
Haliaeetus leucocephalus	Bald Eagle	Areas close to coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water for food sources. Nests are found in tall trees except where only cliff faces or ground sites are available. Preference is for tall, sturdy conifers, but can also nest in pine, spruce, fir, cottonwood, willow, oak, beech, and others. In entire Analysis Area.
REQUIRES OR IS TOLERANT OF OPEN OR EDGE HABITAT		
Falco peregrinus	Peregrine Falcon	Nests on ledges or cliffs, buildings, bridges, quarry walls. Non-breeding sites include farmland, open country, lake shores, and broad river valleys in Accomack, Alleghany, Buchanan, Charles City, Dickenson, Giles, Gloucester, Isle of Wight, Lancaster, Lee, Madison, Middlesex, Newport News (City), Norfolk (City), Northampton, Page, Portsmouth (City), Prince George, Richmond (City), Rockbridge, Shenandoah, and York Counties in VA.
Lanius ludovicianus migrans	Migrant Loggerhead Shrike	Typical habitat includes fencerows and open grasslands with fencerows, trees, and shrubs. In Highland, Bath, Augusta, and Nelson Counties, VA.
Thryomanes bewickii altus	Appalachian Bewick's Wren	Historically, thickets, old fields, fencerows, and old home sites in Highland County, VA. Species is considered extirpated within the Analysis Area.

Sources: See Appendix E

5.6.3.1 American Peregrine Falcon (*Falco peregrinus*)

Species Description

The American Peregrine Falcon (Peregrine Falcon) has a global conservation status of apparently secure (G4) and a state conservation status of critically imperiled for breeding populations and imperiled for non-breeding populations (S1B/S2N) (VDCR, 2016). The Peregrine Falcon a medium-sized diurnal falcon that occurs globally in a wide variety of habitats, from the arctic tundra to deserts, to continental forests and others (Luensmann, 2010; NatureServe, 2015). In the eastern United States, habitats include cliff systems, valley slopes with mixed-mesophytic and northern hardwood forests, and ridgetops with pine species, oak, and/or a variety of other deciduous species.

Peregrine Falcons typically nest on broad, open cliff ledges, deep cliff recesses or rock cavities, or in shallow caves (Luensmann, 2010). An average clutch size for Peregrine Falcon is 3 to 4 eggs. In the Project area, the nesting season typically begins in late March or early April, although it's been recorded as early as February 12, and young fledge at 35 to 53 days old. The species is carnivorous and hunts any small to medium-sized prey such as birds, fish, bats, and other mammals. Large raptors and owls can kill Peregrine Falcons, although adults are typically safe from predation. Other predators of young Peregrine Falcons include other Peregrine Falcons and mammals such as bears, weasels, and ground squirrels.

The primary threat to the species has been past exposure to organochlorine herbicides, particularly DDT and DDE, resulting in complications in reproduction prior to the ban of these herbicides in 1972 (Luensmann, 2010). Other pressures on this species may include reductions in wetland habitat, which provide abundant prey, poaching, climate change, and disturbance from recreational or other human activities. Frequent or prolonged disturbance can lead to nest desertion.

Potential Presence in Project Area

There are no known occurrences of Peregrine Falcon within 2 miles of the Project centerline based on VDCR NHD data, and no Peregrine Falcons or nests were observed within a 2-mile-wide aerial survey area conducted during Bald and Golden Eagle nest surveys (see Atlantic, 2016c). Given the topography of the area, suitable cliff or shallow cave habitat could occur in the vicinity of the Project, and presence is assumed in these areas.

Impact Evaluation

Cliff and shallow cave habitat would not be crossed by the pipeline; therefore, direct impacts to potential habitat would not occur. However, given the likely presence of suitable habitat in the vicinity of the Project area, indirect impacts to Peregrine Falcon are possible. If present during Project construction, direct impacts to Peregrine Falcon could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. In particular, should construction take place during the nesting season, nests and young could be abandoned if construction disturbance is too prolonged or frequent. Similar impacts could occur as a result of vegetation maintenance of the permanent right-of-way; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years), and would be less likely to result in nest abandonment. An adverse effect from the long-term loss of forest habitat for the permanent right-of-way and new permanent access roads is not anticipated since Peregrine Falcon can hunt in open areas and may use the maintained right-of-way for hunting.

<u>Conservation Measures</u>

Potential impacts to the Peregrine Falcon will be avoided or mitigated through the implementation of the *Migratory Bird Plan*. In addition, conservation measures in the Upland Erosion Control Plan, Timber Removal Plan; Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C), will help protect the species and/or stabilize and re-establish disturbed habitats. Conservation measures relevant to Peregrine Falcon include the following:

- For tree clearing that occurs during the winter months and prior to the migratory bird nesting season, a qualified biological monitor searching for Golden Eagles and Bald Eagles will also monitor for Peregrine Falcon nests or activity, since the nesting season for the species begins in March.

- Atlantic will notify the GWNF if occupied Peregrine Falcon nests are found in the Project area, and a 25-foot protection buffer will be established around the active nests until the young have fledged in order to minimize human disturbance and ensure the nest is not abandoned, with weekly monitoring until the young have fledged or construction is completed.

- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Peregrine Falcon by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Upland Erosion Control Plan will be implemented to help stabilize foraging habitats and ensure that excavated soil and sediment remains within the construction area and does not impact potential cliff nesting habitat that could occur downslope, including

    - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - stabilization of access road surfaces by grading and installing stone where needed;

    - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water away from the rock outcrops; and

- removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore foraging habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7)

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and

  - reporting of restoration status following field inspections.

<u>Preliminary Determination of Effect</u>

Construction has the potential to cause temporary adverse impacts to the Peregrine Falcon through disturbance and potential abandonment of nests and young if construction should take place during the nesting season. Because impacts will be temporary and/or intermittent, and implementation of the *Migratory Bird Plan* and the other conservation measures listed above will help minimize impacts, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of Peregrine Falcon in the GWNF.

5.6.3.2 Bald Eagle (*Haliaeetus leucocephalus*)

Species Description

The Bald Eagle has a global conservation status of secure (G5) and a Virginia state conservation status ranging between vulnerable to apparently secure (S3S4B/S3S4N) (VDCR, 2016). The species has a breeding range that extends from central Alaska, northern Yukon, northwestern and southern Mackenzie, northern Saskatchewan, northern Manitoba, central Ontario, central Quebec, Labrador, and Newfoundland, south locally to the Commander and Aleutian Islands, southern Alaska, Baja California, New Mexico, Arizona, the Texas Gulf Coast, and Florida (NatureServe, 2015). In the nonbreeding season, Bald Eagles occur generally throughout the breeding range, most commonly from southern Alaska and southern Canada southward (NatureServe, 2015).

Bald Eagle breeding habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, reservoirs, or other large bodies of water that reflect the general availability of primary food sources, including fish and waterfowl (NatureServe, 2015). Nests are found in tall trees except where only cliff faces or ground sites are available. The species tends to use tall, sturdy conifers for nesting, but tree species used vary regionally and may include pine, spruce, fir, cottonwood, poplar, willow, sycamore, oak, beech, mangroves, or others (Cornell Lab of Ornithology, 2015; NatureServe, 2015). An important habitat attribute is the presence of mature forests with an abundance of comparatively large trees near large bodies of water (Snyder, 1993). The Bald Eagle nesting season in Virginia is between December 15 and July 15 (FWS, 2014). The clutch size is typically 2 eggs, and the young fledge around 10 to 12.5 weeks (NatureServe, 2015).

The population of Bald Eagles has historically undergone dramatic fluctuations. Bald Eagles became rare in the contiguous United States as a result of being hunted by humans in combination with the use of DDT as a pesticide, which significantly lowered their reproduction rates. The species was listed for protection under the Bald Eagle Protection Act in 1940, and in 1978, the entire Bald Eagle population in the contiguous United States was listed for protection under the ESA. Since 1980, Bald Eagle populations have increased dramatically as DDT levels dropped, breeding productivity recovered, and hunting decreased (Buehler, 2000) and the Bald Eagle has been removed from the ESA. However, it remains protected under the federal Bald and Golden Eagle Protection Act.

Potential Presence in Project Area

Aerial helicopter surveys were conducted for Bald Eagle nests in a 2-mile-wide corridor along the proposed centerline in the GWNF in March of 2016 (see the survey report in Atlantic, 2016c). Surveys consisted of four parallel helicopter passes, with an increased survey effort near preferred habitats such as large waterbodies and river corridors. No Bald Eagles were observed, although one unoccupied, unknown stick nest was found within approximately 314 feet of the proposed centerline. The nest was unoccupied but appeared to have been tended within the season. Suitable nesting and roosting habitat is present in numerous areas in or near the Project area based on the presence of mature forests and large rivers and other bodies of water. Therefore, the presence of Bald Eagles in the Project area within the GMNF is assumed.

Impact Evaluation

Since no Bald Eagles were confirmed in the Project area, direct impacts from the Project are not anticipated. However, given the potential nest in the survey area and suitable nesting and roosting habitat occur in other portions of the survey area, impacts on Bald Eagle are possible. If present during project construction, impacts to Bald Eagle could include noise disturbance from construction activities, which could displace individuals, increase stress, and disrupt normal activities. In particular, should construction take place during the nesting season, nests and young could be harmed by construction equipment or abandoned by the parents if construction disturbance is too prolonged or frequent. Noise disturbance from vegetation maintenance of the permanent right-of-way could also occur; however, vegetation maintenance would be brief and occur infrequently (approximately every 3 years), and would be less likely to result in nest abandonment. Vegetation clearing of forest habitat for the right-of-way and new permanent access roads would have the indirect effect of removing nesting and roosting habitat, particularly near large bodies of water. Although forest habitat in the temporary construction workspace corridor would be allowed to redevelop following construction, the creation of the 53.5-foot-wide permanent right-of-way and new road corridors would result in the long-term loss of forest habitat.

Conservation Measures

Potential impacts to the Bald Eagle will be avoided or mitigated through the implementation of the *Migratory Bird Plan*, which includes implementation of the *National Bald Eagle Management Guidelines*, and the Virginia Endangered Species Project Review. In addition, conservation measures in the Upland Erosion Control Plan, Timber Removal Plan; Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C), will help protect the species and/or stabilize and re-establish disturbed habitats. Relevant conservation measures include the following:

- For tree clearing that occurs during the Winter roosting or nesting season, a qualified biological monitor will walk ahead of the clearing crews and search for roosting bald eagles and nesting bald eagles.
- Atlantic will adhere to the *National Bald Eagle Management Guidelines* and Forest Service Standards to minimize or avoid impacts to individual Bald Eagles, including work space buffers, if inactive or active nests are found within 660 feet of the construction area during pre-construction surveys or during construction.
- Atlantic will coordinate with GWNF staff to determine an appropriate buffer based on the work activity, visibility to nest, and stage of nesting if the recommended buffers in the Guidelines cannot be implemented.
- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail.
- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Bald Eagle by re-establishing or retaining suitable forest habitat:
    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.
    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat; and

  - retention of large-diameter trees or snags at the periphery of the construction area, where possible, to further help reduce habitat impacts.

- Conservation measures in the Upland Erosion Control Plan will be implemented to reduce stormwater runoff and stabilize habitats, including

  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - stabilization of access road surfaces by grading and installing stone where needed;

  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water away from the right-of-way; and

  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI.

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to re-establish suitable foraging, roosting, and nesting habitat, including

  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7)

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

- regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

- monitoring to assess all restored areas on USFS lands in years 1 and 5;

- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5; and

- reporting of restoration status following field inspections.

Preliminary Determination of Effect

The Project has the potential to cause temporary direct adverse impacts on the Bald Eagle through disturbance from construction and vegetation maintenance and long-term indirect impacts through removal of potential nesting and roosting forest habitat in the permanent right-of-way and permanent new access roads. Since no confirmed occurrences of Bald Eagle nests were found during field surveys, the presence of substantial numbers of Bald Eagle in the Project area is low, and since the *National Bald Eagle Management Guidelines* and Forest Service Standards would be implemented, potential impacts would be minimized or avoided. In addition, although forest habitat would be removed for the permanent right-of-way, abundant suitable habitat adjacent to the right-of-way and new road corridors would remain. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward Federal listing or loss of viability* of Bald Eagle in the GWNF.

5.6.3.3 Migrant Loggerhead Shrike (*Lanius ludovicianus migrans*)

Species Description

The Migrant Loggerhead Shrike is a medium-sized perching bird that measures approximately 7 inches in length. This species is identified by its black face mask and black lower wings and tail. The wings also contain conspicuous white markings. This species is identified by its black facial mask, black lower wings and tail, dark grey on the upper body, with white on the lower body (Environment Canada, 2010). The bill is black with a distinctive hook. The Migrant Loggerhead Shrike is a subspecies of the Loggerhead Shrike (*Lanius ludovicianus).* Loggerhead Shrikes are found throughout North America and Canada and are more common in the west (Pennsylvania Natural Heritage Program, 2007). The *migrans* subspecies is found throughout eastern North America from southeast Canada to eastern Texas (Cornell Laboratory of Ornithology, 2016). The global conservation status for the species is apparently secure to vulnerable (G4T3Q), and the state conservation status is critically imperiled for both breeding and imperiled for non-breeding populations (S1B, S2N) (VDCR, 2016).

Migrant Loggerhead Shrikes occupy open habitats such as grasslands, hayfields, utility corridors, and residential yards with dense shrubs or trees available for nesting and perches (Environment Canada, 2010). The species is carnivorous, feeding mostly on insects and small vertebrates (Environment Canada, 2010). Only about five percent of prey items are vertebrate species such as small rodents. A characteristic feeding behavior is impaling prey on tree thorns or barbed wire fences (Pruitt, 2000).

The breeding season begins in late winter or early spring, with clutches initiated later in mountainous areas and at higher latitudes (Pruitt, 2000). Both sexes assist in territory defense, nest building, and young rearing. Nesting sites are often placed in isolated trees or clumps of trees rather than a continuous stand. Pairs build a bulky, open cup nest of fine grasses, hair, and root material.

Historically an abundant bird, Migrant Loggerhead Shrikes are in decline and have disappeared from parts of the northeast (NatureServe, 2015; Pennsylvania Natural Heritage Program, 2007). The main threat is inconclusive. However, researchers postulate that habitat loss, along with increased herbicides use, decreased prey availability, collisions with vehicles, intraspecific competition, and climate and warming trends, among other causes, may be contributing to the species' decline (Pruitt, 2000; USFS, 2003; Environment Canada, 2010). Conversion of open land to forest (e.g. farm abandonment) may result in declines (Pruitt, 2000; USFS, 2003). Unoccupied breeding habitat is present in West Virginia; however, in Virginia, habitat loss may be more of a factor (USFS, 2003). Flight characteristics and habitat choice put Loggerhead Shrikes at risk for collisions with automobiles. Favorable open habitat is often associated with roads, and paralleling powerlines provide suitable perching sites. Juveniles are the most susceptible to vehicular collisions (Pruitt, 2000; USFS, 2003).

Potential Presence in Project Area

There are no VDCR NHD documented occurrences of Migrant Loggerhead Shrike within 2 miles of the centerline, and there is little open habitat in the survey area that would support this species (see Section 4.1.1 and Atlantic [2016o]). One area with potentially suitable open habitat was identified between [redacted]. Field surveys of this area found no evidence of Loggerhead Shrike.

Impact Evaluation

Because no Migrant Loggerhead Shrikes were found in the Survey area, along with only one area with potentially suitable habitat, adverse impacts to the species are not anticipated. However, the conversion of the permanent right-of-way from forest to grassland and scrub-shrub habitat could provide suitable habitat for the Migrant Loggerhead Shrike in the GWNF.

Conservation Measures

Atlantic will restore the permanent right-of-way and temporary workspaces to help establish potential open and scrub-shrub habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to Migrant Loggerhead Shrike will also be applied. Relevant conservation measures include the following:

- To avoid disturbance to nesting migratory birds, including Migrant Loggerhead Shrike, vegetation clearing will occur outside of the migratory bird nesting season of March 15 to August 30.
- The following conservation measures that will be implemented according to the Visual Resources Plan may also benefit Migrant Loggerhead Shrike by re-establishing suitable shrub habitat adjacent to the open habitat of the permanent right-of-way:
    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.

- Atlantic will coordinate with the GWNF to include thorny shrubs or other suitable plants beneficial to the species in the revegetation plan to enhance suitable hunting and nesting habitat for Migrant Loggerhead Shrike in and adjacent to the permanent pipeline right-of-way.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and scrub-shrub habitat, including

    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);

    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

    - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

    - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

    - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

    - monitoring to assess all restored areas on USFS lands in years 1 and 5;

    - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

    - reporting of restoration status following field inspections.

Preliminary Determination of Effect

The creation of grassland and scrub-shrub habitat in the permanent right-of-way would have a *beneficial impact on* the species in the GWNF by creating new potential habitat.

5.6.3.4 Appalachian Bewick's Wren (*Thryomanes bewickii altus*)

Species Description

The Appalachian Bewick’s Wren is a small passerine bird that is 5 inches in length. This species is identified as a having a light brown back with light gray undersides. A prominent white stripe is present above the eye and extends to the side of the head. The bill is gray and slightly downturned. The tail is noticeably long and usually held somewhat upright while the bird is perching (National Audubon Society, 1996). The Appalachian Bewick’s Wren is a subspecies of the more common Bewick’s Wren, a population that occurs in the western United States. Bewick’s Wren populations in the western portions of North America are considered secure (G5); however, the Appalachian subspecies is ranked as imperiled (T2) (NatureServe, 2015). In Virginia, the species is listed as state endangered and the Virginia Wildlife Action Plan ranks the species as having a Critical Conservation Need (VDGIF, 2016). In West Virginia, the species is considered extirpated (VDCR, 2016).

Suitable habitat includes upland shrub thickets, agricultural areas, and open woodlands at elevations up to 4,000 feet (Maryland Department of Natural Resources, n.d.). During the breeding season, males sing loudly to defend their territory. Within this territory, males will build several incomplete nests out of twigs and other course material. When the female arrives on territory, she will choose a nest and complete it with grass, moss and other strands of material (National Audubon Society, 1996).

The Appalachian Bewick’s Wren was historically a more common species. The major factors of the population decline are still a matter of conjecture (Maryland Department of Natural Resources, n.d.). Several hypotheses include competition with other bird species. Invasive species such as the House Sparrow (*Passer domesticus*) and the European Starling (*Sturnus vulgaris*) compete for cavity nesting locations. These species are known to aggressively disrupt and remove eggs of other nesting birds. Other explanations include the expanding range of the House Wren (*Troglodytes aedon)*. House Wrens have been observed displacing nests of Appalachian Bewick’s Wrens (Kennedy and White, 1996; Maryland Department of Natural Resources, n.d.).

Potential Presence in Project Area

There are no VDCR NHD documented occurrences of Appalachian Bewick’s Wren within 2 miles of the centerline, and the species is considered extirpated from the Analysis Area. In addition, no surveys were deemed necessary for the species based on consultation with the GWNF, and there is little open habitat in the survey area that would support this species (see Section 4.1.1 and the botany report in Atlantic [2016q]).

Impact Evaluation

Since Appalachian Bewick’s Wren is considered extirpated from the Analysis Area and there is little potential suitable habitat in the Project area, adverse impacts to the species are not anticipated. However, the conversion of the permanent right-of-way from forest to grassland and scrub-shrub habitat could provide suitable habitat for Appalachian Bewick’s Wren in the GWNF.

Conservation Measures

Atlantic will restore the permanent right-of-way and temporary workspaces to help establish potential open and scrub-shrub habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). Relevant conservation measures include the following:

- To avoid disturbance to nesting migratory birds, including Appalachian Bewick's Wren, vegetation clearing will occur outside of the migratory bird nesting season between March 15 and August 30.

- The following conservation measures that will be implemented according to the Visual Resources Plan may also benefit Appalachian Bewick's Wren by re-establishing suitable shrub habitat adjacent to the open habitat of the permanent right-of-way:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and scrub-shrub habitat, including

    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);

    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
- regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
- monitoring to assess all restored areas on USFS lands in years 1 and 5;
- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
- reporting of restoration status following field inspections.

Preliminary Determination of Effect

The creation of grassland and scrub-shrub habitat in the permanent right-of-way would have a *beneficial impact on* the species in the GWNF by creating new potential habitat.

5.6.4 Amphibians

The RFSS list for the Project contains three amphibians (see Appendix E). A desktop assessment of known range and species habitat requirements determined that one of these species, cow knob salamander (*Plethodon punctatus*), could occur in the Project area. There were no documented occurrences of cow knob salamander in VDCR NHD data within 2 miles of the centerline. Surveys conducted in 2015 on an alternative route found numerous occurrences of cow knob salamander approximately 2 miles from the current Project area. These populations are now avoided by the pipeline reroute. Potential habitat was identified through desktop analysis on Gum Tree Mountain and Tower Hill Mountain. This area was surveyed between April and May in 2016 (see the survey report in Atlantic, 2016d). Habitat suitability surveys were conducted in the survey area, followed by nocturnal presence/absence surveys of two areas verified to contain suitable habitat. No cow knob salamanders were found. The USFS concurred with these findings (Thompson, 2016b). Based on these results, it is assumed that cow knob salamander does not occur in the Project area and further analysis is not warranted. Atlantic determines that the Project will have *no effect* on the cow knob salamander.

5.6.5 Aquatic Species—Fish and Mussels

The RFSS list for the Project contains 12 fish and 10 mussels (see Appendix E). Of these, two fish and four mussels were found to have potential habitat in the Analysis Area (see Table 5.6.5-1). Ten streams crossed by the Project were identified as having potential habitat for RFSS fish and mussels based on a desktop analysis and were surveyed for presence/absence and habitat suitability in July 2016 (see the survey report in Atlantic [2016l]). No RFSS fish or mussels were found during field surveys at the 10 waterbody crossings completed in 2016. In addition, suitable habitat for these species was not found during field surveys due to insufficient flow and size. The crossings are in the far upper headwater reaches of each stream, where the streams appear prone to drying during periods of dry weather. However, the Downstream Sedimentation Analysis (Appendix I) and the Erosion and Sedimentation Report (Appendix H) indicates that potential habitats downstream or downslope from the Project area could be indirectly affected by the Project (see Table 5.6.5-1 for a list of RFSS with potential habitat in the Analysis Area).

TABLE 5.6.5-1

Regional Forester Sensitive Species Fish and Mussels with Potential Habitat in the George Washington National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
FISH		
Notropois semperasper	Roughhead Shiner	Limited to relatively pristine streams; typically it occurs in cool and warm, usually clear, large creeks and medium-sized rivers with moderate gradient in Augusta, Bath, and Highland Counties in VA. Species is documented within 2 miles of Project area in the GWNF based on WVDNR NHP NHI data. VDCR NHD documented occurrence at a Project waterbody crossing (2016 data; 1972 occurrence).
Noturus gilberti	Orangefin madtom	Riffles and runs of medium to large, cool to warm, usually clear streams in Botetourt, Campbell, Craig, Franklin, Montgomery, Patrick, Pittsylvania, Roanoke Counties and Salem City in VA. Also found in other counties in Upper James Watershed.
MUSSELS		
Alasmidonta varicosa	Brook floater	Riffles and moderate rapids with sandy shoals or gravel bottoms in Augusta County, VA.
Elliptio lanceolata	Yellow lance	Sandy substrates, rocks and in mud, in slack water areas in Bath and Nelson Counties in VA.
Fusconaia masoni	Atlantic pigtoe	Fast flowing, well oxygenated streams and is restricted to fairly pristine habitats in Bath County, VA.
Lasmigona subviridis	Green floater	Averse to strong currents; small creeks and large rivers and sometimes canals at depths of 1-4 feet in Bath and Nelson Counties in VA.

Sources: See Appendix E

5.6.5.1 General Impacts to Fish and Mussels

Since no RFSS fish or mussels or suitable habitats were found at Project waterbody crossings during field surveys, direct impacts to RFSS fish and bivalves will not occur. However, should these species be present in the cumulative effects Analysis Area (within the area that effects from the Project can still be measured and significant [OAR ranking 8]) downstream from the pipeline crossing, or in streams adjacent to Project workspace, indirect impacts could occur. For the GWNF, this cumulative effects Analysis Area includes aquatic habitat within 1 mile of the Project area (following the stream conveyance) that could occur upslope or downslope of the Project on GWNF property to account for potential impacts from pipeline construction and ATWS, and within 0.5 mile of new access roads to account for potential impacts from access road construction (see Appendix I). The Analysis Area involves 23 HUC-12 subwatersheds, nine of which are crossed by the Project on GWNF property (see Table 4.3-1). The Erosion and Sedimentation Report found higher erosion rates would occur in these subwatersheds and in waterbodies crossed by the pipeline for approximately 4 years following construction, which could result in the delivery of sediments and contaminants from Project activities into waterbodies downstream or downslope from the Project through stormwater runoff and downstream flow. Indirect impacts would include temporarily reduced water quality, as discussed in Section 5.4.3. However, impacts to water quality are anticipated to be minimal based on estimates of suspended solids in the water column caused by predicted construction erosion rates with ECDs in place (see Section 9.0 in Appendix H). Therefore, any effects to RFSS fish and mussels would likely be minimal, particularly downslope and downstream from construction areas since the effects from increased sediment or contaminant inputs will be diluted once the affected waters reached waterbodies supporting RFSS fish or mussels. The discussion in Sections 5.6.5.3 through 5.6.5.7 includes an analysis of impacts within the cumulative effects Analysis Area for each species.

5.6.5.2 General Conservation Measures

Potential impacts to fish and mussel aquatic habitat will be minimized through the implementation of the conservation measures in the Timber Removal Plan, Blasting Plan, Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, SPCC Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Visual Resources Plan, Non-Native Invasive Plant Species Management Plan, and Water Quality Monitoring Plan, as specified in the *COM Plan* (see Appendix C). Examples of conservation measures that will protect aquatic habitat for RFSS fish and bivalves include the following:

- A dry stream crossing method, including either the flume or dam-and-pump method, will be used for pipeline construction across waterbodies within the GWNF to reduce the introduction of sediment and turbidity in the waterbody during construction.

- The following conservation measures that will be implemented according to the Visual Resources Plan may also help mitigate impacts to aquatic species by re-establishing or retaining the existing light and temperature regimes in aquatic habitat through re-establishing or retaining forested riparian habitat:

    - The outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF, including species suitable for riparian areas.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures will be implemented to reduce impacts to aquatic habitat both during and after construction per the Project's Stream and Wetland Crossing Procedures, including

    - completing construction across streams as quickly as possible.

    - limiting in-water work to seasonal restrictions where applicable, as specified in Section 2.2.2.2 and Appendix B;

    - locating spoil from waterbody crossings at least 10 feet from the water's edge;

    - locating all extra work areas (such as staging areas) at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land;

    - installation of sediment barriers along the entire construction right-of-way within the waterbody immediately after initial disturbance of the waterbody or in adjacent upland, and continued maintenance throughout construction to prevent the flow of sediments into the waterbody;

    - maintenance of a clearly marked 100-foot-wide vegetative buffer between a waterbody and the pipeline right-of-way where it runs parallel to the waterbody;

  - maintenance of adequate waterbody flow rates to prevent the interruption of existing downstream uses;

  - stabilization of waterbody banks and installation of temporary sediment barriers within 24 hours of completing instream construction activities.

  - restoration of steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces);

  - restoration of all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI;

  - restricting the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

  - revegetation of disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

- Conservation measures will be implemented to reduce impacts on aquatic habitat both tree removal per the Project’s Timber Removal Plan, including

  - avoiding altering existing surface drainage patterns by the placement of timber or brush piles at the edge of the construction right-of-way;

  - logs and slash will not be yarded across perennial streams unless fully suspended;

  - logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment; and

  - any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.

- Conservation measures will be implemented to reduce stormwater runoff from upland construction areas to aquatic habitat both during and after construction per the Upland Erosion Control Plan, including

  - prohibiting the use of herbicides in or within 100 feet of a stream or wetland, except as allowed by the USFS;

  - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - stabilization of access road surfaces by grading and installing stone where needed;

  - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

  - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to stabilize streambanks and reduce upland stormwater runoff to aquatic habitat both during and after construction, including

  - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;

  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);

  - no use of lime or fertilizer within 100 feet of wetlands or waterbodies;

  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - reporting of restoration status following field inspections

- Inspection and monitoring will be carried out to ensure conservation measures at waterbody crossings and adjacent upland areas are properly employed and maintained to reduce stormwater runoff to aquatic habitat both during and after construction per the Project's Water Quality Monitoring Plan, including

  - monitoring turbidity at all stream crossings that are state-designated as coldwater fisheries four times per day during active construction both 50 feet upstream and downstream from the construction area, and one time per day for four days following the completion of restoration activities;

  - implementation of remediation measures should the chronic turbidity reading exceed standards.

- Atlantic will adhere to the Spill Prevention, Control, and Countermeasure Plan to prevent hazardous materials from entering aquatic habitat, including

  - restricting equipment refueling and lubricating and storage of hazardous materials to upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

5.6.5.3 Roughhead Shiner (*Notropois semperasper*)

Species Description

The roughhead shiner has a global conservation status of critically imperiled to vulnerable (G2G3) and a state conservation status of critically imperiled to imperiled (S2S3) (VDCR, 2016). The roughhead shiner is endemic to the upper James River drainage and its range includes the Ridge and Valley Province in Virginia, including in August, Bath, and Highland Counties (Jenkins and Burkhead, 1975).

The roughhead shiner is found in clear rocky pools and backwaters of large streams to medium-sized rivers (Jenkins and Burkhead, 1975). The species is limited to relatively pristine streams, typically occurring in cool and warm waters with moderate gradient, hard bottom, and little siltation. This species prefers slow to moderate currents of runs, pools near flowing water, and backwaters, but can occasionally be found in swifter water. Adults of this species primarily eat immature aquatic insects (NatureServe, 2015).

The roughhead shiner usually spawns from early or mid-May to early June, but spawning may extend into July or August. Spawning occurs in water temperatures of 20 to 28.8 degrees Celsius in shallow runs and riffles on gravel over chub nests. Each female has between 450 and 1,482 eggs. Both sexes mature in 2 years. Most roughhead shiners live no longer than 3 years, but a few may survive into the fourth year (Helfrich et al., 2005; NatureServe, 2015).

Occurrences of this species are rare to common (generally uncommon) in the different parts of its range. The species appears to be negatively affected by degradation of habitat by sedimentation of suitable habitat, impoundment and pulp mill effluents, and competition with apparently recently introduced telescope shiner (*Notropis telescopus*) (Burkhead and Jenkins, 1991; Jenkins and Burkhead, 1994; NatureServe, 2015). Conservation recommendations include tightening the regulation of discharge of chemical effluents in the upper James River drainage (NatureServe, 2015).

Potential Presence in Project Area

No roughhead shiners were found in waterbodies crossed by the Project on the GWNF during presence/absence and habitat suitability field surveys in July 2016, and current habitat conditions in these waterbodies are not likely to support the species due to insufficient stream flow and size (see the survey report in Atlantic [2016l]). The Project does cross four waterbodies that are known to support or historically support the roughhead shiner, including Back Creek in the Jim Dave Run-Back Creek subwatershed, the Cowpasture River in the Scotchtown Draft-Cowpasture River subwatershed, the Jackson River in the Bolar Run-Jackson River subwatershed, and the Calfpasture River in the Holloway Draft-Calfpasture River subwatershed. Three occurrences are located within the 1-mile Analysis Area (in the Scotchtown Draft-Cowpasture River subwatershed). In addition, three UNTs to Warwick Run that are crossed by the Project on GWNF property have State of Virginia-designated in-water work seasonal restrictions for roughhead shiner.

Impact Evaluation

No direct impacts to roughhead shiner will occur as a result of the Project on the GWNF since no roughhead shiners were found at waterbody crossings during field survey, and the habitats at these crossings were found unsuitable for the species. Temporary indirect impacts on potential aquatic habitat are possible as a result of overland flow of sediments and potential contaminants from the construction area, and of downstream flow from waterbody crossings, into large streams that could provide potential habitat within 1 mile of the Project in the subwatersheds affected by the Project (see Section 5.6.5.1). Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively moderate erosion rates along the construction workspace in the Jim Dave Run-Back Creek, Scotchtown Draft-Cowpasture River, and Bolar Run-Jackson River where roughhead shiner has historically occurred (see Table 8-1 in Appendix H). However, temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.6.5.1).

Conservation Measures

Conservation measures to reduce potential impacts to roughhead shiner and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.6.5.2. In addition, the following conservation measure specific to roughhead shiner will be implemented:

- In-water work in three UNTs to Warwick Run at approximately [redacted] will be limited to March 15 to June 30 to avoid potential downstream impacts based on VDGIF time of year restrictions for these streams for roughhead shiner.

Preliminary Determination of Effect

Since no roughhead shiners were found in waterbodies crossed by the Project in the GWNF, and these waterbodies do not contain suitable habitat, roughhead shiner will not be directly affected by the Project. Any indirect water quality effects that could occur in potential habitat within 1 mile of the Project area will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the roughhead shiner in the GWNF.

5.6.5.4 Orangefin madtom (*Noturus gilberti*)

Species Description

The orangefin madtom has a global conservation status of imperiled (G2) and a state conservation status of imperiled (S2) (VDCR, 2016). The range of the orangefin madtom includes the Ridge and Valley and upper Piedmont of the upper Roanoke River (including the Dan River) drainage in Virginia and North Carolina outside of the Project area, as well as the upper James River, Virginia, where it was possibly introduced (NatureServe, 2015), and which does occur in the Project area.

The orangefin madtom is approximately 5 to 7.5 centimeters (2 to 3 inches) long, and is found in cool to warm, clear streams with swift riffles and small cobble substratum. This species lives under large gravel, rubble, and probably boulders and other cover, occupying interstitial spaces among cobbles, but is generally not found in areas with large amounts of sand and silt (Simonson and Neves, 1992). It prefers medium-sized, moderate gradient, montane and upper Piedmont streams. The largest populations of the species are found in clear streams. Adult orangefin madtoms feed largely on immature benthic insects, especially mayflies, caddisflies, and midges (NatureServe, 2015). At least some foraging is done nocturnally in pools and runs (Burkhead, 1983).

Orangefin madtoms are generally regarded as sedentary, but dispersal characteristics are unknown. Their habitat use has been found to vary with seasons. During winter months when water temperatures are below 8 to l0 degrees Celsius, this species sought the deepest interstices found in inhabited riffles; in effect, the least energetic environment. Orangefin madtoms spawn in the spring during April and May in water temperatures of 8 to 17 degrees Celsius (Burkhead, 1983). The species has low fecundity and it is thought that eggs are laid under loose rubble (Burkhead, 1983; NatureServe, 2015). Both sexes mature in 2 years and live no longer than 3 years (Burkhead, 1983).

Occurrences of orangefin madtom are rare or uncommon. The species is apparently extirpated in the heavily silted lower North Fork of the Roanoke River and in the lower Roanoke River below Salem, lower Little Dan River, and upper Smith River. It appears to be negatively affected by channelization, siltation, various forms of chronic pollution, catastrophic chemical spills, impoundment, dewatering, and bait-seining. The species' low reproductive rate and short life span likely exacerbate these threats (Simonson, 1987; Simonson 1997; and Simonson and Neves, 1992). The species is a federal Species of Concern under the Endangered Species Act, and is listed as threatened by the State of Virginia. Conservation recommendations include taking measures to decrease siltation. The taking of orangefin madtoms should be prohibited in any stream known to contain *N. gilberti* (NatureServe, 2015).

Potential Presence in Project Area

Field surveys in July 2016 did not find any occurrences of orangefin madtom in waterbodies crossed by the Project, and current habitat conditions in these waterbodies are not likely to support the species due to insufficient stream flow and size (see the survey report in Atlantic [2016l]). Based on the known distribution of the introduced orangefin madtom population, the species occurs in streams in the Cabin Creek–Mill Creek, Scotchtown Draft–Cowpasture River, and Lick Run-Stuart Run subwatersheds. The Project will cross two waterbodies with documented occurrences of orangefin madtom, including the Cowpasture River in the Scotchtown Draft-Cowpasture Creek subwatershed, and Mill Creek in the Cabin Creek-Mill Creek subwatershed. However, both crossings occur outside of the GWNF, and the occurrences are more than 1 mile downstream from the Project area.

Impact Evaluation

No direct impacts to orangefin madtom will occur as a result of the Project on the GWNF since no orangefin madtoms were found at waterbody crossings, and the habitats at these crossings were found unsuitable for the species. Temporary indirect impacts on the species are possible (see Section 5.6.5.1). Temporary indirect impacts on potential aquatic habitat are possible as a result of overland flow of sediments and potential contaminants from the construction area, and of downstream flow from waterbody crossings, into large streams that could provide potential habitat within 1 mile of the Project in the subwatersheds affected by the Project (see Section 5.6.5.1), although the nearest documented occurrences of orangefin madtom occur more than 1 mile from the Project area. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively low and moderate erosion rates along the construction workspace in the Cabin Creek-Mill Creek, Scotchtown Draft-Cowpasture Creek, and Lick Run-Stuart Run subwatersheds (see Table 8-1 in Appendix H). Temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.6.5.1).

Conservation Measures

Conservation measures to reduce potential impacts to orangefin madtom and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.6.5.2.

Preliminary Determination of Effect

Since no orangefin madtoms were found in waterbodies crossed by the Project in the GWNF, and these waterbodies do not contain suitable habitat, the orangefin madtom will not be directly affected by the Project. Any indirect water quality effects that could occur in potential habitat within 1 mile of the Project area will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the orangefin madtom in the GWNF.

5.6.5.5 Brook floater (*Alasmidonta varicosa*)

Species Description

The brook floater is a kidney-shaped mussel and can reach 70 millimeters (2.8 inches) in length. It has a global conservation status of vulnerable (G3), a state conservation status of critically imperiled (S1) (VDCR, 2016), and is listed as endangered by the State of Virginia.

The brook floater is considered to be a species of creeks and small rivers, where it is found within rocks in gravel substrates and sandy shoals. It typically occurs in gravel and sandy substrates in clean running water and can be found in riffles and moderate rapids with sandy shoals or riffles with gravel bottoms. It prefers high dissolved oxygen levels and may be found clustered behind boulders or near banks when flow velocity is high (Nedeau, 2007). This species is more common in small to mid-sized streams or creeks than in large rivers and is more common in upper portions of large watersheds with intact upland forest. However, it is absent from headwater streams. The larval form of the species is typically parasitic on fish, and potential glochidial host species include the blacknose dace (*Rhinichthys atratulus*), longnose dace (*Rhinichthys cataractae*), golden shiners (*Notemigonus crysoleucas*), pumpkinseed (*Lepomis gibbosus*), marginated madtom (*Noturus insignis*), yellow perch (*Perca flavescens*), blacknosed dace (*Rhinichthys atratulus*), and slimy sculpin (*Cottus cognatus*) (PNHP and Pennsylvania Fish & Boat Commission [PFBC], 2007; NatureServe, 2015). Adult brook floaters are filter feeders that primarily consume plankton and detritus (NatureServe, 2015).

Brook floater adults are essentially sessile, and, as with most unionid bivalves, the species requires a fish host during the larval portion of its life cycle. Fertilization occurs in summer with glochidia released the following spring. The period of time required by glochidia to complete metamorphosis to juveniles varies according to species and is unknown for this species. Related mussel species generally complete metamorphosis in between 30 and 60 days. The brook floater is a long-term brooder and gravid females may be found from August to May (NatureServe, 2015).

Historically, this species was found from Nova Scotia to South Carolina throughout the Atlantic drainages, with an isolated record in the Greenbrier River in West Virginia. The current distribution of this species is sporadic but still relatively widespread, and includes the Middle James River watershed, the northern reach of the Shenandoah River watershed, and the Potomac River, as well as small populations in North and South Carolina, and several populations in New York (NatureServe, 2015). The species' population decline is evident at many localities, and extirpations have occurred in half of its locations in the United States (NatureServe, 2015; PNHP and PFBC, 2007). The species appears to be negatively affected by pollution, siltation, wastewater runoff, impoundments, and biological collection. Additionally, the sequestering and sparseness of current brook floater populations leave it vulnerable to further extirpation by stochastic events (i.e., drought, flood, pollution (Maine Department of Inland Fisheries and Wildlife, 2013). Introduced species, such as the Asian clam (*Corbicula fluminea*) and zebra mussel (*Dreissena polymorpha*) may also be contributing to population declines (PNHP and PFBC, 2007). Conservation recommendations include effective site and host species protection (NatureServe, 2015; South Carolina Department of Natural Resources, 2015).

Potential Presence in Project Area

No brook floaters were found in waterbodies crossed by the Project on the GWNF during presence/absence and habitat suitability field surveys for other species in July 2016. Current habitat conditions in these waterbodies are not likely to support the species due to insufficient stream flow and size (see the survey report in Atlantic [2016l]). No documented occurrences of brook floaters were found within 1 mile of the Project area (see Appendix I). The Project does cross two waterbodies with documented occurrences of brook floaters, including Christians Creek and Back Creek. Both crossings occur outside of the GWNF, and the occurrences are outside of the cumulative effects Analysis Area. However, suitable habitat could occur within creeks in the Canada Run-South River and Inch Branch-Back Creek subwatersheds, the latter of which is crossed by the Project on GWNF property.

Impact Evaluation

No direct impacts to brook floater will occur as a result of the Project on the GWNF since no brook floaters were found at waterbody crossings, and the habitats at these crossings were found unsuitable for the species. Temporary indirect impacts on the species in the GWNF are not anticipated based on the species' available distribution data, results of freshwater mussel surveys, and downstream analysis. However, temporary indirect impacts on potential aquatic habitat are possible as a result of overland flow of sediments and potential contaminants from the construction area, and of downstream flow from waterbody crossings, into creeks outside of the GWNF that could provide potential habitat within 1 mile of the Project in the subwatershed affected by the Project (see Section 5.6.5.1), although the nearest documented occurrences of brook floaters occur more than 1 mile from the Project area. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively low erosion rates along the construction workspace in the Inch Branch-Back Creek subwatershed (see Table 8-1 in Appendix H). Temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.6.5.1).

Conservation Measures

Conservation measures to reduce potential impacts to the brook floater and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.6.5.2.

Preliminary Determination of Effect

Since no brook floaters were found in waterbodies crossed by the Project in the GWNF, and these waterbodies are not expected to support the species, the brook floater will not be directly affected by the Project. Any indirect water quality effects that could occur in potential habitat within 1 mile of the Project area will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the brook floater in the GWNF.

5.6.5.6 Yellow lance (*Elliptio lanceolata*)

Species Description

The yellow lance has a global conservation status of critically imperiled to vulnerable (G2G3) and a state conservation status in Virginia of critically imperiled to imperiled (S2S3) (VDCR, 2016). It is an elongated mussel that reaches up to 88 millimeters (3.5 inches) in length. Historically, the range of this species extended from the Satilla River system in Georgia to the Susquehanna River system in Pennsylvania, but currently the range of the yellow lance extends from the Rappahannock River Basin in Virginia south to the Neuse River Basin of North Carolina (NatureServe, 2015; North Carolina Wildlife Resources Commission [NCWRC], 2017).

The yellow lance is often found in clean, sandy substrates, but can also be found in streams with a gravel substrate. It is also found buried deep in sand and may migrate with shifting sands. The preferred habitat of this mussel has clean and coarse to medium sized sands as substrate. This species is found in the main channels of drainages down to streams as small as a meter (3.28 feet) across (NatureServe, 2015; NCWRC, 2017). The yellow lance is not found in lakes. Adult yellow lance are filter feeders that primarily consume plankton and detritus (Prince, 2017). The life history of this species is largely unknown. Yellow lance adults are largely sedentary and, as with most unionid bivalves, the species is thought to require a fish host during the larval portion of its life cycle, although fish host species have not been identified (NatureServe, 2015; NCWRC, 2017).

Occurrences of this species are difficult to quantify because of the taxonomic confusion regarding this species, although the species appears to be declining throughout its range. In Virginia, it is thought to be nearly extirpated from a large portion of its range, with populations still occurring in the Rapidan-Upper Rappahannock, Mattaponi, the Upper James, and the Middle James-Willis watersheds (NatureServe, 2015). Threats to the species include habitat degradation due to anthropogenic encroachment (Johnson, 1970). Conservation recommendations include effective site protection as well as further research on the species (NatureServe, 2015).

Potential Presence in Project Area

Field surveys in July 2016 did not find any occurrences of this species in waterbodies crossed by the Project, and current habitat conditions in these waterbodies are not likely to support the species due to insufficient stream flow and size (see the survey report in Atlantic [2016l]). The species is known to occur in the lower reaches of the Scotchtown Draft-Cowpasture River subwatershed, particularly the Cowpasture River, which will be crossed by the Project. Two UNTs to Cowpasture River that are crossed by the Project on GWNF property have State of Virginia designated in-water work seasonal restrictions for yellow lance. However, the nearest documented occurrence of the species is more than 1.0 mile downstream from the current Project route, and there are no other documented occurrences of the species in the Analysis Area.

Impact Evaluation

No direct impacts on yellow lance will occur as a result of the Project on the GWNF since no yellow lances were found at waterbody crossings, and the habitats at these crossings were found unsuitable for the species. Temporary indirect impacts on the species in the GWNF are also not anticipated based on the species' available distribution data, results of freshwater mussels surveys, and the downstream analysis. However, temporary indirect impacts on potential aquatic habitat are possible as a result of overland flow of sediments and potential contaminants from the construction area, and of downstream flow from waterbody crossings, into creeks outside of the GWNF that could provide potential habitat within 1 mile of the Project in the subwatershed affected by the Project (see Section 5.6.5.1), although the nearest documented occurrence of yellow lance occurs more than 1 mile from the Project area. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively low erosion rates along the construction workspace in the Scotchtown Draft-Cowpasture River subwatershed (see Table 8-1 in Appendix H). Temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.6.5.1).

Conservation Measures

Conservation measures to reduce potential impacts on the yellow lance and potential aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.6.5.2. In addition, the following conservation measure specific to yellow lance will be implemented:

In-water work in two UNTs to Cowpasture River at approximately [redacted] will be limited to May 15 to July 31 to avoid potential downstream impacts based on VDGIF time of year restrictions for these streams for yellow lance.

Preliminary Determination of Effect

Since no yellow lances were found in waterbodies crossed by the Project in the GWNF, and these waterbodies are not expected to support the species, yellow lance will not be directly affected by the Project. Any indirect water quality effects that could occur in potential habitat within 1 mile of the Project area will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the yellow lance in the GWNF.

5.6.5.7 Atlantic Pigtoe (*Fusconaia masoni*)

Species Description

The Atlantic pigtoe has a global conservation status of imperiled (G2) and a state conservation status in Virginia of imperiled (S2) (VDCR, 2016). The species is listed as threatened by the State of Virginia and is a candidate for federal listing. It is approximately 60 millimeters (2.4 inches) in length. The Atlantic pigtoe prefers fast-flowing water with coarse sand or gravel substrate, often at the downstream edge of riffles. The species' widespread decline and extirpation through its range is due to impoundments, pollution, and sedimentation from human activity.

Historically, the range of this species was from the Ogeechee drainage basin in Georgia north to the James River drainage basin in Virginia. According to the VDGIF Wildlife Environmental Review Map Service database, a population is known to occur in Craig Creek, Goshen Branch, and Little Calfpasture River, Virginia (Bogan and Alderman, 2004). This species is no longer found in the Ogeechee River system in Georgia (NatureServe, 2015).

Potential Presence in Project Area

No Atlantic pigtoes were found in waterbodies crossed by the Project on the GWNF during presence/absence and habitat suitability field surveys for other species in July 2016, and current habitat conditions in these waterbodies are not likely to support the species due to insufficient stream flow and size (see the survey report in Atlantic [2016l]). The two nearest documented occurrences are outside of the Analysis Area in Goshen Branch and Smith Creek in the lower Guys Run-Calfpasture River subwatershed (see Appendix I).

Impact Evaluation

No direct impacts on yellow lance will occur as a result of the Project on the GWNF since no yellow lances were found at waterbody crossings, and the habitats at these crossings were found unsuitable for the species. Temporary indirect impacts on the species either in the GWNF or due to Project activities on the GWNF are also not anticipated within the cumulative effects Analysis Area based on the species' available distribution data, results of freshwater mussels surveys, and the downstream analysis. Project flow from the Project area is not anticipated to reach the Guys Run-Calfpasture River subwatershed (see Appendix H).

Conservation Measures

No conservation measures are proposed for Atlantic pigtoe since no impacts to the species or its habitat are expected.

Preliminary Determination of Effect

Since the known range of the Atlantic pigtoe is outside of the Analysis Area, Atlantic determines that the Project will have *no impact* on Atlantic pigtoe in the GWNF.

5.6.5.8 Green Floater (*Lasmigona subviridis*)

Species Description

The green floater has a global conservation status of vulnerable (G3) and a state conservation status of imperiled (S2) (VDCR, 2016). The species is listed as threatened by the State of Virginia and is under review for federal listing. It is approximately 55 millimeters (2.1 inches) in length. The green floater is found in streams, small rivers, and canals of low to medium gradient at depths of 1 to 4 feet with slow pools and eddies, fine gravel and sand bottom, and mid-range calcium concentrations. It is averse to strong currents, and is usually found in hydrologically stable streams that are not those prone to flooding and drying and have good water quality.

Adult green floaters are filter feeders that primarily consume plankton and detritus (NatureServe, 2015). Green floater adults are largely sedentary and, as with most unionid bivalves, the species was thought to require a fish host during the larval portion of its life cycle, although specific host species have not been identified. However, there is recent evidence that juveniles of this species can metamorphose without a host within the marsupia of the adult female (NatureServe, 2015). The green floater breeding season is bradytictic, meaning it is a long term breeder, and it broods eggs/glochidia from August to June.

Historically, the green floater was widespread in Atlantic drainages, but currently the range of the green floater is limited from New York south to North Carolina and west to Tennessee and West Virginia, with historical extirpations occurring in several states, including Georgia and Kentucky (NatureServe, 2015). The population decline has resulted from eutrophication and siltation, as well as pressure from introduced species such as the Asian clam and zebra mussel (NatureServe, 2015). Hydrologic regime alteration, pollution, increased sediment load, nutrient enrichment, and increased stream temperatures from agriculture and municipal development have also likely contributed to the reduction in green floater and other freshwater mussel populations (Strayer and Jirka, 1997). Conservation recommendations include effective site and enforced species protection (Cummings and Cordeiro, 2012).

Potential Presence in Project Area

The green floater is found in the Kanawha drainage system above Kanawha Falls in Virginia, West Virginia, and North Carolina, as well as the Middle New River, Greenbrier River, and Upper James River sub-basins (Clarke, 1985), the latter of which contains the Project area in the GWNF. The green floater is known from five subwatersheds in the GWNF, including the Jim Dave Run–Back Creek, Bolar Run–Jackson River, Dry Run, Scotchtown Draft–Cowpasture River, and Lick Run–Stuart Run subwatersheds, four of which are crossed by the Project (see Appendix H). One study documents the green floater within the adjacent MNF (Nature Conservancy, 2001), and the species is known to occur in the West and East Fork Greenbrier River in the MNF. The green floater is not known to occur along the Project area in the GWNF. No green floaters were found in waterbodies crossed by the Project on the GWNF during presence/absence and habitat suitability field surveys for other species in July 2016, and current habitat conditions in these waterbodies are not likely to support the species due to insufficient stream flow and size (see the survey report in Atlantic [2016l]). Four perennial streams with potential habitat are traversed by the project, but none of these fall within GWNF property. Surveys have been completed at two of the four crossings and did not yield evidence of live mussels. The remaining crossings are greater than 1.6 kilometers (1.0 mile) upstream of the GWNF (see Appendix I). No documented occurrences of the species were found in the Analysis Area (Appendix I).

Impact Evaluation

No direct impacts on green floater will occur as a result of the Project on the GWNF since no green floaters were found at waterbody crossings, and the habitats at these crossings were found unsuitable for the species. Temporary indirect impacts on the species in the GWNF are not anticipated based on the species' available distribution data, results of freshwater mussel surveys, and the downstream analysis. However, temporary indirect impacts on potential aquatic habitat are possible as a result of overland flow of sediments and potential contaminants from the construction area, and of downstream flow from waterbody crossings, into low-current streams outside of the GWNF within the two subwatersheds affected by the Project (see Section 5.6.5.1), although there are no documented occurrences of green floater occur more than 1 mile from the Project area. Based on the Erosion and Sedimentation Report, the Project is predicted to produce relatively low to moderate erosion rates along the construction workspace in the Bolar Run–Jackson River, Dry Run, Scotchtown Draft–Cowpasture River, and Lick Run–Stuart Run subwatersheds (see Table 8-1 in Appendix H). Temporary impacts to aquatic habitat are expected to be minimal based on predicted erosion rates and dilution from overland and downstream flow (see Section 5.6.5.1).

Conservation Measures

Conservation measures to reduce potential indirect impacts to aquatic habitat, including ECDs, are discussed in Sections 5.4.3 and 5.6.5.2.

Preliminary Determination of Effect

Since no green floaters were found in waterbodies crossed by the Project in the GWNF, and these waterbodies do not contain suitable habitat, the green floater will not be directly affected by the Project. Any indirect water quality effects that could occur in potential habitat within 1 mile of the Project area will be temporary and are anticipated to be minimal with the implementation of conservation measures. Therefore, Atlantic determines that the Project *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability* of the green floater in the GWNF.

5.6.6 Other Invertebrates (Snails, Pseudoscorpions, Amphibods, Isopods, Millipedes, Centipedes, Springtails, Mayflies, Dragonflies, Stoneflies, Beetles, Scorpionflies, and Butterflies and Moths)

The RFSS list for the Project contains 52 invertebrates other than mussels (see Appendix E). Of these, 21 species have the potential to occur in the Project area based on range and habitat, 5 of which are cave obligates and are discussed in Section 5.6.1. The remaining species, one snail, four millipedes, one centipedes, one dragonfly, three beetles, and six months and butterflies, were included in field surveys. There was a historic (1985) documented occurrence of one of these species, frosted elfin (*Callphrys irus*), within 2 miles of the Project centerline in the GWNF based on VDCR NHD data, although field surveys found no suitable habitat in the Project area.

Field surveys were carried out within a 300-foot-wide survey corridor centered on the proposed right-of-way. Surveys were conducted in potentially suitable habitat based on a desktop analysis and coordination with USFS and the VDCR (see the insect habitat assessment and survey report in Atlantic [2016k]). Potential habitats were surveyed for presence/absence, host plants, and habitat suitability in June 2016, with a follow-up presence/absence survey for Maureen's hydraenan minute moss beetle (*Hydraena maureenae*) in suitable habitat in October 2016. Suitable habitat was found for 12 species, and preferred host plants were found for eight species: both suitable habitat and host plants were found for six species. However, no RFSS insects were found during the June surveys. For two species, Herodias underwing and Milne's euchlaena moth, presence/absence could not be determined due to the need for nocturnal surveys using ultra-violet light, which were not carried out, while for Appalachian grizzled skipper, surveys took place outside of the necessary survey season: therefore, presence is assumed for these three species and they are analyzed further below (see Table 5.6.6-1). One species, Maureen's hydraenan minute moss beetle was found in six streams during follow-up surveys in October 2016.

A separate habitat analysis and survey was carried for millipedes, centipedes, and a snail (see the field survey report for *Diplopoda* and *Gastropoda* in Atlantic [2016f]). Seventy-one collection sites along the GWNF Project corridor were surveyed for sensitive species. All millipedes, centipedes, and snails encountered were collected and identified. Preliminary results of the snail identifications concerning round supercoil (*Paravitrea reesei*) were negative: these negative results were confirmed by an expert in January 2017, with the conclusion that no round supercoil were found in the Project area. One RFSS millipede, Hoffman's cleidogonid millipede (*Cleidogona hoffmani*), was found at nine sites. Another RFSS millipede (Shenandoah Mountain xystodesmid millipede [*Nannaria shenandoa*]) may have been found at six sites, although identifications were inconclusive: presence will be assumed for the purpose of this analysis. In addition, a potential new species of millipede of the genus Rudiloria was discovered during the survey. Atlantic will consult with the GWNF to determine the analysis and conservation needs for this species, the results of which will be addressed for the final BE. The following sections provide an analysis of potential impacts, conservation measures, and a preliminary determination of effect for RFSS invertebrates with documented occurrences or potential habitat in the Project area.

TABLE 5.6.6-1

Regional Forester Sensitive Species Other Invertebrates with Potential Habitat in the George Washington National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
SNAILS		
Paravitrea reesei	Round supercoil	Calcareous woodlands and glades, prefers moist environments such as under rocks, in moist leaf litter, and on river bluffs and slopes near water. In Monroe and Summers Counties in WV. In scattered western counties in VA: found in Jefferson National Forest and Carroll, Pulaski, Montgomery, Pittsylvania, Carroll, Grayson, and Smyth Counties.
AMPHIPODS	—	
None		—
ISOPODS		
None	—	—
MILLIPEDES		
Cleidogona hoffmani [a]	Hoffman's cleidogonid millipede	Mountaintop species, leaf litter, deciduous forests in Bland, Grayson, and Smyth Counties in VA. Only known from 12 locations in Tennessee, North Carolina, and Virginia.
Nannaria shenandoa [a]	Shenandoah Mountain xystodesmid millipede	Leaf litter, mixed oak forest in Rockingham and Augusta County, VA from 831 to 1,094 feet. Also identified within the South Fork Shenandoah Watershed.
CENTIPEDES		
None		
SPRINGTAILS		
None	—	—
MAYFLIES		
None	—	—
DRAGONFLIES		
None	—	—
STONEFLIES		
None	—	—
BEETLES		
Hydraena maureenae [a]	Maureen's hydraenan minute moss beetle	Interstitial water in riparian-shale substrate along stream edge in Bath County, VA. Found in seven streams during field surveys.
SCORPIONFLIES		
None	—	—
BUTTERFLIES / MOTHS		
REQUIRES FOREST HABITAT		
Catocala herodias gerhardi	Herodias underwing	Pitch pine/bear oak scrub woodlands, >3000 feet: in Augusta and Bath Counties, VA. Larval food plants are oaks, (e.g., scrub oak).
Euchlaena milnei	Milne's euchlaena moth	Moist, forested slopes of mixed pine hardwood forests or oak woodlands with acidic soil: in Augusta and Bath Counties, VA. Larval food plants include willows.
REQUIRES OR IS TOLERANT OF OPEN OR EDGE HABITAT		
Pyrgus centaureae wyandot	Appalachian grizzled skipper	Shale barrens, open shale in oak woodlands in Alleghany, Frederick, Montgomery, Roanoke, Rockbridge, Salem (City) Counties, VA. Dwarf cinquefoil is a host plant.
Callophrys irus	Frosted elfin	Pine barrens and oak savannas; dry, open woods, clearings, and road/powerline ROWs with abundant wild indigo and/or lupine. In Augusta, Fairfax, Isle of Wight, Montgomery, Prince William, Roanoke, Rockbridge, and Spotsylvania counties, VA. VDCR NHD documented occurrence within approximately 1,008 feet of the Project centerline (2016 data; 1985 occurrence).

Sources: See Appendix E

[a] Found during 2016 field surveys (see Atlantic [2016k])

5.6.6.1 Hoffman's Cleidogonid Millipede (*Cleidogona hoffmani*)

Species Description

Hoffman's cleidogonid millipede (Hoffman's millipede) has a global conservation status of vulnerable (G3) and a state conservation status ranging from imperiled to vulnerable (S2S3) in Virginia (VDCR, 2016). The species prefers leaf litter within deciduous forests habitat. They may also be found under decaying logs (Jean, 2017). While there is limited information available on this species, the order of Hoffman's millipede, Order *Chordeumatida*, typically have a lifespan of approximately 6 to 8 months based on research done on European species (Spelda, 2015). Juveniles typically hatch in late summer, with the first adults developing in the fall. The most active period for adults is late fall and early spring, and they die after laying their eggs either in the fall or before summer (Meyer, 1990, as cited in Spelda, 2015).

Potential Presence in Project Area

The Hoffman's millipede preferred habitat, deciduous forest, is common in the Project area and GWNF (see Section 4.1). The habitat analysis and survey carried out for millipedes and centipedes found Hoffman's millipede at nine sites along the Project area: seven of these sites were located within the Project area between [redacted] (see Appendix A; Atlantic [2016f]). Hoffman's millipede occurred most frequently in acidic oak hickory forest, but was also found in modified successional terrestrial forest, oak-heath forest, and dry mesic calcareous forest. No other known occurrences of Hoffman's millipede occur within 2 miles of the Project centerline based on VDCR NHD data.

Impact Evaluation

Because Hoffman's millipede was found in the Project area, direct impacts to the species are anticipated. Direct impacts may include injury to or mortality of individuals as a result of construction activities. In addition, habitat impacts would include the removal of deciduous forest habitat for the right-of-way and new access roads (see Table 5.6.6-1). A portion of the deciduous forest habitat will be allowed to revegetate in the temporary workspace following construction, although recovery will likely take approximately 20 years. Project maintenance and operation would result in the long-term loss of forest habitat in the permanent right-of-way and new permanent access road corridors.

Avoidance and Minimization

Atlantic has considered the feasibility of avoidance and minimization of impacts to the Hoffman's millipede populations by shifting the pipeline right-of-way or moving temporary construction workspace, as required for RFSS by the GWNF Land and Resource Management Plan (LRMP). However, given the number of areas found with Hoffman's millipede over a substantial segment of pipeline right-of-way, and with similar forest habitat widespread on both sides of the pipeline right-of-way, it is anticipated that Hoffman's millipede is also abundant in this area. As such, rerouting the pipeline around the areas found to contain Hoffman's millipede would not likely avoid the species. In addition, reducing the affected area by narrowing the construction right-of-way would not likely have a significant effect on the species. As such, Atlantic is not proposing any avoidance measures, but will implement mitigation measures to reduce impacts.

<u>Conservation Measures</u>

Atlantic will take steps to restore the temporary workspaces to stabilize disturbed habitats and re-establish potential deciduous forest habitat following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Erosion and Sediment Control Measures, Timber Removal Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). In addition, Atlantic will implement site-specific conservation measures for the areas documented to contain Hoffman's millipede between [redacted] Relevant conservation measures include the following:

- Felled woody debris will be retained along the edge of the right-of-way to enhance habitat for Hoffman's millipede.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts on Hoffman's millipede by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- In areas where Hoffman's millipede was found (see mileposts above), Atlantic will coordinate with the GWNF to include overstory species associated with Hoffman's millipede in the revegetation plan to more quickly restore deciduous forest habitat suitable for Hoffman's millipede.

- No pesticides will be used on GWNF property in order to avoid potential harm to Hoffman's millipede and other organisms.

- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Conservation measures to reduce erosion will be implemented in suitable habitat both during and after construction per the Upland Erosion Control Plan, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

  - o Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

  - o Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

  - o use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);

  - o installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - o mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

  - o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - o monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - o reporting of restoration status following field inspections

Preliminary Determination of Effect

Since they were found at multiple sites in the Project area, Hoffman's millipedes are likely to experience direct and indirect adverse effects as a result of the Project, including potential mortality and loss of forest habitat. Given the species' apparent widespread distribution in the GWNF Project area, Hoffman's millipedes are anticipated to occur in adjacent forest habitats. In addition, two occupied habitats were outside of the Project area and would remain undisturbed. Given the likely presence of Hoffman's millipede in abundant forest habitat adjacent to the Project area, and with the re-establishment of forest habitat in temporary workspaces through implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of Hoffman's millipede in the GWNF.

5.6.6.2 Shenandoah Mountain Xystodesmid Millipede (*Nannaria shenandoa*)

Species Description

The Shenandoah Mountain xystodesmid millipede (Shenandoah millipede) has a global conservation status of critically imperiled (G1) and a state conservation status of critically imperiled (S1) in Virginia (VDCR, 2016). The species prefers leaf litter within a mixed oak forest.

Potential Presence in Project Area

The species' preferred habitat, mixed oak forest, is common in the Project area and GWNF (see Section 4.1). The habitat analysis and field survey found suitable habitat for the Shenandoah millipede as well as potential Shenandoah millipede (*Nannaria* spp.) at six sites along the Project area, although species determinations were inconclusive: presence of Shenandoah millipede will be assumed for the purpose of this analysis (see Atlantic [2016f]). Four of the sites where *Nannaria* spp. were found occur in the Project area between [redacted] (see Appendix A). Most of the *Nannaria* spp. occurrences were found in acidic oak forest, although one was also found in Piedmont Mountain Floodplain Forest. No other known occurrences of the Shenandoah millipede occur within 2 miles of the Project centerline based on VDCR NHD data.

Impact Evaluation

Because the Shenandoah millipede may have been found in the Project area, direct impacts to the species are anticipated. Direct impacts may include injury to or mortality of individuals as a result of construction activities. In addition, temporary impacts would include the removal of forest habitat for the right-of-way and new access roads (see Table 5.6.6-1). A portion of the forest habitat will be allowed to revegetate in the temporary workspace following construction, although recovery will likely take approximately 20 y[redacted]ars. Project maintenance and operation would result in the long-term loss of forest habitat in the permanent right-of-way and new permanent access road corridors.

Avoidance and Minimization

Atlantic has considered the feasibility of avoidance and minimization of impacts to the Shenandoah millipede populations by shifting the pipeline right-of-way or moving temporary construction workspace, as required for RFSS by the GWNF Land and Resource Management Plan (LRMP). However, given the number of areas found with Shenandoah millipede over a substantial segment of pipeline right-of-way, and with similar forest habitat widespread on both sides of the pipeline right-of-way, it is anticipated that Shenandoah millipede is also abundant in this area. As such, rerouting the pipeline around the areas found to contain Shenandoah millipede would not likely avoid the species. In addition, reducing the affected area by narrowing the construction right-of-way would not likely have a significant effect on the species. As such, Atlantic is not proposing any avoidance or minimization measures, but will implement mitigation measures to reduce impacts.

Conservation Measures

Atlantic will take steps to restore the temporary workspaces to re-establish potential forest habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Erosion and Sediment Control Measures, Timber Removal Plan, Restoration and Rehabilitation Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). In addition, Atlantic will implement site-specific conservation measures for the areas documented to contain *Nannaria* spp. between [redacted] Relevant conservation measures include the following:

- Felled woody debris will be retained along the edge of the right-of-way to enhance habitat for Shenandoah millipede.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts on Shenandoah millipede by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- In areas where Shenandoah millipede was found (see mileposts above), Atlantic will coordinate with the GWNF to include overstory species associated with Shenandoah millipede, such as oak species, to more quickly restore forest habitat suitable for Shenandoah millipede.

- No pesticides will be used on GWNF property in order to avoid potential harm to Shenandoah millipede and other organisms.

- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- Conservation measures to reduce erosion will be implemented in suitable habitat both during and after construction per the Upland Erosion Control Plan, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including
  - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);
  - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
  - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
  - monitoring to assess all restored areas on USFS lands in years 1 and 5;
  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
  - reporting of restoration status following field inspections.

Preliminary Determination of Effect

Since they were found at a number of sites in the Project area, Shenandoah millipede is likely to experience direct and indirect adverse effects as a result of the Project, including potential mortality and loss of potentially suitable forest habitat. Given the species' apparent widespread distribution in the GWNF Project area, Shenandoah millipedes are anticipated to occur in adjacent forest habitats. Given the likely presence of Shenandoah millipede in abundant forest habitat adjacent to the Project area, and with the re-establishment of forest habitat in temporary workspaces through implementation of the conservation measures listed above, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of Shenandoah millipede in the GWNF.

5.6.6.3 Maureen's hydraenan minute moss beetle (*Hydraena maureenae*)

Species Description

The Maureen's hydraenan minute moss beetle (Maureen's beetle) is a small aquatic beetle that is approximately 0.05 inches in length (ESI, 2016b). Endemic to Bath County, Virginia, the global and state status of this species is potentially imperiled (G2?/S2?) (VDCR, 2016). Virginia's Wildlife Action Plan ranks this species as Tier II (VDGIF, 2016). Suitable habitat includes the margins of clear mountain streams with a shale substrate. As an adult, it shelters in sand grains in shallow water and among submerged vegetation along stream margins, while larvae subsist in the moist soil of the riparian zone (Thorp and Covich, 2010; NatureServe, 2015). Adults cannot swim and will float upside down at the surface if dislodged from the substrate (Thorp and Covich, 2010). It is hypothesized that this species is active year round (ESI, 2016b). Threats to this species may include reduced oxygen concentrations, elevated water temperatures, extremes of flow, and pollution, particularly from soaps and detergents (Elliott, 2008).

Potential Presence in Project Area

There are no VDCR NHD documented occurrences of Maureen's beetle within 2 miles of the centerline. However, Maureen's beetle is known to occur in Bath County, and suitable habitat was found during the June 2016 field survey. A follow up survey in October 2016 conducted throughout the survey area found eight streams with suitable habitat. Eight individuals of Maureen's beetle were found in six streams at [redacted] All six sites where Maureen's beetles were found in the Project area occur at Project waterbody crossings (see Appendix A). Existing USFS Roads also occur near these occurrences. However, since these roads are existing and no road expansion is anticipated, no new impacts to Maureen's beetle would occur due to use of these roads.

Impact Evaluation

Because Maureen's beetle was found at six waterbody crossings, direct impacts to the species are anticipated. Direct impacts may include injury to or mortality of individuals as a result of pipeline construction activities. Temporary water quality impacts may occur to the beetle's aquatic habitat, both at the waterbody crossings, downstream from the waterbody crossings, and in waterbodies adjacent to the construction workspace, as described in Section 5.4. Indirect impacts would include the temporary loss of riparian vegetation, which would reduce shading and could adversely affect water temperatures in Maureen's beetle aquatic habitat across the 125-foot-wide construction right-of-way. Approximately 30 feet of riparian area on either side of waterbody crossings will be permanently converted from forested riparian habitat to herbaceous and scrub/shrub riparian habitat since trees will not be allowed to develop within 15 feet of the pipeline adjacent to a waterbody, and vegetation will be limited to herbaceous plants and shrubs in this area. In addition, soils disturbed by construction activities can also facilitate the spread of non-native invasive plant species such as Japanese knotweed, which can degrade riparian and aquatic habitat by displacing native plant species, destabilizing streambanks, and creating dense stands of vegetation that can adversely affect water quality and riparian and aquatic habitat (Potomac Highlands Cooperative Weed and Pest Management Area, 2011).

Avoidance and Minimization

Atlantic has evaluated the feasibility of avoidance and minimization of impacts to Maureen's beetle by shifting the pipeline right-of-way or moving temporary construction workspace, as required for RFSS by the GWNF Land and Resource Management Plan (LRMP). However, given the number of areas found with Maureen's beetle, and with similar suitable habitats upstream and downstream of the pipeline right-of-way, it is anticipated that Maureen's beetle is abundant in this area. As such, rerouting the pipeline around the areas found to contain Maureen's beetle would not likely avoid the species. Horizontal directional drill will not be feasible due to the geology at the stream crossings. As such, Atlantic is not proposing any avoidance or minimization measures, but will implement mitigation measures to reduce impacts on Maureen's beetle.

Conservation Measures

Potential impacts to Maureen's beetle aquatic habitat will be mitigated through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, Timber Removal Plan, SPCC Plan, Contaminated Media Plan, Restoration and Rehabilitation Plan, Non-Native Invasive Plant Species Management Plan, and Water Quality Monitoring Plan, as specified in the *COM Plan* (see Appendix C). In addition, Atlantic will implement conservation measures for the waterbody crossings documented to contain Maureen's beetle at [redacted]. Relevant conservation measures include the following:

- Ground disturbance at waterbody crossings will be limited to the trench line and travel lane, rather than the entire 125-foot right-of-way, which will minimize impacts to Maureen's beetle and associated habitat.

- Adequate waterbody flow rates will be maintained around the construction area in order to sustain Maureen's beetle habitat downstream of the construction area during construction.

- No new permanent roads will be constructed across the waterbodies documented to contain Maureen's beetle, which will avoid potential modification of Maureen's beetle habitat.

- Blasting will be used for rock removal as needed at the six pipeline waterbody crossings documented to contain Maureen's beetle, since it is the least environmentally impactful method for rock removal.

- The following conservation measures that will be implemented according to the Visual Resources Plan may also help mitigate impacts to Maureen's beetle by re-establishing or retaining the existing light and temperature regimes in aquatic habitat through re-establishing or retaining forested riparian habitat:

    - The outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF, including species suitable for riparian areas.

    - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to Maureen's beetle riparian and aquatic habitat, including

    - employment of least-intrusive tree removal methods to reduce damage to adjacent forested riparian habitat;

    - avoiding altering existing surface drainage patterns by the placement of timber or brush piles at the edge of the construction right-of-way;

    - logs and slash will not be yarded across perennial streams unless fully suspended;

- logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment; and
- any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.

- Conservation measures will be implemented to reduce impacts to aquatic habitat both during and after construction per the Project's Stream and Wetland Crossing Procedures, including
    - completing construction across streams as quickly as possible.
    - limiting in-water work to seasonal restrictions where applicable, as specified in Section 2.2.2.2 and Appendix B;
    - locating spoil from waterbody crossings at least 10 feet from the water's edge;
    - locating all extra work areas (such as staging areas) at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land;
    - installation of sediment barriers along the entire construction right-of-way within the waterbody immediately after initial disturbance of the waterbody or in adjacent upland, and continued maintenance throughout construction to prevent the flow of sediments into the waterbody;
    - maintenance of a clearly marked 100-foot-wide vegetative buffer between a waterbody and the pipeline right-of-way where it runs parallel to the waterbody;
    - maintenance of adequate waterbody flow rates to prevent the interruption of existing downstream uses;
    - stabilization of waterbody banks and installation of temporary sediment barriers within 24 hours of completing instream construction activities.
    - restoration of steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces);
    - restoration of all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI;
    - restricting the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.
    - revegetation of disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

- Conservation measures will be implemented to reduce stormwater runoff from upland construction areas to aquatic habitat both during and after construction per the Upland Erosion Control Plan, including
    - prohibiting the use of herbicides in or within 100 feet of a stream or wetland, except as allowed by the USFS;
    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;
    - Stabilization of access road surfaces by grading and installing stone where needed;
    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;
    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;
- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to stabilize streambanks and reduce upland stormwater runoff to aquatic habitat both during and after construction, including
    - completion of final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench, seasonal or other weather conditions permitting;
    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
    - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
    - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion (no tackifiers will be used within 100 feet of wetlands and waterbodies);
    - no use of lime or fertilizer within 100 feet of wetlands or waterbodies;
    - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
    - monitoring to assess all restored areas on USFS lands in years 1 and 5;

- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

- reporting of restoration status following field inspections

- Inspection and monitoring will be carried out to ensure conservation measures at waterbody crossings and adjacent upland areas are properly employed and maintained to reduce stormwater runoff to aquatic habitat both during and after construction per the Project's Water Quality Monitoring Plan, including

  - monitoring turbidity at all stream crossings that are state-designated as coldwater fisheries four times per day during active construction both 50 feet upstream and downstream from the construction area, and one time per day for four days following the completion of restoration activities;

  - implementation of remediation measures should the chronic turbidity reading exceed standards.

- Atlantic will adhere to the Spill Prevention, Control, and Countermeasure Plan to prevent hazardous materials from entering aquatic habitat, including

  - restricting equipment refueling and lubricating and storage of hazardous materials to upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

- Conservation measures in the Non-Native Invasive Plant Species Management Plan to prevent the spread of non-native invasive plants that could degrade rapids clubtail riparian habitat (also see Section 5.6.7), including

  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

<u>Preliminary Determination of Effect</u>

Since they were found at multiple Project waterbody crossings, Maureen's beetle is likely to experience direct and indirect adverse effects as a result of the Project, including potential mortality and temporary alteration of suitable aquatic habitat. Given the species' apparent widespread distribution in the GWNF Project area, Maureen's beetle are anticipated to occur in aquatic habitats adjacent to the occupied waterbody crossings. Given the likely presence of Maureen's beetle in aquatic habitat adjacent to the Project area, and with the implementation of the conservation measures described above to protect Maureen's beetle, minimize habitat impacts during construction, and help re-establish aquatic habitat following construction, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of Maureen's beetle in the GWNF.

5.6.6.4 Herodias Underwing (*Catocala herodias gerhardi*)

Species Description

The Herodias underwing is a moth with a wingspan of 1 to 1.5 inches (ESI, 2016b). The forewings are gray with brown streaks and dark colored veins. The hind wings are orange with red and black bands (Nelson, 2007). Northern populations have a whitish margin along the front edge distinguishing it from other species (ESI, 2016b). Globally this species is considered imperiled to vulnerable (S2S3) at the state level in Virginia and vulnerable (G3) at the global level (VDCR, 2016). The Virginia Wildlife Action Plan lists the underwing as having a high conservation need (Tier III). The species is unranked in West Virginia. The Herodias Underwing ranges from Massachusetts, Connecticut, New Jersey, New York, and Virginia, to West Virginia (Nelson, 2007).

Herodias underwing moths prefer pitch pine (*P. rigida*) and scrub oak (*Quercus ilicifolia*) scrub woodlands and oak-pine barrens (Nelson, 2007; WVDNR, 2015). The larval food plants are oaks, particularly scrub oak. Adults of the species are active from July to August (ESI, 2016b).

Factors that result in population declines include pesticide applications for gypsy moth control. Habitat loss from development and over browsing by white-tailed deer has also contributed to declines of this species and local extirpation (WVDNR, 2015). In addition, off-road vehicles in suitable habitat can threaten local populations (Nelson, 2007).

Potential Presence in Analysis Area

There are no VDCR NHD documented occurrences of Herodias underwing within 2 miles of the centerline, although Herodias underwing has been found in Augusta and Bath County, Virginia. Both suitable habitat and host species were found in the Project area during the field survey. Acidic oak hickory forest, which could provide suitable habitat, is the most common ecological community group in the Project area. Scrub/bear oak (*Q. ilicifolia*) was among the oak species encountered, especially in areas above 3,000 feet elevation. Presence/absence of this species in the survey area cannot be determined since nocturnal surveys with ultra-violet light would be needed, but were not able to be carried out within the active season for the species. Therefore, presence of this species is assumed in the Project area.

Impact Evaluation

Direct impacts to Herodias underwing could occur if individuals are present in the Project area during construction. Adult moths and larvae could be crushed by construction equipment or displaced by construction disturbance. Impacts would include the loss of varying types of oak forest habitats, which would be cleared from the right-of-way and new access roads during construction (see Table 5.2.2-1). A portion of these habitats would be allowed to revegetate in the temporary workspace following construction, although recovery would likely take approximately 20 years before the habitat would likely support Herodias underwing. Project maintenance and operation would result in the long-term loss of forest habitat in the permanent right-of-way and new permanent road corridors.

Conservation Measures

Atlantic will restore the temporary workspaces to re-establish oak and pine forest habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, Timber Management Plan, Non-Native Invasive Plant Species Management Plan, and Visual Resources Plan, as specified in the *COM Plan* (see

Appendix C). A conservation measure specific to Herodias underwing will also be applied. Relevant conservation measures include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Herodias underwing by re-establishing or retaining suitable forest habitat:
  - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.
  - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Atlantic will coordinate with the GWNF to include Herodia's underwing host plants, if commercially available, in the revegetation plan to help create suitable habitat for the species, including pitch pine and scrub oak.
- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail.
- No pesticides will be used on GWNF property in order to avoid potential harm to Herodias underwing and other organisms.
- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including
  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.
- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including
  - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;
  - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;
  - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;
- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

- use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);
- installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;
- mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;
- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
- application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
- regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
- monitoring to assess all restored areas on USFS lands in years 1 and 5;
- monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
- reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.6.7), including
  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

If present in the Project area, Herodias underwings would experience direct and indirect adverse effects as a result of the Project, including potential mortality and alteration of potentially suitable habitat. Since a portion of forest habitat will be restored following construction; and since abundant suitable forest habitat will persist adjacent to the Project area and throughout the GWNF, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of the Herodias underwing in the GWNF.

5.6.6.5 Milne's Euchlaena Moth (*Euchlaena milnei*)

Species Description

Milne's euchlaena moth is a medium sized moth that ranges from Illinois, North Carolina, Ohio, Virginia, and Wisconsin, to West Virginia. The moth is identified as having dull yellow wings outlined in maroon or brown. Brown patches are present in the rear half of the hindwings and inner portion of the forewings. The species is very similar to the common *E. trigrinaria*, but color and slight pattern variations in the wings distinguish the two (ESI, 2016b). The species has a global conservation status of imperiled to apparently secure (G2G4) (VDCR, 2016). In Virginia, the conservation status in the state is imperiled (S2) (VDCR, 2016), and the moth is considered as having a moderate conservation need (Tier IV) (VDGIF, 2016).

Known distribution of this species is widespread but spotty and disjunct. The States in which the species is known to occur include Illinois, Maryland, North Carolina, Ohio, Virginia, West Virginia, and Wisconsin. Definitive habitat is unknown due to the widespread distribution and rare occurrences of the species (ESI, 2016b). However, it is known that this species prefers moist slopes in mixed pine/hardwood forests or oak woodlands with acidic soils. Food sources are unknown but may include rose, oak, maple, birch, and willows based on preferences by other members of the genus (Olcott, 2016). The moth is active in June and July (WVDNR, 2015; ESI, 2016b). Larva probably feed until a mid to late instar, then overwinter in leaf litter and complete development in the spring. Predators to the species include bats, owls, birds, and lizards.

Threats to the species include gypsy moth and Dimilin spraying. Additionally, the tree litter where the pupation period takes place is sensitive to fire.

Potential Presence in Analysis Area

This is a very rare species with few remaining individuals in Virginia, and there are no VDCR NHD documented occurrences of Milne's Euchlaena moth within 2 miles of the centerline. The species has been found in Augusta and Bath Counties. Both suitable habitat and potential host species were found in the Project area during the field survey. Acidic oak hickory forest, which could provide suitable habitat, is the most common ecological community group in the Project area. Scrub/bear oak (*Quercus ilicifolia*), a potential host species, was among the oak species encountered, especially in areas above 3,000 feet elevation. Presence/absence of this species in the survey area cannot be determined since nocturnal surveys with ultra-violet light would be needed for detection, but were not able to be carried out within the active season for the species. Therefore, presence of this species is assumed in the Project area.

Impact Evaluation

Direct impacts to Milne's euchlaena moth could occur if individuals are present in the Project area during construction. Adult moths and larvae could be crushed by construction equipment or displaced by construction disturbance. Habitat impacts would include the loss of varying types of oak and mixed pine-deciduous forest habitats, which would be cleared from the right-of-way and new access roads during construction (see Table 5.2.2-1). A portion of these habitats would be allowed to revegetate in the temporary workspace following construction, although recovery would likely take approximately 20 years before the habitat would likely support Milne's euchlaena moth. Project maintenance and operation would result in the long-term loss of forest habitat in the permanent right-of-way and new permanent road corridors.

<u>Conservation Measures</u>

Atlantic will restore the temporary workspaces to re-establish oak and mixed pine-hardwood forest habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, Timber Management Plan, Non-Native Invasive Plant Species Management Plan, and Visual Resources Plan, as specified in the *COM Plan* (see Appendix C). A conservation measures specific to Milne's euchlaena moth will also be applied. Conservation measures relevant to Milne's euchlaena moth include the following:

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to Milne's euchlaena moth by re-establishing or retaining suitable forest habitat:
  - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.
  - Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.
- Atlantic will coordinate with the GWNF to include Milne's euchlaena moth host plants, if commercially available, in the revegetation plan to help create suitable habitat for the species, such as wild rose, oak, maple, birch, and willow.
- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail.
- No pesticides will be used on GWNF property in order to avoid potential harm to Milne's euchlaena moth and other organisms.
- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest foraging habitat, including
  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.
- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including
  - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;
  - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

  - o Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

  - o use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);

  - o installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

  - o mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - o targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

  - o application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

  - o regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

  - o monitoring to assess all restored areas on USFS lands in years 1 and 5;

  - o monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

  - o reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.6.7), including

  - o cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

If present in the Project area, Milne's euchlaena moth would experience direct and indirect adverse effects as a result of the Project, including potential mortality and alteration of potentially suitable habitat. Since a portion of the potential forest habitat will be restored following construction; and since abundant suitable forest habitat will persist adjacent to the Project area and throughout the GWNF, Atlantic determines that the Project *may impact individuals, but is not likely to cause a trend toward federal listing or loss of viability* of Milne's euchlaena moth in the GWNF.

5.6.6.6 Frosted elfin (*Callophrys irus*)

Species Description

The frosted elfin is a small hairstreak butterfly with a wingspan of 1.25 inches. The wings are brownish grey with faint dark lines. A dark spot on the lower hindwing, found on most individuals, can be a distinguishing feature (Brock and Kaufman, 2003). The global conservation status is ranked as vulnerable (G3) (VDCR, 2016). The frosted elfin is ranked under the Virginia Wildlife Action Plan as moderate conservation need (Tier IV) (VDGIF, 2016), with a state conservation ranking in Virginia of critically imperiled (S1) (VDCR, 2016). This species ranges throughout eastern North American from Southern Canada to north Florida, but is regarded as uncommon throughout its range (Brock and Kaufman, 2003).

Habitat includes pine-oak woodlands with rocky soils, recently burned areas of savannas and oak barrens with sand and rocky soils (WVDNR, 2015). With the loss of much of this habitat, most populations rely on managed open areas with nearby tree cover. Populations have been known to occur in utility right-of-ways and maintained openings along railroads (PNHP, 2008). There are two subgroups that occur within the global population. The larva of one population feeds on wild indigo (*Baptisia australis)*, while the other feeds on lupine (*Lupinus perennis)* (PNHP, 2008).

For a managed area to be suitable for this species, the area should be maintained as open grassy habitat. Mowing should be limited to late summer, fall or winter. Herbicide application or spring mowing can be detrimental to local populations (PNHP, 2008). Although historic populations relied on fire to maintain open habitat, overuse of prescribed burns can have negative impacts to populations by reducing egg and larval survival (PNHP, 2008). Other factors, such as overbrowsing by white-tailed deer can reduce larval food sources and result in the decline of local populations (WVDNR, 2015).

Potential Presence in Project Area

There is a VDCR NHD documented occurrence within approximately 1,008 feet of the Project centerline from 1985, although frosted elfin is now believed to be extirpated from Augusta County. It is not known to occur in Bath or Highland Counties. Neither frosted elfin nor suitable habitat was found during field surveys. Therefore, the species is not likely to occur in the Project area.

Impact Evaluation

Because frosted elfin relies on open grassy habitat, the development and maintenance of a 53.5-foot-wide right-of-way passing through the GWNF and into other counties could provide suitable habitat and a dispersal corridor for the species.

Conservation Measures

Atlantic will restore the permanent right-of-way to establish potential suitable open habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to frosted elfin will also be applied. Relevant conservation measures include the following:

- Atlantic will coordinate with the GWNF to include the frosted elfin host plants wild indigo and lupine, if commercially available, in the revegetation plan to help create suitable habitat for the species in the permanent right-of-way.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

    - installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

    - removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);

    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

    - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

    - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;

    - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;

    - monitoring to assess all restored areas on USFS lands in years 1 and 5;

    - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;

    - reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.6.7), including
  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

Preliminary Determination of Effect

Because of the potential creation of suitable habitat, and with implementation of the habitat restoration measures described above, Atlantic determines that the Project could have a *beneficial impact* on frosted elfin in the GWNF.

5.6.6.7 Appalachian grizzled skipper (*Pyrgus centaureae wyandot*)

Species Description

The Appalachian grizzled skipper is a small dark butterfly with white "checkered" patterning on the wings. The body is covered with dark hairs (Brock and Kaufman, 2003). Globally this subspecies is ranked critically imperiled to imperiled, though the status of the species is secure (G5T1T2) (VDCR, 2016). In Virginia, the species has a conservation status of critically imperiled (S1), is listed as state threatened, and is ranked by the Virginia Wildlife Action Plan as having "critical conservation need" (Tier I) (VDGIF, 2016). This species has disappeared from parts of its historic range, such as New York and New Jersey. Prior to 1994, the species was a Candidate for listing under the Endangered Species Act. However, it no longer has a federal status. This species occurs on only four sites in Virginia, within Allegheny and Rockbridge County. One of these sites is a ruffed grouse management area within the George Washington National Forest (Parshall, 2002).

Suitable habitat in Virginia tends to be elevated on dryer south-facing slopes and ridges (Parshall, 2002). The species prefer openings in oak or pine forest with sandy soils (WVDNR, 2015). The larval host of this species is Canada cinquefoil and requires this plant in abundance. Adults are early flying butterflies, starting as early as mid-April. Eggs are oviposited beneath the leaves of cinquefoil, and produce only one brood per year. The larvae pupate in late summer and will overwinter in that state. This skipper is non-migratory (Parshall, 2002).

Pesticide spraying for gypsy moth control is the primary factor causing population declines of this species within the Appalachian Mountains. Other factors include overuse of prescribed burns and land development (Brock and Kaufman, 2003). The host plant can occur in a variety of habitats, including dry-mesic to dry forests, woodlands, barrens, clearings, fields, and roadsides (Virginia Botanical Associates, 2016). It has been found that pipeline corridors can aid the skipper in dispersing to new habitats, and open habitat maintained by right-of-way could provide suitable habitat (Parshall, 2002).

Potential Presence in Project Area

There are no VDCR NHD documented occurrences of Appalachian grizzled skipper within 2 miles of the centerline. No Appalachian grizzled skipper caterpillar activity was observed on host plants (dwarf cinquefoil) in the survey area. However, due to the inability to survey for adult butterflies during the appropriate survey window between April and May, the survey for Appalachian grizzled skipper is inconclusive. Therefore, this species is assumed present in the Project area.

Impact Evaluation

Because Appalachian grizzled skipper can occur open grassy habitat, including open habitat maintained as right-of-way, the development and maintenance of a 53.5-foot-wide right-of-way passing through the GWNF and into other counties could provide suitable habitat and a dispersal corridor for the species.

Conservation Measures

Atlantic will restore the permanent right-of-way to establish potential open and edge habitats following construction through the implementation of the standard conservation measures in the Upland Erosion Control Plan, Restoration and Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). A conservation measure specific to Appalachian grizzled skipper will also be applied. Relevant conservation measures include the following:

- Atlantic will coordinate with the GWNF to include Appalachian grizzled skipper host plants, if commercially available, in the revegetation plan to help create suitable habitat for the species in the permanent right-of-way, such as dwarf cinquefoil.

- Conservation measures to reduce erosion will be implemented in potential habitat both during and after construction per the Upland Erosion Control Plan, including

    - Installation of all perimeter BMPs immediately after any bulk earth-moving activity;

    - Installation of temporary slope breakers—also referred to as interceptor dikes, temporary right-of-way diversions, or water bars, as needed—to reduce runoff velocity and divert water off the construction right-of-way;

    - Removal of temporary sediment barriers from an area only when replaced by permanent erosion control measures or once the area has been successfully restored to uniform 70 percent perennial vegetation, as confirmed by the EI;

- Conservation measures in the Restoration and Rehabilitation Plan will be implemented following construction to restore or create suitable open and edge habitat, including

    - use of site-specific and area-specific seed mixes, including native seed and local ecotypes, where available, and specific revegetation techniques in accordance with USFS consultations (also see Section 5.6.7);

    - installation of permanent erosion control devices and the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil in areas with steep terrain;

    - mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking;

  - targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;
  - application of certified weed-free mulch, such as salvaged wood materials, native wood chips, wood fiber hydromulch, bonded fiber matrix, or weed-free straw to slopes immediately after seeding to prevent erosion;
  - regular restoration monitoring of the right-of-way by routine aerial surveillance and site reconnaissance surveys for significant and/or new erosion;
  - monitoring to assess all restored areas on USFS lands in years 1 and 5;
  - monitoring to assess the success of reseeding and planting efforts by quantitative analysis in years 3 through 5;
  - reporting of restoration status following field inspections

- Conservation measures in the Non-Native Invasive Plant Species Management Plan to prevent the spread of non-native invasive plants that could outcompete native host plants (also see Section 5.6.7), including
  - cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials.

<u>Preliminary Determination of Effect</u>

Because of the potential creation of suitable habitat and a dispersal corridor, and with implementation of the habitat restoration measures described above, Atlantic determines that the Project would have a *beneficial impact* on Appalachian grizzled skipper in the GWNF.

5.6.7 Plants

The RFSS list for the Project contains 57 plant species (see Appendix E). Sixteen of these plant species were determined to have the potential to occur in the Project area based on known ranges and suitable habitat (see Table 5.6.7-1). Of these, one species, sword-leaf phlox (*Phlox buckleyi*) has two documented occurrences—one as recently as 2015—within 2 miles of the Project centerline based on VDCR NHP NHI data (see Table 5.6.7-1). A survey/inventory of all plant species encountered along a 300-foot-wide study area centered on the Project corridor and access roads was carried out from April to August in 2016 (see the plant survey report in Atlantic [2016q]). Descriptions of the plant communities in the survey area were also recorded and quantified (see Section 5.2 and Atlantic [2016f]). No RFSS plants have been found in the survey area, although suitable habitat was identified for all of the species in Table 5.6.7-1. The following sections provide an analysis of general potential impacts, conservation measures, and a preliminary determination of effect for RFSS plants that have potential habitat in the GWNF, to be updated upon the completion of surveys. Plant species are analyzed according to groupings based on general habitat requirements.

TABLE 5.6.7-1

Regional Forester Sensitive Species Plants with Potential Habitat in the George Washington National Forest Project Area

Scientific Name	Common Name	Habitat Preferences
REQUIRES FORESTED HABITAT		
Aconitum reclinatum	Trailing white monkshood	Rich cove sites, rocky high elevation forests, high elevations streambanks, seepage swamps, mafic fens, seepages with high pH, usually on base-rich substrates in Bath, Highland, and Augusta Counties in VA.
Carex polymorpha	Variable sedge	Open acid, usually sandy soil, oak-heath woodlands, pine-oak/heath woodlands, clearings and wetland ecotones; responds to fire: in Bath, Highland, and Augusta Counties in VA.
Cleistesiopsis bifaria	Small spreading pogonia	Well drained, rather open, scrubby hillsides, oak-pine-heath woodlands, dry, acidic soils: in Craig, Dickenson, Scott, and Wise Counties.
Euphorbia purpurea	Glade spurge	Rich, swampy woods, seeps, and thickets in Bedford, Floyd, Grayson, Greene, Montgomery, Page, Rockbridge, Russell, Tazewell, and Washington Counties in VA.
Heuchera alba	White alumroot	High elevation rocky woods and bluffs in Augusta and Highland Counties in VA.
Liatris helleri	Turgid gay-feather	Clay soils, gravel, shale barrens, and rocky (granitic, amphibolite) outcrops, at elevations ranging from 2,300 to 4,250 feet; in Bath and Augusta Counties in VA.
Micranthes caroliniana	Carolina saxifrage	Moist, shaded rocks and cliffs. In Buchanan, Carroll, Dickenson, Grayson, Russell, Smyth, Tazewell, Washington, and Wythe Counties in VA.
Monotropsis odorata	Sweet pinesap	Dry oak-pine-heath-woodlands with sandy soil in Bath and Augusta Counties in VA.
Trillium pusillum var. *moniticulum*	Mountain least trillium	Open oak woodlands in well-drained soil and margin of thickets in Augusta County, VA.
REQUIRES OR IS TOLERANT OF OPEN OR EDGE HABITAT		
Allium oxyphilum	Nodding onion	Shale barrens, sandstone glades, rocky sandstone and shale substrates in Augusta and Highland Counties, VA.
Clematis coactilis	Virginia white-haired leatherflower	Shale barrens, rock calcareous woodlands in Wythe, Pulaski, Giles, Montgomery, Craig, Roanoke, and Botetourt Counties in VA.
Corallorhiza bentleyi	Bentley's coralroot	Dry, acid woods, along roadsides, well-shaded trails in Appalachian deciduous forests in Bath County, VA.
Phlox buckleyi	Sword-leaf phlox	Open, often dry oak woodlands and rocky slopes, usually over shale in humus rich soils, along roadsides in Augusta and Bath Counties in VA. Two VDCR NHD documented occurrences within approximately 215 and 3,138 feet of the Project centerline (2014 data; 1986 and 2015 occurrences).
Pycnanthemum torrei	Torrey’s mountain-mint	Open, dry rocky woods, roadsides, and thickets near streams, and heavy clay soil over calcareous rock. In Arlington, Bland, Campbell, Dinwiddie, Fairfax, Fauquier, Franklin, Giles, Greensville, Lunenburg, Nelson, Prince William, Southampton, and Sussex Counties, VA.
REQUIRES WETLAND OR RIPARIAN HABITAT		
Juglans cinerea	Butternut	Rich mesophytic forests, mostly along toeslopes, lower slopes, ravines, and well-drained bottomland of various types, including banks and terraces of creeks and streams, and floodplain forests in Augusta, Bath, Highland, and Nelson Counties in VA.
Poa paludigena	Bog bluegrass	Shrub swamps and seeps, usually under shale in Bath County, VA.

Sources: See Appendix E

Potential Presence in Project Area

Forest-Dependent Species

Nine RFSS plants with the potential to occur in the Project area within the GWNF were assessed as being forest-dependent species and relatively intolerant of open or edge habitat. Ecological community groups documented in the survey area to date that could support these species include rich cove and slope forests, oak/heath forests, pine-oak/heath woodlands, and alluvial floodplain communities (see Section 5.2). However, none of the species were found during 2016 field surveys.

Species that Occur in Open or Edge Habitats

Five RFSS plants with the potential to occur in the Project area were assessed as typically occurring in habitats such as shale barrens and along roadsides and trails (edge) habitat. Ecological community groups documented in the survey area to date that might support these species include acidic oak-hickory forests and oak/heath forests, among others (see Section 5.2). However, none of the species were found during 2016 field surveys.

Wetland and Riparian Species

Two RFSS plants with the potential to occur in the Project area were assessed as wetland (e.g., shrub swamps) or riparian species. These species could occur in the PSS wetlands and along Project waterbodies that were found in the Analysis Area, or in seeps (see Section 5.3). However, neither species was found during 2016 field surveys.

<u>Impact Evaluation</u>

Atlantic anticipates no impacts to RFSS plants based on negative 2016 surveys, although suitable habitats were found to be present for the species in Table 5.6.7-1. If RFSS plants are found in the final 20 percent of the survey area, or if field surveys inadvertently missed species that are difficult to detect, such as sweet pinesap, direct and indirect impacts could occur. Direct impacts could include the loss of individuals and habitat during the clearing phase of construction. While a portion of this habitat would be allowed to redevelop following construction, the 53.5-foot-wide permanent right-of-way would be kept clear of trees and result in the long-term loss of forest habitat. The loss of trees and other vegetation would increase the amount of solar radiation, wind, and precipitation affecting plant habitat, which could alter the microclimate in the right-of-way and for some distance into the forest, creating an edge effect. Vehicle movement, supplies and equipment, and trenching during construction would cause also indirect effects through soil compaction and a loss of soil structure. Soil disturbance could secondarily contribute to effects by facilitating the introduction or spread of invasive, non-native species, which could be brought to the Project area on vehicles and equipment. Both impacts to soils and competition from invasive species could inhibit re-establishment of existing RFSS plant populations following the end of construction.

Forest-Dependent Species

RFSS plants requiring forest habitats are more likely to be present and experience impacts given that forests are the most common habitat type in the GWNF (approximately 95 percent of the GWNF) (see Section 4.1.1.2). RFSS plants requiring forest habitat, if present, would also experience the greatest long-term impacts. Along with direct effects from removal of individual plants during construction, habitat alteration would result in the loss of suitable forest habitat in the 53.5-foot permanent right-of-way and new permanent access road corridors. In addition, habitat alteration would cause effects by altering the microclimate along the forest edge adjacent to the right-of-way and consequently reducing the health and fecundity of RFSS forest-dependent plants. Re-establishment of these RFSS populations in the temporary workspace would depend on their tolerance of an altered microclimate and the redevelopment of forest habitat, which could take approximately 20 years.

Meadow, Scrub-Shrub, and Forest Edge Species

RFSS plants requiring open or edge habitats are less likely to be present and experience adverse impacts given the relatively small amount (less than 2 percent) of open habitats that occur in the GWNF (see Section 4.1.1.2). RFSS plants requiring open or forest edge habitat, if present, would likely experience temporary direct impacts from construction through removal of individual plants and habitat disturbance, and intermittent impacts from maintenance activities such as mowing. In addition, the changes in microclimate from tree removal for the permanent right-of-way and new permanent access roads could create additional edge habitat for these RFSS plants. Therefore, for species that occur in open or edge habitats, long-term impacts could be beneficial or benign for species tolerant of infrequent disturbance (mowing would likely occur approximately every 3 years).

Wetland and Riparian Species

RFSS plants requiring wetland or riparian habitat are less likely to be present and experience impacts given the relatively small amount of wetlands (including rivers and streams) that occur in the GWNF (see Section 4.3.1). RFSS plants requiring wetland or riparian habitat, if present, would likely experience temporary direct impacts from construction through removal of individual plants and habitat disturbance, and intermittent impacts from maintenance activities such as mowing. Of this area, less than 0.1 acre of PFO wetland habitat will be permanently converted to PEM or PSS wetland habitat, which would occur as a result of the maintenance of the permanent right-of-way: the remaining wetlands will be allowed to return to their natural state following construction. Less than 0.1 acre of PEM and PSS wetland habitat will be temporarily affected during Project construction. In addition, 27 streams and the associated riparian habitat will be temporarily affected during construction across the 125-foot-wide construction right-of-way. In addition, approximately 30 feet of riparian area on either side of waterbody crossings will be permanently converted from forested riparian habitat to herbaceous and scrub/shrub riparian habitat since trees will not be allowed to develop within 15 feet of the pipeline adjacent to a waterbody, and vegetation will be limited to herbaceous plants and shrubs in this area. The change in microclimate may prevent some riparian plant species from re-establishing in the right-of-way and into the adjacent forest edge.

Conservation Measures

Atlantic will restore the permanent right-of-way and temporary workspaces to stabilize disturbed habitat and establish or re-establish open habitat in the permanent right-of-way, and forest habitat in the temporary workspaces, through implementation of the Upland Erosion Control Plan, Stream and Wetland Crossing Procedures, Timber Removal Plan, Restoration and Rehabilitation Plan, and Non-Native Invasive Plant Species Management Plan, as specified in the *COM Plan* (see Appendix C). Conservation measures relevant to RFSS plants include the following:

- Approximately 14 acres of forest habitat will be retained by using the horizontal directional drill under the Appalachian Trail, which could benefit forest-dependent RFSS plants.

- The following conservation measures that will be implemented according to the Visual Resources Plan will also help minimize and mitigate impacts to forest-dependent RFSS plants by re-establishing or retaining suitable forest habitat:

    - All additional temporary workspaces and the outermost portions of the construction right-of-way—including 20 feet on the working side and 13 feet on the spoil side—will be replanted with a combination of indigenous tree and shrub seedlings on USFS property per the *COM Plan*. The mix of tree and shrub species will be determined in consultation with the GWNF.

- Right-of-way edges will be shaped or feathered by retaining forest vegetation up to 10 feet into the construction right-of-way along straight-line tangents of pipeline corridor that are visible to the public.

- Conservation measures in the Timber Removal Plan will be implemented to reduce impacts to forest habitat, which could benefit forest-depended RFSS plants, including

  - employment of least-intrusive tree removal methods to reduce damage to adjacent forest habitat.

- The right-of-way will be restored in accordance with the Restoration and Rehabilitation Plan, including

  - development of seed mixes in consultation with the GWNF, including use of local ecotypes (when possible) and West Virginia-certified seed or alternative seed sourced from approved distributors;

  - consultation with the USFS on the timing of seeding during the appropriate seasons and according to elevation (e.g., generally March 15th to June 1st and August 15th to October 15th);

  - methods for erosion control;

  - erosion control monitoring;

  - methods for soil restoration (e.g., removal of excavated rock, distribution of rock on the work area, grading to preconstruction contours to the extent practicable, and testing and treatment for soil compaction where requested by the GWNF);

  - topsoil segregation, replacement, and conditioning to help re-establish native plant communities in areas determined in consultation with the GWNF and according to the *COM Plan*;

  - special procedures for steep slope areas (e.g., the use of additional structural materials; steep slope construction method with reduced construction times; and targeted mitigation of seeps, springs, or other subsurface water encountered);

  - additional restoration measures for the GWNF (e.g., no clearcutting on high risk soils, use of a seed mix with greater than 50 percent annuals, with reseeding to perennials in 1.5 years, and successful revegetation within 5 years);

  - special procedures for riparian areas (e.g., use of native species for revegetation, and possible use of supplemental plantings of fast growing native tree seedlings and shrubs in forested riparian areas outside of the permanent easement);

  - special procedures for wetland areas (e.g., clearing vegetation at ground level in non-forested wetland areas, use of equipment mats to prevent soil compaction, limiting the removal of stumps to the trench area in forested wetlands where feasible);

- restoration monitoring and maintenance (e.g., assessment of the effectiveness of erosion control measures, quantitative assessment of revegetation status for years 3 and 5, monitoring of vegetation for the life span of the pipeline operations);

- implementation of a restoration goal of reseeded/replanted species equal to or greater than 80 percent ground cover, with implementation of remedial actions where goals are not met;

- reporting of restoration status and remedial actions to the USFS and FERC through summary reports; and

- training for environmental inspectors regarding the USFS Restoration and Rehabilitation Plan, including techniques specific to the USFS, seeding techniques on steep slope sites, emergency contacts and numbers, and erosion minimization and control measures.

- Conservation measures in the Non-Native Invasive Plant Species Management Plan will be implemented to minimize the spread of invasive plant species that could outcompete RFSS plants, including

    - environmental training for Project personnel on the Project's USFS Invasive Plant Species Management Plan;

    - identification of non-native invasive plant infestations through survey within a 300-foot-wide corridor along the ACP pipeline route and a preconstruction inspection (see the non-native invasive species list in the *COM Plan*);

    - marking of non-native invasive plant infestations with color-coded flagging, staking, and/or signs on the construction right-of-way for possible avoidance and use of control measures during construction;

    - establishment of herbicide and mechanical/hand pulling treatment methods in coordination with the USFS, including site-specific treatment methods in areas where treatments may be restricted (e.g., difficult topography, saturated soils, etc.);

    - identification of sensitive features (e.g., RFSS plants) occurring near non-native invasive plant infestations, and implementation of recommendations for weed control near sensitive features from the Virginia Natural Heritage Program;

    - implementation of measures to prevent the spread of non-native invasive plants during construction activities (e.g., cleaning and inspection of equipment and vehicles prior to arrival at construction site, use of wash stations (off of USFS lands), wash water containment/filtration, maintenance of cleaning logs, segregation of infested topsoil, cleaning of vehicles prior to leaving infested areas, use of certified weed-free erosion control materials);

    - monitoring of non-native invasive plant infestations along the construction right-of-way for the life of pipeline operations; and

  - maintenance of a non-native invasive plant density and cover similar to nearby non-forested, undisturbed lands, with implementation of remedial actions where goal is not met.

- Vegetation will be cleared in a reduced construction right-of-way width of 75 feet in wetlands to reduce impacts to wetland vegetation (already factored into the affected acreages).

- Herbaceous vegetation will be maintained in a reduced permanent right-of-way width of 10 feet, centered on the pipeline, in wetlands, to reduce impacts to adjacent wetland vegetation (although trees developing within 15 feet of the pipeline will be removed).

Preliminary Determination of Effect

Forest-Dependent Species

Potential RFSS plant forest habitat would be permanently removed in the permanent right-of-way, and forest habitat in the temporary workspace would take over 20 years to re-establish. To date, no RFSS forest-dependent plants have been found in the survey area. If RFSS plants are found in the portion of the Project area yet to be surveyed, effects would be variable depending on their conservation status, the proportion of the population affected, the potential for recovery, and the extent of other populations within the GWNF. However, because none of these species were found during field surveys in the portion of the Project area surveyed in 2016, Atlantic determines that the Project will have *no impact* on RFSS forest-dependent plants in the GWNF. If RFSS forest-dependent plants are found during surveys of the remaining Project area in 2017, an analysis of impacts for these species will be added to the final BE.

Species that Occur in Open or Edge Habitats

Potential temporary construction and intermittent maintenance activities could impact RFSS plants that occur in open or forest edge habitats. In addition, the development of a 53.5-foot permanent pipeline right-of-way through the Forest would create additional open and forest edge habitats. Topsoil segregation, storage, and restoration will help retain seed sources and soil fertility for re-establishment of native plants. While invasive species present a threat to the establishment of native RFSS plants, the USFS Restoration and Rehabilitation Plan and Invasive Plant Species Management Plan will reduce this threat. To date, no RFSS plants have been found in the survey area. If RFSS plants that occur in open or edge habitat are found in the portion of the Project area yet to be surveyed, effects would be variable depending on their conservation status, the proportion of the population affected, the potential for recovery, and the extent of other populations within the GWNF. However, because none of these species were found during field surveys in the portion of the Project area surveyed in 2016, Atlantic determines that the Project will have *no impact* on RFSS plants that occur in open or edge habitats in the GWNF. If any of these plant species are found during surveys of the remaining Project area in 2017, an analysis of impacts will be added to the final BE.

Wetland and Riparian Species

Potential temporary and intermittent impacts could occur to RFSS plants that occur in wetland and riparian habitats. In addition, potential PSS, PFO, and riparian habitat would be permanently affected by the maintenance of a permanent right-of-way. While invasive species present a threat to the re-establishment of native RFSS species following construction, the *Restoration and Rehabilitation Plan* and *Invasive Plant Species Management Plan* would reduce this threat. To date, no RFSS plants have been found in the survey area. If wetland and riparian RFSS plants are found in the portion of the Project area yet to be surveyed, effects would be variable depending on their conservation status, the proportion of the population affected, the potential for recovery, and the extent of other populations within the GWNF. However, because none of these species were found during field surveys in the portion of the Project area surveyed in 2016, Atlantic determines that the Project will have *no impact* on RFSS plants that occur in open or edge habitats in the GWNF. If any of these plant species are found during surveys of the remaining Project area in 2017, an analysis of impacts will be added to the final BE.

6.0 CUMULATIVE IMPACTS

Current conditions in the MNF and GWNF have been impacted by a variety of activities over the last century, including logging, fire, mining, agriculture, recreation, pipeline and transmission line development, and forest management. These past activities are considered part of the baseline environmental condition of the cumulative impact area and will not be considered further in the analysis. This section summarizes the reasonably foreseeable future actions—those that are likely to occur or are probable, rather than those that are merely possible—within the MNF and GWNF.

6.1 MONONGAHELA NATIONAL FOREST

The following actions are planned within the MNF proclamation boundary according to the Schedule of Proposed Actions in the MNF and the USFS Projects page:[8]

- Bear Rocks Projects,
- Bickle Run Culvert and Bridge Repair Project,
- Big Mountain Project;
- Big Rock Project;
- Bird Run Bridge Repair Project,
- Brushy Mountain Ruffed Grouse Habitat Management Project (Brushy Mountain);
- Columbia Gas Road Right-of-Way Special Use Permit (Columbia Gas);
- Corridor H Project;
- EF1 Tornado Salvage Harvest Project (Tornado Salvage);
- Forest-Wide Non-Native Invasive Species (NNIS) Management Project (NNIS Management);
- Lower Williams Wildlife Enhancement Project (Lower Williams);
- John Bell Pattison Allegheny Front Migration Observatory Special Use Permit;

[8] http://www.fs.usda.gov/projects/mnf/landmanagement/projects.

- Mountain Valley Pipeline Project;
- Mower Tract Restoration Project;
- Music Run Right-of-Way Project;
- Pendleton County PSD Waterline and Temporary Construction Right-of-Way Special Use Permit (Pendleton County PSD Waterline);
- Re-issuance of Forest-wide Outfitter and Guide Permit for Snowshoe Resort Management;
- Re-issuance of Outfitter and Guide Special Use Permits on the Cheat-Potomac Ranger District;
- Tea Creek Phase II Project;
- Tygart Chestnut Ridge Project;
- Union Chapel Church Road Right-of-Way Project;
- WB Express Project;
- West Fork of Greenbrier Rail with Trail Development Project (Greenbrier Rail);
- Wildlife Openings Project; and
- WV Restoration Venture-Anthony Creek Disperse Areas Project.

The Big Mountain, Big Rock, Brushy Mountain, Tornado Salvage, NNIS Management, Mower Tract Restoration, Tygart Chestnut Ridge Project, and Wildlife Openings Projects will have beneficial impacts on habitat within the MNF, including early successional forest, oak forest, wetland, aquatic, bat, and running buffalo clover habitats.

The proposed Project, along with the Corridor H, Greenbrier Rail, Pendleton County PSD Waterline, and WB Xpress Projects, could have negative long-term impacts on habitat within the MNF due to forest clearing, soil disturbance, wetland and waterbody crossings, and the possible introduction of invasive or noxious plants. The WB Xpress Project will occur 16 miles from the proposed Project construction at its nearest point within the MNF. Construction of the Corridor H Project within the MNF was previously scheduled to occur during 2016 in Tucker and Randolph counties, but was still shown with the final design not yet underway in October 2016 on the Project website (West Virginia Division of Highways, 2016). This project will result in 4 miles of new four-lane highway. The Greenbrier Rail Project is located in Pocahontas and Randolph Counties, and was scheduled for construction in 2015 and 2016. Because these projects are dispersed within the MNF proclamation boundary, the potential for space crowding impacts, or the high geographic density of effects on a system, is unlikely. The proposed Project's impacts will be minimized by reducing the width of the construction workspace and permanent pipeline right-of-way, implementing project-specific conservation plans, and consulting with the WVDNR and MNF staff to restore habitat and minimize the potential introduction and spread of invasive and noxious plants. Atlantic will re-plant temporary and permanent workspaces in coordination with the appropriate federal and state agencies. Furthermore, Atlantic will adhere to the mitigation requirements set forth by the construction special use permit issued by the MNF.

The Project will contribute to negative impacts on habitat within the MNF; however, the overall impacts are not expected to be cumulatively significant. Construction associated with the proposed Project may reduce suitable forest, riparian, and wetland habitat for some RFSS species through habitat removal or conversion. However, this effect, along with the cumulative effects of other nearby projects enacted in the past, present, or reasonably foreseeable future, is not expected to substantially alter species viability because of the relatively large acreage of suitable forest habitat under federal management in the MNF (approximately 87 percent of land within the MNF proclamation boundary), along with the small amounts of wetland and riparian habitats that would be affected. In addition, current analyses do not indicate a significant downward trend in the extent of these habitats or their capability to support associated species, particularly with the implementation of the projects listed above that are intended to improve habitats in the MNF. The development of the proposed Project will also potentially increase the amount of open and edge habitat, which, along with similar effects of other nearby projects enacted in the past, present, or reasonably foreseeable future, will have a cumulatively beneficial impact on species that occur in these habitats.

Based on a review of readily available documents of the above projects, a number of specific RFSS were identified as having the potential to experience cumulative impacts as a result of the proposed Project and five other recent projects in the MNF. Affected species include West Virginia flying squirrel, green floater, Roan Mountain sedge, Appalachian oak fern, and white alumroot (see Table 6.1-1). However, adverse impacts from the projects listed in Table 6.1-1were limited to *may impact individuals but is not likely to cause a trend toward federal listing or loss of viability*, and several projects resulted in a *beneficial impact* on the species. Beneficial impacts include management of non-native invasive weeds, which may compete with Roan Mountain sedge, Appalachian oak fern, and white alumroot (Forest-Wide Non-Native Invasive Species Management Project); the Mower Tract Restoration Project involves spruce-hardwood forest regeneration on currently open grasslands on non-native conifer plantations, which will benefit the three plants as well as WV northern flying squirrel; non-system road and skid trail decommissioning with the Mower Tract Restoration Project, which will improve available habitats for native plant species. Conversely, the Tygart Chestnut Ridge Project will involve development of wildlife openings, which could impact the Roan Mountain sedge found in the area, although known populations will be avoided: Appalachian oak fern is not found in the area, but have potential habitat. The Big Mountain Project involves commercial timber harvesting, skid trail construction, landing construction, and foliar herbicide application in areas (harvest units) with known occurrences of Roan Mountain sedge. This project also involves prescribed fire for oak-hickory ecosystem restoration in areas with known occurrences of Roan Mountain sedge and Appalachian oak fern, although burning during the dormant season are expected to minimize impacts to plants. The Project does not anticipate extirpation of the known occurrences, nor to reduce the population viability on a Forest-wide basis. The Mountain Valley Project could affect aquatic species, including the green floater and candy darter, through the development of natural gas pipeline facilities; however, state-designated seasonal work restrictions will be implemented to minimize and avoid impacts to these species. The other adverse impacts from these projects to the species listed here include temporary disturbance from project activities on WV northern flying squirrel and aquatic species.

The loss of suitable habitat from forest harvesting, pipeline construction, and road construction from these projects could lead to cumulative adverse impacts from the proposed Project on RFSS, particularly Roan Mountain sedge. However, given that these projects do not anticipate extirpating known occurrences or having population level effects, and since other projects will improve or increase available habitat, no significant adverse cumulative effects are anticipated as a result of the proposed Project in the MNF.

TABLE 6.1-1

Specific RFSS Identified in Other Recent Projects in the Cumulative Effects Analysis Area

	Project				
Species	Big Mountain Project (2017)	Forest-Wide Non-Native Invasive Species Management Project (2010)	Mower Tract Restoration Project (2016)	Tygart Chestnut Ridge Project (2016)	Mountain Valley Project (2016)
West Virginia northern flying squirrel	X (potential adverse)	X (potential adverse)	X (overall beneficial)		
Green floater					X (potential adverse)
Candy darter					X (potential adverse)
Roan Mountain sedge	X (potential adverse)		X (overall beneficial)	X (potential adverse)	
Appalachian oak fern	X (potential adverse)		X (overall beneficial)	X (potential adverse)	
White alumroot	X (potential adverse)	X (overall beneficial)			

Sources: USFS, 2010; USFS, 2017; USFS, 2016b; USFS, 2016c; FERC, 2016a; FERC, 2016b

6.2 GEORGE WASHINGTON NATIONAL FOREST

The following actions are planned within the Glenwood-Pedlar, Warm Springs and North River Ranger Districts, through which the proposed ACP route passes, according to the Schedule of Proposed Actions in the GWNF and the USFS Projects page:[9]

- Forestwide Maintenance of Open and Semi Open Lands, Roadside Corridors, and Utility Rights-of-Way (all Ranger Districts [RD]);
- Brady Hill Thinning Project (Glenwood-Pedlar RD);
- Jordan Bridge Replacement (Glenwood-Pedlar RD);
- Plan Amendment to the Jefferson NF for Land Allocation Change with Mountain Valley Pipeline Project (Glenwood-Pedlar RD);
- Loves Run Yellow Pine Restoration Project (Glenwood-Pedlar RD);
- Pulaski Tract Vegetation Project (Glenwood-Pedlar RD);
- Gate Mountain Timber Sale (North River RD);
- Hearthstone Dam Rehabilitation (North River RD);
- Hone Quarry Dam Rehabilitation (North River RD);

[9] http://www.fs.usda.gov/projects/gwj/landmanagement/projects.

- Briery Branch Dam Rehabilitation (North River RD);
- Elkhorn Prescribed Burn (North River RD);
- North Shenandoah Mountain Restoration and Management Project (North River RD);
- South Archer Project (North River RD);
- Verizon Virginia Fiber Optic Line (North River RD);
- Wallace and Marshall Tracts Prescribed Burn (North River RD);
- Border Restoration Project (Warm Springs RD);
- Fiber Optic Line on Warm Springs Mountain (Warm Springs RD);
- Hidden Valley Campground Host Site Improvements (Warm Springs RD);
- Lockridge Cross Region Collaborative Prescribe Burn Project (Warm Springs RD); and
- Paddy Knob Early Successional Habitat (Warm Springs RD).

The Brady Hill, Loves Run, Pulaski Tract, Gate Mountain Timber Sale, North Shenandoah Mountain, South Archer, Wallace and Marshall Tracts Prescribed Burn, Border Restoration, Lockridge Cross Prescribed Burn, Paddy Knob and Elkhorn Prescribed Burn Projects will have beneficial impacts on habitat within the GWNF, including wildlife, aquatic, yellow pine and early successional habitats, and non-native invasive species control.

The Forestwide Corridors and Utility Rights-of-Way, Jordan Bridge, Hone Quarry Dam Rehabilitation, Briery Branch Dam Rehabilitation and Hidden Valley Campground Upgrade Projects would not appear to have significant positive or negative cumulative impacts, when combined with the proposed ACP Project.

The proposed Mountain Valley Pipeline would cross 3.4 miles of the GWNF about 80 miles southwest of where the ACP route crosses the GWNF. It would result in temporary impacts to habitat of approximately 50 to 55 acres and up to 20 acres of permanent impacts to forest habitat. Construction is anticipated in approximately the same time frame as the ACP Project. However, due primarily to its distance from the ACP route, no cumulative impacts on biological resources are anticipated.

The proposed Project, along with the Hearthstone Dam Rehabilitation, Verizon Virginia Fiber Optic, and Fiber Optic on Warm Springs Mountain Projects, could have negative, albeit likely de minimus cumulative impacts on habitat within the GWNF due to forest clearing, soil disturbance, wetland and waterbody crossings, and the possible introduction of invasive or noxious plants. The Hearthstone Dam Rehabilitation Project lies about seven miles north of the ACP route and would convert approximately 2 acres of forest to grassland. The project is scheduled for implementation in 2017. The Verizon Virginia Fiber Optic Project lies about four miles west of the proposed ACP route and would lie within an existing utility corridor along State Highway 42 between Buffalo Gap and Graigsville. The Fiber Optic on Warm Springs Mountain Project would lie about ten miles west of the ACP route and consists of burying approximately 12,000 feet of line within an existing corridor. The construction schedules for the two fiber optic projects are not known.

Because these projects are dispersed within the GWNF, the potential for space crowding impacts, or the high geographic density of effects on a system, is unlikely. The proposed Project's impacts will be minimized by reducing the width of the construction workspace and permanent pipeline right-of-way, implementing project-specific conservation plans, and consulting with the GWNF staff to restore habitat and minimize the potential introduction and spread of invasive and noxious plants. Atlantic will restore temporary and permanent workspaces in coordination with the appropriate federal and state agencies. Furthermore, Atlantic will adhere to the mitigation requirements set forth by the construction special use permit issued by the GWNF.

The Project will contribute to negative impacts on habitat within the GWNF; however, the overall impacts are not expected to be cumulatively significant. Construction associated with the proposed Project may reduce suitable forest, riparian, and wetland habitat for some RFSS species through habitat removal or conversion. However, this effect, along with the cumulative effects of other nearby projects enacted in the past, present, or reasonably foreseeable future, is not expected to substantially alter species viability because of the relatively large acreage of suitable forest, riparian, and wetland habitat under federal management in the GWNF, and because current analyses do not indicate a significant downward trend in the extent of these habitats or their capability to support associated species, particularly with the implementation of the projects listed above that are intended to improve habitats in the GWNF. In addition, the development of the proposed Project will potentially increase the amount of open and edge habitat, which, along with similar effects of other nearby projects enacted in the past, present, or reasonably foreseeable future, will have a cumulatively beneficial impact on species that occur in these habitats.

On non-USFS lands in the vicinity of the ACP's crossing of the GWNF, several bridge replacement and highway improvement projects are planned; impacts from these projects would be localized and generally *de minimus* by themselves. No cumulative impacts with the ACP Project are anticipated. These projects, with their general locations and expected construction timeframes, include:

- Cascades Bridge Replacement, Bath County—Fall 2017;
- Route 616 Road Widening; Augusta County—Summer 2018;
- Whiskey Creek Bridge Replacement, Augusta County—under construction;
- Little Calfpasture Creek Bridge Replacement; Augusta County—under construction; and
- Route 610 Road Improvements Augusta County—2017 to 2018.

Based on a review of readily available documents of the above projects, no specific RFSS were identified as experiencing potential cumulative impacts as a result of the proposed Project in the GWNF.

7.0 SUMMARY OF EFFECTS

The proposed Project could impact a number of RFSS and their habitats through the construction and operation of the ACP pipeline and construction of new access roads. As of the date of this document, approximately 1.3 miles in the GWNF remains to be surveyed in 2017 for areas that were not accessible in 2015 or 2016. Results will be provided to the GWNF as they become available, and the determination of impacts for each RFSS and their habitats will be updated in the BE accordingly. The primary RFSS habitats found in the MNF and GWNF based on field survey are forest habitats. Small areas of wetland and riparian habitats were also found, while open habitats occur infrequently. Eight RFSS have been documented in the survey area, including Allegheny woodrat, Roan Mountain sedge, white alumroot, Allegheny oak fern, bristly black currant, Hoffman's millipede, Shenandoah millipede (*Nannaria* spp.), and Maureen's beetle. Potential impacts to these species include direct and indirect adverse impacts resulting from temporary construction activities as well as long-term maintenance in the pipeline right-of-way, or indirect beneficial impacts from creation of open and edge habitat in the pipeline right-of-way. For species with suitable habitat in the Project area that were not found, or for which Atlantic could not verify presence/absence, similar impacts are possible. To date, Atlantic has determined that all adverse impacts may impact individuals but are not likely to cause a trend toward federal listing or loss of viability.

Potential impacts to RFSS and their habitats will be mitigated through the implementation of conservation measures, including general conservation measures established in a number of Project plans and FERC's Plans and Procedures. These conservation measures and others will continue to be coordinated with the USFS, and approved conservation measures will be included in the final version of the BE.

8.0 REFERENCES

Adirondack Ecological Center. 2016a. Little. Little Brown Bat (*Myotis lucifigus)*. Available online at: http://www.esf.edu/aec/adks/mammals/littlebrownbat.htm. Accessed July 2016.

Adirondack Ecological Center. 2016b. Tri-colored bat (*Perimyotis subflavus).* Available online at: http://www.esf.edu/aec/adks/mammals/eastern_pipistrelle.htm. Accessed July 2016

Albanese, G.E., N.E. Nelson, M.W. Vickery, P.R. Sievert. 2007. Larval feeding behavior and ant association in frosted elfin, *Callophrys irus* (*Lycaenidae*). Journal of Lepidopterists Society 61(2).

Allen, T.J. 1997. The Butterflies of West Virginia and their Caterpillars. University of Pittsburgh Press, Pittsburgh, PA.

Allen, T.J. and R.E. Acciavatti. 2002. Tiger Beetles of West Virginia. West Virginia Division of Natural Resources Wildlife Resources Section, Elkins, West Virginia.

Amelon, S. and D. Burhans. 2006. Conservation assessment: *Myotis leibii* (eastern small-footed myotis) in the eastern United States. Pages 57−68 in Thompson, F.R., III (editor). Conservation Assessments for Five Forest Bat Species in the Eastern United States. General Technical Report NC-260. U.S. Forest Service, North Central Research Station, St. Paul, Minnesota.

Arroyo-Cabrales, J. and S.T. Álvarez-Castañeda. 2008. *Myotis leibii*. The IUCN Red List of Threatened Species 2008: e.T14172A4414839. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T14172A4414839.en. Accessed April 2016.

Atlantic Coast Pipeline, LLC. 2015a. Virginia Segment - Protected Bat Species Presence/Probable Absence Survey Report. Dated November 2015. Prepared by Natural Resource Group, an ERM Group company for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2015b. West Virginia Segment – Protected Bat Species Presence/Probable Absence Survey Report. Dated November 2015. Prepared by Natural Resource Group, an ERM Group company, for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016a. Allegheny Woodrat and Timber Rattlesnake Survey Report. Dated July 7, 2016. Prepared by AllStar Ecology on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016b. Allegheny Woodrat Trapping Report. Dated October 19, 2016. Prepared by AllStar Ecology on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016c. Bald and Golden Eagle Survey Report. Dated July 7, 2016. Prepared by Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016d. 2016 Cow Knob Salamander George Washington National Forest Survey Results. Dated July 6, 2016. Prepared by Natural Resource Group, an ERM Group company, for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016e. Green Salamander (*Aneides aeneus)* Habitat Assessment and Survey along the proposed Atlantic Coast Pipeline Project in West Virginia. Dated July 11, 2016. Prepared by Environmental Solutions & Innovations, Inc. on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016f. Field Surveys for Forest Sensitive Species (Class *Diplopoda and Gastropoda*) on Federal Lands within the George Washington National Forest for the Atlantic Coast Pipeline in Virginia. Dated October 19, 2016. Prepared by Environmental Solutions & Innovations, Inc. on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016g. Freshwater Mussel (*Unionidae*) Surveys for the proposed ACP in West Virginia. Dated August 31, 2016. Prepared by Environmental Solutions & Innovations, Inc. on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016h. George Washington National Forest Protected Bat Species - Year 2 Survey Report. Dated July 2016. Prepared by Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016i. Macroinvertebrate Biological Survey Report on the George Washington National Forest. Dated July 29, 2016. Prepared by Civil & Environmental Consultants, Inc. on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016j. Northern Goshawk and Golden-Winged Warbler Survey Report. Dated July 22, 2016. Prepared by Civil & Environmental Consultants, Inc. on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016k. Summary Report of Habitat Assessments and Surveys of Regional Forester Sensitive and Rare Insects in the George Washington National Forest along the Atlantic Coast Pipeline in Virginia. Dated October 20, 2016. Prepared by Environmental Solutions & Innovations, Inc. on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016l. Summary Report of Habitat Assessments and Surveys of Forest Sensitive Fishes and Freshwater Mussels in George Washington National Forest along the Atlantic Coast Pipeline in Virginia. Dated October 19, 2016. Prepared by Environmental Solutions & Innovations, Inc. on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016m. Timber Rattlesnake Survey Report. Dated September 14, 2016. Prepared by AllStar Ecology on behalf of Environmental Resources Management (ERM), for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016n. Virginia Habitat Survey Report – Protected Small Mammal Species – 2016 Field Season. Dated October 19, 2016. Prepared by Vanasse Hangen Brustlin, Inc. (VHB) and Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016o. Virginia Segment - Habitat and Presence/Absence Survey Report for the Loggerhead Shrike (*Lanius ludovicianus*) - 2016 Field Season. Dated August 8, 2016. Prepared by Vanasse Hangen Brustlin, Inc. (VHB) and Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016p. Virginia Segment - Protected Bat Species - Year 2 Presence/Probable Absence Survey Report. Dated October 13, 2016. Prepared by Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016q. Virginia Segment Survey Report for Threatened, Endangered, Sensitive, and Locally Rare Plant Species: George Washington National Forest – 2016 Field Season. Dated November 1, 2016. Prepared by Vanasse Hangen Brustlin, Inc. (VHB) and Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016r. West Virginia Botanical Survey Report. Dated September 14, 2016. Prepared by AllStar Ecology on behalf of Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016s. West Virginia Segment – Protected Bat Species Presence/Probable Absence Survey Report 2015-2016. Dated October 13, 2016. Prepared by Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC. 2016t. West Virginia Segment – Protected Bat Species Habitat Assessment Addendum Report 2015-2016. Dated October 19, 2016. Prepared by Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC. ERM, Minneapolis, MN.

Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. 2016a. Protected Snake Conservation Plan. Prepared by Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. Federal Energy Regulatory Commission, Washington, D.C. Filed July 29, 2016. Accession No. 20160729-5256. Available online at: https:8206//elibrary.ferc.gov/IDMWS/File_list.asp?document_id=14481649. Accessed March 2017.

Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. 2016b. Spill, Prevention, Control, and Countermeasures Plan. Prepared by Environmental Resources Management (ERM) for Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. Federal Energy Regulatory Commission, Washington, D.C. Filed July 18, 2016. Accession No. 20160718-5164. Available online at: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20160718-5164. Accessed March 2017.

Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. 2017a. Migratory Bird Plan Revision 3. Prepared by Environmental Resources Management for Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. Federal Energy Regulatory Commission, Washington, D.C. Filed January 27, 2017. Accession No. 20170127-5202. Available online at: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170127-5202. Accessed March 2017.

Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. 2017b. Karst Survey Report Revision 1. Prepared by GeoConcepts Engineering, Inc. for Atlantic Coast Pipeline, LLC and Dominion Transmission, Inc. Federal Energy Regulatory Commission, Washington, D.C. Filed February 24, 2017. Accession No. 20170127-5202. Available online at: https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20170127-5202. Accessed March 2017.

Audubon, Guide to North American Birds. 2016. Loggerhead Shrike. Available online at: http://www.audubon.org/field-guide/bird/loggerhead-shrike. Accessed May 2016.

Audubon, Guide to North American Birds. 2016a. Peregrine Falcon. Available online at: https://www.audubon.org/field-guide/bird/peregrine-falcon. Accessed April 2016.

Audubon, Guide to North American Birds. 2016b. Bewick's Wren. Available online at: https://www.audubon.org/field-guide/bird/bewicks-wren. Accessed April 2016.

Audubon, Guide to North American Birds. 2016c. Long-eared Owl. Available online at: http://www.audubon.org/field-guide/bird/long-eared-owl. Accessed May 2016.

Augspurger, T., A.E. Keller, M.C. Black, W.G. Cope, and F.J. Dwyer. 2003. Water quality guidance for protection of freshwater mussels (*Unionidae*) from ammonia exposure. Environmental Toxicology and Chemistry 22(11): 2569−2575.

Banfield, A. 1974. The Mammals of Canada. University of Toronto Press, Toronto, Canada.

Bat Conservation International. 2014. Species Profile: *Myotis leibii*. Available online at: http://www.batcon.org/resources/media-education/species-profiles/detail/2014. Accessed April 2016.

Beckham, E.C. 1980. *Percina gymnocephala*, a new percid fish of the subgenus *Alvordius*, from the New River in North Carolina, Virginia, and West Virginia. Occasional Papers of the Museum of Zoology, Louisiana State University 57:1–11. Available online at: http://sites01.lsu.edu/wp/mnspapers/files/2014/09/57.pdf. Accessed November 2016.

Beckman, J. and N. Bross-Fregonara. 2016. Mountain Fish Show Their Spring Colors. Available online at: http://www.wvdnr.gov/wildlife/magazine/archive/03Spring/Mountain_Fish_Show_Their_Spring_Colors.shtm. Accessed April 2016.

Besha, J.A. 1984. Glen Park Hydroelectric Project. Supplemental Report, Article 34: Indiana Bat Monitoring Requirements. James Besha Associates, Consulting Engineers.

Bess, J. 2005. Conservation Assessment of the West Virginia white (*Pieris virginiensis* Edwards). USDA Forest Service, Eastern Region. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054237.pdf. Accessed November 2016.

BirdLife International. 2012. *Vermivora chrysoptera*. The IUCN Red List of Threatened Species 2012: e.T22721618A39860643. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2012-1.RLTS.T22721618A39860643.en. Accessed September 2016.

Bogan, A.E. and J.M. Alderman. 2004. Workbook and key to the freshwater bivalves of South Carolina. North Carolina Museum of Natural Sciences, Raleigh, North Carolina.

Brock, J.P. and K. Kaufman. 2003. Butterflies of North America. Hillstar Editions, I.C., Tucson, Arizona.

Brodman, R. 2004. R9 Species Conservation Assessment for the Green Salamander, *Aneides aeneus* (Cope and Packard). Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054400.pdf. Accessed April 2016.

Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). The Birds of North America Online (P.G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, New York. Available online at: http://bna.birds.cornell.edu/bna/species/506. Accessed July 2016.

Buidin, C., Y. Rochepault, J.P.L. Savard, and M. Savard. 2006. Breeding range extension of the northern saw-whet owl in Quebec. The Wilson Journal of Ornithology 118(3):411.

Bunkley J.P., C.J.W. McClure, N.J. Kleist, C.D. Francis, and J.R. Barber. 2015. Anthropogenic noise alters bat activity levels and echolocation calls. Global Ecology and Conservation 3:62−71.

Burkhead, N.M. 1983. Ecological studies of two potentially threatened fishes, the orangefin madtom (*Noturus gilberti*) and Roanoke logperch (*Percina rex*) endemic to the Roanoke River drainage. Report to Wilmington District Corps of Engineers, Wilmington, North Carolina.

Burkhead, N.M. and R.E. Jenkins. 1991. Fishes. Pages 321−409 in K. Terwilliger (coordinator). Virginia's Endangered Species: Proceedings of a Symposium. McDonald and Woodward Publishing Company, Blacksburg, Virginia.

Burns, A. 2007. Comparison of two electrofishing gears (backpack and parallel wires) and abundances of fishes of the upper Greenbrier River drainage. Master’s Thesis. West Virginia University, Morgantown, WV. Available online at: http://www.wvuforestry.com/sWelsh/Burns_Angela_thesis.pdf. Accessed November, 2016.

Butchkoski, E. 2014. Allegheny Woodrat (*Neotoma magister*). Pennsylvania Game Commission. Available online at: http://www.pgc.pa.gov/Wildlife/EndangeredandThreatened/Pages/AlleghenyWoodrat.aspx. Accessed May 2016.

Butterflies and Moths of North America. 2016. Persius Duskywing. Available online at: http://www.butterfliesandmoths.org/species/Erynnis-persius. Accessed May 2016.

Carey, J.H. 1995. *Ribes lacustre*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis/. Accessed July 2016.

Chipps, S.R., W.B. Perry, and S.A. Perry. 1993. Status and distribution of *Phenacobius teretulus*, *Etheostoma osburni*, and *Rhinichthys bowersi* in the Monongahela National Forest, West Virginia. Virginia Journal of Science 44(1):47−58. Available online at: http://www.vacadsci.org/vjsArchives/V44/44-1/44-47.pdf. Accessed November, 2016.

Chips, S.R., W.B. Perry, and S.A. Perry. 1994. Patterns of microhabitat use among four species of darters in three Appalachian Streams. American Midland Naturalist 131:175−180.

Christian, D. and J. Daniels. 1985. Distributional records of rock voles, *Microtus chrotorrhinus*, in northeastern Minnesota. The Canadian Field-Naturalist 99:356−359.

Christiansen, K. and P. Bellinger. 1996. Cave Arrhopalites: new to science. Journal of Cave and Karst Studies 38(3):168−180. Available online at: https://caves.org/pub/journal/PDF/V58/V58N3-Christiansen.pdf. Accessed April 2016.

Claire, C. 2015. Allegheny woodrat (*Neotoma magister*) distribution across Pennsylvania. Theses and Dissertations, Paper 1254. Indiana university of Pennsylvania Knowledge Repository @ Indiana University of Pennsylvania. Available online at: http://knowledge.library.iup.edu/cgi/view content.cgi?article=2155&context=etd. Accessed February 2017.

Clarke, A.H. 1985. The tribe *Alasmidontini* (*Unionidae: Anodontinae*). Part II: *Lasmigona* and *Simpsonaias*. Smithsonian Contributions to Zoology 399:1−75. Available online at: http://www .sil.si.edu/smithsoniancontributions/Zoology/pdf_hi/SCTZ-0399.pdf. Accessed November 2016.

Cobb, B., E. Farnsworth, and C. Lowe. 2005. A Field Guide to Ferns of Northeastern and Central American. Houghton Mifflin Company, New York, New York.

Connecticut Department of Energy and Environmental Protection. 2016. Long-Eared Owl (*Asio otus*). Available online at: http://www.ct.gov/deep/cwp/view.asp?q=326032. Accessed May 2016.

Conoway, C.H. 1952. Life History of the Water Shrew (*Sorex Palustris Navigator*). The American Midland Naturalist 48(1): 219−248. Available online at: https://www.jstor.org/stable/2422144?seq=1#page_scan_tab_contents. Accessed February 2017.

Conserve Wildlife. 2016. Bronze Copper Butterfly (*Lycaena hyllus*). Available online at: http://www.conservewildlifenj.org/species/fieldguide/view/Lycaena%20hyllus/. Accessed October 12, 2016.

Cornell Lab of Ornithology. 2015. All About Birds: Bird Guide [web application]. Available online at: https://www.allaboutbirds.org/guide/search.aspx. Accessed July 2016.

Corser, J.D. 2001. Decline of disjunct green salamander (*Aneides aeneus*) populations in the southern Appalachians. Biological Conservation 97(1):119−126.

COSEWIC. 2010. COSEWIC assessment and status report on the Virginia Mallow *Sida hermaphrodita* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 18 pp. Available online at: www.sararegistry.gc.ca/status/status_e.cfm. Accessed May 2016.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center, Jamestown, North Dakota. Available online at: http://www.npwrc. usgs.gov/resource/1998/classwet/classwet.htm. Accessed January 2015.

Crampton, L.H. and R. Barclay. 1998. Selection of roosting and foraging habitat by bats in different-aged aspen mixed wood stands. Conservation Biology 12:1347−1358.

Cuarón, A.D., F. Reid, and K. Helgen. 2008. *Spilogale putorius*. The IUCN Red List of Threatened Species 2008: e.T41636A10524977. Available online at: http://dx.doi.org/10. 2305/IUCN. UK.2008.RLTS.T41636A10524977.en. Accessed March 2016.

Cummings, K. and J. Cordeiro. 2012. *Lasmigona subviridis*. The IUCN Red List of Threatened Species 2012: e.T11361A502725. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T11361A502725.en. Accessed November 2016.

Cusick, A. 1994. *Gymnocarpium appalachianum*. Ohio Department of Natural Resources Rare Plant Abstract. Available online at: http://naturepreserves.ohiodnr.gov/portals/dnap/pdf/Rare_Plant_Abstracts/Gymnocarpum_appalachianum.pdf. Accessed July 2016.

DeGraaf, R. M. and D.D. Rudis. 1986. New England Wildlife: Habitat, Natural History, and Distribution. General Technical Report NE-108. U.S. Forest Service, Northeastern Forest Experimental Station, Broomall, Pennsylvania.

Denton, R. K. 2017. Email from R. K. Denton (Senior Geologist, GeoConcepts Engineering, Inc.) to T. Brunner (ERM), dated February 3.

DeVault, J. 2017. Email from J. DeVault (Environmental Scientist, AllStar Ecology, LLC) to A. O'Brien and M. Voth (ERM), dated February 6.

Dolan, R.W. 2004. U.S. Forest Service Eastern Region. Conservation Assessment for the Rock Skullcap (*Scutellaria saxatilis* Riddell). Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054324.pdf. Accessed May 2016.

eFloras. 2010. eFloras [web application]. Harvard University. Available online at: http://www.eflorastorg/search_page.aspx?flora_id=0. Accessed July 2016.

Elliott, J.M. 2008. The ecology of riffle beetles (*Coleoptera: Elmidae*). Freshwater Reviews 2008 (1): 189−203.

Environment Canada. 2010. Recovery Strategy for the Loggerhead Shrike, *migrans* subspecies (*Lanius ludovicianus migrans*) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. Available online at: http://www.southsaskriverstewards.ca/ckfinder/userfiles/files/LoggerheadShrike_RecoveryStrategy.pdf. Accessed January 2017.

ESI. 2016a. Environmental Solutions & Innovations, Inc. Field Surveys for Forest Sensitive Species (Class *Diplopoda* and *Gastropoda*) on Federal Lands within the George Washington National Forest for the Atlantic Coastal Pipeline in Virginia. October 19, 2016.

ESI. 2016b. Environmental Solutions & Innovations, Inc. Summary Report of Habitat Assessments and Surveys of Forest Sensitive and Rare Insects in George Washington National Forest Along the Atlantic Coast Pipeline in Virginia. August 1, 2016.

Evans, R. 2002. Conservation Assessment for Selected Dragonflies of the Allegheny National Forest. Available at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054251.pdf. Accessed October 11, 2016.

Federal Energy Regulatory Commission. 2013a. Upland Erosion Control, Revegetation, and Maintenance Plan. Office of Energy Projects, Washington, DC. Available online at: https://www.ferc.gov/industries/gas/enviro/plan.pdf. Accessed March 2017.

Federal Energy Regulatory Commission. 2013b. Wetland and Waterbody Construction and Mitigation Procedures. Office of Energy Projects, Washington, DC. Available online at: https://www.ferc.gov/industries/gas/enviro/procedures.pdf. Accessed March 2017.

Federal Energy Regulatory Commission. 2016a. Mountain Valley Project and Equitrans Expansion Project Draft Environmental Impact Statement. FERC Docket Number: CP16-10-000 and CP16-13-000. Available online at: https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp. Accessed February 2017.

Federal Energy Regulatory Commission. 2016b. WB XPress Draft Environmental Impact Statement. FERC Docket Number: CP16-10-000 and CP16-13-000. Available online at: https://elibrary.ferc.gov/idmws/search/fercadvsearch.asp. Accessed March 2017.

Federal Register. 1993. 33 CFR Part 328: Definition of Waters of the United States. U.S. Government Printing Office, Washington, D.C. (51 FR 41250, Nov. 13, 1986, as amended at 58 FR 45036, Aug. 25, 1993).

Federal Register. 2012. Publication of the Final National Wetland Plant List: Volume 77(90):27210−27214. U.S. Army Corps of Engineers, Washington, DC.

Fenton, M.B. and R.M.R. Barclay. 1980. *Myotis lucifugus*. Mammalian Species 142:1−8. Available online at http://www.science.smith.edu/msi/pdf/i0076-3519-142-01-0001.pdf. Accessed November 2016.

Fergus, C. 2001. Allegheny Woodrat. Wildlife Note 58:LDR0103. Available online at: http://www.pgc.pa.gov/Education/WildlifeNotesIndex/Documents/woodrat.pdf. Accessed August 2016.

Fleming, G. and K. Patterson. 2013. The Natural Communities of Virginia: Ecological Groups and Community Types. Natural Heritage Technical Report 13-16. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia.

Fleming, G.P., K.D. Patterson, K. Taverna, and P.P Coulling. 2016. The Natural Communities of Virginia: Classification of Ecological Community Groups. Second Approximation. Version 2.7. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, Virginia.

Ford, W.M., S.B. Casteberry, M.T. Mengak, J.L. Rodrigue, D. J. Feller, and K.R. Russel. 2006. Persistence of Allegheny woodrats *Neotomoa magister* across the mid-Atlantic Appalachian Highlands landscape, USA. Ecography 29:745−754. Available online at: http://knowledge.library.iup.edu/cgi/viewcontent.cgi?article=2155&context=etd. Accessed February 2017.

Francl, K.E., Ford, W.M., Sparks, D.W., and V. Brack, Jr. 2012. Capture and reproductive trends in summer bat communities in West Virginia: assessing the impact of white-nose syndrome. Journal of Fish and Wildlife Management 3(1):33−42. Available online at: http://dx.doi.org/10.3996/062011-JFWM-039.

Hammerson, G. and J. Mitchell. 2004. *Plethodon punctatus*. The IUCN Red List of Threatened Species 2004: e.T59351A11921999. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T59351A11921999.en. Accessed April 2016.

Georgia Environmental Protection Division. 2001. A Guidebook for Local Governments for Developing Regional Watershed Protection Plans. Available online at: https://epd.georgia.gov/sites/epd.georgia.gov/files/related_files/site_page/devwtrplan.pdf. Accessed March 2017.

Georgia Wildlife. 2008. Sweet pinesap. Available online at: http://georgiawildlife.com/sites/default/files/uploads/wildlife/nongame/pdf/accounts/plants/monotropsis_odorata.pdf. Accessed May 2016.

Gleason, H.A. and A. Cronquist. 1991. Manual of vascular plants of northeastern United States and adjacent Canada. New York Botanical Garden, Bronx, New York.

Godin, A.J. 1977. Wild Mammals of New England. Johns Hopkins University Press, Baltimore, Maryland.

Goedeke, T., J. Sharma, A. Treher, A. Frances, and K. Poff. 2015. *Corallorhiza bentleyi*. The IUCN Red List of Threatened Species 2015: e.T64175940A64175949. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T64175940A64175949.en. Accessed May 2016.

Gompper, M. and D. Jachowski. 2016. *Spilogale putorius*. The IUCN Red List of Threatened Species 2016: e.T41636A45211474. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T41636A45211474.en. Accessed February 2017.

Grzmek, B. 1972. Animal Life Encyclopedia: Volume 12. Van Nostrand Reinhold Company, New York, New York.

Hamilton, W.J., Jr, 1943. The Mammals of Eastern United States. Comstock Publishing Company, Ithaca, New York.

Hammerson, G. 2004. *Aneides aeneus*. The IUCN Red List of Threatened Species 2004: e.T1282A3385547. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2004.RLTS.T1282A3385547.en. Accessed September 2016.

Hammerson, G.A. 2007 *Crotalus horridus*. The IUCN Red List of Threatened Species 2007: e.T64318A12765920. http://dx.doi.org/10.2305/IUCN.UK.2007.RLTS.T64318A12765920.en.

Handley, C.O. Jr. 1991. Mammals. Pages 539–616 in K. Terwilliger (coordinator). Virginia's Endangered Species: Proceedings of a Symposium. McDonald and Woodward Publishing Company, Blacksburg, Virginia.

Helfrich, L., T. Newcomb, E. Hallerman, and K. Stein. 2005. EFISH: The Virtual Aquarium. Species profiles. Available online at: http://www.web1.cnre.vt.edu/efish/index.html. Accessed November, 2016.

Hellquist, C.B. 1984. Observations of *Potamogeton hillii Morong* in North America. Rhodora 86:101–111.

Hellquist, C.B. and G.E. Crow. 1980. Aquatic Vascular Plants of New England: Part 1. *Zosteraceae, Potamogetonaceae, Zannichelliaceae, Najadaceae*. Station Bulletin 515. New Hampshire Agricultural Experiment Station University of New Hampshire.

Hicks, A. 2006. Allegheny Woodrat, *Neotoma magister*. Available online at: http://www.njabp.com/dep/fgw/ensp/pdf/end-thrtened/woodrat.pdf. Accessed August 2016.

Holsinger R. John. 1978. Systematics of the Subterranean Amphipod Genus *Stygobromus* (*Crangonyctidae*), Part II: Species of the Eastern United States. Smithsonian Contributions to Zoology:266. Available online at: http://www.sil.si.edu/smithsoniancontributions/Zoology/pdf_hi/SCTZ-0266.pdf. Accessed May 2016.

Hotopp, K., Winslow, M., 2012. Carnegie Museum of Natural History *Virginia Land Snails*. Available online at: http://www.carnegiemnh.org/science/mollusks/VA_PDFs/Paravitrea%20reesei%20Morrison,%201937.pdf. Accessed May 2016.

Howell. H.A. (1906) Revision of the Skunks of the Genus *Spilogale*. North American Fauna: Number 26: pp. 1–55.

Interagency Coordination Tool. 2016. Candy Darter (*Etheostoma osburni*). Available online at: http://ict.mapwv.org/ict_ci/Species/candy.pdf. Accessed April 2016.

Jacobs B. Steven. 2010. *College of Agricultural Scientist, Cooperative Extension, Entomological Notes, Department of Entomology, Springtails*. Available online at: http://ento.psu.edu/extension/factsheets/pdf/Springtail. Accessed April 2016.

James, M.R. 1987. Ecology of the freshwater mussel *Hyridella menziesi* (Gray) in a small oligotrophic lake. Archive fuer Hydrobiologie 3: 337−348.

James A. Douglas, Green R. Andrea. March 2, 2009. A Status Assessment of the Eastern Subspecies of Bewick’s Wren (Thryomanes Bewickii and Thryomanes Bewickii Altus).

Jean, R. 2017. Email dated February 9, 2017, from R. Jean (Indianapolis Regional Manager, Environmental Solutions & Innovations, Inc.) to K. Hempy-Mayer (ERM).

Jenkins, R. E. and N. M. Burkhead. 1975. Distribution and aspects of life history and morphology of the cyprinid fish *Notropis semperasper* endemic to the Upper James River drainage, Virginia. Chesapeake Science 16:178−191.

Jenkins, R. E. and N. M. Burkhead. 1994. The freshwater fishes of Virginia. American Fisheries Society, Bethesda, Maryland.

Johnson, R. I. 1970. The systematics and zoogeography of the Unionidae (Mollusca: Bivalvia) of the Southern Atlantic Slope Region. Bulletin of the Museum of Comparative Zoology 140:263−449.

Johnson, J.S., J.D. Kiser, K.S. Watrous, and T.S. Peterson. 2011. Day-roosts of Myotis leibii in the Appalachian Ridge and Valley of West Virginia. Northeastern Naturalist 18(1): 95-106.

Jordan & Evermann. Florida Museum of Natural History. 2016 *Orangefin Madtom, Noturus gilberti*. Available online at: http://www.flmnh.ufl.edu/catfish/ictaluridae/orangefinmadtom.htm. Accessed April 2016.

Kennedy E. D. and D. W. White. 1996. Interference Competition for House Wrens as a Factor in the Decline of Bewick’s Wrens. *Conservation Biology*. 10 (1).

Kentucky Department of Fish and Wildlife Resources. 2014a. Amphibia. Available online at: http://fw.ky.gov/WAP/Pages/Amphibia.aspx#41. Accessed July 2016.

Kentucky Department of Fish and Wildlife Resources. 2014b. Mammalia. Available online at: http://fw.ky.gov/WAP/Pages/Mammalia.aspx. Accessed July 2016.

Kentucky Department of Fish and Wildlife Resources. 2016. Little Brown Bat (*Myotis lucifugus*). Available online at: http://fw.ky.gov/Wildlife/Pages/Little-Brown-Bat.aspx. Accessed April 2016.

Kirkland, G.L., Jr. 1977. Responses of small mammals to the clearcutting of northern Appalachian forests. Journal of Mammology 58(4), pp 600–609.

Kirkland, G.L., Jr. 1981. Sorex dispar and Sorex gaspensis. In: Mammalian Species Number 155 (1–4). American Society of Mammalogostis, Baltimore, MD. Available online at: http://www.science.smith.edu/msi/pdf/i0076-3519-155-01-0001.pdf. Accessed February, 2017.

Kirkland, G.L., Jr. and F.J. Jannet, Jr. 1982. *Microtus chrotorrhinus*. In: Mammalian Species Number 180: 1–5. American Society of Mammalogists, Baltimore, MD.

Kirshcbaum, K., and Ivory, A., 2016. *Asio otus* long-eared owl. Available online at: http://animaldiversity.org/accounts/Asio_otus/. Accessed May 19, 2016.

Kuehne, R.A. and R.W. Barbour. 1983. The American Darters. Biology. Book 2. The University Press of Kentucky, Lexington, Kentucky.

Kula, A.A., D.M. Castillo, M.R. Dudash, C.B. Fenster. 2014. "Interactions between a pollinating seed predator and its host plant: the role of environmental context within a population." *Ecology and Evolution* 4(14). Available online at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4130447/. Accessed November 2016.

Kunz T.H. and J.D. Reichard. 2010. Status Review of the Little Brown Myotis (*Myotis Lucifugus*) and Determination that Immediate Listing Under the Endangered Species Act is Scientifically and Legally Warranted. Boston University, Boston, MA. Available online at: https://www.bu.edu/cecb/files/2010/12/Final-Status-Review.pdf. Accessed October 2016.

Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr. 1980. Atlas of North American freshwater fishes. North Carolina State Museum of Natural History, Raleigh, North Carolina. i-x + 854 pp.

Lesmeister, D.B., M.E Gompper, and J.J. Millspaugh. 2007. Habitat Selection and Home Range Dynamics of Eastern Spotted Skunks in the Ouachita Mountains, Arkansas, USA. Journal of Wildlife Management 73(1): 18−25. Available online at: http://www.bioone.org/doi/abs/10.2193/2007-447?journalCode=wild. Accessed February 2017.

Lewis, J. Julian. 2001. Conservation Assessment for Monongahela Cave Springtail (*Sinella agna*). USDA Forest Service, Eastern Region. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054260.pdf . Accessed May 2016.

Lichvar, R., N.C. Melvin, M.L. Butterwick, and W.N. Kirchner. 2012. *National Wetland Plant List Indicator Rating Definitions.* ERDC/CRREL TN-12-1. Hanover, NH: U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory. Available online at: http://www.fws.gov/wetlands/documents/National-Wetland-Plant-List-Indicator-Rating-Definitions.pdf. Accessed January 22, 2015.

Cassola, F. 2016. Microtus chrotorrhinus. The IUCN Red List of Threatened Species 2016: e. T42626A22347958. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T42626A10734223.en. Accessed February 2017.

Linzey, A.V. & NatureServe (Hammerson, G.). 2008b. *Synaptomys cooperi*. The IUCN Red List of Threatened Species 2008: e.T42639A10738505. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T42639A10738505.en. Accessed May 2016.

Linzey, D. W. 1998. The Mammals of Virginia. The McDonald & Woodward Publishing Company, Blacksburg, VA.

Lobstein, M. B. 2016. Prince William Wildflower Society. Trillium: A Family to Call Its Own. Available online at: http://vnps.org/princewilliamwildflowersociety/botanizing-with-marion/trillium-a-family-to-call-its-own/. Accessed May 2016.

Lotts, K. & Naberhaus, T. Butterflies and Moths of North America. Available at: http://www.butterfliesandmoths.org/species/erora-laeta. Accessed October 11th, 2016.

Luensmann, Peggy. 2006. *Melanerpes erythrocephalus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis/. Accessed September 2016.

Luensmann, Peggy. 2010. *Falco peregrinus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis/. Accessed September 2016.

Maryland Department of Natural Resource. n.d. Rare, Threatened and Endangered Animal Factsheet. Available online at: http://dnr.maryland.gov/wildlife/Pages/plants_wildlife/rte/rteanimalfacts.aspx?AID=Appalachian%20Bewick's%20Wren. Accessed November 2016.

Maine Department of Inland Fisheries and Wildlife. 2013. Brook floater *Alasmidonta varicosa* fact sheet. Available at: https://www1.maine.gov/ifw/wildlife/endangered/listed_species_me.htm. Accessed February 2017.

Martin, W.H. 2017. Email dated March 1 from W.H. Martin (AllStar Ecology Herpatologist) to J. DeVault (AllStar Ecology Environmental Scientist).

Massachusetts Division of Fisheries and Wildlife. 2015. Natural Heritage & Endangered Species Program: Hill's Pondweed *Potamogetonhillii*. Available online at: http://www.mass.gov/eea/docs/dfg/nhesp/species-and-conservation/nhfacts/pothil.pdf. Accessed May 2016.

Mengak, M. (Ph.D., Univ. of Georgia). 2016a. Personal communication regarding southern rock vole and Allegheny woodrat habitat and survey sampling methods.

Michigan Natural Features Inventory. 2004. *Lanius ludovicianus migrans*. Rare Species

Michigan Natural Features Inventory. 2007. Rare Species Explorer (Web Application). Available online at: http://mnfi.anr.msu.edu/explorer. Accessed May 2016.

Microtus chrotorrhinus. The IUCN Red List of Threatened Species 2008: e.T42626A10734223. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2008. RLTS.T42626A10734223.en. Accessed April 2016.

Minnesota Department of Natural Resources Rare Species Guide. 2016b. *Cicindela Patruela patruela.* Available online at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail &selectedElement=IIC OL02232.

Minnesota Department of Natural Resources. 2016a. *Perimyotis subflavus*. Available online at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AMACC0 3020. Accessed April 2016.

Minnesota Department of Natural Resources. 2016c. *Poa paludigena*. Available online at http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PMPOA4 Z1W0. Accessed May 2016.

Minnesota Department of Natural Resources. *Patruela*. Available online at: http://www.dnr.state. mn.us/rsg/profile.html?action=elementDetail&selectedElement=IIC.OL02232.

Minor, Maria. 2015. *Guide to New Zealand Soil Invertebrates*. *Chilopoda*. Massey University, Palmerston North New Zealand. Available online at: http://soilbugs.massey. ac.nz/chil opoda.php. Accessed April 2016.

Mitchell, et al. Endangered and Threatened Species of Pennsylvania. Harrisburg, PA: Wild Resource Conservation Fund, 1995) Available online at: http://www.naturalheritage. state.pa. us/factsheets/11436.pdf. Accessed April 2016.

Monty, A-M and G. A. Feldhamer. 2002. Conservation Assessment for the Eastern Woodrat (*Neotoma floridana*) and the Allegheny Woodrat (*Neotoma magister*). USDA Forest Service, Eastern Region, May 2002. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/ fsm91_054316.pdf. Accessed October 2016.

Muchmore, W. B. 1964. New terrestrial isopods of the genus *Miktoniscus* from eastern United States (Crustacea: Isopoda: Oniscoidea). Ohio J. Sci. 64:51-57. Available online at: https://kb.osu.edu/dspace/bitstream/handle/1811/4979/V64N01_051.pdf?sequence=1. Accessed May 2016.

Multi-Resolution Land Characteristics Consortium. 2015. National Land Cover Database. Available online at: https://www.mrlc.gov/nlcd2011.php. Accessed August 2016.

Murdock, Nora. 2000 U.S. Fish and Wildlife Service. Recovery Plan for *Liatris helleri*. Available online at: http://ecos.fws.gov/docs/recovery_plans/2000/000128.pdf. Accessed May 2016.

National Audubon Society. 1996. Guide to North American Birds: Bewick's Wren (*Thryomanes bewickii*). Available online at: http://www.audubon.org/field-guide/bird/bewicks-wren. Accessed November 2016. Adapted from K. Kaufmann, author: Lives of North American Birds. Houghton Mifflin Harcourt: Boston. 675 pp.

National Park Service. 2016. The search for Sweet pinesap. Available online at: https://www.nps.gov/grsm/learn/nature/dff11-sweetpinesap.htm. Accessed May 2016.

National Park Service. 2016. *Threatened and Endangered Species*. Available online at: https://www.nps. gov/grsm/learn/nature/te-species.htm. Accessed May 2016.

National Wildlife Federation. 2016. Little Brown Bat. Available online at: https://www.nwf.org/Wildlife/Wildlife-Library/Mammals/Bats/Little-Brown-Bat.aspx. Accessed April 2016.

Natural Resources Conservation Service. 2001. Wetland Mammals. Available online at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_010045.pdf. Accessed August 2016.

Natural Resources Conservation Service. 2016. The PLANTS Database (http://plants.usda.gov, 25 August 2016). National Plant Data Team, Greensboro, NC, 27401-4901, USA.VDGIF, Accessed July 2016.

Nature Conservancy. 2001. Central Appalachian Forest Ecoregional Plan. Species by Eos. Available online at: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/EcoregionalPlans/CAP/CAPtable_capoccurrences.xls. Accessed November, 2016.

NatureServe (Whittaker, J.C., Hammerson, G. & Norris, S.J.). 2008. *Sorex palustris*. The IUCN Red List of Threatened Species 2008: e.T41410A10460785. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T41410A10460785.en. Accessed April 2016.

NatureServe. 2013a. Notropis scabriceps. The IUCN Red List of Threatened Species 2013: e.T202325A18229265. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T202325A18229265.en. Accessed November 2016.

NatureServe. 2013b. *Percina gymnocephala*. The IUCN Red List of Threatened Species 2013: e.T202579A18233373. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T202579A18233373.en. Accessed November, 2016.

NatureServe. 2013c. *Phenacobius teretulus*. The IUCN Red List of Threatened Species 2013: e.T16957A19034012. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T16957A19034012.en. Accessed November, 2016.

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available online at: http://explorer.natureserve.org/. Accessed April–November 2016.

Nedeau, E.J. 2007. Brook floater *Alasmidonta varicosa* fact sheet. Prepared for Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, Massachusetts.

Nelson, M.W. 2007. Gerhard's Underwing. Massachusetts Division of Fisheries and Wildlife: Natural Heritage & Endangered Species Program. Available online at: http://www.mass.gov/eea/docs/dfg/nhesp/species-and-conservation/nhfacts/catocala-herodias.pdf. Accessed November 2016.

Nelson, M.W. 2012. Notes on a Recently Discovered Population of *Hadena ectypa* (Morrison, 1875) (*Noctuidae: Noctuinae: Hadenini*) in Massachusetts. Journal of the Lepidopterists' Society 66(1), 2012, 1–10 Available online at: http://images.peabody. ttp://imagepsoc/jls/2010s/2012/2012-66-1-001.pdf. Accessed May 2016.

North Carolina Wildlife Resources Commission. 2005. Green Salamander Fact Sheet. Available online at: http://www.ncwildlife.org/Portals/0/Conserving/documents/FactSheets/nongame_greensalamander_lores.pdf. Accessed March 2016.

North Carolina Wildlife Resources Commission. 2016. *Atlantic Pigtoe.* Available online at: http://www.ncwildlife.org/Learning/Species/Mollusks/AtlanticPigtoe.aspx.Accessed April 2016.

North Carolina Wildlife Resources Commission. National Park Service. 2016b. Peregrine Falcon. Available online at: https://www.nps.gov/shen/learn/nature/falcon.htm. Accessed July 2016.

North Carolina Wildlife Resources Commission. 2017. Yellow Lance (Lea, 1828). Available at: http://www.ncwildlife.org/Learning/Species/Mollusks/Yellow-Lance#33361013-distribution. Accessed February 2017.

Olcott, S. 2016. E-mail correspondence on August 3, 2016 between S. Olcott, West Virginia Department of Natural Resources and S. Throndson, Environmental Resources Management.

Olcott, S. 2016. Email Communication on August 3, 2016 between S. Throndson (ERM) and S. Olcott (WVDNR [Susan.P.Olcott@wv.gov]).

Orrock, J.L, E.K. Harper, J.F. Pagels, and W.J. McShea. 1999. Additional records of the rock vole, *Microtus chrotorrhinus* (Miller) (*Mammalia*: *Rodentia: Muridae*), in Virginia. Banisteria 14:36−38. Available online at: https://orrocklab.zoology.wisc.edu/Html/Pubs/orrock_et_al._banisteria_1999.PDF. Accessed February 2017.

Orrock, J.L. and J.F. Pagels. 2003. Tree communities, microhabitat characteristics, and small mammals associated with the endangered rock vole, *Microtus chrotorrhinus*, in Virginia. Southeastern naturalist 2(4): 547–558.

Parshall, D. K. 2002. USDA Forest Service Eastern Region. Conservation Assessment for the Southern Grizzled Skipper (*Pyrgus Centaureae Wyandot*). Available online at: http://www.fs. usda. gov/Internet/FSE_DOCUMENTS/fsm91_054252.pdf. Accessed May 2016.

Parshall, D.K. 2002. Conservation Assessment for the Southern Grizzled Skipper (Pyrgus Centaureae Wyandot). USDA Forest Service Eastern Region. Available online at: http://www.fs. usda.gov/Internet/FSE_DOCUMENTS/fsm91_054252.pdf. Accessed November 2016.

Pennsylvania Game Commission. 2005. Allegheny woodrat surveys. Project Annual Job Report, Code No. 06718.

Pennsylvania Natural Heritage Program and Pennsylvania Fish & Boat Commission. 2007. Brook Floater (*Alasmidonta varicosa*) Factsheet. Available online at: http://www.naturalheritage.state.pa.us/factsheets/12195.pdf. Accessed February 2017.

Pennsylvania Natural Heritage Program. 2008. Frosted Elfin (*Callophrys irus*). Available online at: http://www.naturalheritage.state.pa.us/ccvi/frosted%20elfin.pdf. Accessed November 2016.

Pennsylvania Natural Heritage Program. 2008. Northern Barrens Tiger Beetle (*Cicindela patruela*). Available online at: http://www.naturalheritage.state.pa.us/ccvi/northern%20barrens%20tiger%20beetle%20ccvi%20summary.pdf. Accessed November 2016.

Pennsylvania Natural Heritage Program. 2016b. Green Floater (*Lasmigona subviridis*) Factsheet. Available online at: http://www.naturalheritage.state.pa.us/factsheets/12224.pdf. Accessed May 2016.

Pennsylvania Natural Heritage Program. 2016c. Rock skullcap (*Scutellaria saxatilis*) Factsheet. Available online at: http://www.naturalheritage.state.pa.us/factsheets/14098.pdf. Accessed May 2016.

Pennsylvania Natural Heritage Program. 2016d. White Monkshood (*Aconitum reclinatum*) Factsheet. Available online at: http://www.naturalheritage.state.pa.us/factsheets/14392.pdf. Accessed May 2016.

Pennsylvania Natural Heritage Program. 2016e. Northern Goshawk (*Accipiter gentilis*) Factsheet. Available online at: http://www.naturalheritage.state.pa.us/factsheets/10943.pdf. Accessed July 2016.

Pennsylvania Natural Heritage Program. 2007. Migrant Loggerhead Shrike (*Lanius ludovicianus migrans*) Factsheet. Available online at: http://www.naturalheritage.state.pa.us/factsheets/11138.pdf. Accessed August 2016.

Pennsylvania Natural Heritage Program. 2016. Rapids Clubtail. Available at: http://www.naturalheritage.state.pa.us/ccvi/rapids%20clubtail.pdf. Accessed October 12, 2016.

Pennsylvania Natural Heritage Program. 2016. Green-Faced Clubtail. Available online at: http://www.naturalheritage.state.pa.us/ccvi/green-faced%20clubtail.pdf. Accessed October12, 2016.

Peregrine Fund. 2016a. Explore Raptors: Peregrine Falcon. Available online at: http://www.peregrinefund.org/explore-raptors-species/Peregrine_Falcon. Accessed April 2016.

Peregrine Fund. 2016b. Explore Raptors: Bald Eagle. Available online at: http://peregrinefund.org/explore-raptors-species/Bald_Eagle. Accessed April 2016.

Perry, R.W. and R. E. Thill. 2007. Tree roosting by male and female eastern *Pipistrelles* in a forested landscape. Journal of Mammalogy 88(4): 974-981. Available online at: http://jmammal.oxfordjournals.org/content/jmammal/88/4/974.full.pdf. Accessed November 2017.

Petrides, G.A. 1986. A Field Guide to Trees and Shrubs . Houghton Mifflin Company. New York, NY

Potomac Highlands Cooperative Weed and Pest Management Area. 2011. Fighting Invasive Plants in West Virginia. Available online at: http://www.wvforestry.com/fightinginvasives_final.pdf. Accessed February 2017.

Prince, A. 2017. The Upper Tar River Basin: Swift Creek and Fishing Creek Subbasin. North Carolina Natural Heritage Program Memo. Available at: http://www.ncwildlife.org/Portals/0/Learning/documents/Species/img_7b1c_forestmemo2.pdf. Accessed February 2017.

Pruitt, L. 2000. Loggerhead Shrike Status Assessment. U.S. Fish and Wildlife Service, Bloomington, IN. Available online at: https://www.fws.gov/midwest/es/soc/birds/losh/LOSHSA_entire.pdf. Accessed October 2016.

Ramel, G. 1995. Dragon-flies (*Odonata*). Available online at: http://www.earthlife.net/insects/odonata.html. Accessed October 12 2016.

Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Rudolph D. C., C. A. Ely, R.R. Schaefer, J.H. Williamson, and R.E. Thill. 2006. "The Diana Fritillary (Speyeria diana) and Great Spangled Fritillary (S. Cybele): Dependence on Fire in the Ouachita Mountains of Arkansas." *Journal of Lepidopterists' Society* 60(4). 218-226. Nov. 2016.

Schweitzer, D.F. 1989. A Review of Category 2 Insecta in FWS Regions 3,4,5. Report prepared for the United States Fish and Wildlife Service.

Scottish Natural Heritage, 2013. The Dragonfly. Available online at: http://www.snh.org.uk/publications/on-line/naturallyscottish/dragonfly/breedandfeed.asp. Accessed October 12, 2016.

Selby, G. 2007. Regal Fritillary (*Speyeria idalia Drury*): A Technical Conservation Assessment. USDA Forest Service. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206808.pdf. Accessed November 2016.

Selby, G. 2007. Regal Fritillary (Speyeria idalia Drury): A Technical Conservation Assessment. Available at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5206808.pdf. Accessed October 13, 2016.

Shepherd, M. D. 2005. Species Profile: Callophrys irus. In Shepherd, M. D., D. M. Vaughan, and S. H. Black (Eds). Red List of Pollinator Insects of North America. CD-ROM Version 1 (May 2005). Portland, OR: The Xerces Society for Invertebrate Conservation.

Simonson, T. D. 1987. Distribution, ecology, and reproductive biology of the orangefin madtom (*Noturus gilberti*). Master's thesis, Virginia Polytechnic Institute & State University, Blacksburg, Virginia.

Simonson, T.D. 1997. Orangefin madtom, A reevaluation of the freshwater fishes. Part IV. *in* Endangered, threatened, and rare fauna of North Carolina (E. F. Menhinick and A. L. Braswell, eds.). North Carolina Museum of Natural Sciences and the North Carolina Biological Survey, Raleigh, North Carolina. 15-16 pp.

Simonson, T.D. and R.J. Neves. 1992. Habitat suitability and reproductive traits of the orangefin madtom *Noturus gilberti* (*Pisces: Ictaluridae*). American Midland Naturalist 127:115−124.

Smith, T.W., J.T. Donaldson, T.F. Wieboldt, G.L Kauffman, and M.J Waterway. 2006. The geographic and ecological distribution of the Roan Mountain sedge, *Carex roanensis* (*Cyperaceae*). Castanea: 71 (1), pp 45-53.

Smock, and S. H. Sklarew. 1998. The water shrew, *Sorex palustris* (Richardson) (*Insectivora:Soricidae*) and its habitat in Virginia. Brimleyana 25:120-134.

Snyder, S. A. 1993. *Haliaeetus leucocephalus*. In: Fire Effects Information System [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: http://www.fs.fed.us/database/feis/animals/bird/hale/all.html. Accessed September 2016.

South Carolina Department of Natural Resources. 2015. Supplemental Volume: Species of Conservation Concern, SC SWAP 2015. Species of Greatest Conservation Need (Priority Species) Available at: http://dnr.sc.gov/swap/species2015.html. Accessed February 2017.

South Carolina Department of Natural Resource. 2005. Diana Fritillary *Speyeria diana*. Available online at: http://www.dnr.sc.gov/cwcs/pdf/DianaFritillary.pdf. Accessed November 2016.

Spelda, J. 2015. Class *Diplopoda*, Order *Chordeumatida*–A Manual. Available online at: http://sea-entomologia.org/IDE@/revista_26B.pdf. Accessed January 2017.

Stauffer, J.R. Jr., J.M. Boltz, and L.R. White. 1995. The Fishes of West Virginia. Proceedings of the Academy of Natural Sciences of Philadelphia. Available online at: https://books.google.com/books?id=ATYnjnKaFlcC&printsec=frontcover&dq=The+Fishes+of+West+Virginia&hl=en&sa=X&ved=0ahUKEwiL8dmHgrLSAhWIiVQKHfebBjkQ6AEIHDAA#v=onepage&q=The%20Fishes%20of%20West%20Virginia&f=false. Accessed April 2016.

Stihler, C.W, J.L. Wallace, E.D. Michael, and H. Pawelczyk. 1995. Range of (*Glaucomys sabrinus fuscus*), a federally endangered subspecies of the northern flying squirrel in West Virginia. Proceedings of the West Virginia Academy of Science 67:13−20.

Stihler, C. W. 2005. The Elegance of Spring Trilliums. West Virginia Wildlife Magazine. Available online at: http://www.wvdnr.gov/wildlife/magazine/archive/05spring/elegance_spring_trilliums.shtm. Accessed May 2016.

Stone, Katharine R. 2013. *Accipiter gentilis*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: https://www.fs.fed.us/database/feis/animals/bird/acge/all.html. Accessed February 2017.

Strausbaugh, P.D., and E.L. Core. 1978. Flora of West Virginia. Seneca Books, Inc., Grantsville, West Virginia.

Strayer, D.L. and K.J. Jirka. 1997. The Pearly Mussels of New York State. New York State Museum Memoir 26. The University of the State of New York. Available online at: http://www.caryinstitute.org/publications/pearly-mussels-new-york-state. Accessed February 2017.

Tennessee Bat Working Group. 2016. Tri-colored Bat. Available online at: http://www.tnbwg.org/TNBWG_PESU.html. Accessed July 2016.

Tennessee Wildlife Resources Agency. 2016. Tri-colored Bat (formerly Eastern Pipistrelle). Available online at: http://www.tnwatchablewildlife.org/details2.cfm?_sort=aounumber&uid=10121316291520054&commonname=Tri-colored%20Bat%20(formerly%20Eastern%20Pipistrelle)&DISPLAYHABITAT=&typename=Mammal&Taxonomicgroup=Mammal%20-%20Bats. Accessed July 2016.

Thompson, C. 2016a. Letter dated August 18, 2016 from C. Thompson (USFS, Monongahela National Forest) to K. Bose (Federal Energy Regulatory Commission) regarding the 2016 Green Salamander Survey Report.

Thompson, C. 2016b. Letter dated August 18, 2016 from C. Thompson (USFS, Monongahela National Forest) to K. Bose (Federal Energy Regulatory Commission) regarding the 2016 Cow Knob Salamander Survey Report.

Thorp, J.H. and A.P. Covich (Eds.). 2010. Ecology and Classification of North American Freshwater Invertebrates. Elsevier, Inc., San Diego, California.

Timm, R.M., Heaney, L.R., and D.D. Baird. 1977. Natural History of Rock Voles (*Microtus chrotorrhinus*) in Minnesota. The Canadian Field-Naturalist 91: 177−181.

Turner, G.G., D.M. Reeder, and J.T.H. Coleman. 2011. A Five-Year Assessment of Mortality and Geographic Spread of White-Nose Syndrome in North American Bats and a Look to the Future. Bat Research News 52(2): 13−27. Available online at: http://www.facstaff.bucknell.edu/dreeder/turnerreedercoleman-brn-wns.pdf. Accessed November 2016.

Ulev, E. 2008. *Crotalus horridus*. In: Fire Effects Information System [Online]. U.S. Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available online at: https://www.fs.fed.us/database/feis/animals/reptile/crho/all.html. Accessed February 2017.

U.S. Army Corps of Engineers. 1987. Corps of Engineers 1987 Wetlands Delineation Manual. Technical Report Y-87-1, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

U.S. Army Corps of Engineers. 2005. Ordinary High Water Mark Identification. Regulatory Guidance Letter No. 05-05. Dated 7 December 2005. Available online at: http://www.usace.army.mil/Portals/2/docs/civilworks/RGLS/rgl05-05.pdf. Accessed February 2017.

U.S. Army Corps of Engineers. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0). ERDC/EL TR-10-20. U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.

U.S. Environmental Protection Agency. 2003. Developing Water Quality Criteria for Suspended and Bedded Sediments (SABS) – Potential Approaches. Draft. Office of Science and Technology. Available online at: https://www.epa.gov/sites/production/files/2015-10/documents/sediment-report.pdf. Accessed February 2017.

U.S. Fish and Wildlife Service. 1990. Appalachian Northern Flying Squirrels Recovery Plan. Available online at: http://ecos.fws.gov/docs/recovery_plans/1990/900924c.pdf. Accessed May 2016.

U.S. Fish and Wildlife Service. 2000. Loggerhead Shrike. Available online at: http://www.fws.gov/midwest/es/soc/birds/losh/loshsa_entire.pdf. Accessed May 2016.

U.S. Fish and Wildlife Service. 2001. Olive-Sided Flycatcher Habitat Model. Available online at: https://www.fws.gov/r5gomp/gom/habitatstudy/metadata/olive-sided_flycatcher_model.htm. Accessed May 2016.

U.S. Fish and Wildlife Service. 2013a. 50 CFR Part 17 Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the Eastern Small-footed Bat and Northern Long-eared Bat as Endangered or Threatened Species. Available online at: https://www. gpo. gov/fdsys/pkg/FR-2013-10-02/pdf/2013-23753.pdf . Accessed November 2016.

U.S. Fish and Wildlife Service. 2013b. *Northeast Newsroom: West Virginia Northern Flying Squirrel*. Available online at: http://www.fws.gov/northeast/newsroom/wvnfsq.html. Accessed December 2014.

U.S. Fish and Wildlife Service. 2014. Virginia Field Office, Endangered Species Project Reviews in Virginia. Step 6a – Eagle Nests. Available online at: http://www.fws. gov/northeast/virginiafield/endangered/projectreviews_step6a.html.

U.S. Fish and Wildlife Service. 2016. 2016 Range-Wide Indiana Bat Summer Survey Guidelines. Available online at: https://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/2016IndianaBatSummerSurveyGuidelines11April2016.pdf. Accessed November 2016.

U.S. Forest Service. 2003. Conservation Assessment for Loggerhead Shrike (Lanius ludovicianus). Available online at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm91_054295.pdf. Accessed October 2016.

U.S. Forest Service. 2006. Monongahela National Forest Final Environmental Impact Statement for Forest Plan Revision. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm9_011356.pdf. Accessed September 2016

U.S. Forest Service. 2010. Forest-Wide Nonnative Invasive Plant Management Project Environmental Assessment. Monongahela National Forest Supervisor's Office. Available online at: https://www.fs.usda.gov/detail/mnf/landmanagement/resourcemanagement/?cid=STELPRDB5200876. Accessed February 2017.

U.S. Forest Service. 2011. 2006 Monongahela National Forest Land and Resource Management Plan (Updated 2011). Available online at: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5330420.pdf. Accessed January 2017.

U.S. Forest Service. 2016a. *Accipter gentilis*. Available online at: http://www.fs.fed.us/database/feis/animals/bird/acge/all.html. Accessed May 2016.

U.S. Forest Service. 2016b. Mower Tract Restoration and Recreation Enhancement Project Final Environmental Assessment. Greenbrier Ranger District, Monongahela National Forest. Available online at: http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/101476_FSPLT3_3806202.pdf. Accessed February 2017.

U.S. Forest Service. 2016c. Tygart-Chestnut Ridge Wildlife and Watershed Project Final Environmental Assessment. Region 9— Greenbrier Ranger District, Monongahela National Forest. Available online at: http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/99941_FSPLT3_3113070.pdf. Accessed February 2017.

U.S. Forest Service. 2017. Big Mountain Project Environmental Assessment. Monongahela National Forest, Cheat-Potomac Ranger District. Available online at: https://www.fs.usda.gov/project/?project=36612. Accessed February 2017.

U.S. Geological Survey, Gap Analysis Program. 2011. National Land Cover, Version 2. August 2011. Available online at: http://gapanalysis.usgs.gov/gaplandcover/viewer/.

U.S. Geological Survey. 2016. Olive-sided flycatcher *Contopus cooperi*. Available online at: http://www.mbr-pwrc.usgs.gov/infocenter/i4590id.html. Accessed May 2016.

U.S. Geological Survey. 2017. Data inventory for USGS station 02011460 Back Creek near Sunrise, VA Available online at: https://waterdata.usgs.gov/nwis/inventory/?site_no=02011460. Accessed February 2017.

Vesipa, R., C. Camporeale, and L. Ridolfi. 2016. Recovery times of riparian vegetation. Draft. Available online at: https://www.researchgate.net/publication/299345383_Recovery_times_of_riparian_vegetation?focusFeedback=1. Accessed February 2017.

VHB. 2017. Memorandum dated January 16, from VHB to Maggie Voth (ERM).

Virginia Botanical Associates. 2016. Digital Atlas of the Virginia Flora-*Potentilla candaensis* L. Available online at: http://vaplantatlas.org/index.php?do=plant&plant=3264. Accessed November 2016.

Virginia Department of Conservation and Recreation. 2016a. Natural Heritage Program Atlas of Rare Butterflies, Skippers, Moths, Dragonflies, and Damselflies in Virginia. Milne's Euchlaena moth. Available online at: http://www.vararespecies. org/specie/Euchlaena%20milnei. Accessed May 2016.

Virginia Department of Conservation and Recreation. 2016b. Natural Heritage Program Natural Community and Rare Species Lists. Available online at: http://www.dcr.virginia.gov/natural-heritage/infoservices. Accessed March 2016.

Virginia Department of Conservation and Recreation Division of Natural Heritage. 2016c. Natural Heritage Technical Report 16-07. Available online at: http://www.dcr.virginia.gov/natural-heritage/document/anlist2016.pdf. Accessed February 2017.

Virginia Department of Game and Inland Fisheries, 1995, Collection Database. Available online at: http://www.vafwis.org/fwis/booklet.html?Menu=_.Habitat&bova=020027. Accessed April 2016.

Virginia Department of Game and Inland Fisheries. 2016. Wildlife Information. Available online at: http://www.dgif.virginia.gov/wildlife/information/?s =050020. Accessed April 2016 and August 2016.

Virginia Department of Game and Inland Fisheries. 2016. Special Status Faunal Species in Virginia. Available online at: https://www.dgif.virginia.gov/wp-content/uploads/virginia-threatened-endangered-species.pdf. Accessed November 2016.

Virginia Herpetological Society. 2016. Cow Knob Salamander. Available online at: http://www.virginiaherpetologicalsociety.com/amphibians/salamanders/cow-knob-salamander/cow_knob_salamander.php. Accessed April 2016.

Virginia Plant Atlas. 2016. Digital Atlas of the Virginia Flora: *Phlox bucklei* Wherry. Available online at: http://vaplantatlas.org/index.php?do=plant&plant=3144. Accessed May 2016.

Virginia Tech Virtual Aquarium. 2016. Available online at: http://www.web1.cnre.vt.edu/efish/families/appalachia.html. Accessed April 2016.

West Virginia Department of Environmental Protection, Office of Explosives and Blasting. 2006. Report of Potential Effects of Surface Mine Blasts Upon Bat Hibernaculum. Available online at: https://www.osmre.gov/resources/blasting/docs/StateReports/2006WVOEBBats.pdf. Accessed January 2017.

West Virginia Department of Natural Resources. 2003. Rare Species–Peregrine Falcon. Available online at: http://www.wvdnr.gov/Wildlife/RETSpecies.asp. Accessed July 2016.

West Virginia Department of Natural Resources. 2003. West Virginia Natural Heritage Database. Available online at: http://www.wvdnr.gov/Wildlife/Endangered.shtm. Accessed November 2016.

West Virginia Division of Highways. 2016. Corridor H Development Status. Available online at: http://www.wvcorridorh.com/engineer/0416_construct.html. Accessed March 2017.

West Virginia Division of Natural Resources. 2015. 2015 West Virginia State Wildlife Action Plan. Available online at: http://www.wvdnr.gov/2015%20West%20Virginia%20State%20Wildlife%20Action%20Plan%20Submittal.pdf. Accessed August 2016.

West Virginia Division of Natural Resources. 2016. Rare, Threatened & Endangered Species – WV Natural Heritage Program. Available online at: http://www.wvdnr.gov/Wildlife/RareSpecList.shtm. Accessed March 2017.

Wildscreen Arkive. 2016. Green Salamander (*Aneides aeneus*). Available online at http://www.arkive.org/green-salamander/aneides-aeneus/. Accessed December 2016.

Wilton Wildlife Preserve and Park. 2016. Frosted Elfin Butterfly. Available online at: http://www.wiltonpreserve.org/conservation/frosted-elfin-butterfly. Accessed May 2016.

Winslow, M. and K. Hotopp. 2012. Land Snails and Slugs of the Mid-Atlantic and Northeastern United States: Virginia Land Snails, *Paravitrea reesei*. Carnegie Museum of Natural History. Available online at http://www.carnegiemnh.org/science/mollusks/va_paravitrea_reesei.html. Accessed November 2016.

Wisconsin Department of Natural Resources, 2015). *Gomphus quadricolor*. Available online at: http://wiatri.net/inventory/odonata/SpeciesAccounts/SpeciesDetail.cfm?TaxaID=91. Accessed October 11, 2016

Wisconsin Department of Natural Resources. 2013. Wisconsin Little Brown Bat Species Guidance. Bureau of Natural Heritage Conservation, Wisconsin Department of Natural resources. Available online at: http://dnr.wi.gov/files/PDF/pubs/er/ER0705.pdf. Accessed September 2016.

Wisconsin Department of Natural Resources. 2016. Hill's Pondweed (*Potamogeton hillii*). Available online at: http://dnr.wi.gov/topic/EndangeredResources/Plants.asp? mode=detail&SpecCode=PMPOT030F0. Accessed May 2016.

Wisniewski, 2008. Georgia Department of Natural Resources Species Profile: Atlantic Pigtoe. Available at: http://georgiawildlife.com/sites/default/files/uploads/wildlife/nongame/pdf/accounts/invertebrates/fusconaia_masoni.pdf. Accessed February 9, 2017.

Woodbridge, B. and C.D. Hargis. 2006. Northern goshawk inventory and monitoring technical guide. General Technical Report WO-71. Washington, DC: U.S. Forest Service. Available online at: https://www.fs.fed.us/rm/pubs_other/wo_gtr071.pdf. Accessed February 2017.

Woods, A.J., J.M. Omernik, D.D. Brown. Level III and IV Ecoregions of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. U.S. Environmental Protection Agency, Corvallis, Oregon.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE PROJECT

BIOLOGICAL EVALUATION

APPENDIX A

Monongahela and George Washington
National Forest Regional Forester's Sensitive
Species List Survey Maps

Contains Privileged Information
Filed Under Separate Cover on March 10, 2017

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

APPENDIX B

Monongahela and George Washington National Forest Waterbody Crossings

and

Monongahela and George Washington National Forest Affected Waterbody Baseline Conditions

TABLE B-1

Waterbody Crossings and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests

Crossing Count	Milepost	Approximate Crossing Width (feet)	Construction Method/ Access Road Type	Feature ID [a]	Waterbody Name	Flow Regime	State Water Quality Classification [b]	Fishery Type [c]	Restricted In-Water Work Periods [d]
MONONGAHELA NATIONAL FOREST									
PIPELINE									
1	81.5	4	1) Dam and Pump 2) Flume	spoa402	UNT to Sugar Camp Run	Intermittent	Unclassified	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
2	82.0	12	1) Dam and Pump 2) Flume	spoa400	UNT to Shock Run	Perennial	UNT to Tier 3	Coldwater Stream (Brook Trout)	September 15 to March 31 (MNF additional erosion control measures required October 1 to June 1 within 100 feet of perennial stream)
ACCESS ROADS									
1	71.9	2	Permanent Existing Access Road	spoa422	UNT to Slaty Fork	Ephemeral	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
2	71.9	3	Permanent Existing Access Road	spoa423	UNT to Slaty Fork	Ephemeral	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
3	71.9	Culverted Crossing or Directly Adjacent to AR (no impact)	Permanent Existing Access Road	spoa424	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
4	71.9	3	Permanent Existing Access Road	spoa425	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
5	71.9	5	Permanent Existing Access Road	spoa427	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31

TABLE B-1 (cont'd)

Waterbody Crossings and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests

Crossing Count	Milepost	Approximate Crossing Width (feet)	Construction Method/ Access Road Type	Feature ID [a]	Waterbody Name	Flow Regime	State Water Quality Classification [b]	Fishery Type [c]	Restricted In-Water Work Periods [d]
6	71.9	5	Permanent Existing Access Road	spoa428	UNT to Slaty Fork	Perennial	UNT to HQS, Tier 3	Coldwater Stream (Brook Trout)	September 15 to March 31 (MNF additional erosion control measures required October 1 to June 1 within 100 feet of perennial stream)
7	71.9	4	Permanent Existing Access Road	spoa421	UNT to Slaty Fork	Ephemeral	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
8	71.9	3	Permanent Existing Access Road	spoa429	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
9	71.9	7	Permanent Existing Access Road	spoa420	Slaty Fork	Intermittent	HQS, Tier 3	Coldwater Stream (Brook Trout)	September 15 to March 31
10	72.0	2	Permanent Existing Access Road	spoa430	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
11	72.0	2	Permanent Existing Access Road	spoa431	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
12	72.0	5	Permanent Existing Access Road	spoa432	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
13	72.0	2	Permanent Existing Access Road	spoa433	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
14	72.0	2	Permanent Existing Access Road	spoa434	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
15	72.0	2	Permanent Existing Access Road	spoa435	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
16	72.0	9	Permanent Existing Access Road	spoa436	UNT to Slaty Fork	Perennial	UNT to HQS, Tier 3	Coldwater Stream (Brook Trout)	September 15 to March 31 (MNF additional erosion control measures required October 1 to June 1 within 100 feet of perennial stream)
17	72.0	2	Permanent Existing Access Road	spoa437	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31

TABLE B-1 (cont'd)

Waterbody Crossings and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests

Crossing Count	Milepost	Approximate Crossing Width (feet)	Construction Method/ Access Road Type	Feature ID [a]	Waterbody Name	Flow Regime	State Water Quality Classification [b]	Fishery Type [c]	Restricted In-Water Work Periods [d]
18	72.0	2	Permanent Existing Access Road	spoa438	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
19	72.0	6	Permanent Existing Access Road	spoa439	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
20	72.0	2	Permanent Existing Access Road	spoa440	UNT to Slaty Fork	Intermittent	UNT to HQS, Tier 3	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
21	72.0	9	Permanent Existing Access Road	spoa441	UNT to Slaty Fork	Perennial	UNT to HQS, Tier 3	Coldwater Stream (Brook Trout)	September 15 to March 31 (MNF additional erosion control measures required October 1 to June 1 within 100 feet of perennial stream)
22	81.2	5	Permanent Existing Access Road	spoa408	UNT to Sugar Camp Run	Intermittent	Unclassified	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
23	81.9	1	Permanent Existing Access Road	spoa410	UNT to Sugar Camp Run	Ephemeral	Unclassified	Coldwater Stream (Brook Trout)	September 15 to March 31
24	83.5	2	Permanent Existing Access Road	spoa407	UNT to Knapp Creek	Intermittent	UNT to HQS	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
25	83.8	2	Permanent Existing Access Road	spoa406	UNT to Knapp Creek	Intermittent	UNT to HQS	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
26	84.1	5	Permanent Existing Access Road	spoa405	UNT to Knapp Creek	Intermittent	UNT to HQS	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31
27	84.1	8	Permanent Existing Access Road	spoa404	UNT to Knapp Creek	Perennial	UNT to HQS	Coldwater Stream (Brook Trout)	September 15 to March 31 (MNF additional erosion control measures required October 1 to June 1 within 100 feet of perennial stream)
28	84.4	3	Permanent Existing Access Road	spoa403	UNT to Knapp Creek	Intermittent	UNT to HQS	UNT to Coldwater Stream (Brook Trout)	September 15 to March 31

TABLE B-1 (cont'd)

Waterbody Crossings and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests

Crossing Count	Milepost	Approximate Crossing Width (feet)	Construction Method/ Access Road Type	Feature ID [a]	Waterbody Name	Flow Regime	State Water Quality Classification [b]	Fishery Type [c]	Restricted In-Water Work Periods [d]
GEORGE WASHINGTON NATIONAL FOREST									
PIPELINE									
1	85.0	45	1) Dam and Pump 2) Flume	shia407	UNT to Warwick Run	Perennial	WQS not assessed; Class I-IV	Brook Trout; Roughead Shiner	October 1 to March 31; March 15 to June 30
2	85.1	10	1) Dam and Pump 2) Flume	shia410	UNT to Warwick Run	Perennial	WQS not assessed; Class I-IV	Brook Trout; Roughead Shiner	October 1 to March 31; March 15 to June 30
3	85.4	10	1) Dam and Pump 2) Flume	shia409	UNT to Lick Draft	Perennial	WQS not assessed; Class I-IV	Brook Trout	October 1 to March 31
4	85.5	8	1) Dam and Pump 2) Flume	shia408	Lick Draft	Perennial	WQS not assessed; Class I-IV	Brook Trout	October 1 to March 31
5	94.1	7	1) Flume 2) Dam and Pump	sbaa004	Laurel Run	Perennial	Impaired; Class I-IV	Brook Trout	October 1 to March 31
6	98.3	20	Dam and Pump	sbaa005	UNT to Cowpasture River	Perennial	WQS not assessed	Yellow Lance Mussel	May 15 to July 31
7	98.9	4	Dam and Pump	sbaa006	UNT to Cowpasture River	Intermittent	WQS not assessed	Yellow Lance Mussel	May 15 to July 31
8	99.3	3	Dam and Pump	sbaa003	UNT to Gibson Hollow	Intermittent	WQS not assessed	Unclassified	No Restrictions Listed
9	99.3	TBD	TBD	sbaa019	Gibson Hollow	Perennial	WQS not assessed	Unclassified	No Restrictions Listed
10	115.8	TBD	1) Dam and Pump 2) Flume	saua436	Barn Lick Branch	Perennial	WQS not assessed	Unclassified	No Restrictions Listed
11	117.1	10	1) Dam and Pump 2) Flume	saua416	Dowell's Draft	Perennial	Aquatic Life; Class I-IV	Brook Trout	October 1 to March 31

TABLE B-1 (cont'd)

Waterbody Crossings and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests

Crossing Count	Milepost	Approximate Crossing Width (feet)	Construction Method/ Access Road Type	Feature ID [a]	Waterbody Name	Flow Regime	State Water Quality Classification [b]	Fishery Type [c]	Restricted In-Water Work Periods [d]
12	117.2	9	1) Dam and Pump 2) Flume	saua418	UNT to Dowell's Draft	Intermittent	UNT to Aquatic Life; Class I-IV	UNT to Brook Trout	October 1 to March 31
13	117.7	7	1) Dam and Pump 2) Flume	saua419	UNT to East Branch Dowell's Draft	Intermittent	UNT to Aquatic Life; Class I-IV	UNT to Brook Trout	October 1 to March 31
14	120.2	2	1) Flume 2) Dam and Pump	saua427	Buckhorn Creek	Ephemeral	Aquatic Life	Unclassified	No Restrictions Listed
15	120.2	25	1) Dam and Pump 2) Flume	saua427	Buckhorn Creek	Perennial	Aquatic Life	Unclassified	No Restrictions Listed
16	120.4	29	1) Dam and Pump 2) Flume	saua428	UNT to Buckhorn Creek	Perennial	UNT to Aquatic Life	Unclassified	No Restrictions Listed
17	120.6	3	1) Dam and Pump 2) Flume	saua429	UNT to Stoutameyer Branch	Intermittent	WQS not assessed	Unclassified	No Restrictions Listed
18	121.1	10	1) Dam and Pump 2) Flume	nhd_va_030	Stoutameyer Branch	Perennial	WQS not assessed	Unclassified	No Restrictions Listed
19	122.5	3	1) Flume 2) Dam and Pump	saua421	UNT to Jennings Branch	Intermittent	WQS not assessed; Class I-IV	UNT to Brook Trout	October 1 to March 31
20	122.8	6	1) Flume 2) Dam and Pump	saua422	UNT to Jennings Branch	Intermittent	WQS not assessed; Class I-IV	UNT to Brook Trout	October 1 to March 31
21	123.0	3	1) Flume 2) Dam and Pump	saua423	UNT to Jennings Branch	Ephemeral	WQS not assessed; Class I-IV	UNT to Brook Trout	October 1 to March 31
22	154.2	5	1) Flume 2) Dam and Pump	saua072	UNT to Back Creek	Intermittent	WQS not assessed; Class V-VIII	Unclassified	No Restrictions Listed
23	154.4	8	1) Dam and Pump 2) Flume	saua434	UNT to Back Creek	Intermittent	WQS not assessed; Class V-VIII	Unclassified	No Restrictions Listed

TABLE B-1 (cont'd)

Waterbody Crossings and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests

Crossing Count	Milepost	Approximate Crossing Width (feet)	Construction Method/ Access Road Type	Feature ID [a]	Waterbody Name	Flow Regime	State Water Quality Classification [b]	Fishery Type [c]	Restricted In-Water Work Periods [d]
24	154.5	4	1) Flume 2) Dam and Pump	saua071	UNT to Back Creek	Intermittent	WQS not assessed; Class V-VIII	Unclassified	No Restrictions Listed
25	154.8	10	1) Dam and Pump 2) Flume	saua433	UNT to Back Creek	Intermittent	WQS not assessed; Class V-VIII	Unclassified	No Restrictions Listed
26	154.9	6	1) Flume 2) Dam and Pump	saua432	UNT to Back Creek	Ephemeral	WQS not assessed; Class V-VIII	Unclassified	No Restrictions Listed
27	155.0	2	1) Flume 2) Dam and Pump	saua431	UNT to Back Creek	Intermittent	WQS not assessed; Class V-VIII	Unclassified	No Restrictions Listed
28	155.1	11	1) Flume 2) Dam and Pump	saua430	UNT to Back Creek	Ephemeral	WQS not assessed; Class V-VIII	Unclassified	No Restrictions Listed
ACCESS ROADS									
1	85.1	14	Permanent Existing Access Road	shia411	UNT to Warwick Run	Perennial	WQS not assessed; Class I-IV	UNT to Brook Trout; Roughhead Shiner	October 1 to March 31; March 15 to June 30
2	85.4	15	Permanent Existing Access Road	shia408	Lick Draft	Perennial	WQS not assessed; Class I-IV	Brook Trout	October 1 to March 31
3	93.7	2	Permanent Existing Access Road	sbaa008	UNT to Muddy Run	Intermittent	WQS not assessed	Unclassified	No Restrictions Listed
4	93.7	2	Permanent Existing Access Road	sbaa009	UNT to Muddy Run	Intermittent	WQS not assessed	Unclassified	No Restrictions Listed
5	93.7	2	Permanent Access Road	sbaa010	UNT to Muddy Run	Intermittent	WQS not assessed	Unclassified	No Restrictions Listed
6	93.7	2	Permanent Access Road	sbaa011	UNT to Muddy Run	Intermittent	WQS not assessed	Unclassified	No Restrictions Listed
7	117.1	15	Permanent Existing Access Road	saua416	Dowell's Draft	Perennial	Aquatic Life; Class I-IV	Brook Trout	October 1 to March 31

TABLE B-1 (cont'd)

Waterbody Crossings and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests

Crossing Count	Milepost	Approximate Crossing Width (feet)	Construction Method/ Access Road Type	Feature ID [a]	Waterbody Name	Flow Regime	State Water Quality Classification [b]	Fishery Type [c]	Restricted In-Water Work Periods [d]
8	117.2	8	Permanent Existing Access Road	saua418	UNT to Dowell's Draft	Intermittent	UNT to Aquatic Life; Class I-IV	UNT to Brook Trout	October 1 to March 31
9	117.3	10	Permanent Existing Access Road	saua420	East Branch Dowells Draft	Perennial	WQS not assessed	UNT to Brook Trout	October 1 to March 31
10	120.2	10	Existing Trail to New Temporary Road	saua426	UNT to Buckhorn Creek	Perennial	UNT to Aquatic Life	Unclassified	No Restrictions Listed
11	120.2	20	Permanent Existing Access Road	saua424	Buckhorn Creek	Perennial	Aquatic Life	Unclassified	No Restrictions Listed
12	120.3	1	Existing Trail to New Temporary Road	saua425	UNT to Buckhorn Creek	Ephemeral	UNT to Aquatic Life	Unclassified	No Restrictions Listed

[a] Feature IDs starting with "nhd" have not been surveyed and were digitized based on National Hydrography Dataset: assumed 10-foot-wide perennial and 5-footwide intermittent.

[b] Abbreviations for West Virginia State Water Quality Classifications are listed below:

West Virginia Stream Water Use Categories:

- **Tier 3** = As designated by the WV Department of Environmental Protection, maintains and protects water quality in outstanding national resource waters and includes waters in Federal Wilderness Areas, specifically designated federal waters, and high quality waters or naturally reproducing trout streams in state parks, national parks, and national forests (http://www.dep.wv.gov/WWE/Programs/wqs/Pages/default.aspx).
- State Water Quality Classifications were determined using West Virginia Code of State Regulations, Title 47, Series 2 and communication with West Virginia Department of Environmental Protection staff (Peterson, 2015).
- High Quality Streams (**HQS**) are based on the 6th Edition of the West Virginia HQS prepared by the Wildlife Resources Section of the WV Division of Natural Resources.
- State regulations require the classification to extend into upstream tributaries, indicated by UNT (unnamed tributary) to [Stream Class].

Abbreviations for Virginia State Water Quality Classifications are listed below:

Virginia Trout Waters Classes:

- **WQS** = Water Quality Standards, were determined using a Virginia Department of Environmental Quality GIS 2014 dataset available at: http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS/VEGISDatasets.aspx. **Aquatic Life** streams includes streams designated for indigenous populations of aquatic life; **Impaired** streams reflect an impairment in Designated Uses Categories; **Not Assessed** are streams needing additional information. For Assessment Methodology refer to: http://www.deq.virginia.gov/Portals/0/DEQ/Water/WaterQualityAssessments/IntegratedReport/2014/ir14_Ch4.1_Assessment_Methodology.pdf.
- **Classes I, II, III, IV** are wild natural trout streams ranking from highest to lowest quality.
- **Classes V, VI, VII, and VIII** are stockable trout streams ranking from highest to lowest quality.
- State Water Quality Classifications were determined using Virginia Department of Environmental Quality GIS dataset, 2014 Integrated WQ Report Rivers, June 13, 2017, available from the Virginia Environmental Geographic Information System (VEGIS) website at: http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS/VEGISDatasets.aspx.
- State regulations require the classification to extend into adjacent tributaries, indicated by UNT (unnamed tributary) to [Stream Class]

[c] Fisheries type is based on agency consultation letters and/or online data.

[d] Restricted in-water work periods are based on agency consultation letters or online data.

TABLE B-2

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation: Species	Dominant Bank Vegetation: Average Diameter at Breast Height (DBH) (inches)	Aquatic Habitats Present	Aquatic Organisms Observed	Notes
MONONGAHELA NATIONAL FOREST									
UNT to Sugar Camp Run	spoa402 | 81.5	Intermittent	High	Cobble, gravel, sand, silt/clay, organic	White pine, red maple, sugar maple, northern red oak, witch hazel, chestnut oak, striped maple, violet, hay scented fern, Christmas fern, partridge berry, wood fern	Trees: 12.0 Saplings: 1.5	Coarse woody debris in channel, scattered leaf packs	Invertebrates	Steep gradient, no evidence of bank instability, area is mature second growth forest with white pine and mixed hardwoods, water velocity approximately 0.75 feet per second (fps).
UNT to Shock Run	spoa400 | 82.0	Perennial	High	Cobble, Gravel, Sand , Boulder, Organic	Sugar maple, hemlock, sweet birch, beech, black cherry, striped maple, witch hazel, green ash, Christmas fern, wood nettle, foamflower, violet, lady fern, woodland sedge	Trees 12.0 Saplings: 1.0	Small step pools, riffles, coarse woody debris in channel, scattered leaf packs, wrack piles	Invertebrates crayfish	Moderately steep gradient, areas of bank instability in form of loose rock/soil with exposed roots; area is mature second growth mixed hardwood forest with scattered hemlocks, water velocity approximately 1.75 fps.
GEORGE WASHINGTON NATIONAL FOREST									
UNT to Warwick Run	shia407 | 85.0	Perennial	High	Cobble, Gravel, Sand, Boulder, Organic	Hemlock, white pine, sugar maple, green ash, basswood, sweet birch, yellow poplar, hydrangea, striped maple, Dutchman's pipe, Christmas fern, violet, wood aster, blackberry, wood fern	Trees: 14.0 Saplings: 1.0	Riffles, scattered pools, woody debris, wrack piles	Water striders invertebrates minnows crayfish	Moderately steep gradient, channel is braided, area is mature second growth mixed hardwoods with hemlock and white pine, canopy sparse in places due to hemlock and white pine mortality, water velocity approximately 1.5 fps.

TABLE B-2 (cont'd)

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation		Aquatic Habitats Present	Aquatic Organisms Observed	Notes
					Species	Average Diameter at Breast Height (DBH) (inches)			
UNT to Warwick Run	shia410 | 85.1	Perennial	High	Cobble, Gravel, Sand, Organic	Hemlock, white pine, sugar maple, yellow poplar, shagbark hickory, striped maple, witch hazel, cornflower, Christmas fern, bellwort, green ash, violet, wood nettle	Trees: 14.0 Saplings: 1.5	Small pools, coarse woody debris, scattered leaf packs	Invertebrates crayfish	High gradient stream with flashy high flows, bank instability in the form of loose rocks and soils, exposed roots are present, water velocity approximately 2 fps.
UNT to Lick Draft	shia409 | 85.4	Perennial	High	Cobble, Gravel, Sand, Boulder, Organic	Northern red oak, red maple, sugar maple, hemlock, white oak, yellow poplar, sweet birch, hydrangea, witch hazel, ironwood, wood nettle, starwort, violet, Christmas fern, wood fern	Trees: 13.0 Saplings: 1.0	Isolated step pools, occasional leaf packs, woody debris, overhanging roots, riffles	Invertebrates salamander, crayfish	Moderately steep gradient mountain, bank instability is present in places of loose rocks/soil and exposed roots, water velocity approximately 2 fps.
Lick Draft	shia408 | 85.5	Perennial	High	Cobble, Gravel, Boulder, Sand, Organic	Hemlock, yellow poplar, white pine, shagbark hickory, sugar maple, red maple, striped maple, sweet birch, witch hazel, mountain laurel, wood aster, violet, hay scented fern, miter box, trillium, wood fern	Trees: 14.0 Saplings: 1.5	Coarse woody debris, scattered small pools, overhanging roots, riffles	Minnows, invertebrates water striders, frog	Moderately steep gradient, signs of instability include loose rock/soil, and exposed roots, paralleled by an old road bed on west bank, water velocity approximately 1.5 fps.

TABLE B-2 (cont'd)

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation: Species	Dominant Bank Vegetation: Average Diameter at Breast Height (DBH) (inches)	Aquatic Habitats Present	Aquatic Organisms Observed	Notes
Laurel Run	sbaa004 | 94.1	Perennial	High	Cobble, Gravel, Sand, Silt/Clay, Organic	White oak, black gum, scarlet oak, chestnut oak, sassafras, sweet birch, white pine, witch hazel, mountain laurel, rhododendron, wood fern, Indian cucumber root, violet, Christmas fern	Trees: 12.0 Saplings: 1.5	Leaf packs, scattered small pools, overhanging roots, course woody debris, wrack piles	caddisfly, cranefly, mayfly; crayfish	Perennial stream of moderate gradient with a meandering channel; there is a small braid at the upstream edge of the corridor. Mature second growth mixed hardwood forest with scattered white pine, water velocity approximately 0.75 fps.
UNT to Cowpasture River	sbaa005 | 98.3	Perennial	High	Cobble, Gravel, Bedrock, Sand, Boulder	White oak, sugar maple, white pine, chestnut oak, pignut hickory, black gum, red maple, witch hazel, blackhaw, huckleberry, grape, cinquefoil, panic grass, wild rye, violet, woodland sedge	Trees: 12.0 Saplings: 1.5	Step pools, coarse woody debris, wrack piles	mayfly, caddisfly; crayfish	Moderately steep gradient, banks exhibit no signs of instability, slopes above bank are steep, mature growth mixed hardwood forest with white –pine, water velocity approximately 1.25 fps.
UNT to Cowpasture River	sbaa006 | 98.9	Intermittent	High	Cobble, Gravel, Sand, Silt/clay, Organic	White oak, black gum, shagbark hickory, northern red oak, pignut hickory, white pine, sugar maple, witch hazel, huckleberry, panic grass, wood rush, cinquefoil, woodland sedge, violet, wild yams, spotted wintergreen	Trees: 13.0 Saplings: 1.75	Leaf packs, coarse woody debris	None	Moderately steep gradient, banks not well defined, no evidence of bank instability, mature second growth mixed hardwood forest with white pine, water velocity approximately 0.75 fps.

TABLE B-2 (cont'd)

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation		Aquatic Habitats Present	Aquatic Organisms Observed	Notes
					Species	Average Diameter at Breast Height (DBH) (inches)			
UNT to Gibson Hollow	sbaa003 | 99.3	Intermittent	Moderate	Gravel, Sand, Silt/Clay, Organic	Northern red oak, white oak, white pine, red maple, hop hornbeam, chestnut oak, hawthorne, violet, wild oat grass, woodland sedge, wood rush	Trees: 11.0 Saplings: 2.0	Leaf packs, coarse woody debris	None	Outflow from seep, alternately subterranean and surface, no evidence of bank instability, mature second growth mixed hardwood forest, water velocity approximately 0.15 fps.
Gibson Hollow	sbaa019 | 99.3	Perennial	High	Bedrock, Cobble, Gravel, Sand, Silt/Clay, Organic	northern red oak, white oak, hop hornbeam, red maple, black gum, white pine, shagbark hickory, wild rye, Japanese stilt grass, deer tongue grass, mountain brome, golden ragwort, wood aster, violet	Trees: 12.0 Saplings: 1.5	Coarse woody debris, leaf packs, pools, scattered emergent vegetation	Water striders, caddisfly, crayfish	Dirt ATV road crossing, palustrine forested wetland on both sides of stream, water velocity approximately 0.33 fps.
Barn Lick Branch	saua436 |115.8	Perennial	Moderate	Sand, Silt/Clay, Gravel, Cobble	White oak, white pine, musclewood	Trees: 10.0 Saplings: 2.0	Cobble, roots along bank, debris pile	none	Strong sinuosity, weak riffle pool, strong grade control, well developed bars and benches, debris piles, water velocity approximately 1.50 fps.
Dowell's Draft	saua416 | 117.1	Perennial	Moderate	Cobble, Gravel	Eastern hemlock, white pine, white oak, violet, red maple, Christmas fern	Trees: 14.0 Saplings: 2.0	Riffles and pools, downed logs in bed, Over hanging banks and roots	None	Water velocity approximately 2.0 fps.

TABLE B-2 (cont'd)

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation		Aquatic Habitats Present	Aquatic Organisms Observed	Notes
					Species	Average Diameter at Breast Height (DBH) (inches)			
UNT to Dowell's Draft	saua418 | 117.2	Intermittent	Moderate	Bedrock, Gravel, Sand	White Pine, White Oak, Red Maple, Common Smilax, May-apple, Christmas fern, bedstraw	Trees: 12.0 Saplings: 2.0	Riffles and pools	None	Water velocity approximately 1.5 fps
UNT to East Branch Dowell's Draft	saua419 | 117.7	Intermittent	Moderate	Gravel, Sand, Cobble	White pine, white oak, red maple, post oak, mountain laurel, river oats, poison Ivy	Trees: 12.0 Saplings: 2.0	Riffles and Pools, leaf packs	None	Stream branches downstream for a short distance and then merges back into a single stream, water velocity approximately 1.0 fps
UNT to Buckhorn Creek	saua426 | 120.2	Perennial	Moderate	Cobble, Gravel, Sand, Silt/Clay	Northern red oak, sugar maple, eastern hemlock, white pine, mountain laurel	Trees: 10.0 Saplings: 2.0	Cobble, roots along bank, debris pile	Mayfly, caddis fly, stonefly	Moderate sinuosity, weak to moderate riffle, strong grade control and benches, debris pile present, water velocity approximately 1.5 fps
Buckhorn Creek	saua427 | 120.2	Ephemeral	Moderate	Cobble, Gravel, Boulder	white Oak, White Pine, American Hornbeam, red maple, may-apple, violet, smilax	Trees: 12.0 Saplings: 2.0	None	None	Due to the high cobble content the OHWM is obscured, water velocity not available.
Buckhorn Creek	saua427 | 120.2	Perennial	High	Cobble, Gravel, Sand	White oak, White Pine, Sycamore, Red Maple, May-Apple, Violet, Smilax	Trees: 10.0 Saplings: 2.0	None	None	Stream located several hundred feet from campground facility. Water velocity approximately 1.5 fps
UNT to Buckhorn Creek	saua425 | 120.3	Ephemeral	Moderate	Silt/Clay, Gravel, Sand, Cobble	Northern red oak, sugar maple, white oak, mountain laurel	Trees: 6.0 Saplings: 2.0	None	None	Weak sinuosity, leaf letter and fibrous roots present in channel, weak to absent ordinary high water mark, lacked hydric soils, water velocity not available

TABLE B-2 (cont'd)

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation: Species	Dominant Bank Vegetation: Average Diameter at Breast Height (DBH) (inches)	Aquatic Habitats Present	Aquatic Organisms Observed	Notes
UNT to Buckhorn Creek	saua428 | 120.4	Perennial	High	Gravel, Cobble, Sand	Red oak, white pine, American hornbeam, striped maple, violet, Christmas fern, multiflora rose, wintergreen	Trees: 14.0 Saplings: 2.0	Deep pools and riffles, over hanging banks and roots, course woody debris	None	Stream located in natural valley. Water velocity approximately 1.0 fps
UNT to Stoutameyer Branch	saua429 | 120.6	Intermittent	Moderate	Silt/Clay, Sand, Gravel	White oak, chestnut oak, red maple, American hornbeam	Trees: 8.0 Saplings: 2.0	None	None	Stream located in drainage way, water velocity approximately 0.5 fps
Stoutameyer Branch	nhd_va_030 | 121.1	Perennial	High	Cobble, Gravel, Sand, Silt/Clay, Organic	White oak, chestnut oak, northern red oak, white pine, eastern hemlock, sycamore, hickory, mountain laurel, alternate leaf dogwood, white wood aster, greenbrier, woodland sedge, wild oat grass, Christmas fern	Trees: 14.0 Saplings: 2.0	Overhanging banks and roots, coarse woody debris, leaf packs	caddisfly	Waterbody paralleled by Stover Shop Road, water velocity approximately 1.0 fps
UNT to Jennings Branch	saua421 | 122.5	Intermittent	High	Sand, Gravel	White pine, mountain laurel, common smilax, dogwood, sphagnum	Trees: 14.0 Saplings: 2.0	Leaf packs	None	Stream goes subterranean in sections, water velocity approximately 0.5 fps
UNT to Jennings Branch	saua422 | 122.8	Intermittent	High	Gravel, Sand Cobble, bedrock	White pine, mountain laurel, chestnut oak, scarlet oak, lowbush blueberry, pasture rose	Trees: 12.0 Saplings: 2.0	Leaf packs, downed logs, overhanging roots	None	Stream surveyed as saua422. Water velocity approximately 1.0 fps.

TABLE B-2 (cont'd)

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation		Aquatic Habitats Present	Aquatic Organisms Observed	Notes
					Species	Average Diameter at Breast Height (DBH) (inches)			
UNT to Jennings Branch	saua423 | 123.0	Ephemeral	High	Silt/Clay, Sand, Boulder	Red oak, post oak, blackberry, red maple, common blue violet	Trees: 22.0 Saplings: 2.0	Leaf packs	None	Stream surveyed as saua423. Loses stream bed in some sections, water velocity approximately 0.3 fps.
UNT to Back Creek	saua072 | 154.2	Intermittent	High	Cobble, bedrock [c]	Yellow popular, chestnut oak, black cherry, northern red oak, dogwood, mountain laurel, huckleberry, greenbrier, Christmas fern	Trees: 10.0 Saplings: 1.0	Leaf packs, small pools, woody debris	None	Stream begins where subterranean flow comes to surface, no signs of bank instability observed, water velocity approximately 0.25 fps.
UNT to Back Creek	saua434 | 154.4	Intermittent	Moderate	Gravel, Sand, Silt/Clay, Organic, Cobble	Red oak, witch hazel, tulip-tree, falsenettle, Japanese stiltgrass	Trees: 12.0 Saplings: 2.0	Leaf Packs, overhanging banks/roots, downed coarse woody debris, pools	Crayfish, minnows, frogs, caddisfly larvae, stonefly nymphs	Stream is strongly intermittent with deep pools with minnows in them Fringe wetland present for part of the stream. Water velocity approximately 0.2 fps.
UNT to Back Creek	saua071 | 154.5	Intermittent	High	Cobble, Bedrock, Silt [c]	White oak, red oak, chestnut oak, sweet birch, dogwood, mountain laurel, Christmas fern	Trees: 10.0 Saplings: 0.75	Small pools, leaf packs	Various invertebrates	Slopes above banks appear stable, loses bed/bank/OHWM near western edge of corridor in a rocky flat where flow becomes subterranean, water velocity approximately 1.0 fps.
UNT to Back Creek	saua433 | 154.8	Intermittent	Moderate	Gravel, Cobble, Boulder Sand, Organic,	Red maple, white pine, American beech, chestnut oak, red oak, Spicebush, common greenbrier	Trees: 12.0 Saplings: 2.0	Leaf Packs, overhanging banks, downed coarse woody debris, pools	None	Intermittent stream mapped on NHD, water velocity not available.

TABLE B-2 (cont'd)

Baseline Conditions for Waterbodies Affected by the Atlantic Coast Pipeline in the Monongahela and George Washington National Forests [a]

Waterbody Name	Waterbody ID | Milepost	Stream Classification	Stream Quality Rating [b]	Substrate (highest to lowest percent composition)	Dominant Bank Vegetation: Species	Dominant Bank Vegetation: Average Diameter at Breast Height (DBH) (inches)	Aquatic Habitats Present	Aquatic Organisms Observed	Notes
UNT to Back Creek	saua432 | 154.9	Ephemeral	Moderate	Gravel, Cobble, Sand	American beech, red oak, red maple, American hog peanut, witch-hazel, cucumber tree, common greenbrier, hackberry	Trees: 12.0 Saplings: 2.0	Leaf Packs	None	Channel maybe weakly ephemeral, several FACU plants growing in streambed, stream contained numerous fibrous roots and leaf piles, water velocity not available.
UNT to Back Creek	saua431 | 155.0	Intermittent	Moderate	Gravel, Sand, Organic, Cobble	Tulip-tree, American beech, red oak, red maple, common greenbrier, sassafras	Trees: 14.0 Saplings: 2.0	Leaf Packs, overhanging banks	Caddisfly larvae, stonefly nymph	Stream fed by seep. Water velocity approximately 0.2 fps.
UNT to Back Creek	saua430 | 155.1	Ephemeral	Moderate	Gravel, Cobble, Sand	Tulip-tree, American beech, red oak, red maple, Japanese stiltgrass, American hog peanut	Trees: 12.0 Saplings: 2.0	Leaf Packs	None	Channel maybe weakly ephemeral, several FACU plants growing in streambed, stream contained numerous fibrous roots and leaf piles, water velocity not available.

a Baseline conditions were assessed during waterbody surveys.

b Stream Quality Rating Categories:

- High Quality: Natural channel, natural vegetation extends at least one or two active channel widths on each side; banks stable and protected by roots; water color is clear to tea-colored; no barriers to fish movement; many fish cover types available; diverse and stable aquatic habitat; no disturbance by livestock or man.
- Moderate Quality: Altered channel evidenced by rip-rap; natural vegetation extends 1/3-1/2 of the active channel width on each side; filtering function or riparian vegetation only moderately compromised; banks moderately unstable; water color is cloudy, submerged objects covered with greenish film; moderate odor; minor barriers to fish movement; fair aquatic habitat; minimum disturbance by livestock or man.
- Low Quality: Channel is actively down cutting or widening; rip rap and channelization excessive; natural vegetation less than 1/3 of the active channel width on each side; lack of regeneration; filtering function severely compromised; banks unstable (eroding); water color is muddy and turbid; obvious pollutants (algal mats, surface scum, surface sheen); heavy odor; severe barriers to fish movement; little to no aquatic habitat; severe disturbance from livestock or man.

c Substrate approximated based on review of datasheet photographs.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

BIOLOGICAL EVALUATION

APPENDIX C

Monongahela and George Washington National Forests

Construction, Operations, and Maintenance Plan
Second Draft

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket Nos. CP15-554-000
CP15-554-001

Construction, Operations, and Maintenance Plan

DRAFT

Prepared by

ERM

Updated Rev 2
January 2017

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

Attachments Are Provided Under Separate Cover Except Where Noted

LIST OF ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
ACRES	Assessment, Cleanup and Redevelopment Exchange System
ANST	Appalachian National Scenic Trail
AO	Authorized Officer
APE	Area of Potential Effect
Atlantic	Atlantic Coast Pipeline, LLC
ATV	all-terrain vehicle
ATWS	Additional Temporary Workspace
BA	biological assessment
BFM	bonded fiber matrix
BIC	Best in Class
Blocking Plan	OHV Blocking Plan
BMP	best management practice
BRP	Blue Ridge Parkway
BSRF	Belted Silt Retention Fence
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
CM	Compliance Monitors
COM	Construction, Operation and Maintenance
CP	cathodic protection
CPCN	Certificate of Public Convenience and Necessity
DEQ	Department of Environmental Quality
Dominion	Dominion Resources, Inc.
DTI	Dominion Transmission, Inc.
E&S	Erosion and Sediment Control
EACG	Eastern Area Coordination Group
ECC	Environmental Construction Coordinator
EI	Environmental Inspector
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERP	Emergency Response Plan
ERS	electronic reporting system
ESCP	Erosion and Sedimentation Control Plan
FAO	Fire Authorized Officer
FERC PM	FERC Environmental Project Manager
FERC	Federal Energy Regulatory Commission
Fire Plan	Fire Prevention and Suppression Plan
FSO	Field Safety Officer
ft./sec.	feet per second
FWS	U.S. Fish and Wildlife Service
GAI	GAI Consultants, Inc.
GPS	global positioning system
GWNF	George Washington National Forest[1]
HCA	High Consequence Areas

[1] George Washington National Forest refers to the northern portion of the George Washington & Jefferson National Forests throughout this document. Originally two separate national forests, the GWNF and Jefferson National forest were administratively combined in 1995 and are administered as a single national forest unit.

HDD	horizontal directional drill
ICS	Incident Command System
LRMP	Land and Resource Management Plans
LUST	Leaking Underground Storage Tank
MNF	Monongahela National Forest
MP	Milepost
NEPA	National Environmental Policy Act
NFS	National Forest Service
NNIS	Non-Native Invasive Species
NPS	National Park Service
NTP	Notice to Proceed
NTU	Nephelometric Turbidity Units
OHV	Off-Highway Vehicle[2]
OPS	Office of Pipeline Safety
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
PPV	peak particle velocity
Procedures	Wetland and Waterbody Construction and Mitigation Procedures
Projects	Atlantic Coast Pipeline and Supply Header Project
RECP	Rolled Erosion Control Product
RQ	reportable quantities
SACG	Southern Area Multi-Agency Coordination Group
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
Survey	Soil Survey
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
Transportation Plan	Traffic and Transportation Plan
UDP	Unanticipated Discoveries Plan
USACE	U.S. Army Corps of Engineers
USDA	United States Department of Agriculture
USDOT	U.S. Department of Transportation
USFS	U.S. Forest Service
UTV	Utility Task Vehicle
VAC	Virginia Code
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VESCH	Virginia Erosion and Sediment Control Handbook
WVDOT	West Virginia Department of Transportation

[2] Off-Highway Vehicle (OHV) in this document refers generally to all types of motorized off-highway vehicles, including both street-legal and non-street-legal full-sized vehicles, motorcycles, all-terrain vehicles (ATV), Utility Task Vehicles (UTV), etc.

1.0 INTRODUCTION

1.1 BACKGROUND

Atlantic Coast Pipeline, LLC (Atlantic) is a company formed by four major U.S. energy companies – Dominion Resources, Inc. (Dominion; NYSE: D), Duke Energy Corporation (Duke Energy; NYSE: DUK), Piedmont Natural Gas Co., Inc. (Piedmont; NYSE: PNY), and Southern Company Gas (NYSE: GAS).[3] The company was created to develop, own, and operate the proposed Atlantic Coast Pipeline (ACP), an approximately 600-mile-long, interstate natural gas transmission pipeline system designed to meet growing energy needs in Virginia and North Carolina. Atlantic has contracted with Dominion Transmission, Inc. (DTI), a subsidiary of Dominion, to permit, build, and operate the ACP on behalf of Atlantic.

The ACP will serve the growing energy needs of multiple public utilities and local distribution companies in Virginia and North Carolina. Based on current customer commitments, approximately 79.2 percent of the natural gas transported by the ACP will be used as a fuel to generate electricity for industrial, commercial, and residential uses. The remainder of the natural gas will be used directly for residential (9.1 percent), industrial (8.9 percent), and commercial and other uses such as vehicle fuel (2.8 percent). By providing access to low-cost natural gas supplies, the ACP will increase the reliability and security of natural gas supplies in Virginia and North Carolina.

An Environmental Impact Statement (EIS) is being prepared for the project by the Federal Energy Regulatory Commission (FERC), which has jurisdiction over the project under Section 7 of the Natural Gas Act. The FERC is responsible for the preparation of the Project's EIS in compliance with the Council on Environmental Quality regulations for implementing the National Environmental Policy Act (40 Code of Federal Regulations [CFR] Parts 1500-1508), and FERC's National Environmental Policy Act implementing regulations (18 CFR Part 380). The FERC will use the EIS to aid in deciding whether to issue the ACP a Certificate of Public Convenience and Necessity (CPCN). The U.S. Forest Service (USFS), along with several other Federal agencies, is cooperating with the FERC in preparing the EIS for the Project, and will use the EIS to aid in its own decision-making process, as discussed below. A complete list of federal, state/commonwealth, and local permits is included as Attachment N.

FERC, in consultation with the State Historic Preservation Officers, is also responsible for compliance with Section 106 of the National Historic Preservation Act (16 U.S. Code § 470f) and its implementing regulations (36 CFR Part 800) promulgated by the Advisory Council on Historic Preservation.

FERC, in consultation with the U.S. Fish and Wildlife Service (FWS), is also the lead federal agency responsible for compliance with Sections 7(a)(2) and 7(c) of the Endangered Species Act (16 U.S. Code. §§ 1536(a)(2), 1536(c)). FERC will prepare a biological assessment (BA) consistent with the requirements of 50 CFR § 402.12(f). The BA will identify conservation measures to avoid or minimize any adverse effects the Project may have on federally listed species and their critical habitat.

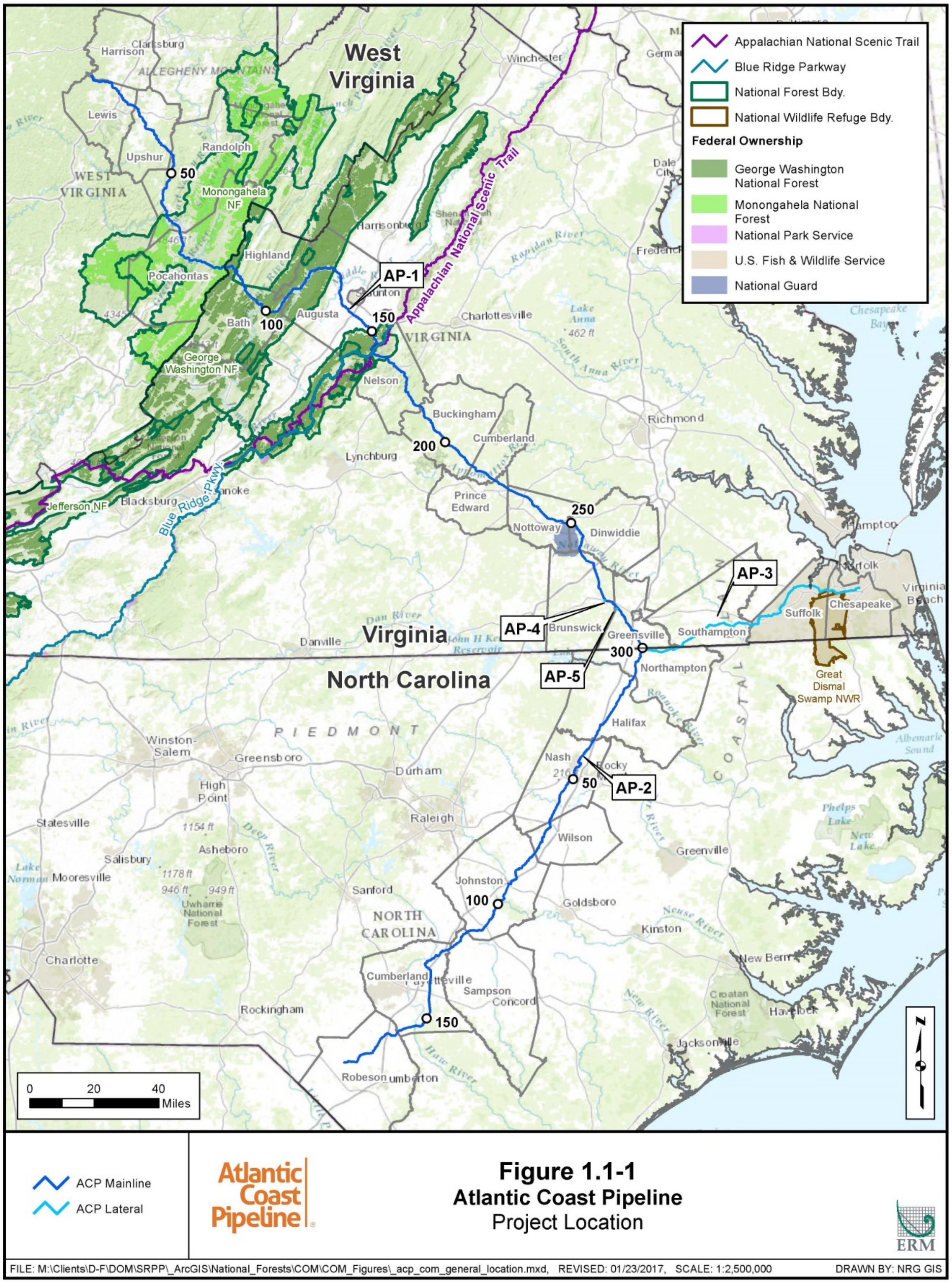
Portions of the Project would cross USFS lands administered by the Monongahela National Forest (MNF) and George Washington National Forest (GWNF)[4] (see Figure 1.1-1). Accordingly, Atlantic submitted an Application for Transportation and Utility Systems and Facilities on USFS Lands (Form SF-299) on November 12, 2015, and amended its application to incorporate various route changes on July 29, 2016.[5]

---

[3] On August 24, 2015, Southern Company and AGL Resources announced that the boards of directors of both companies approved a definitive merger agreement. Pursuant to the agreement, AGL Resources will become a new wholly owned subsidiary of Southern Company. The companies announced completion of this transaction on July 1, 2016.

[4] Since 1995, the GWNF in central western Virginia and the Jefferson National Forest in southwestern Virginia have been administratively combined as the single George Washington & Jefferson National Forests, managed by a single Forest Supervisor.

[5] Atlantic submitted a separate application to the National Park Service (NPS) for a right-of-way across NPS-administered Blue Ridge Parkway lands.


Appalachian National Scenic Trail
Blue Ridge Parkway
National Forest Bdy.
National Wildlife Refuge Bdy.
Federal Ownership
George Washington National Forest
Monongahela National Forest
National Park Service
U.S. Fish & Wildlife Service
National Guard
West Virginia
Virginia
North Carolina
AP-1
AP-2
AP-3
AP-4
AP-5
50
100
150
200
250
300
ACP Mainline
ACP Lateral
Atlantic Coast Pipeline
Figure 1.1-1
Atlantic Coast Pipeline
Project Location
ERM
0 20 40 Miles
FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\National_Forests\COM\COM_Figures_acp_com_general_location.mxd, REVISED: 01/23/2017, SCALE: 1:2,500,000
DRAWN BY: NRG GIS

The ACP's proposed route does not lie within a GWNF-designated utility corridor. The GWNF's Land and Resource Management Plan (LRMP) requires that decisions for new authorizations outside designated utility corridors include an amendment to the LRMP to change the management prescription of the corridor area. The GWNF will therefore determine whether to amend the LRMP to reallocate approximately 104.2 acres to the Designated Utility Corridors prescription area (Rx 5C) from the Dispersed Recreation Areas (Rx 7-E1) and Mosaics of Habitat (Rx 13) prescription areas. Several other project-specific amendments to LRMPs for both the MNF and the GWNF are being considered; these are noted in the relevant Construction, Operation, and Maintenance (COM) Plan section. The USFS must also decide whether to authorize granting a right-of-way/use permit to construct and operate the pipeline facilities on USFS lands. The COM Plan specifies the terms under which a right-of-way across USFS lands would be granted. The COM Plan is intended to be appended to the right-of-way grant.

The COM Plan consists of a number of individual topical plans and attachments applicable to construction and operation of the ACP on USFS lands. During the planning and building of the ACP, changes to the COM Plan may be warranted. The COM Plan is the repository and reference for new and amended permits, approvals, clearances, and plans that may be issued during the planning, construction and operation of the portion of the Project on USFS lands.

2.0 PROJECT DESCRIPTION

The following ACP project description encompasses the entire project (i.e. portions of the Project that lie on both USFS and non-USFS lands):

Mainline Pipeline Facilities:

- AP-1: approximately 333 miles of underground 42-inch outside diameter natural gas transmission pipeline in Harrison, Lewis, Upshur, Randolph, and Pocahontas Counties, West Virginia; Highland, Bath, Augusta, Nelson, Buckingham, Cumberland, Prince Edward, Nottoway, Dinwiddie, Brunswick, and Greensville Counties, Virginia; and Northampton County, North Carolina.

- AP-2: approximately 186 miles of underground 36-inch outside diameter natural gas transmission pipeline in Northampton, Halifax, Nash, Wilson, Johnston, Sampson, Cumberland, and Robeson Counties, North Carolina.

Lateral Pipeline Facilities:

- AP-3: approximately 83 miles of underground 20-inch outside diameter natural gas lateral pipeline in Northampton County, North Carolina; and Greensville and Southampton Counties and the Cities of Suffolk and Chesapeake, Virginia.

- AP-4: approximately 0.4 mile of underground 16-inch outside diameter natural gas lateral pipeline in Brunswick County, Virginia.

- AP-5: approximately 1 mile of underground 16-inch outside diameter natural gas lateral pipeline in Greensville County, Virginia.

Compressor Station Facilities:

- Compressor Station 1 (Marts Compressor Station): a new, natural gas-fired compressor station at approximately Milepost 6 (MP) 7.5 of the AP-1 mainline in Lewis County, West Virginia.

- Compressor Station 2 (Buckingham Compressor Station): a new, natural gas-fired compressor station at approximately MP 191.5 of the AP-1 mainline in Buckingham County, Virginia.

- Compressor Station 3 (Northampton Compressor Station): a new natural gas-fired compressor station at approximately MP 300.1 of the AP-1 mainline and MP 0.0 of the AP-2 mainline and 0.0 of the AP-3 lateral in Northampton County, North Carolina.

Other Aboveground Facilities:

- Nine new metering and regulating stations at receipt and/or delivery points along the new pipelines (including one at Compressor Station 1 and one at Compressor Station 2).

- Forty-one valve sites at select points along the new pipelines at intervals specified by U.S. Department of Transportation (USDOT) regulations at Title 49 CFR Part 192.

- Eleven sets of pig launcher and/or receiver sites at 11 sites along the new pipelines (including launcher/receiver sites at Compressor Stations 2 and 3).

2.1.1.1 Facilities on U.S. Forest Service Lands

This COM Plan applies only to USFS lands crossed by the ACP Project. On USFS lands, the ACP consists of a 42-inch, buried steel pipe across portions of the MNF and GWNF. The pipeline route crosses the MNF for a total of 5.2 miles, all within the Marlinton Ranger District. It crosses the GWNF for a total of 15.9 miles in the Warm Springs, North River, and Glenwood & Pedlar Ranger Districts, in Virginia. No compressor stations, meter and regulating stations, pig launcher/receivers, mainline valves or other major above-ground facilities are proposed on USFS lands. Minor appurtenant facilities on USFS lands include pipeline markers and cathodic protection (CP) test stations.

Pipeline markers will be installed at road and rail and trail crossings, and at other areas as deemed necessary to alert the public to the line's presence. Outside of USFS lands, larger aerial markers will be installed in the permanent right-of-way at periodic intervals to facilitate aerial surveillance during operation of the pipeline system. No aerial markers will be installed on USFS lands.

Installation of a CP system is necessary to protect the pipe from corrosion, and is required by USDOT pipeline safety regulations. The CP system for the ACP utilizes a number of anode beds installed perpendicular to the right-of-way; none of these will be located on USFS lands. The CP system also requires the installation of CP test stations, which consist of a small-diameter plastic stand-pipe

[6] The mileposts used in the initial FERC Application, which was filed on September 18, 2015 (FERC Accession Number 20150918-5212), were based on three-dimensional changes in topography along the proposed pipeline routes. In areas where a pipeline route has changed due to the adoption of an alternative, the mileposts in the affected area have been scaled to account for the resulting difference in the length of the route. For these reasons, the straight-line distance between consecutive mileposts as indicated or depicted in tables and figures in this updated Resource Report may be greater than or less than 5,280 feet. The mileposts should be considered as reference points only.

holding wires attached to the pipe, at periodic intervals, usually at road crossings next to the pipeline marker. Some CP test stations will be installed on USFS lands.

Construction of the ACP requires the use of existing USFS roads for access to the right-of-way. Some of these roads will require improvements, ranging from light grading and graveling of existing road prisms, to widening at certain locations to accommodate pipe and log trucks. A number of new roads will also be required. Once the pipeline is installed, these same roads will be used to access the right-of-way for operations and maintenance purposes. Roads to be used for ACP purposes, including new and existing roads, and existing roads that will require improvements, are shown in Table 2.1.1-1.

2.1.1.2 Land Requirements

On USFS lands, Atlantic proposes to utilize a nominal 125-foot-wide construction right-of-way for installation of the 42-inch pipeline, with a 40-foot-wide spoil side and an 85-foot-wide working side. For most pipeline construction activities, this right-of-way width would accommodate large equipment, pipe stringing and set up, welding, the trench, and the temporary storage of topsoil and trench spoil.

Additional temporary workspace (ATWS) is proposed on USFS lands at certain locations, such as road crossings, and where additional spoil or topsoil storage, log landings or equipment staging is needed. Accordingly, the total width of the construction right-of-way will exceed the nominal 125 foot width in these areas. Conversely, the nominal 125-foot construction right-of-way width is proposed to be reduced to 75 feet in wetlands and certain other ecologically sensitive areas.

Typical right-of-way configurations are provided in Attachment A[7]. The alignment sheets (provided in Attachment B) give the exact dimensions of the proposed construction right-of-way, including ATWS, on USFS lands.

On USFS lands, Atlantic proposes to utilize a 53.5-foot-wide permanent right-of-way for operating purposes. The permanent right-of-way will be maintained in an herbaceous state to allow for maintenance access along the right-of-way, although no permanent access road will be established on or along the right-of-way. All temporary construction work areas outside the permanent right-of-way will be restored in accordance with the Restoration and Rehabilitation Plan.

The ACP will mostly use existing USFS roads to access the pipeline right-of-way. A number of new roads would be required. Several existing, unnumbered roads that will be used are not part of the USFS road system, and so are considered new roads in this COM Plan. Section 2.1.1.4 provides more details about access roads proposed to construct and operate the pipeline.

[7] Atlantic will add to Attachment A two drawings associated with steep slope design, at a later date.

TABLE 2.1.1-1

Atlantic Coast Pipeline Access Roads on USFS Lands

Forest Road No.	Project Access Road Name	Mile-post	County	State	New/ Existing	Improve-ments	National Forest	Area Affected by Construction and Operations (acres)	Length (miles)	Needed for O&M	Width of Road ROW (ft)[8]	Cultural/Bio Survey status
New road connecting MNF road 1026 and right-of-way	05-001-C009.AR2	71.7	Pocahontas	WV	New	N/A	MNF	0.0	0.1	Yes	30	Pending
MNF Road 1026 (Buzzard Ridge Road)	05-001-C009.AR1	71.7	Pocahontas	WV	Exist	Yes	MNF	13.9	3.8	Yes	30	Pending
MNF Road 1012 (Sugar Camp Road)	05-001-E064.AR1	81.8	Pocahontas	WV	Exist	Yes	MNF	4.8	1.3	Yes	30	Complete
New road connecting MNF Road 1012 (Sugar Camp Road) and right-of-way	05-001-E064.AR1	81.8	Pocahontas	WV	New	N/A	MNF	1.5	0.4	Yes	30	Complete
MNF Road 1017 (Shock Run Road)	05-001-E064.AR3	83.3	Pocahontas	WV	Exist	Yes	MNF	0.1	0.0	Yes	30	Complete
MNF Road 55 (Allegheny Road)	05-001-E064-AR2	83.3 to 83.8	Pocahontas	WV	Exist	Yes	MNF	10.2	2.8	Yes	30	Complete
New road along an existing un-numbered road between Highway 84 and right-of-way	06-001-B001.AR3	85.0	Highland	VA	New	N/A	GWNF	0.6	0.2	Yes	30	Complete
New Road	06-001-B001-AR7	85.3	Highland	VA	New	N/A	GWNF	1.8	0.5	Yes	30	Complete
New road along an existing un-numbered road between Highway 84 and right-of-way	06-001-B001.AR4	85.4	Highland	VA	New	N/A	GWNF	0.4	0.1	Yes	30	Pending
GWNF Road 124	36-014.AR2	93.6	Bath	VA	Exist	Yes	GWNF	19.1	5.3	Yes	30	Complete
GWNF Road 281 (Tower Mtn. Road)	36-016.AR1	96.3	Bath	VA	Exist	Yes	GWNF	10.1	2.8	Yes	30	Complete
GWNF Road 309	36-016.AR2	99.6	Bath	VA	Exist	Yes	GWNF	2.0	0.6	Yes	30	Complete
GWNF Roads 449 and 449A	07-001.AR1-AR 3	116.8	Augusta	VA	Exist	Yes	GWNF	9.2	3.0	Yes	30	Complete
New Road connecting GWNF Road 449 and right-of-way.	07-001.AR1-AR 4	117.2	Augusta	VA	New	Yes	GWNF	0.1	0.1	Yes	30	Complete

[8] Estimated. Final width subject to as-built surveys

TABLE 2.1.1-1

Atlantic Coast Pipeline Access Roads on USFS Lands

Forest Road No.	Project Access Road Name	Mile-post	County	State	New/ Existing	Improve-ments	National Forest	Area Affected by Construction and Operations (acres)	Length (miles)	Needed for O&M	Width of Road ROW (ft)[8]	Cultural/Bio Survey status
New road along an existing un-numbered road between GWNF Road 449A and right-of-way	07-001.AR1-AR 6	118.0	Augusta	VA	New	N/A	GWNF	0.9	0.8	Yes	30	Complete
GWNF Road 466A	07-001.AR1-AR 8	120.2	Augusta	VA	Exist	Yes	GWNF	1.1	0.3	No	30	Complete
GWNF Road 466	07-001.AR1-AR 9	120.4	Augusta	VA	Exist	Yes	GWNF	2.0	0.6	Yes	30	Complete
GWNF Road 1755	07-001.AR1-AR 7	121.1	Augusta	VA	New	Yes	GWNF	1.4	0.4	Yes	30	Complete

Some existing roads require minor grading and graveling and/or widening to accommodate construction vehicles. Most roads utilized for construction would also be used to access the permanent right-of-way for operation and maintenance purposes. Table 2.1.1-2 below shows the acreage directly affected on the MNF and GWNF for the construction right-of-way, the permanent right-of-way, and access roads.

TABLE 2.1.1-2

Summary of National Forest Lands Directly Affected by the Atlantic Coast Pipeline (acres)

National Forest	Permanent right-of-way (50' width)	Temporary Workspace, including Additional Temporary Workspace	Access Roads (as is or with improvements)	Access Roads (new)
Monongahela National Forest	33.1	47.0	29.06	1.5
George Washington National Forest	105.2	144.40	43.5	9.1
Total	**138.3**	**191.4**	**72.5**	**10.6**

2.1.1.3 Construction Schedule

Overall Construction Schedule

Subject to receipt of the required permits and regulatory approvals, initial construction activities (e.g., timber removal, preparation of contractor yards and access roads) are expected to begin in November, 2017. The ACP pipeline will be built along 17 spreads, five of which lie on USFS lands. It is anticipated that all facilities will be placed in service by the fourth quarter of 2019. Key milestone dates for the construction schedule are summarized in Table 2.1.1-3.

Construction on the MNF will span two spreads. Spread 3 crosses the MNF for about 0.8 mile, north of Cloverlick Mountain. Initial site preparation on Spread 3 is scheduled to begin in September, 2018. Timber removal[9] is scheduled to begin in November, 2018, with pipeline construction to commence in April, 2019. Spread 3A crosses the MNF for about 4.3 miles between Michael Mountain and the Virginia border. Timber removal on Spread 3A is scheduled for November, 2017. Pipeline construction is scheduled to commence in April, 2018. Construction on the GWNF will span four spreads. Spread 3A, which also lies on the MNF, crosses the GWNF for about 4 miles just east of the West Virginia-Virginia border, where the GWNF abuts the MNF. As indicated above, timber removal on this spread is scheduled for November, 2017 and pipeline construction is scheduled to commence in April, 2018.

Spread 4 crosses the GWNF for about 3.9 miles in Highland and Bath counties, Virginia. Initial site preparation on Spread 4 is scheduled to begin in September, 2018. Timber removal is scheduled to begin in November, 2018, with pipeline construction to commence in April, 2019. Spread 4A crosses the GWNF for about 6.7 miles in Augusta County. Timber clearing is scheduled to begin in November, 2017. Pipeline construction is scheduled to start in April, 2018.

Spread 5 crosses the GWNF for about 1.2 miles in the vicinity of the Mt. Torrey Furnace and the Appalachian National Scenic Trail in Augusta County. The horizontal directional drill crossing of the Appalachian National Scenic Trail and Blue Ridge Parkway, which lies within Spread 5, is scheduled to be constructed from March to September, 2018. Timber may be cleared from the horizontal directional drilling (HDD) entry and exit sites in late 2017. For the rest of Spread 5, initial site preparation is scheduled to begin in September, 2018, with timber removal beginning in November, 2018, and pipeline construction commencing in February, 2019. Figure 2.1-1 shows the locations and scheduled start dates of construction spreads in and near the MNF and GWNF.

[9] Throughout the COM Plan "timber removal" is used to describe the entire merchantable timber logging process, from felling to removal of the logs from the right-of-way,

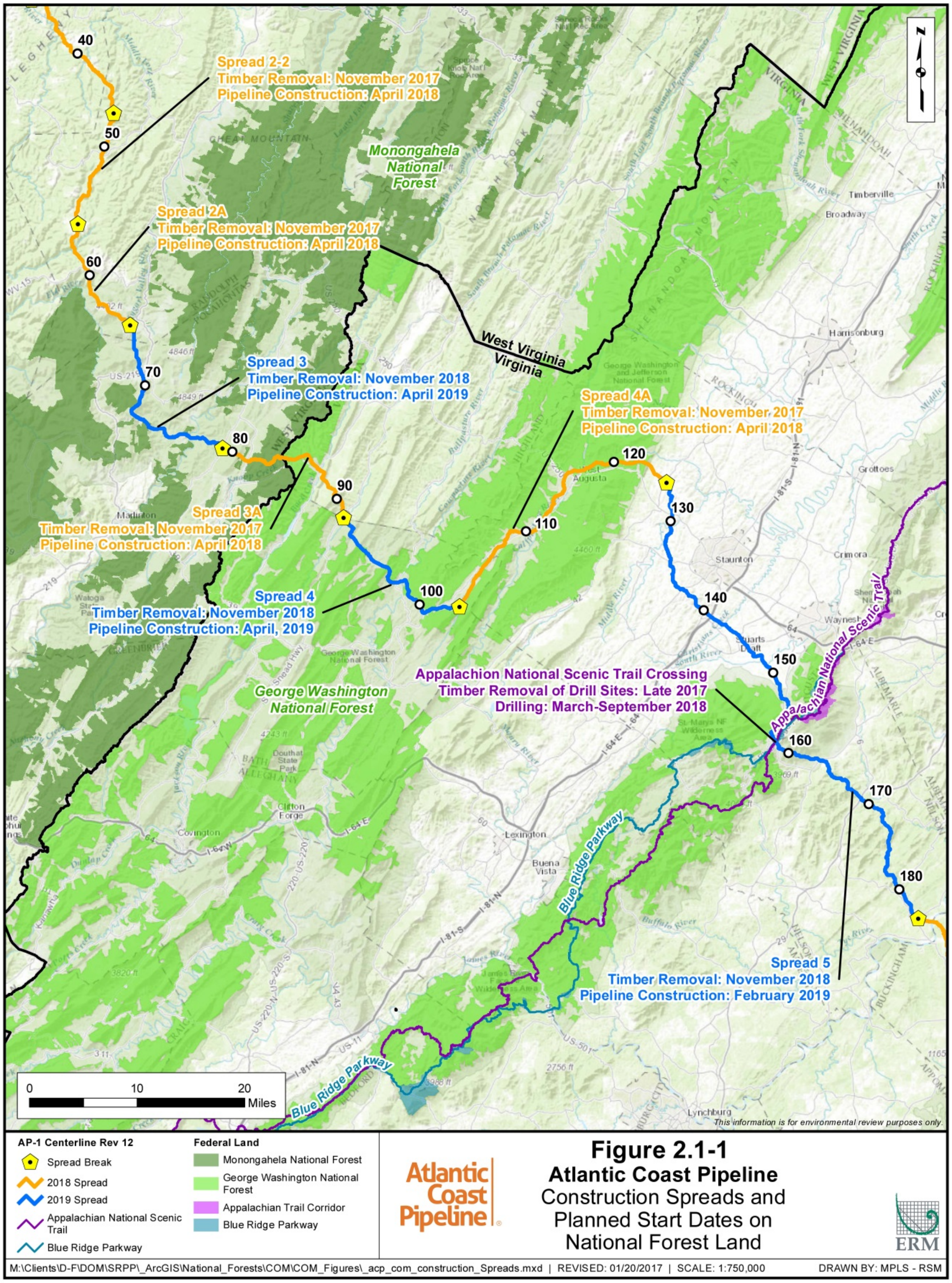


Figure 2.1-1
Atlantic Coast Pipeline
Construction Spreads and Planned Start Dates on National Forest Land

TABLE 2.1.1-3

Construction Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Spread	Approximate Mileposts	Counties/Cities and States/Commonwealths	Begin Construction	Finish Construction [d]
ATLANTIC COAST PIPELINE				
Initial Construction Activities				
Initial Site Preparation (2018 spreads)	By spread	See below	November 2017	1Q 2018
Tree Clearing (2018 spreads) [b, c]	By spread	See below	November 2017	1Q 2018
Initial Site Preparation (2019 spreads)	By spread	See below	September 2018	1Q 2019
Tree Clearing (2019 spreads) [b, c]	By spread	See below	November 2018	1Q 2019
Construction of Pipeline				
Spread 1-1 (AP-1)	0.0–17.2	Harrison, and Lewis Counties, WV	April 2019	4Q 2019
Spread 1-2 (AP-1)	17.2–31.6	Lewis and Upshur Counties, WV	April 2019	4Q 2019
Spread 2-1 (AP-1) [f]	31.6–47.3	Upshur and Randolph Counties, WV	April 2018	4Q 2018
Spread 2-2 (AP-1) [f]	47.3–56.1	Randolph County, WV	April 2018	4Q 2018
Spread 2A (AP-1) [f]	56.1–65.4	Randolph County, WV	April 2018	4Q 2018
Spread 3 (AP-1)	65.4–79.2	Randolph and Pocahontas Counties, WV	April 2019	4Q 2019
Spread 3A (AP-1) [f]	79.2–91.3	Pocahontas County, WV and Highland County, VA	April 2018	4Q 2018
Spread 4 (AP-1)	91.3–103.1	Highland and Bath Counties, VA	April 2019	4Q 2019
Spread 4A (AP-1) [f]	103.1–125.9	Bath and Augusta Counties, VA	April 2018	4Q 2018
Spread 5 (AP-1) [g]	125.9–183.3	Augusta and Nelson Counties, VA	February 2019	4Q 2019
Spread 6 (AP-1) [g]	183.3–239.6	Nelson, Buckingham, Cumberland, Prince Edward, and Nottoway Counties, VA	February 2018	4Q 2018
Spread 7 (AP-1)	239.6–300	Nottoway, Dinwiddie, Brunswick, and Greensville Counties, VA, and Northampton County, NC	February 2019	4Q 2019
Spread 8 (AP-2)	0.0–61.6	Northampton, Halifax, and Nash Counties, NC	February 2018	4Q 2018
Spread 9 (AP-2)	61.6–125.0	Nash, Wilson, Johnston, Sampson, and Cumberland Counties, NC	February 2019	4Q 2019
Spread 10 (AP-2)	125.0–183.0	Cumberland and Robeson Counties, NC	February 2018	4Q 2018
Spread 11 (AP-3)	0.0–83.0	Northampton County, NC, Greensville and Southampton Counties, VA, and the Cities of Suffolk and Chesapeake, VA	February 2018	4Q 2018
Spread 12 (AP-4; AP-5) [e]	0.0–0.4; 0.0–1.1	Brunswick County, VA; Greensville County, VA	February 2018	4Q 2018
Construction of Compressor Stations				
Compressor Station 1	7.6	Lewis County, WV	November 2017	4Q 2019
Compressor Station 2	191.5	Buckingham County, VA	November 2017	4Q 2019
Compressor Station 3	300.1	Northampton County, NC	November 2017	4Q 2019
Construction of Metering and Regulating Stations				
Kincheloe	7.6	Lewis County, WV	November 2017	4Q 2019
Long Run	47.2	Randolph County, WV	April 2018	4Q 2019
Woods Corner	191.5	Buckingham County, VA	November 2017	4Q 2019
Smithfield	92.7	Johnston County, NC	November 2017	3Q 2019
Fayetteville	132.9	Johnston County, NC	February 2018	3Q 2019
Pembroke	183.0	Robeson County, NC	March 2018	3Q 2019
Elizabeth River	83.0	City of Chesapeake, VA	April 2018	3Q 2019
Brunswick	0.4	Brunswick County, VA	January 2018	3Q 2019

TABLE 2.1.1-3

Construction Schedule by Spread for the Atlantic Coast Pipeline and Supply Header Project [a]

Spread	Approximate Mileposts	Counties/Cities and States/Commonwealths	Begin Construction	Finish Construction [d]
Greensville	1.1	Greensville County, VA	February 2018	3Q 2019
SUPPLY HEADER PROJECT				
Initial Construction Activities				
Initial Site Preparation (Spread 13)	By spread	See below	November 2017	1Q 2018
Tree Clearing (Spread 13) [b, c]	By spread	See below	November 2017	1Q 2018
Initial Site Preparation (Spread 14)	By spread	See below	November 2018	1Q 2019
Tree Clearing (Spread 14) [b, c]	By spread	See below	November 2018	1Q 2019
Construction of Pipeline Spreads				
Spread 13 (TL-635)	0.0–33.6	Wetzel, Doddridge, Tyler, and Harrison Counties, WV	April 2018	4Q 2019
Spread 14 (TL-636)	0.0–3.9	Westmoreland County, PA	January 2019	4Q 2019
Construction of Compressor Station Modifications				
JB Tonkin	0.0	Westmoreland County, PA	February 2018	3Q 2019
Crayne	NA	Greene County, PA	February 2018	3Q 2019
Burch Ridge	NA	Marshall County, WV	April 2019	4Q 2019
Mockingbird Hill	0.0	Wetzel County, WV	February 2018	3Q 2019
M&R Stations				
CNX	NA	Lewis County, WV	January 2019	4Q 2019
Abandonment of Gathering Compressor Units				
Hastings	NA	Wetzel County, WV	January 2019	4Q 2019

[a] The number and timing of the construction spreads are subject to change dependent upon construction and permit requirements.
[b] The start of tree clearing is dependent upon the results of the environmental surveys and agency consultations.
[c] Including tree clearing for aboveground facilities, access roads, and contractor yards. Tree clearing for construction spreads 1-1, 1-2, 3, 4, Blue Ridge Parkway HDD, and James River HDD will take place in 2018.
[d] The finish construction date refers to the end of mechanical construction; additional restoration and post construction activity is expected to occur in the Project area beyond the timeframe reflected here. 1Q = first quarter; 2Q = second quarter; 3Q = third quarter; 4Q = fourth quarter.
[e] Spread 12 will be completed with spread 11 and is counted as one spread.
[f] Hydrostatic test and remaining cleanup will be completed by the 3Q of 2019.
[g] Blue Ridge Parkway and James River HDDs will be constructed in 2018.

Seasonal Restrictions

Timber Removal/Clearing

Based on agency consultations to date, timing restrictions for tree clearing in West Virginia and Virginia are as follows:

- West Virginia:
  - migratory birds: restricted between April 1 through August 31
  - Indiana bat: restricted between April 1through November 15
- Virginia:
  - migratory birds: restricted between April 1 through August 15
  - Indiana bat: restricted between April 1 through November 15 (if hibernacula is within 5 miles of right-of-way); otherwise April 15 through September 15.

Timber removal on the MNF is scheduled to take place between November 1 and April 1 of both construction seasons. For any areas of the right-of-way within 5 miles of known Indiana bat hibernacula, no timber removal will occur before November 16.

Timber removal on the GWNF is scheduled to take place between November 1 and April 1 of both construction seasons. For any areas of the right-of-way within 5 miles of known Indiana bat hibernacula, no timber removal will occur before November 16.

Surveys for eagles were completed in 2016 via helicopter and no eagle nests were identified on USFS lands. Bald eagles are known to occur year round in areas with suitable habitat along the ACP route; bald eagles nest in late winter into the summer and roost in the winter. Golden eagles are not known to nest in this area, although they do winter roost. If additional bald eagle nests or occupied bald or golden eagle winter roosting habitat are identified ahead of or during construction, Atlantic will follow the National Bald Eagle Management Guidelines for work within 660 feet of bald eagle nests. For tree clearing that occurs during the winter roosting or nesting season, a qualified biological monitor will accompany the clearing crews for work conducted in areas where golden and bald eagles are believed to be present on USFS lands.

Stream and Wetland Crossings

At streams containing sensitive fisheries and other sensitive aquatic organisms, crossings utilizing dry crossing methods will be scheduled to occur during the least sensitive periods, determined in consultation with federal and state/commonwealth agencies, including the USFS. Streams on USFS lands where timing restrictions have been adopted are shown in Tables 2.1.1-1 and 2.1.1-2.

TABLE 2.1.1-1

Waterbodies Crossed and Crossing Methods for the Atlantic Coast Pipeline in the Monongahela National Forest

Waterbody			Crossing		Special Designations		
Feature ID	Waterbody Name	Flow Regime	Approximate Crossing Width (feet)	Construction Method[a]	State Water Quality Classification[a]	Fishery [b] Type	Time Restrictions[c]
AP-1 MAINLINE							
spoa402	UNT to Sugar Camp Run	Intermittent	4	1) Dam and Pump 2) Flume	UNT to B1	Coldwater; some segments designated as trout streams	April 1 to June 30
spoa400	UNT to Shock Run	Perennial	12	1) Dam and Pump 2) Flume	Unclassified	Coldwater	April 1 to June 30

[a] Abbreviations for West Virginia State Water Quality Classifications are listed below:
West Virginia Stream Water Use Categories:
Category A - Public Water; Category B - Propagation and Maintenance of Fish and Other Aquatic Life; Category B1 - Warm Water Fishery; Category B2 - Trout Waters; Category B4 – Wetlands; Category C - Water Contact Recreation (Category C); Category D - Agricultural and Wildlife Uses; Category D1 –Irrigation; Category D2 - Livestock; Category D3 - Wildlife; Category E - Water Supply Industrial, Water Transport, Cooling and Power ; Category E1 - Water Transport; Category E2 - Cooling Water; Category E3 -Power Production; Category E4 - Industrial (West Virginia CSR, 2014).
State Water Quality Classifications were determined using West Virginia Code of State Regulations, Title 47, Series 2 and communication with West Virginia Department of Environmental Protection (WVDEP) staff (Peterson, 2015). WVDEP considers all waters of the state Category A, B, and C waters. Waterbodies are assumed to be capable of supporting public water use. Those waterbodies listed in the table as Category A waters are waterbodies listed in appendices to West Virginia CSR, Title 47.
High Quality Streams (HQS) are based on the Sixth Edition of the West Virginia High Quality Streams prepared by the Wildlife Resources Section of the West Virginia Division of Natural Resources.
State regulations require the classification to extend into adjacent tributaries, indicated by UNT (unnamed tributary) to [Stream Class] to indicate connected tributaries to classified waters.

[b] Fisheries type is based on readily available data from agency consultation letters or online data. Additional consultation with state and federal agencies will be on-going to further refine these waterbody designations.

[c] Timing restrictions are based on readily available data from agency consultation letters or online data. Additional consultations with state and federal agencies, as well as field survey data for protected species will be necessary to further refine timing restrictions.

TABLE 2.1.1-2

Waterbodies Crossed and Crossing Methods for the Atlantic Coast Pipeline in the George Washington National Forest

	Waterbody				Crossing		Special Designations		
State/ Facility/ Milepost	Feature ID[a]	Waterbody Name	Flow Regime	Approximate Crossing Width (feet)[b]	FERC Classification[c]	Construction Method [d]	State Water Quality Classification[e]	Fishery Type[f]	Time Restrictions[g]
AP-1 MAINLINE									
85.0	shia407	UNT to Townsend Draft	Perennial	45	Intermediate	1) Dam and Pump 2) Flume	Unclassified	Unclassified	--
85.1	shia410	UNT to Townsend Draft	Perennial	10	Intermediate	1) Dam and Pump 2) Flume	Unclassified	Unclassified	--
85.4	shia409	UNT to Lick Draft	Perennial	10	Intermediate	1) Dam and Pump 2) Flume	Unclassified	Unclassified	--
85.5	shia408	Lick Draft	Perennial	8	Minor	1) Dam and Pump 2) Flume	Unclassified	Unclassified	--
94.1	nhd_va_e_024	Laurel Run	Perennial	5	Minor	Dam and Pump	Aquatic Life, I-IV	Wild Brook Trout	October 1 to March 31
98.3	nhd_va_j_007	UNT to Cowpasture River	Intermitten t	5	Minor	Dam and Pump	UNT to Aquatic Life	Unclassified	--
115.8	saub108	Barn Lick Branch	Perennial	8		1) Dam and Pump 2) Flume	Unclassified	Unclassified	--
117.1	sauc002	Dowell's Draft	Perennial	10	Intermediate	1) Flume 2) Dam and Pump	Unclassified	Unclassified	--
117.2	sauc004	UNT to Dowell's Draft	Perennial	9	Minor	Dam and Pump	Unclassified	Unclassified	--
117.7	sauc005	UNT to Dowell's Draft	Intermitten t	7	Minor	Dam and Pump	Unclassified	Unclassified	--
120.2	sauc007	UNT to White Oak Draft	Perennial	2		1) Dam and Pump 2) Flume	UNT to Aquatic Life, I-IV	UNT to Wild Brook Trout	October 1 to March 31
120.2	sauc006	White Oak Draft	Perennial	25	Intermediate	Dam and Pump	Aquatic Life, I-IV	Wild Brook Trout	October 1 to March 31
120.4	sauc008	White Oak Draft	Perennial	29	Intermediate	1) Flume 2) Dam and Pump	Aquatic Life, I-IV	Wild Brook Trout	October 1 to March 31
120.6	sauc009	UNT to White Oak Draft	Intermitten t	3		1) Dam and Pump 2) Flume	UNT to Aquatic Life, I-IV	UNT to Wild Brook Trout	October 1 to March 31
121.1	nhd_va_030	Stoutameyer Branch	Perennial	1	Minor	1) Dam and Pump 2) Flume	Unclassified	Coldwater	--
122.5	sauc010	UNT to Jennings Branch	Intermitten t	3	Minor	Dam and Pump	UNT to Aquatic Life, I-IV	UNT to Wild Brook Trout	October 1 to March 31
122.8	sauc011	UNT to Jennings Branch	Perennial	6	Minor	1) Dam and Pump 2) Flume	UNT to Aquatic Life, I-IV	UNT to Wild Brook Trout	October 1 to March 31
123.0	sauc012	UNT to Jennings Branch	Intermittent	3	Minor	1) Dam and Pump 2) Flume	UNT to Aquatic Life, I-IV	UNT to Wild Brook Trout	October 1 to March 31

TABLE 2.1.1-2

Waterbodies Crossed and Crossing Methods for the Atlantic Coast Pipeline in the George Washington National Forest

State/ Facility/ Milepost	Waterbody					Crossing	Special Designations		
	Feature ID[a]	Waterbody Name	Flow Regime	Approximate Crossing Width (feet)[b]	FERC Classification[c]	Construction Method [d]	State Water Quality Classification[e]	Fishery Type[f]	Time Restrictions[g]
AP-1 MAINLINE									
154.2	saua072	UNT to Back Creek	Intermittent	5	Minor	1) Flume 2) Dam and Pump	UNT to Aquatic Life, V-VIII	UNT to Stockable Trout Stream	--
154.4	sauc104	UNT to Back Creek	Intermittent	8	Minor	Dam and Pump	UNT to Aquatic Life, V-VIII	UNT to Stockable Trout Stream	--
154.5	saua071	UNT to Back Creek	Intermittent	4	Minor	1) Flume 2) Dam and Pump	UNT to Aquatic Life, V-VIII	UNT to Stockable Trout Stream	--
154.8	sauc103	UNT to Back Creek	Intermittent	10	Intermediate	Dam and Pump	UNT to Aquatic Life, V-VIII	UNT to Stockable Trout Stream	--
154.9	sauc102	UNT to Back Creek	Ephemeral	6.	Minor	Dam and Pump	UNT to Aquatic Life, V-VIII	UNT to Stockable Trout Stream	--
155.0	sauc101	UNT to Back Creek	Intermittent	Not Crossed By Centerline	N/A	Not Crossed by Centerline	UNT to Aquatic Life, V-VIII	UNT to Stockable Trout Stream	--
155.1	sauc100	UNT to Back Creek	Ephemeral	11	Intermediate	Dam and Pump	UNT to Aquatic Life, V-VIII	UNT to Stockable Trout Stream	--

TABLE 2.1.1-2

Waterbodies Crossed and Crossing Methods for the Atlantic Coast Pipeline in the George Washington National Forest

	Waterbody				Crossing		Special Designations		
State/ Facility/ Milepost	Feature ID[a]	Waterbody Name	Flow Regime	Approximate Crossing Width (feet)[b]	FERC Classification[c]	Construction Method[d]	State Water Quality Classification[e]	Fishery Type[f]	Time Restrictions[g]

a Atlantic utilized a project-specific nomenclature system that assigned a unique identifier (ID) to each waterbody encountered during field surveys. The breakdown of the unique waterbody ID includes the following abbreviations and descriptors, using shia407 as an example: s = stream, hi = Highland County (two letters used for each county), a = crew A collected the feature, and 407 is the unique number from 000 – 999 used to uniquely identify the waterbody. Where access to property was not available to field crews, National Hydrography Dataset (NHD) data were used to supplement field survey data. Unique IDs beginning with "NHD" represent waterbodies for which ground truth data have not yet been collected. This unique ID is consistently used for each waterbody to correlate to the geospatial data (GIS data), field data collected on datasheets, and waterbody impact tables used during project permitting.

b Waterbodies with a Feature ID starting with NHD represent waterbodies that are based on desktop data from the National Hydrography Dataset, and widths have been assumed as 10 feet wide for perennial and 5 feet wide for intermittent waterbodies in this dataset.

c Minor = <10 feet wide at time of crossing. Intermediate = 10 – 100 feet wide at time of crossing.

d Construction methods are provided for features that intersect the centerline. e Abbreviations for Virginia Water Quality Classifications are listed below:

Virginia Trout Waters Classes:

Classes I, II, III, IV are wild natural trout streams ranking from highest to lowest quality

Classes V, VI, VII, VIII are stockable trout streams ranking from highest to lowest quality

Water Quality Classifications were determined using Virginia Department of Environmental Quality GIS dataset, 2012 Integrated WQ Report Rivers, January 27, 2014 available for download from the Virginia Environmental Geographic Information System (VEGIS) website at: http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS/VEGISDatasets.aspx. State regulations require the classification to extend into adjacent tributaries, indicated by UNT (unnamed tributary) to [Stream Class] to indicate connected tributaries to classified waters.

Unclassified – waters that do not have an assigned classification, or are not unnamed tributaries to classified waters.

f Fisheries type is based on readily available data from agency consultation letters or online data. Additional consultation with state and federal agencies will be on-going to further refine these waterbody designations.

g Timing restrictions are based on readily available data from agency consultation letters or online data. Additional consultations with state and federal agencies, as well as field survey data for protected species will be necessary to further refine timing restrictions.

2.1.1.4 Access

The ACP will mostly use existing USFS roads to access the pipeline right-of-way. A number of new roads will be required. Several existing, unnumbered roads that will be used are not part of the USFS road system, and so are considered new roads in this COM Plan (see Table 2.1.1-1). Maps showing locations of access road improvements on USFS lands are provided in Attachment F.

New Access Road 05-001-C009.AR2 would consist of about 100 feet of new road on the MNF between Forest Road 1026 (Buzzard Ridge Road) and the pipeline right-of-way near MP 71.7. The pipeline right-of-way itself does not lie on USFS lands at this location.

New Access Road 05-001-E064.AR1 would consist of about 0.4 mile of new road on the MNF between Forest Road1012 (Sugar Camp Road) and the right-of-way, at approximately MP 81.8.

New Access Road 06-001-B001.AR3 would consist of about 0.2 mile of new road on the GWNF, following the alignment of an unnamed road between Highway 84 and the right-of-way, at approximately MP 85.0.

New Access Road 06-001-B001.AR7 would consist of about 0.5 mile of new road on the GWNF, at approximately MP 85.3.

New Access Road 06-001-B001.AR4 would consist of about 0.1 mile of new road on the GWNF, following the alignment of an unnamed road between Highway 84 and the right-of-way, at approximately MP 85.4.New Access Road 07-001.AR1-AR4 is a short (approximately 200 feet) new road at approximately MP 117.2, connecting GWNF Forest Road 449 with the right-of-way.

New Access Road 07-001-AR1-AR-6 would consist of about 0.8 mile of new road on the GWNF, following the alignment of an unnamed road between Forest Road 449A and the right-of-way, at approximately MP 118.0.New Access Road 07-001.AR1-AR 7 would follow GWNF Forest Road 1755 for about 0.4 mile between Stover Shop Road and the pipeline right-of-way at about MP 121.1. Forest Road 1755 would require substantial improvements along its entire length to accommodate construction equipment, and so has been considered a new road for purposes of the COM Plan. This segment of Forest Road 1755 would be closed to the public during road construction.

Among the existing roads that will be utilized is GWNF Forest Road 281 (Project Access Road No. 36-016.AR1). A portion of this existing road lies within GWNF Management Prescription Area 2C3 (Eligible Recreation River Corridor). The GWNF LRMP includes a standard relevant to road construction or reconstruction within this Management Prescription, which GWNF is considering as potentially requiring a project-specific LRMP amendment:

> *Allow road construction or reconstruction to improve recreational access, improve soil and water, to salvage timber, or to protect property or public safety.* **(GWNF LRMP 2C3-015)**

ACP's plans for this access road include a widening of the entrance way, where GWNF Road 281 intersects Indian Draft Road, and graveling of the surface. Atlantic is not proposing construction or reconstruction of Forest Road 281.

Most of the existing USFS roads to be used for pipeline construction will require minor grading and graveling and/or widening to accommodate construction vehicles. Improvements to existing roads, as well as new road construction, will be done according to USFS specifications. New and existing improved roads will meet USFS requirements for all seasons, based on engineering standards that use information such as ASHTO and UNIFIED values for soils to be used as base material as well as the anticipated level of use (intensity, duration and type/weight of vehicles).

Dominion will provide the USFS proposed design details for access road construction and improvements after civil surveys have been completed. The roads and associated drainage structures will be designed and constructed in accordance with USFS requirements. Methods and locations for disposal of any excess fill created by road construction will also be identified.

All roads utilized for construction would also be used to access the permanent right-of-way for operation and maintenance purposes. Use of USFS access roads not identified in the COM Plan, or the undertaking of improvements to existing USFS roads not identified in the COM Plan, will not occur unless approved in writing by the USFS Authorized Officer (AO) and FERC.

2.1.1.5 General Pipeline Construction Procedures

Construction of the ACP will follow industry-standard practices and procedures as described below. In a typical scenario, construction involves a series of discrete activities conducted in a linear sequence. These include survey and staking; clearing and grading; trenching; pipe stringing, bending, and welding; lowering-in and backfilling; hydrostatic testing; final tie-in; commissioning; and right-of-way cleanup and restoration. Figure 2.1-2 illustrates each of the steps in a typical construction sequence. A description of each step in the process is provided below.

2.1.2 Survey and Staking

Atlantic's surveyors will stake the pipeline centerlines and limits of the construction right-of-way and ATWS areas. Wetland boundaries and other environmentally sensitive areas will also be marked at this time.

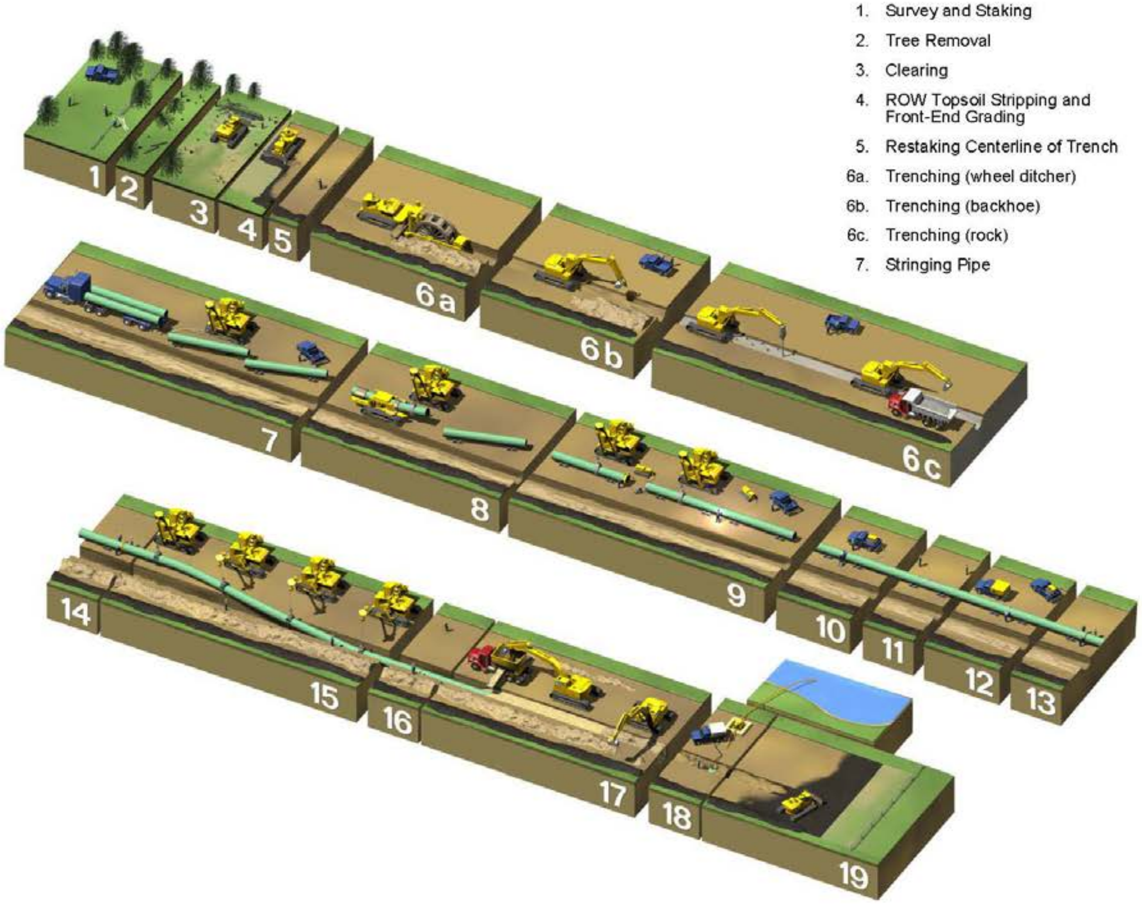
Atlantic's surveyors will record existing USFS property corner monuments and their accessories, including any property boundary markers and survey markers that may be disturbed during construction, so they may be re-established after construction, in accordance with the USFS Land Surveying Guide.

2.1.3 Clearing and Grading

Prior to beginning ground-disturbing activities, Atlantic's construction contractors will coordinate with the One-Call systems in West Virginia and Virginia to have existing underground utilities (e.g., cables, conduits, and pipelines) identified and flagged. Merchantable timber will be felled, decked and hauled to mills in accordance with the Timber Removal Plan.

After merchantable timber has been cleared from the construction right-of-way, clearing crews will mobilize to the construction areas. Fences along the right-of-way will be cut and braced, and temporary gates and fences will be installed to contain livestock, if present. The clearing crew will then clear the work area of vegetation and other obstacles, including trees, stumps that lie within the trenchline, logs, brush, and rocks.

Cleared vegetation and stumps will either be chipped (except in wetlands) burned (if permitted), or hauled offsite to a commercial disposal facility or for beneficial reuse, as specified in the Restoration and Rehabilitation Plan or otherwise directed by the AO. No chips, mulch, or mechanically cut woody debris will be stockpiled in wetlands, and no upland woody debris will be disposed of in wetlands.



1. Survey and Staking
2. Tree Removal
3. Clearing
4. ROW Topsoil Stripping and Front-End Grading
5. Restaking Centerline of Trench
6a. Trenching (wheel ditcher)
6b. Trenching (backhoe)
6c. Trenching (rock)
7. Stringing Pipe
8. Field Bending Pipe
9. Line-Up, Initial Weld
10. Fill & Cap, Final Weld
11. As-Built Footage
12. X-Ray Inspection, Weld Repair
13. Coating Field Welds
14. Inspection & Repair of Coating
15. Lowering Pipe into Trench
16. As-Built Survey
17. Pad, Backfill, Rough Grade
18. Hydrostatic Testing, Final Tie-in
19. Replace Topsoil, Final Clean-Up, Full Restoration

For environmental review purposes only

Atlantic Coast Pipeline

Figure 2.1-2
Atlantic Coast Pipeline
Typical Pipeline Construction Sequence

ERM

M:\TYPICALS_CLIENT_PROJECTS\D-F\DOM\ACP\TYPICAL_CONSTRUCTION\TYP_CON_SEQUENCE.VSD, Date: 10/15/2014, REVISED: 1/20/2017

DRAWN BY: McGregor

Burning of slash, stumps, or non-merchantable wood is not currently anticipated. If burning is deemed necessary, it will be done only after Atlantic has acquired all applicable permits and approvals, including specific authorization from the AO. In West Virginia, such burning would require an Approval to Conduct Open Burning for Land Clearing Debris from the West Virginia Department of Environmental Protection. In Virginia, burning on Federal lands would not be subject to the Virginia Department of Forestry's Burn Law. Virginia counties may enact bans on outdoor burning, but such ordinances do not apply to Federal lands Any burning on USFS lands will be done in accordance with standards contained in USFS' Management Direction for Fire Management, and with the *Fire Prevention and Suppression Plan* (Fire Plan). This would entail preparation of a project-specific Burn Plan for USFS approval.

Following clearing, the construction right-of-way and ATWS will be graded where necessary to provide a level work surface to allow safe passage of construction equipment and emergency vehicles. More extensive grading will be required in steep side slope or vertical areas and where necessary to prevent excessive bending of the pipelines. Topsoil will be segregated in accordance with the Upland Erosion Control Plan.

In accordance with the Upland Erosion Control Plan, in areas where topsoil segregation is required Atlantic will segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil) and the entire topsoil layer in shallow soils (less than 12 inches of topsoil). Excavated topsoil will be placed on the edge or edges of the construction right-of-way as shown in the typical drawings provided in Attachment A.

In areas disturbed by grading, and as required by the Upland Erosion Control Plan, temporary erosion and sediment controls will be installed immediately after initial disturbance within the right-of-way to minimize erosion. All materials used for erosion and sediment control will be certified as weed free. The erosion and sediment control materials will be inspected and maintained throughout the construction and restoration phases of the Project, as appropriate, and as required by the Upland Erosion Control Plan, described in Section 8.

2.1.4 Trenching

Pipe trench will be excavated by rotary trenching machines, track-mounted backhoes, or other similar equipment. Trench spoil will be deposited adjacent to the trench within the construction right-of-way. The trench for each pipeline will be excavated to a depth that provides sufficient cover over the pipeline after backfilling. The typical dimensions of each pipeline trench will vary depending on a number of factors, such as the substrate in the vicinity of the trench (see Table 2.1.4-1). The bottom width of the trench will accommodate the diameter of the pipeline and sufficient pad material around it (typically approximately one foot on either side of the pipeline). The top width will vary to allow the sides of the trench to be adapted to local soil conditions at the time of construction. If trench dewatering is required, it will be conducted in accordance with the Upland Erosion Control Plan and applicable permits in a manner that will not cause additional erosion or result in heavily silt-laden water flowing into a wetland or waterbody.

Atlantic will conduct topsoil segregation in accordance with the FERC Upland Erosion Control, Revegetation and Maintenance Plan. In areas where topsoil segregation is conducted, subsoil from trench excavations will be placed adjacent to the topsoil in a separate pile to allow for proper restoration of the soil during backfilling and restoration. Gaps will be left between the topsoil and subsoil piles to prevent stormwater runoff from backing up or flooding. Mixing of topsoil and subsoil piles will be prevented by separating them physically or with a mulch or silt fence barrier, where necessary and dictated by site conditions, to accommodate reduced workspace.

When rock or rocky formations are encountered, hydraulic hammers, tractor-mounted mechanical rippers or rock trenchers will be used for breaking up the rock prior to excavation. In areas where mechanical equipment or other means cannot be used to break up or loosen boulders or shallow bedrock, blasting will be required. Locations where blasting may be required on USFS lands are identified in the Blasting Plan.

2.1.5 Pipe Stringing, Bending, and Welding

Individual joints of pipe (up to approximately 80 feet long) will be transported to the construction right-of-way and strung along the trenchline in a single, continuous line. Individual sections of pipe will be bent, where necessary, to allow for a uniform fit with the contours at the bottom of the trench and horizontal points of inflection. Typically, a track-mounted, hydraulic pipe-bending machine will tailor the shape of the pipe to conform to the contours of the trench. After the pipe sections are bent, they will be welded together into long sections and placed on temporary supports along the trench.

TABLE 2.1.4-1

Typical Trench Dimensions for the Atlantic Coast Pipeline

Pipeline	Outside Diameter	Cover	Top Width (feet)	Depth (feet)	Typical Depth of Cover (feet)
ATLANTIC COAST PIPELINE					
AP-1	42-inch	Non-agricultural upland	10–15	7.5	3
		Agricultural	10–15	8.5	4
		Wetland	15–20	7.5	3
		Road, railroad, and waterbody crossings	15–20	9.5	5

Welding is a crucial phase of pipeline construction because the integrity of the pipeline depends on this process. Each weld must exhibit the same structural integrity with respect to strength and ductility. Welding will be conducted in compliance with 49 CFR 192 and API Standard 1104, Welding of Pipelines and Related Facilities. Completed welds will be visually and radiographically inspected. Welds that do not meet established specifications will be repaired or removed. Following welding and after inspection, pipe weld joints will be coated with an epoxy coating in accordance with required specifications. If the coating is sprayed on, it will be contained within semi-automatic application rings that ensure little or no overspray of coating into the environment. The coating will be inspected for defects, and repaired, if necessary, prior to lowering the pipe into the trench.

2.1.6 Lowering-in and Backfilling

Prior to lowering-in, the trench will be inspected for rocks and other debris that could damage the pipe or its protective coating, and where necessary, the pipe will be protected with rock-shield, a thick, plastic-based protective mesh wrapped around the pipe to protect it from rock damage. Dewatering may be necessary to inspect the bottom of the trench in areas where water has accumulated. If dewatering is required, it will be conducted in accordance with the Upland Erosion Control Plan and applicable permits in a manner that will not cause erosion or result in silt-laden water flowing into a wetland or waterbody.

The pipe will be lifted from the temporary supports and lowered into the trench using side-boom tractors. Sand bags or sifted spoil (not topsoil) will be placed in the bottom of the ditch to support the pipe. As necessary, trench breakers (stacked sand bags, bags of ready mix concrete or foam) will be installed in the trench around the pipe where necessary to prevent movement of subsurface water along the pipeline.

After lowering-in, the pipe will be padded and the trench will be backfilled with previously excavated materials using bladed equipment or backhoes. If the material excavated from the trench is rocky, the pipeline will be protected with a rock shield or covered with other suitable fill (i.e., crushed limestone rock or screened sand). Additionally, excavated rock may be buried within the limits of the construction right-of-way, crushed with a rock pulverizer and incorporated into fill, or used as gravel to upgrade access roads. Excavated material not required for backfill will be removed and disposed of at approved upland disposal sites. Atlantic will not remove excess soil or rock material from USFS lands without authorization from the AO.

If soils containing hazardous materials are encountered during excavation, Atlantic will implement the procedures identified in the Contaminated Media Plan to isolate and contain the suspected soil contamination, collect and test samples of the soil to identify the contaminants, and develop a response plan for crossing or avoiding the site. With the exception of soils classified as hazardous material, all native soils can be used as backfill without affecting the pipe, regardless of soil chemistry or texture.

2.1.7 Hydrostatic Testing

After backfilling and all other construction activities that could affect the pipeline are complete, each pipeline will be hydrostatically tested in sections to verify that each system is free from leaks and will provide the required margin of safety at operating pressures. Individual sections of pipeline to be tested will be determined by water availability, terrain conditions and class location. No water will be withdrawn from sources on either the MNF or the GWNF. As practicable, water will be transferred from one test section to another to reduce the amount of water that is required for testing. No hydrostatic discharge locations are anticipated to be required on either the MNF or the GWNF.

During hydrostatic testing, internal pressures and durations will be in accordance with 49 CFR 192 and applicable permit conditions. If leaks are found during testing, the leaks will be repaired and the section of pipe retested until the required specifications are met.

Water Impoundment Structures

No water impoundment structures are proposed to be located on USFS lands.

Final Tie-in and Commissioning

After hydrostatic testing, the pipeline will first be cleaned and dried utilizing compressed air and dry foam pig(s). The pig(s) will be continuously run through the pipeline, at designated controlled launching and receiving points located within the construction limits of disturbance, until a desired moisture content is achieved. After the pipeline has been dried and verified through Atlantic inspection, in-line inspection tools (telemetry pigs) are utilized to detect anomalies within the pipe that may have been introduced during construction. In the event that any anomalies are identified, they will first be located and excavated for field verification, and then cut out and replaced with pre-tested pipe, in accordance with all project environmental permits and guidelines. Once all anomaly repairs (if any are identified) have been completed, then final-tie(s) will be completed and commissioning of the line will begin. During the commissioning of the line, operational equipment associated with the pipeline (ex. mainline valves) are inspected and verified for proper installment and functionally working controls, including communication systems, and the initial start-up of compressor facilities begin. The line and associated facilities are slowly purged and loaded with natural gas until brought into actual operation.

2.1.8 Clean-Up and Restoration

Final cleanup will begin after backfilling and as soon as weather and site conditions permit. Final cleanup (including final grading and installation of permanent erosion control devices) will be completed within timeframes specified in the Upland Erosion Control Plan (Section 8) and the Restoration and Rehabilitation Plan (Section 10). Construction debris will be collected and taken to an approved disposal facility. Preconstruction contours will be restored as closely as practicable. Segregated topsoil will be spread over the surface of the right-of-way, and permanent erosion controls will be installed.

Revegetation measures will be implemented in accordance with the Restoration and Rehabilitation Plan. Work areas will be stabilized and seeded as soon as possible after final grading, weather and soil conditions permitting, subject to the recommended seeding dates for the seed mixes used to revegetate different areas along the pipelines. Seeding will stabilize the soil, improve the appearance of the area disturbed by construction, and restore native flora.

If seasonality or timing prevent the use of vegetative erosion control measures, physical measures such as matting, silt fences, etc. will be used in the short term and inspected and maintained regularly to ensure proper functioning until seeding occurs and revegetation becomes effective.

As-built drawings of the pipeline segments crossing USFS lands will be provided to the USFS following construction. Upon completion of construction, Atlantic will re-establish all disturbed USFS property corner monuments and their accessories, including any property boundary markers, in conformance with the USFS Land Surveying Guide.

Markers showing the location of the pipeline will be installed intermittently along the pipeline right-of-way according to ACP specifications, on both sides of all road, rail and trail crossings, and at fencelines. The markers will convey emergency information in accordance with applicable government regulations, including USDOT safety requirements

The pipeline "line-of-sight" markers will be flat fiberglass stakes with markings on both sides of the marker. The pipeline markers at road and railroad crossings will be round posts (3 inches in diameter and 5 feet in height) with wording on at least one side facing the roadway. The markers will contain markings required by law, including the following:

- the marker must state the word "Warning";
- the marker must identify what product is being carried in the pipeline;
- the marker must identify the pipeline operator;
- the marker must include a telephone number that can be reached 24 hours per day, 365 days per year in case of an emergency; and
- the marker must include "call before you dig" labeling and the telephone of the state/commonwealth One-Call system.

No aerial markers will be installed on USFS lands.

2.1.9 Specialized Pipeline Construction Procedures

In addition to standard pipeline construction methods, Atlantic will use special construction techniques where warranted by site-specific conditions, e.g., when constructing across waterbodies, wetlands, roads, highways, railroads, steep terrain, karst areas, agricultural areas, and residential areas; when blasting through rock; or when working in winter conditions. Each of these specialized measures is described below. Illustrations of select crossing methods are provided in Attachment A.

2.1.9.1 Waterbody Crossings

Atlantic will cross all waterbodies on USFS lands using open cut construction methods. Specifically, Atlantic will employ the "dry" open cut methods discussed below. Other stream crossing methods, including the open cut wet crossing method, coffer dam method, conventional bore method, or HDD method, are therefore not discussed. It should be noted that while HDD will not be employed to cross waterbodies on the USFS, a single HDD will be utilized to cross both the Appalachian National Scenic Trail, which lies on the GWNF, and Blue Ridge Parkway (BRP), which lies on NPS land.

Atlantic will adhere to the measures specified in the Stream and Wetland Crossing Procedures described in Section 9, and any additional requirements contained in federal or state/commonwealth waterbody crossing permits, including applicable permits and approvals from the U.S. Army Corps of Engineers and various state/commonwealth agencies. Complete lists of the waterbodies crossed on USFS lands and the construction method proposed for each crossing are provided in Tables 2.1.1-4 and 2.1.1-5.

During the clearing and grading phase of construction, temporary bridges will be installed across waterbodies on USFS lands in accordance with the Procedures to allow construction equipment and personnel to cross. The bridges may include clean rock fill over culverts, timber mats supported by flumes, railcar flatbeds, flexi-float apparatuses, or other types of spans. Construction equipment will be required to use the bridges, except that the clearing and bridge installation crews will be allowed one pass through waterbodies before bridges are installed (this one-time pass through to install temporary bridges will be included in any applicable state/commonwealth permit applications pertaining to stream crossing construction). The temporary bridges will be removed when construction and restoration activities are complete.

ATWS will be required on both sides of waterbody crossings to stage construction equipment, fabricate the pipeline, and store construction materials. Except as authorized by the FERC and the AO, the ATWS will be located at least 100 feet away from the water's edge at each waterbody on USFS lands. ATWS locations are shown on the alignment sheets provided in Attachment B. These locations are subject to the same environmental field surveys and analyses as any project construction work area.

Clearing adjacent to waterbodies will involve the removal of trees and brush from the construction right-of-way and ATWS areas. Woody vegetation within the construction right-of-way will be cleared to the edge of each waterbody. Sediment barriers will be installed at the top of the bank if no herbaceous strip exists. Initial grading of the herbaceous strip will be limited to the extent needed to create a safe approach to the waterbody and to install temporary bridges.

Following clearing, sediment barriers will be installed and maintained across the right-of-way adjacent to waterbodies and within ATWS to minimize the potential for sediment runoff. Silt fence, coir logs and/or weed-free straw bales[10] located across the working side of the right-of-way will be removed during periods of active construction when vehicle traffic is present, and will be replaced each night.

[10] While straw bales are not allowed by the State of West Virginia for a primary form of erosion control, Atlantic proposes to use them in West Virginia as a secondary form of erosion control, in some instances or as directed by the MNF.

Alternatively, drivable berms may be installed and maintained across the right-of-way in lieu of silt fences and/or weed-free straw bales.

Vehicle and equipment refueling and lubricating at waterbodies will take place in upland areas that are 100 feet or more from the edge of the waterbody and adjacent wetlands. Stationary equipment such as water pumps for use during stream crossing construction may need to be operated continuously on the banks of waterbodies and may require refueling in place. All such stationary equipment will be enclosed within impermeable secondary containment structures. The Spill Prevention, Control and Countermeasure (SPCC) Plan addresses the handling of fuel and other materials associated with the Projects. The SPCC Plan will be available on each construction spread.

After the pipeline is installed across a waterbody using one of the methods described below, the trench will be backfilled with native material excavated from the trench. If present and moved prior to construction, larger rocks or boulders will be replaced in the stream channel within the construction area following backfill of the trench. The streambed profile will be restored to pre-existing contours and grade conditions to prevent scouring. The stream banks will then be restored as near as practicable to pre-existing conditions and stabilized. Typical stabilization measures include seeding, plantings, and installation of erosion control blankets. Jute thatching or bonded fiber blankets will be installed on banks of waterbodies or road crossings to stabilize seeded areas. Temporary erosion controls will be installed immediately following bank restoration. Any non-biodegradable fabric used for bank stabilization will be removed when vegetation is re-established. Rip-rap is not anticipated to be necessary to stabilize streambanks; in the event that rip-rap is deemed an appropriate stabilization measure, Atlantic will consult with the USFS and seek the AO's approval and other permits as necessary. The waterbody crossing area will be inspected and maintained until restoration of vegetation is complete.

2.1.9.2 Flume Method Dry Crossing

The flume crossing method consists of isolating and temporarily diverting the flow of water across the trenching area through one or more large-diameter, smooth steel flume pipes placed in the waterbody. This method allows for trenching activities to occur within a relatively dry stream or riverbed (i.e., beneath the flume pipes containing the water flow) thereby avoiding sedimentation and turbidity in the waterbody. The flume method is typically used to cross small to intermediate flowing waterbodies that support coldwater or other significant fisheries.

For each waterbody where the flume method is implemented, a sufficient number of adequately sized flume pipes will be installed in the waterbody to accommodate the highest anticipated flows during construction. Atlantic will use stream gauge data from the U.S. Geological Survey to determine the highest anticipated flows during the time the flume crossing is in effect. As noted above, the duration of in-stream construction activities (excluding blasting, if required) will be limited to as short a duration as possible. In the absence of stream gauge data, Atlantic's engineers and Environmental Inspectors (EI) will estimate the highest anticipated flows based on the width of the waterbody at the ordinary high water mark, the depth of the waterbody, existing flows at the time of the crossing, and the weather forecast at the time of the crossing. As a contingency, Atlantic will stage additional flume pipes at the crossing in the event that the volume of flow increases due to a precipitation event.

Prior to installation, EIs will visually verify the flume pipes are free of dirt, grease, oil, or other pollutants. After placing the pipes in the waterbody, sand- or pea gravel-filled bags, water bladders, or metal wing deflectors will be placed in the waterbody around the flume pipes upstream and downstream of the proposed trench. These devices will serve to dam the stream and divert the water flow through the flume pipes thereby isolating the water flow from the construction work area between the dams.

After installation of the flume pipes, the remaining standing water between the dams will be pumped out. Pump intakes will be appropriately screened to prevent entrainment of aquatic species. Additionally, fish trapped in the dewatered area will be removed and returned to the flowing waterbody. Leakage from the dams or subsurface flow from below the waterbody bed may cause water to accumulate in the trench once trenching has begun. If water accumulates in this area, it may be periodically pumped through piping into energy dissipation/sediment filtration devices as required by the Procedures. Such devices include geotextile filter bags or straw bale (weed-free) structures. Alternatively, the water will be discharged into areas away from the edge of the waterbody and determined by the EI to be sufficiently level and well-vegetated to avoid erosion and prevent heavily silt-laden water from entering the waterbody.

Backhoe-type excavators located on the banks of the waterbody will be used to excavate a trench under the flume pipe across the dewatered streambed. Spoil excavated from the waterbody trench will be placed and stored on the bank above the high water mark and a minimum of 10 feet from the edge of the waterbody. Temporary erosion control devices such as silt fences will be installed around the perimeter of the spoil piles. Once the trench is excavated, a prefabricated segment of pipe will be installed beneath the flume pipes. The trench will then be backfilled with the native material excavated from the trench across the waterbody bed. The banks will be protected with temporary erosion control devices before removing the dams and flume pipes and returning flow to the waterbody channel.

The flume method has proven to be an effective technique for constructing pipelines across sensitive waterbodies. The potential for the introduction of turbidity or suspended sediments is limited because sediment generated during trench excavation and backfilling operations is isolated to the dewatered area between dams. When flumes are installed properly, the operation of the flume is generally stable and can be left in place for periods prior to and following the installation of the waterbody pipeline crossing. The flume method also provides for continued fish passage through the construction work area via the flume pipes during the crossing.

2.1.9.3 Dam-and-Pump Dry Crossing Method

The dam-and-pump method may be used as an alternative to the flume method. It generally is preferred for waterbodies where hard bedrock occurs and in-stream blasting is required. The dam-and-pump method is similar to the flume method except that pumps and hoses are used instead of flume pipes to isolate and transport the stream flow around the construction work area. Similar to the flume method, the objective of the dam-and-pump method is to create a relatively dry work area to avoid or minimize the transportation of sediment and turbidity downstream of the crossing during in-stream work.

As the first step in implementing the dam-and-pump method, one or more pumps and hoses of sufficient size to transport anticipated flows around the construction work area will be installed in the waterbody. Additional back-up pumps will be on site at all times in case of pump failure. Once the pumps are operational, the waterbody upstream and downstream of the construction area will be dammed with sandbags and/or steel plates. Prior to dewatering the streambed, a fish relocation procedure will be implemented to remove fish from the section of the waterbody to be dewatered. As the dams are installed, the pumps will be started to maintain continuous flow in the waterbody.

Following the installation of the dams, the pumps will be run continuously until the pipeline is installed across the waterbody and the streambed and banks are restored. Pump intakes above the upstream dam will be appropriately screened to prevent entrainment of aquatic species. Energy-dissipation devices will be used to prevent scouring of the streambed at the discharge location. Water flow will be maintained through all but a short reach of the waterbody at the actual crossing location.

Backhoe-type excavators located on the banks of the waterbody will be used to excavate a trench across the waterbody. Spoil removed from the trench will be placed and stored on the bank above the high water mark at a minimum of 10 feet from the edge of the waterbody. Trench plugs will be maintained between the upland trench and the waterbody crossing. After backfilling, the dams will be removed and the banks restored and stabilized as described above.

2.1.9.4 Wetland Crossings

No wetlands are crossed by the pipeline in the MNF and two are crossed in the GWNF. The crossed wetlands are located at MPs 117.0 and 85.4 and are categorized as palustrine forested. The combined length of the crossing of both wetlands is 61 feet, comprising approximately 0.1 acre of temporary impacts and 0.06 acres of permanent potential wetland conversion, as these areas will no longer consist of forest vegetation. Construction across wetlands will be conducted in accordance with the Procedures and additional requirements identified in Federal or state/commonwealth wetland crossing permits. Typical methods for construction across wetlands are described below.

In accordance with the Procedures, the width of the construction right-of-way will be limited to 75 feet through wetlands, with ATWS on both sides of wetland crossings to stage construction equipment and materials, fabricate the pipeline, and store materials and excavated spoil. ATWS will be located in upland areas a minimum of 50 feet from the wetland edge (with the exception of site-specific modifications as approved by the FERC and the AO).

Wetland boundaries will be clearly marked in the field prior to the start of construction with signs and flagging. Construction equipment working in wetlands will be limited to what is essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. In areas where there is no reasonable access to the right-of-way except through wetlands, non-essential equipment will be allowed to travel through wetlands once, unless the ground is firm enough or has been stabilized to avoid rutting.

Clearing of vegetation in wetlands will be limited to trees and shrubs, which will be cut flush with the surface of the ground and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the topsoil, stump removal, grading, topsoil segregation, and excavation will be limited to the area immediately over the trenchline, except a limited amount of stump removal and grading may be conducted in other areas if required by safety-related issues. Topsoil segregation over the trenchline will only occur if the wetland soils are not saturated at the time of construction.

Following clearing, sediment barriers, such as silt fences, straw bales (weed-free), or other approved sediment barriers, will be installed and maintained adjacent to wetlands and within ATWS areas as necessary to minimize the potential for sediment runoff. Sediment barriers will be installed across the full width of the construction right-of-way at the base of slopes adjacent to wetland boundaries. Silt fences, coir logs and/or straw bales (weed-free) installed across the working side of the right-of-way will be removed during active construction when vehicle traffic is present, and will be replaced each night. Alternatively, drivable berms may be installed and maintained across the right-of-way in lieu of silt fences or weed-free straw bales. Sediment barriers will also be installed adjacent to or within wetlands along the edge of the right-of-way, where necessary, to minimize the potential for sediment to run off the construction right-of-way and into wetlands outside the work area. If trench dewatering is necessary, it will be conducted in accordance with the Procedures and applicable permits. Silt-laden trench water will be discharged into an energy dissipation/sediment filtration device, such as a geotextile filter bag or straw bale (weed-free) structure or a well-vegetated upland area, to minimize the potential for erosion and sedimentation.

The method of pipeline construction used in wetlands will depend on site-specific weather conditions, soil saturation, and soil stability at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment on equipment mats, they will be crossed using conventional open-trench construction. This will occur in a manner similar to conventional upland cross-country construction techniques. In unsaturated wetlands, topsoil from the trenchline will be stripped and stored separately from subsoil.

Because little or no grading will occur in wetlands, restoration of contours will be accomplished during backfilling. Prior to backfilling, trench breakers will be installed, where necessary, to prevent subsurface drainage of water from wetlands. Where topsoil is segregated, the subsoil will be backfilled first followed by the topsoil. Topsoil will be replaced to the original ground level leaving no crown over the trenchline. In areas where wetlands overlie rocky soils, the pipe will be padded with rock-free soil or sand before backfilling with native bedrock and soil. Equipment mats, gravel fill, and/or geotextile fabric will be removed from wetlands following backfilling.

Where wetlands are located at the base of slopes, permanent slope breakers will be constructed across the right-of-way in upland areas adjacent to the wetland boundary. Temporary sediment barriers will be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers will be removed from the right-of-way and disposed of at an approved disposal facility.

Road and Trail Crossings

The *Traffic and Transportation Plan* (Transportation Plan) identifies USFS roads crossed by the ACP Project on FS lands, with crossing methods[11].

All roads crossed by the ACP on the MNF and GWNF will be crossed using the open-cut method and then restored to preconstruction condition. This method could require temporary closure of the road, two-track, or trail to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of the road being crossed will be kept open to traffic, except during brief periods when it is essential to close the road to install the pipeline in the trench. Most open-cut road crossings will be completed and the road restored in a few days using the same type of sub-bed and surface material as the original construction. Atlantic will take measures such as posting signs and implementing necessary traffic control measures at open-cut road crossings for safety and to minimize traffic disruptions. Specific measures associated with the timing of any road closures, detours to avoid active construction areas, and mitigation measures for maintaining access across the road, such plating across the road, are provided in the Transportation Plan. Debris from road construction (e.g., remnants of concrete) will be recycled or disposed of at an approved disposal facility.

Details regarding construction across designated USFS trails, including the timing of any closures, detours to avoid active construction areas, and measures for maintaining access across trails, are discussed in Section 17, Public Access Plan. For certain high-use trails, Atlantic will install the pipeline using construction methods to be determined in consultation with the USFS, to ensure that trail access across the right-of-way can continue until the trail crossing segment is ready to be excavated, installed, and backfilled, and to limit the trail closure time to two days or less in most instances. At all trail crossings crossed by the open-cut method, the trail will be restored to its preconstruction condition. Section 2.1.9.11 discusses the crossing of the Appalachian National Scenic Trail (ANST).

[11] The ACP Project does not cross any state highways or railroads on USFS lands.

2.1.9.5 Steep Terrain

Steep slope hazards are one of numerous geologic hazards and processes that could adversely impact environmental resources; or affect the routing, design, construction, and operation or the integrity of the Projects. In accordance with Atlantic's commitment to safety and the environment, Atlantic developed and implemented for all new construction projects, the Slope Stability Policy and Procedure (updated in September, 2016)to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction (see Attachment C). The Slope Stability Policy and Procedure applies to both West Virginia and Virginia. It includes considerations for slips associated with pipeline construction during routing, engineering design, preconstruction planning, construction, and post construction. It exceeds FERC or other regulatory requirements regarding slope stability design.

In addition, Atlantic is committed to identifying mitigation measures beyond standard practices targeted to prevent slips on steep slopes through a Best in Class (BIC) Program. The focus of the BIC Program is to proactively address steep slopes (defined as slopes greater than 30 percent) and landslide hazards related to pipeline construction, compressor station, and metering and regulation facilities that could potentially impact environmental resources, in particular streams, wetlands, and waterbodies. The BIC program is intended to incorporate the permit requirements from West Virginia and Virginia, and then go above and beyond all these regulatory standards, in order to mitigate for potential erosion and sediment discharges related to steep slope and landslide hazards.

The ultimate goal of the BIC Program is to develop project-specific engineering mitigation recommendations targeting un-authorized discharges to water bodies resulting from steep slope, landslide and erosion hazards; and thereby support preparation of the project-specific Erosion & Sediment Control Plan and corresponding Storm Water Pollution Prevention Plans (SWPPP) that will be used to secure the construction stormwater permits for the project. The BIC Program achieves this by pulling together a team of internal Dominion stakeholders along with supporting external subject matter experts to develop project specific mitigation recommendations; by using a process based approach that includes: hazard identification and assessment (i.e. find and then understand the hazard), engineering mitigation design (i.e. targeted design measures that mitigate the hazard), monitoring (i.e. track performance to know if additional mitigation is needed), and operational measures (i.e. monitor and maintain and operate the system, as needed).

The BIC Program Team will convene in a series of design workshops to examine the identified hazards and supporting information along the pipeline alignment. The hazards will be initially identified by studies such as the "Geohazards Assessment" (which may include geotechnical or hydrotechnical investigations) or the karst study, and/or by other targeted studies such as the soil survey. These studies identify and assess or support the review of the hazard, and provide a basis to select the most applicable and robust BIC mitigation response to minimize or eliminate the hazard, and then monitor the hazard through ongoing operations. Atlantic intends to submit to the USFS supplemental drawings associated with steep slope design and will include these drawings in Attachment A.

2.1.9.6 Karst Areas

Based on review of maps from the U.S. Geological Survey, West Virginia Department of Environmental Protection, and Virginia Department of Mines, Minerals, and Energy, portions of the AP-1 mainline route across USFS lands have the potential to contain karst features (Dicken et al., 2005; Hubbard, 1983; Nicholson et al., 2005; West Virginia Department of Environmental Protection, 1998). A detailed desktop assessment and field survey was conducted by a geotechnical expert to identify sinkholes and other karst features (e.g., cave entrances, closed depressions, and sinking streams) along the proposed pipeline route in these areas. The Karst Monitoring and Mitigation Plan (Attachment H) identifies construction and restoration practices in karst areas. In accordance with this plan, erosion and sediment controls will be installed prior to construction along the edge of the right-of-way and in other work areas upslope of known sinkholes or other karst features with a direct connection to the phreatic zone of the karst (i.e., groundwater). Refueling activities and the handling of fuel and other materials in the vicinity of these features will be conducted in accordance with the SPCC Plan. Additionally, Atlantic will monitor clearing, grading, and trenching activities to identify potential karst features that may have been unidentifiable on the surface during the preconstruction survey. If features are uncovered, they will be evaluated by a geotechnical contractor, in conjunction with the construction/environmental team members, to determine the need for mitigation measures, such as stabilization. Additionally, Atlantic will monitor karst features as described in the Karst Monitoring and Mitigation Plan.

2.1.9.7 Blasting

It is anticipated that blasting will be required in areas where hard shallow bedrock or boulders are encountered that cannot be removed by conventional excavation with a backhoe trencher, by ripping with a bulldozer followed by backhoe excavation, or by hammering with a backhoe-attached device followed by backhoe excavation. The Blasting Plan identifies areas on USFS lands where hard shallow bedrock is anticipated and blasting could be necessary. The Blasting Plan also provides blasting procedures, including safety, use, storage, and transportation of explosives, consistent with safety requirements as defined by Federal and state/commonwealth regulations.

2.1.9.8 Winter Construction/Snow Removal

Atlantic does not expect that construction activities will occur in frozen ground conditions, although such a scenario is possible depending on weather conditions, particularly if construction extends into the late 4th Quarter of the year. It is also quite possible that construction could occur during times of snowfall in West Virginia and Virginia, particularly at higher elevations. Atlantic filed a Winter Construction Plan with the FERC (Attachment D), which identifies best management practices (BMP) for winter construction activities. As necessary, snow will be removed from construction work areas to expose soils for grading and excavation. Snow removal will be limited to active construction areas and areas needed to maintain access to the construction right-of-way. Snow will be bladed or pushed to the edges of the right-of-way with a motor-grader, snowplow, or bulldozer fitted with a “shoe” to minimize impacts on underlying soils and vegetation, and stockpiled within the right-of-way or in approved ATWS areas. Snow will not be bladed off the right-of-way. Alternatively, in the event of extreme snow events or significant snowdrifts, snow may be blown off the right-of-way using industrial blowers mounted to construction vehicles. Snow that is blown off the construction right-of-way will be directed away from existing roads and driveways, parking areas, residences, and other landowner structures. Regardless of the method used, snow removal equipment will access the ACP Project area from approved access roads, and will operate from within the construction right-of-way or approved ATWS areas.

Snow will be removed from both the working and spoil sides of the construction right-of-way prior to topsoil segregation and grading to prevent mixing of snow with excavated spoil. Snow which accumulates on the right-of-way during construction will be removed and stockpiled along the edges of the construction right-of-way or in approved ATWS areas, or blown off the right-of-way, as described above. Large accumulations of snow on excavated spoil piles will be removed as practicable prior to backfilling. Snow will not be mixed with spoil during backfilling to the extent practicable.

Snow also will be removed, as necessary, from approved access roads by plowing to the edges of the road or blowing off the road to allow safe access to the construction right-of-way. The access roads will be maintained in accordance with applicable permit requirements and landowner agreements.

Gaps will be left in stockpiled snow piles based on an assessment of drainage patterns to allow water to drain off of the right-of-way during thaw. Gaps will also be left in stockpiled snow at drainage crossings. Atlantic's EIs will assess potential volumes and velocities of snow melt, considering temperature variations and rain amounts, and will work with the construction contractors to determine how best to stockpile snow, and where to create gaps in the event of a significant snow melt, to avoid situations where large accumulations of melting snow could flow away from the right-of-way causing erosion. Erosion control devices and diversion berms will be installed in these areas, as appropriate, in accordance with the Upland Erosion Control Plan. During winter or spring thaw conditions, Atlantic will determine when construction activities may be required, and will ensure they are implemented in accordance with the Winter Construction Plan. These construction activities could include any or all of the following:

- Surveying and staking the access roads, right of way, temporary work space and additional temporary work space
- Opening, upgrading, preparing and maintaining access roads
- Loading and offloading of construction equipment
- Felling, hauling and removing of timber
- Installing and maintaining erosion and sediment control materials and devices
- Chipping, grinding and burning (if permitted) of timber, slash and stumps
- Stripping, salvaging and stabilizing topsoil
- Grading of the right of way, temporary work space and additional temporary work space
- Hammering, drilling, blasting, excavating, storing, hauling and removing rock
- Hauling, stringing and bending of the pipe
- Excavating the ditch
- Welding the pipe and non-destructive examination of the welds
- Sandblasting and coating the welds
- Hauling and stockpiling padding material and installing it in the ditch
- Lowering the pipe into the ditch and backfilling
- Boring under roads, railroads and other infrastructure
- Horizontal directional drilling and associated support activities
- Installing, filling, maintaining, emptying and removing water impoundment structures
- Hauling and trucking of water

- Filling, testing, dewatering, drying, cleaning and internally inspecting the pipeline
- Removing, hauling and disposing of construction debris, trash and waste
- Maintaining and refueling equipment
- Monitoring, maintaining, stabilizing and securing the right of way, temporary work space, additional temporary work space and access roads
- Restoring areas disturbed by construction

2.1.9.9 Concrete Coating

As noted above, concrete coating or bag weights will be used to provide negative buoyancy for the pipelines where they are installed across wetlands and waterbodies. Concrete coating, where required, will be applied to pipe joints at the contractor yards or on the construction right-of-way. The pipe will either be coated at contractor yards, in the construction right-of-way or in approved ATWS areas. All applications of concrete coating will be conducted in accordance with the SPCC Plan and other applicable environmental requirements. Concrete coating activities will not be conducted within 100 feet of wetlands, waterbodies, or springs, or within 300 feet of karst features, unless the location is an existing industrial site designated for such use.

2.1.9.10 Appalachian National Scenic Trail/Blue Ridge Parkway Crossing

Atlantic proposes to cross beneath the ANST and BRP with a single HDD. This method will avoid direct impacts to these features and surrounding federal lands, and will significantly mitigate visual impacts of the pipeline right-of-way from both features. Plan and profile drawings for the proposed HDD are included as Attachment O.

At the proposed pipeline crossing location, the ANST lies on GWNF land, while the nearby BRP lies on NPS lands. The GWNF is considering a project-specific LRMP amendment that would allow the ACP to cross the ANST at this location. **GWNF LRMP Standard 4A-025** states:

> *Locate new public utilities and rights-of-way in areas of [the ANST Management Prescription Area] where major impacts already exist. Limit linear utilities and rights-of-way to a single crossing of the [ANST Management Prescription Area] per project.*

The HDD method is a process that allows for trenchless construction by drilling a hole beneath a surface feature, such as in this case the BRP and the ANST, and installing a prefabricated segment of pipeline through the hole. Use of this method will completely avoid disturbance to the surface of the right-of-way between the entry and exit points of the drill. The distance of the HDD from entry to exit point is approximately 4,600 feet. When installed, the pipe will lie more than 600 feet below the ANST and the BRP.

Tree clearing and site preparation associated with the HDD to cross the ANST and BRP is anticipated to begin in fall of 2017 at the HDD entry and exit sites. Neither of these sites lies on USFS land. This work will be limited to tree clearing, processing timber, and site grading at the entry and exit workspaces. Drilling operations would begin in early spring of 2018. Drilling and installation of the pull section and cleanup and regrading of the construction site, as needed, is conservatively estimated to continue for 12 months.

To complete the HDD, a drill rig will be placed on the entry side of the crossing and a small-diameter pilot hole (i.e., about 4 inches) will be drilled along a predetermined path within the approved and granted right-of-way underneath the BRP, other Federal lands and the ANST using a powered drill bit. As drilling progresses, additional segments of drill pipe will be inserted into the pilot hole to extend the length of the drill under the mountain. The drill bit will be steered and monitored throughout the process to maintain the designated path of the pilot hole. Once the pilot hole is complete, the pilot hole will be enlarged through a process of back-reaming using progressively larger reaming tools until the bore hole is wide enough to accept the permanent pipeline. Several passes will be required to enlarge the hole to a sufficient diameter to accommodate the pipeline. The final hole will be approximately 12 inches larger than the 42-inch-diameter pipeline to be installed, or approximately 54 inches.

Throughout the drilling process, a fluid mixture consisting of water and bentonite clay (a naturally occurring mineral) will be pumped into the drill hole to lubricate the bit, transport rock cuttings to the surface, and maintain the integrity of the hole. Small pits will be dug at or near the entry and exit points for the HDD and will be located completely within the limits of the construction right-of-way. These pits will be used to temporarily store and manage the drilling fluid and cuttings. The fluid and cuttings will be pumped from the pits to an on-site recycling unit where the fluid will be processed (rock cuttings removed) and cleaned for reuse. Water for the drilling operation and hydrostatic testing of the HDD pipe section will be trucked to the site from the James River. The drilling operation will conform to all relevant sections of this COM Plan.

The pipeline segment (also called a pull section) to be installed beneath the surface feature will be fabricated on the right-of-way or in the approved additional temporary workspace on the exit side of the crossing while the drill hole is reamed to size. The pull section will be inspected and hydrostatically tested prior to installation. A steel bullhead will be welded onto the front end of the pull section to aid in pulling the pipe through the drill hole. After the hole is completed, the pull section will be attached to the drill string on the exit side of the hole and pulled back through the hole toward the drill rig. As the pipeline is being installed, excess drilling fluid that is displaced from the hole by the pipeline will be collected and disposed of at an appropriate and approved off-site facility.

Temporary storage of material removed from either the proposed or contingency drill path will occur on the workspace associated with the entry or exit locations, which are not located on USFS land. Cuttings will be hauled away and deposited at approved landfills and will not result in any significant temporary accumulation. Any temporary storage of cuttings will be in accordance with project requirements (e.g., erosion and sedimentation controls, setbacks from water bodies, site clean-up).

Once installation of the HDD pipeline is completed, the pulled segment will be welded into the cross country sections of pipeline on either side of the HDD and the construction site will be cleaned up, regraded as necessary, and reseeded/replanted. Trees will be allowed to regrow in all temporary workspace outside of the permanent right-of-way.

If Atlantic is unable to complete the HDD after multiple adjustments and attempts, a contingency crossing plan employing a “direct drill” approach will be employed. If this crossing method begins, it would continue for approximately 12 to 16 weeks. The ANST crossing contingency plan is described in detail in Attachment P.

2.1.9.11 Construction Safety & Security

Day-to-day security of the work sites (contractor yards, material yards, work sites, etc.) will be the responsibility of the respective contractors assigned to the site. Contractors will likely use private security contractors and/or local off-duty police officers to maintain security. Contractors’ security personnel will coordinate with Atlantic corporate security and will provide briefings on known or potential security risks as necessary. Atlantic will coordinate all security and safety activities at work sites on USFS lands with the designated USFS staff.

Each contractor will have a full-time safety representative assigned to each active construction site. This representative will work closely with Atlantic safety personnel, both field and managerial, to maintain and enforce project safety guidelines. Each contractor will develop site-specific safety plans that will address the safety concerns associated with each work site (steep terrain, urban work areas, etc.).

The contractors' safety plans will be submitted to Atlantic for approval and will address a broad range of project safety guidelines and procedures, including but not limited to:

- Accident investigation
- Substance abuse policy
- Emergency action plans (fire reporting, site evacuation procedures, etc.)
- Local emergency contacts (police, fire, hospitals, etc.)
- Safety training requirements and procedures
- Safe operation of equipment
- Traffic control procedures

General security and safety plans will be reviewed daily, during morning meetings with all construction personnel, prior to leaving the yard. Once on the right-of-way or associated job site, specific safety and security risks associated with the day's work will be addressed with job hazard analysis conducted by crew foremen. The job hazard analysis will be narrower in scope and will address specific hazards associated with the work to be completed that day.

Atlantic will, in close coordination with the USFS, post signs at various strategic locations informing the public about the pipeline construction, any road closures or detours, restricted areas, etc. Along portions of the construction right-of-way between road and trail crossings, ACP will post signs at or near the edge of the work area at spacings of about 200 feet or as dictated by terrain and visibility, warning the public that the construction right of way is closed to public entry. Measures to ensure the safety of the public are discussed in more detail in Section 17, Public Access Plan.

2.2 OPERATIONS AND MAINTENANCE

2.2.1 Routine Maintenance

DTI will operate and maintain the ACP facilities in accordance with all applicable federal and state/commonwealth requirements, including the minimum federal safety standards identified in Transportation of Natural and Other Gas by Pipeline, 49 CFR 192. Operations and maintenance of the ACP facilities will be performed by or at the direction of DTI in its capacity as operator of the ACP pursuant to a Construction, Operations, and Maintenance Agreement with Atlantic.

The USDOT's Pipeline and Hazardous Materials Safety Administration regulates the operations and maintenance of natural gas pipeline facilities. The regulations found at 49 CFR 192.613, 192.703, 192.705, and 192.709 address aerial and ground patrols of pipeline facilities. DTI will conduct regular aerial and ground patrols of the pipeline facilities in accordance with these regulations. The frequency of patrols is determined by class location unit (i.e., population density) and the location of the pipeline. DTI has Standard Operating Procedures for its facilities that define patrol frequency and methods and identify reporting requirements for abnormal or unusual conditions. All patrols are documented in an Inspection Monitoring System Compliance Database.

The pipeline facilities will be inspected by qualified personnel from the air (quarterly) and on foot (yearly) in accordance with the applicable regulations. This will allow for adequate viewing of the right-of-way and use of forward looking infrared technology for leak detection. Foot patrols are conducted by staff trained to identify potential issues such as erosion, slips, and leaks. These surveillance activities will provide information on possible encroachments and nearby construction activities, exposed pipe, and other potential concerns that may affect the safety and operation of the pipelines. Field personnel will advise the appropriate operations personnel of new construction along or near the pipeline system. Line patrol of highway and railroad crossings will be completed as required by the USDOT. Valves will be inspected annually and the results documented.

USFS staff will be notified of any planned foot patrols and will be provided with any resulting reports or photographs concerning the condition of the right-of-way or integrity of the pipeline system.

Pipeline markers and signs will be inspected to assure that pipeline locations are clearly identified. The condition of pipeline markers will be noted during line patrols as well as during road crossing, One-Call, and other inspections. Damaged or missing line markers will be noted and repaired or replaced as necessary.

In order to maintain accessibility of the right-of-way and accommodate pipeline integrity surveys, vegetation along the right-of-way will be cleared periodically, and as necessary, in accordance with the Upland Erosion Control Plan and Stream and Wetland Crossing Procedures (except in the ANST area crossed by HDD where vegetation maintenance will not be required). Clearing equipment will be pre-approved by the USFS, and clearing schedules will meet USFS requirements with respect to sensitive species timing restrictions.

The permanent pipeline right-of-way will be maintained in an herbaceous state. Woody vegetation within the permanent right-of-way will be cleared periodically, in order to maintain accessibility of the right-of-way for maintenance and to accommodate pipeline integrity surveys, In uplands, trees and brush will be cleared over the entire width of the permanent right-of-way on an as-needed basis not to exceed once every 3 years. In wetlands and riparian areas, a 10-foot-wide corridor centered over the pipeline will be cleared at a frequency necessary for the corridor to be permanently maintained in an herbaceous state, as allowed by the Procedures. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating may be selectively cut and removed from the permanent right-of-way.

Where necessary and when required, DTI will use mechanical mowing or cutting along the right-of-way for normal vegetation maintenance. On steep slopes (>40 percent) depending on bank stability the clearing would be completed via motorized equipment and/or hand clearing. No herbicides will be utilized for normal vegetation maintenance.

DTI will monitor the right-of-way for infestations of non-native invasive species that may have been created or exacerbated by its construction activities, and may utilize USFS-approved herbicides to treat such infestations, in accordance with the Non-Native Invasive Plant Species Management Plan.

Operations and maintenance procedures, including record keeping, will be performed in accordance with USDOT requirements.

Pipeline integrity surveys and vegetation maintenance may identify areas along the right-of-way where permanent erosion control devices need to be repaired or additional erosion control devices may be needed. If problem areas are evident, erosion control devices will be repaired or installed, as necessary, and the right-of-way will be stabilized to prevent future degradation. USFS staff will be advised of planned erosion control repairs, re-installations, or additions.

2.2.2 Major Maintenance Work

During the operating life of the pipeline, it may be necessary on occasion to excavate the pipe for inspection, repair or replacement purposes. Atlantic will notify the appropriate Forest in advance of such work to review the work plan, to ensure the work is carried out in compliance with the terms of the right-of-way grant, and to address any other issues regarding the work. In many cases the work would be able to be performed within the permanent right-of-way boundaries. However, in some instances additional workspace may be needed outside the permanent right-of-way, depending on terrain, the extent of the excavation or repairs, etc. In such instances, Atlantic anticipates that the work would be able to be carried out within the ACP construction footprint.

2.2.3 Emergency Repairs

49 CFR Part 192 describes the minimum standards for operating and maintaining pipeline facilities, including the requirement to establish a written plan governing these activities. Under Section 192.615, each pipeline operator must establish an emergency plan that provides written procedures to minimize the hazards from a gas pipeline emergency. Key elements of the plan include procedures for:

- receiving, identifying, and classifying emergency events, such as gas leaks, fires, explosions, and natural disasters;
- establishing and maintaining communications with local fire, police, and public officials, and coordinating emergency response;
- making personnel, equipment, tools, and materials available at the scene of an emergency;
- protecting people first and then property, and making safe from actual or potential hazards; and
- emergency shutdown of systems and safe restoration of service.

DTI has an Emergency Response Plan (ERP) for its existing pipeline system in accordance with the USDOT regulations. DTI will update the ERP to incorporate the proposed Project based on feedback from local emergency service providers (e.g., police, fire, medical, and emergency response). The updates to the ERP will identify the appropriate contacts for emergency service providers (including names and telephone numbers) in the event of an emergency during operation of the Project. The updated ERP will be available prior to construction.

The USDOT requires that pipeline operators establish and maintain liaisons with local fire, police, and other emergency responders to plan for and coordinate emergency response efforts in the event of an incident during construction or operation of the proposed facilities. Additionally, each operator must establish a continuing education program to enable customers, the public, government officials, and those engaged in excavation activities to recognize a natural gas pipeline emergency and report it to the appropriate public officials. Accordingly, DTI will establish and maintain liaisons with local public officials and emergency responders, and provide appropriate training to responders before the proposed ACP is placed in service.

Regular meetings[12] will be held with emergency response agencies (including USFS wildland fire and law enforcement personnel and local fire departments) where the role of the agencies with regard to pipeline fires will be discussed, along with issues related to potential compressor station incidents. The information exchanged between DTI and the emergency response agencies that participate in these meetings will familiarize each organization with the resources, including personnel and equipment, that can be utilized in the unlikely event that an incident occurs. Police and fire departments will also receive emergency telephone numbers that can be used to contact DTI 24 hours a day.

In the unlikely event of an incident, DTI will work with emergency response agencies to maintain access to and from residences and businesses during potential emergency situations. DTI will implement its ERP to bring the incident under control, and work with local responders to maintain access to residences and businesses via existing roads. If a road is damaged by an incident, or access to residences and business is otherwise restricted, DTI responders will cut a new road for access or make an old road passable, to reach the affected residences and businesses. Additionally, in an emergency situation, DTI could use air lift services to reach affected residences and businesses.

2.2.4 Pipeline Operations/Safety and Security

The USDOT is the Federal agency responsible for pipeline safety under Title 49, United States Code Chapter 601. Within the USDOT, the Pipeline and Hazardous Materials Safety Administration's Office of Pipeline Safety (OPS) administers a national regulatory program to facilitate the safe transportation of natural gas and other hazardous materials by pipeline. The OPS has developed safety regulations and other approaches to risk management that promote safety in the design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Many of the regulations are written as performance standards that set the level of safety to be attained and allow the pipeline operator to use various technologies to achieve the required safety standards.

The pipeline facilities associated with the ACP will be designed, constructed, operated, and maintained to meet or exceed the USDOT Minimum Federal Safety Standards in Title 49 CFR Part 192. These regulations, which are intended to protect the public and to prevent natural gas facility accidents and failures, include specifications for material selection and qualification; minimum design requirements; and protection of the pipeline from internal, external, and atmospheric corrosion.

2.2.5 Integrity Management Plan

The Gas Transmission Integrity Management Rule (49 CFR Part 192, Subpart O) specifies how pipeline operators must identify, prioritize, assess, evaluate, repair, and validate the integrity of gas transmission pipelines that could, in the event of a leak or failure, affect High Consequence Areas (HCA). This rule requires that operators develop a written integrity management plan that includes:

- identification of all covered segments;
- development of a Baseline Assessment Plan to assure the integrity of all covered segments;
- a framework that contains all required elements of the Integrity Management Program;
- a process to assure continual improvement to the program;

[12] PHMSA Code requires ACP to hold annual meetings with emergency response agencies. This will be facilitated via regional and/or individual municipality meetings.

- provisions to implement industry standards invoked by reference; and
- a process to document changes to the program (and notify OPS as required).

DTI has implemented a comprehensive Integrity Management Program that meets or exceeds these regulations. DTI's Integrity Management Program addresses the following:

- HCAs – see Section 11.2.2.
- Threat Identification/Risk Assessment – DTI has adopted a threat-based methodology for managing pipeline risk.
- Baseline/Continuous Assessment Plans – Risk assessment provides a rational and consistent method to assess the integrity of a pipeline segment. This method allows for prioritization, which more effectively uses resources in identifying and mitigating threats.
- Remediation/Prevention – Remediation is defined as action taken by the operator to mitigate the danger of a potential integrity concern. Remediation includes pressure reduction and/or timely repair and preventive measures that halt a potential integrity problem so it does not proceed to failure.
- Record-Keeping Provisions – DTI maintains a complete history of all major integrity components within integrated databases.
- Performance and Quality Assurance – DTI's Integrity Management Program is evaluated to confirm that the program effectively assesses integrity and protects HCAs. A Quality Assurance Plan provides documented proof that the operator meets all requirements of its Integrity Management Plan.
- Management of Change – Management of change procedures identify changes to pipeline systems and consider the impact of those changes on the integrity of the pipeline system.
- Communications – DTI has developed and implemented a communications plan to inform company personnel, jurisdictional authorities, and the public about its integrity management efforts and the results of its integrity management activities.

2.2.6 Facilities Security

DTI maintains a Critical Gas Facilities Security Plan that addresses the assessment of risks to DTI facilities. DTI will update this plan to incorporate the proposed Project. The risk assessment process includes sabotage, terrorism, theft and diversion, cyber threats, security breaches, and security incidents. DTI Corporate Security, working with DTI Management, conducts ongoing risk assessment of DTI facilities utilizing the continual risk management methodology. This methodology assesses historical and projected risks.

The security plan implements a strategy that includes the development of close working relationships with the local, state/commonwealth, and federal law enforcement agencies that are responsible for DTI sites throughout the DTI footprint. These relationships include the sharing of risk/threat information pertaining to DTI facilities. The security strategy also includes an ongoing training program for DTI personnel on the security topics of the signs of terrorism, sabotage, and suspicious incidents, to include the reporting of such incidents to DTI Management, DTI Corporate Security, law enforcement, and the appropriate state/commonwealth and federal regulatory agencies.

2.2.7 Abandonment

While Atlantic has no plans for abandonment of its pipeline facilities, if abandonment is necessary, Atlantic will either remove its pipeline facilities from USFS lands or abandon them in place as authorized or directed by the AO, and restore the right-of-way and associated work areas, in consultation with the USFS.

2.3 KEY CONTACTS

Key contacts during the period of ACP construction are as follows:

Names of person(s) to contact:

Dominion Transmission, Inc.: ____________________

U.S. Forest Service Authorized Officer: ____________________

Key Contacts

U.S. Forest Service:

- Authorized Officer(s): ____________________
- Forest Supervisor, Monongahela National Forest ____________________
- Forest Supervisor, George Washington National Forest ____________________

Dominion Transmission, Inc.

- Title: ____________________
- Field Compliance/Monitoring Officers ____________________

Federal Energy Regulatory Commission (FERC)

- FERC Environmental Project Manager ____________________
- Third-Party Monitors ____________________

Dominion Transmission, Inc. (Grant/Permit Holder)

- Project Manager ____________________
- Construction Site Supervisor ____________________
- Environmental Construction Coordinator ____________________
- Environmental Inspectors/Environmental Monitors ____________________

3.0 ENVIRONMENTAL COMPLIANCE

3.1 PURPOSE

The purpose of this Environmental Compliance Plan is to identify processes to ensure compliance with conditions attached to ACP authorizations, for the portion of the Project that lies on USFS lands only. However, it is designed to be consistent with, and will be referenced in, the broader *Implementation Plan*, which is required by the FERC to address environmental compliance across the entire Project. The Environmental Compliance Plan establishes processes and procedures for environmental training, environmental inspection and monitoring, and reporting on USFS lands. It also identifies the roles and responsibilities of Project and agency staff or their representatives, in assuring environmental compliance. This Environmental Compliance Plan extends to all subject areas covered by the COM Plan, for purposes of training, compliance and reporting.

3.2 FERC IMPLEMENTATION PLAN

Among the standard conditions included by the FERC in any issuance of a CPCN, is that the certificate holder submit an *Implementation Plan*. The *Implementation Plan* will describe how Atlantic will comply with the construction procedures and mitigation measures described in their application, supplemental filings (including responses to staff data requests), the final EIS, and conditions required by the CPCN. The *Implementation Plan* will demonstrate to the FERC, regulatory agencies, and federal/state land management agencies that Atlantic has considered all environmental requirements related to the project, and has a plan to ensure they are implemented during construction. The *Implementation Plan* will include, among other items, the following:

- updated alignment sheets;
- any changes, route realignments, facility relocations and staging area changes or additions shown on alignment sheets along with a written description of the change, existing land use/cover type, documentation of landowner or land management agency approval, and a statement of any cultural or federally listed threatened or endangered species that will be affected;
- a statement that Atlantic will inform contractor personnel of the EIs authority and commitment to provide environmental training to contractor personnel;
- a description of how Atlantic will implement the construction procedures and mitigation measures described in its application, supplemental filings (including responses to staff data requests), the final EIS, and required by the CPCN; and how Atlantic will incorporate these requirements into the contract bid documents, construction contracts and construction drawings so that the mitigation required at each site is clear to onsite construction and inspection personnel;
- a schedule or Gantt Chart that includes dates for the completion of all required surveys and reports; the environmental training of construction personnel; the start of construction; and the start and completion of restoration;
- the number of EIs assigned per construction spread, and how Atlantic will ensure that sufficient personnel are available to implement the environmental mitigation measures; company personnel, including EIs and contractors; who will receive copies of the appropriate material; the location and dates of the environmental compliance training; the

procedures (including use of contract penalties) Atlantic will follow if noncompliance occurs;

- a discussion of the EI's roles and responsibilities;
- a commitment by Atlantic to file weekly or biweekly construction status reports;
- a description of Atlantics environmental complaint resolution procedure that provides landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction and restoration of the ACP Project.

Atlantic's *Implementation Plan* will need to be filed within 60 days of acceptance of the CPCN.

3.3 CONTRACTOR BID DOCUMENTS

Atlantic will include copies of all approved environmental construction and mitigation plans and permits for incorporation into the construction contracts. The construction contracts will include penalties for noncompliance with the project's environmental requirements.

3.4 PREPARATION OF REQUEST FOR PROPOSAL FOR THIRD-PARTY COMPLIANCE CONTRACTOR

Following receipt of the CPCN from the FERC, Atlantic will prepare a request for proposal to provide third-party compliance oversight on behalf of the FERC and other agencies, including, pending their concurrence, the MNF and GWNF. The request for proposal will be sent to multiple environmental firms with a demonstrated track record of providing these services to the FERC. The environmental contractor assisting FERC with the Environmental Impact Statement is typically included on the list assuming they are qualified to provide these services. Atlantic will choose its preferred proposals (typically three) and submit them to FERC. The FERC will choose its preferred provider from the proposals submitted by Atlantic.

3.5 NOTICES TO PROCEED

Atlantic will not commence construction anywhere on the Project until the FERC has issued the Project a Notice to Proceed (NTP). FERC's NTP is typically issued once the certificate holder has satisfactorily demonstrated compliance with pre-construction conditions contained in the CPCN. Similarly, Atlantic will not commence construction (including timber removal) on USFS lands unless and until the USFS AO has issued the Project an NTP.

Due to the two-season construction schedule, as well as the need to complete certain surveys, conduct treatment at cultural resource sites, etc., Atlantic anticipates requesting from both the FERC and the USFS partial NTPs covering those segments of the Project that are ready to commence construction and for which pre-construction conditions have been satisfied. Any such requests will document the reasons for the request of a partial NTP, as well as documentation that pre-construction conditions have been satisfied for the requested segment(s).

3.6 ENVIRONMENTAL COMPLIANCE ROLES AND RESPONSIBILITIES

3.6.1 US Forest Service

The USFS has authority over all activities that occur on USFS lands.

3.6.2 USFS Authorized Officer

The USFS AO will have environmental compliance oversight over the portion of the project on USFS lands, and is responsible for determining overall environmental compliance with the COM Plan, Record of Decision, and terms of the right-of-way grant. The AO has stop work authority on all USFS lands. The AO manages the Field Compliance/Monitoring Officers. The AO is responsible for issuing NTPs on USFS lands and for approving requested project changes on USFS lands using the variance request process described in Section 3.9 below.

3.6.3 Field Compliance/Monitoring Officers

The Field Compliance/Monitoring Officers will conduct compliance oversight inspections on all USFS lands. The Field Compliance/Monitoring Officers will be responsible to the AO to verify and document Atlantic's compliance with the COM Plan, the Record of Decision, and terms of the right-of-way grant. The Field Compliance/Monitoring Officers will not interact directly with the contractor but will coordinate and communicate with Atlantic's EIs. The Field Compliance/Monitoring Officers will conduct field review of potential project changes and report findings to the AO to support approval or denial of variance requests. The Field Compliance/Monitoring Officers will have Stop Work authority for discrete activities on USFS lands that pose an immediate threat to a sensitive environmental resource. The Field Compliance/Monitoring Officers will also have the authority to approve that specific goals or objectives have been met.

3.6.4 Federal Energy Regulatory Commission

3.6.5 FERC Environmental Project Manager

The FERC Environmental Project Manager (FERC PM) will have environmental compliance oversight over the entire Project. The FERC PM will direct the activities of the Third-Party Compliance Monitoring Team. The FERC PM will have Stop Work authority for all project-related activities.

3.6.6 Third-Party Compliance Monitoring Team

The FERC Third-Party Compliance Monitoring Team will consist of an office-based Compliance Manager and multiple field-based Compliance Monitors (CM). The Third-Party Compliance Manager will manage the Third-Party Compliance Monitoring Program and be responsible for directing the day to day activities of the Third-Party CMs, reporting compliance results to FERC, and managing the FERC variance approval process. The Third-Party Compliance Manager will be responsible to ensure that corrective actions are documented in relation to all noncompliance activities. The Third-Party Compliance Manager will be responsible to approve or deny Level 2 variance requests. The Compliance Manager will coordinate with Atlantic, the AO, and the FERC PM to ensure compliance.

The CMs will conduct daily inspections of all construction activities and document their observations and levels of compliance in daily reports. The CM will assist in the review of variance requests and be responsible to approve or deny Level 1 variance requests. The CMs' primary responsibilities will be monitoring environmental compliance on all non-USFS lands; however, because the FERC has responsibility for environmental compliance over the entire Project, the CMs will conduct limited monitoring on USFS lands and will coordinate with the Field Compliance/Monitoring Officers. The CMs will not interact directly with the contractor but will coordinate and communicate with Atlantic's EIs and the USFS' Field Compliance/Monitoring Officers. The CMs will have Stop Work authority for discrete activities that pose an immediate threat to a sensitive environmental resource.

3.6.7 Project Manager

Atlantic's Project Manager will be responsible to Atlantic and is responsible for overall management of construction activities.

3.6.8 Construction Site Supervisor

The Construction Site Supervisor will have direct oversight of all personnel that prepare, construct, maintain and rehabilitate the Project. The Supervisor also has control over site-specific construction plans, including the ability to make modifications to those plans, pending any necessary USFS approvals. In addition to USFS requirements, this person must ensure compliance with the FERC Order, COM Plan, the Erosion and Sediment Control Plan (ESCP), Storm Water Pollution Prevention Plan (SWPPP), and West Virginia and Virginia Stormwater Management Program requirements. The Construction Site Supervisor is authorized to direct workers at a site to carry out activities in accordance with these and other permit conditions. The Supervisor will ensure compliance with all applicable safety requirements.

3.6.9 Environmental Construction Coordinator

The Environmental Construction Coordinator (ECC) will serve as part of the environmental team relative to environmental compliance within Atlantic. The ECC has the responsibility of ensuring full compliance with applicable laws, environmental rules, regulations, permits, and company policies that pertain to their Project. The ECC's roles and responsibilities may include:

- Ensure compliance with applicable federal, state, and local environmental regulations, permits, company standards, and procedures, and facility procedures at the Project;
- Promote environmental stewardship;
- Coordinate with EI's and contractors to ensure site environmental compliance;
- Serve as primary site coordinator with Dominion Environmental Services, internal departments, and external agencies regarding environmental issues;
- Serve as contact with community or local public to resolve environmental emergencies, complaints, or problems;
- Maintain environmental permits, plans, and various compliance records; and
- Assist with environmental emergency response activities.

3.6.10 Environmental Inspector

EIs will have the authority to stop activities that violate the environmental conditions of the FERC Order, the COM Plan, stipulations of other environmental permits or approvals, or landowner easement agreements, as well as order appropriate corrective action.

The EI will have peer status with all other activity inspectors and will report directly to the ECC who has overall authority on the construction spread or Project.

The number and experience of EIs assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected. The person designated as the EI will typically be a dedicated role for each construction spread.

At a minimum, the EI shall be responsible for:

- Inspecting construction activities for compliance with the requirements of this COM Plan, the ESCP, the Construction Alignment Sheets, the environmental conditions of the FERC Order, proposed mitigation measures, other federal or state and local environmental permits and approvals, and environmental requirements in landowner easement agreements;
- Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;
- Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;
- Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, including waterbodies and wetlands, or areas with special requirements along the construction work area;
- Identifying erosion/sediment control and soil stabilization needs in all areas;
- Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive resource areas, including cultural resource sites, wetlands, waterbodies and sensitive species habitats;
- Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitat; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;
- Ensuring that subsoil and topsoil are tested on USFS lands to measure compaction and determine the need for corrective action;
- Advising the Construction Site Supervisor when environmental conditions (such as wet weather, severe storm events or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;
- Ensuring restoration of contours and topsoil;
- Verifying that any imported soils have been certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner, and is considered clean and free of hazardous materials;

- Ensuring that the appropriate erosion/sediment control and stabilization needs are implemented in all areas, including ensuring that erosion and sediment controls are properly installed and maintained daily to prevent sediment flow into sensitive resource areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;

- Inspecting and ensuring the maintenance of temporary erosion and sediment control measures at least:

    - On a daily basis in areas of active construction or equipment operation;

    - On a twice-weekly basis in areas with no construction or equipment operation;

    - Within 24 hours of each stormwater event (runoff from precipitation, snowmelt, surface runoff and drainage, including rainfall events resulting in 0.5 inches or more);

- Ensuring the repair of all ineffective temporary erosion and sediment control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;

- Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase;

- Ensuring proper seed mixes, rates and restoration methods are used, and obtaining documentation;

- Ensuring that the Contractor implements and complies with Atlantic's internal environmental standards and related operating procedures;

- Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with this COM Plan, the ESCP and any applicable permits / clearances; and;

- Keeping records of compliance with the environmental conditions of the FERC Order and the mitigation measures proposed by Atlantic in the application submitted to the FERC, the COM Plan, and other federal or state environmental permits during active construction and restoration. Records should include photo documentation.

3.6.11 Environmental Monitors

In addition to EIs, Environmental Monitors will be deployed as required. Environmental Monitors are resource specialists and include for example cultural and biological resource monitors. Depending on the Project requirements, the biological monitors may be general biological monitors, avian or fisheries monitors, or other species-specific monitors with certifications for handling sensitive species. These monitors will be provided on an as-needed basis in compliance with construction monitoring plans and permit conditions. For example, certain monitors may only be required when construction activities are in the vicinity of a specific site (e.g., a known cultural resource site or habitat for a threatened endangered species). Depending on the timing of construction, avian monitors may be required during tree clearing operations.

3.7 ENVIRONMENTAL TRAINING

Environmental training will be given to both Atlantic personnel and contractor personnel whose activities have the potential to impact the environment during pipeline construction. All construction personnel from the ECC, EI, ESCP/Stormwater Management inspectors, craft inspectors, contractor job superintendent to loggers, welders, equipment operators, and laborers will be given some form of environmental training. The level of training will be commensurate with the type of duties of the personnel. At the discretion of Atlantic, environmental training for personnel may also be required on the Project where it is not required by FERC.

Training will be given prior to the start of construction and throughout the construction process, as needed, and will cover the following issues:

- Specifics of this COM Plan, the ESCP and other Atlantic plans;
- General environmental regulatory permit requirements;
- Job or activity specific permit requirements;
- Atlantic policies and commitments;
- Cultural resource procedures and restrictions;
- Threatened and endangered species procedures and restrictions; and
- Any other pertinent information related to the job.

In addition to the EI, all other construction personnel are expected to play an important role in maintaining strict compliance with all permit conditions, and to promptly report any conditions that are perceived as having the potential to threaten environmental protection to the appropriate inspector during construction.

3.8 REPORTING

All EIs and Environmental Monitors will document their daily inspection activities in a daily report using an electronic reporting system. All information for the daily inspection reports will be entered into an electronic daily report template that transfers the information to a Project-specific database. The daily report will have required reporting fields such as date, location information, and compliance level and will be capable of handling photographic documentation. The electronic reporting system will be used to generate information for the Atlantic's weekly report to be submitted to FERC.

Section 8.11 discusses reporting requirements specific to the ESCP.

3.9 VARIANCE PROCEDURES

Project changes will require approval through the variance request process. A dedicated Variance Coordinator may be required to coordinate variance requests from the contractor, ensure approvals are received from Atlantic, ensure any necessary landowner approvals are in place, appropriate documentation is provided (e.g., photos, maps, biological/ cultural survey), and other agency approval as necessary. Levels of variance approvals are as follows:

- Level 1 variance requests include the approval of like-use roads (assuming the Project has received blanket concurrences from the FWS and State Historic Preservation Officer for like-use roads); shifting extra workspace along the construction right-of-way for a short distance within the previously surveyed corridor (without increasing land use disturbance in type or acreage or impacting cultural or environmental resources); and performance-based changes to mitigation measures. On USFS lands, Level 1 variances must be approved in writing by the USFS Field Compliance/Monitoring Officer, unless the USFS delegates this authority to the FERC Compliance Monitor. Any such approvals will be documented by the FERC Compliance Monitor.

- Level 2 variance requests typically include additional workspace within the area surveyed for cultural and biological resources. On USFS lands, Level 2 variance requests must be approved in writing by the USFS Field Compliance/Monitoring Officer. Any such approvals will be documented by the FERC Compliance Monitor.

- Level 3 variance requests typically include additional workspace for which cultural and biological survey and associated agency consultation is required. They may include changes to permanent facility locations or Project-wide changes. On USFS lands, Level 3 variance requests must be approved in writing by the AO. Level 3 variance request must also be formally filed with the FERC for review and approval by the FERC PM.

4.0 TIMBER REMOVAL PLAN

4.1 PURPOSE

The purpose of this plan is to describe how timber removal activities will be conducted on USFS lands, and identify measures for reducing impacts and stabilizing areas where timber is removed. For purposes of this plan, timber removal is defined as removing merchantable timber logs, disposal of non-merchantable timber, and the decking/removal of logs at the edge of the right-of-way or landings. This plan augments the other construction, restoration, and mitigation plans prepared for the Projects. All applicable provisions of other plans apply to timber removal activities (e.g., the equipment refueling procedures described in the SPCC Plan).

The MNF and GWNF each have standards and guidelines applicable to timber removal practices within the National Forests. This Timber Removal Plan has been written to conform to the standards and guidelines contained within the LRMPs of both National Forests.

The ACP will cross USFS lands administered by the GWNF at the ANST. Atlantic is planning to cross the ANST, as well as the nearby Blue Ridge Parkway corridor on NPS land, with a single HDD, eliminating the need to clear trees at these sensitive crossing locations.

4.2 TRAINING

Prior to the start of timber removal, Atlantic will conduct environmental and safety training for Atlantic and Contractor personnel. The training program will focus on this *Timber Removal Plan*, the FERC Plan and Procedures, and other applicable elements of the COM Plan and permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

4.3 COMPENSATION

Timber located on National Forest Service (NFS) lands will be paid for and disposed of at the discretion of the Timber Sale Contracting Officer's. The volume of merchantable timber to be removed for pipeline construction will be determined by a timber cruise complying with a cruise plan provided by the Forest Service. The cruise will evaluate forests within the Project's footprint and provide a volume estimate for merchantable timber. The Forest Service will perform a timber appraisal based upon this cruise to determine the value of the merchantable timber to be removed. Atlantic will reimburse the Federal government based on that valuation, prior to any cutting taking place.

4.4 TIMBER CRUISE AND EXTRACTION PLANS

Timber cruises will be conducted prior to construction to determine timber volumes, values, and species composition. Atlantic will employ timber specialists to cruise, mark and appraise timber in accordance with Cruise Plans provided by the MNF and GWNF (see Attachment Q). For areas containing merchantable timber, the Project will prepare Timber Extraction Plans (a.k.a. Logging Plans) in consultation with the MNF and GWNF after timber cruises are complete. These Plans will be appended to the COM Plan and will identify:

- the timber volume to be cleared;
- tree sizes;
- log grades;
- the dollar value of the timber;

- the logging system(s) to be used for each harvest segment;
- yarding methods and landing locations and decks;
- the volume of timber that will be yarded at each landing;
- the locations of any landings and decks not previously identified; and
- the roads that will be used to haul logs.

4.5 TIMBER REMOVAL METHODS

The Project is considering two timber-clearing methods for the Projects: mechanical harvesting and high line yarder logging. Helicopter logging is not currently being considered, but could be used in steep areas All three methods are described below.

4.5.1 Mechanical Harvesting

Wherever possible, mechanical harvesting will be employed. “Feller bunchers,” which are mechanized tree harvesters that can cut and gather several trees at once, can be used to cut trees on slopes with up to 50 percent grade. The feller bunchers will pile the felled trees, allowing them to be transported (yarded) to larger collection areas (landings) by “skidders” or “forwarders,” which are other specialized machines for moving trees. Skidders drag logs, while forwarders carry logs clear of the ground. Log cranes and logging shovels will load trucks, feed grinders, handle stumps, place environmental mats, build bridges, and aid in the overall safe handling of materials and rigging on the landing and in the woods.

Skidders will be limited to slopes of 35 percent or less. Forwarders, skyline, or other advanced harvesting system may be utilized on slopes from 35-50 percent as approved by the USFS on a case-by-case basis. Skyline systems or helicopters may be used on slopes steeper than 50 percent.

4.5.2 Yarder Logging

Cable yarding systems remove felled timber with the use of cables and blocks using a tower (the “yarder”) and an anchor line. Yarding systems may drag logs up or down hill, or in the case of skyline systems, partially or entirely lift the logs above the ground. Skyline logging will be implemented in some areas because of steep terrain, limited access, and the alignment of the route. Alignment is critical in all cable systems. Where there are slight changes in alignment, skyline yarder logging can be effectively used. Where cable systems are utilized, only skyline systems will be used. Partial or full suspension is necessary on steep slopes. Atlantic will not “drag logs up or downhill” without at least partial suspension.

Yarder work using a skyline system could be used in some places on the right-of-way. This system requires a tailhold, which is the point of anchorage of the skyline. In many cases, a right-of-way alignment does not lend itself to be "in line" for a good tailhold. Loggers typically seek permission to place their tailhold outside the cutting area to create better alignment. Consequently, the tailhold is typically placed off the construction area and on an opposing slope. The tailhold could also be a tree that is rigged off the main cutting area. The Project will seek extra workspace authorization, if necessary to locate any tailholds beyond the construction right-of-way.

Yarders will be used to assist excavators, skidders, stump grinders, and dozers to remove brush and stumps on the right-of-way. With long cable capabilities and good rigging, many machines can be aided by a yarder using stump holds, blocks, and "dead men" as a safety anchor on a steep slope.

A yoder is a combination yarder/loader that can accomplish many of the same tasks as a yarding system on a smaller scale. Yoders can fill the gap for log removal in areas where alignment problems pose major inefficiencies to big yarders. These smaller yarding machines can effectively remove logs in tight, steep areas, such as those encountered in parts of the Appalachian Range.

4.5.3 Helicopter Logging

Helicopter logging is typically employed in remote areas with rough terrain. Timber is generally felled by hand cutters with chain saws. One advantage of helicopter logging is the ability to safely remove timber on remote slopes where no roads exist. Helicopters are also used to safely remove timber on steep slopes and protect terrestrial and aquatic resources. Flying logs to existing roadway systems creates less soil disturbance and requires fewer man-hours on the hills. Logs are flown to the nearest timber landing for truck transport to a mill.

During log transportation, helicopter flight paths typically will be along the pipeline right-of-way. The helicopter can also provide ambulatory service, if needed, as well as help with fire patrol and the delivery of equipment and crew to the field.

4.6 PLANNED TIMBER REMOVAL OPERATIONS

4.6.1 General Requirements

The schedule for timber removal is provided in Section 2.1.1.3. Timber removal on the MNF and the GWNF is scheduled to take place between November 1 and April 1 of both construction seasons, which will minimize the potential to take nesting migratory birds. For any areas of the right-of-way within 5 miles of known Indiana bat hibernacula, no timber removal will occur before November 16.

Surveys for eagles were completed in 2016 via helicopter and no eagle nests were identified on USFS lands. Bald eagles are known to occur year round in areas with suitable habitat along the ACP route; bald eagles nest in late winter into the summer and roost in the winter. Golden eagles are not known to nest in this area, although they do winter roost.

If additional bald eagle nests or occupied bald or golden eagle winter roosting habitat are identified ahead of or during construction, Atlantic will follow the National Bald Eagle Management Guidelines for work within 660 feet of bald eagle nests. For tree clearing that occurs during the winter roosting or nesting season, a qualified biological monitor will accompany the clearing crews for work conducted in areas where golden and bald eagles are believed to be present on USFS lands.

Before initiating timber removal activities, Atlantic and DTI will conduct environmental training for company and contractor personnel. The training program will focus on the FERC *Upland Erosion Control, Revegetation, and Maintenance Plan* (Plan) and *Wetland and Waterbody Construction and Mitigation Procedures* (Procedures), other Project-specific construction, restoration, and mitigation plans; and applicable permit conditions. In addition, the Project will provide large-group training sessions before each crew commences construction with periodic follow-up training for groups of newly assigned personnel.

A detailed civil survey will be conducted before timber removal activities begin to delineate the limits of approved work areas (i.e., the construction right-of-way, temporary and ATWS, aboveground facility sites and associated workspace, staging areas, and contractor yards). The locations of approved access roads will be flagged and marked with signs.

Riparian and wetland areas will be clearly labeled in the field. Other areas/sensitive features will be flagged prior to clearing (e.g., existing snags or large diameter trees on the edge of the construction right-of-way to be saved/protected as green recruitment or habitat/shade trees). Applicable erosion and sediment control measures will be installed in accordance with the Plan and Procedures to prevent unnecessary disturbance associated with initial clearing. Additionally, temporary bridges will be installed at waterbody crossings along the right-of-way in accordance with the Plan and Procedures.

Prior to felling, the boundaries of the construction areas will be painted with paint furnished by the Forest Service. Timber will be felled from construction areas using the method best suited to terrain and topography. Merchantable timber will be skidded or carried to landings for loading onto trucks and hauling off site. Non-merchantable timber will be burned, chipped, stacked along the edge of the right-of-way, hauled off-site, or salvaged for use during restoration activities (e.g., habitat construction, off-highway vehicle [OHV] blocking). After it is cut, non-merchantable timber that will be salvaged for restoration will be flagged, quantified, labeled, and placed along the edge of the construction right-of-way or at the nearest staging area.

Slash will not be windrowed or left in a manner that creates an obstruction. Slash may be chipped and blown off the right-of-way outside wetlands or stream channels. If approved by the CO, slash may be burned. Stumps will be cut as close to the ground as possible and left in place, except over the trench line, or where grading is necessary to create a safe and level work surface. The top of the stumps will be ground flush to grade within the majority of the right-of-way. All stumps excavated from the trench line that cannot be ground to mulch onsite will be placed along the edge of the construction right-of-way or in temporary extra workspaces. Stumps will be hauled from the extra workspaces to a pulp mill, a permitted disposal facility, used on the right-of-way for restoration purposes, burned (if permitted), or disposed of according to land managing agency or landowner specifications.

During construction, the Project will monitor compliance with the environmental requirements and permit conditions for the Project. The EIs will be responsible for monitoring contractor compliance with this *Timber Removal Plan*.

4.6.2 Access Roads and Storage Areas

Approved access roads and storage areas for timber removal activities will be depicted on Project alignment sheets and flagged or otherwise marked in the field.

4.7 MITIGATION MEASURES

4.7.1 General Mitigation Measures

The Project will implement several additional measures to reduce or minimize impacts associated with timber removal activities, including the following:

- During timber removal, temporary erosion control devices will be installed, inspected, and maintained in accordance with the Plan and Procedures. Erosion control and all other timber removal activities taking place during the winter season will be conducted in accordance with the Winter Construction Plan.
- Any debris entering a waterbody as a result of felling and yarding of timber will be removed as soon as practical and will be placed outside the 100-year floodplain where feasible.
- Logs and slash will not be yarded across perennial streams unless fully suspended.

- During logging/clearing operations, the direction of log or slash movement will be conducted to minimize the potential for sediment reaching waterbodies.

- Logs firmly embedded in the bed or bank of waterbodies that are in place prior to felling and yarding of timber will not be disturbed unless they prevent trenching or fluming operations or operation of equipment.

- Any existing logs that are removed from waterbodies to construct the pipeline crossing will be returned to the waterbody after the pipeline has been installed, backfilling is complete, and while stream banks are being restored.

- Landings for clearing operations will not be located in wetlands or riparian areas, and, where feasible, logs yarded out of wetlands or riparian areas will be skidded with at least one end suspended from the ground to minimize soil disturbance.

- Any timber cleared from the pipeline right-of-way or other work areas that will be used for in-stream or upland wildlife habitat diversity structures will be stored in approved temporary workspace areas for use during restoration.

- Prior to clearing operations, EIs will flag existing snags on the edges of the construction right-of-way or ATWS, where feasible, to save from clearing. These snags will be saved as mitigation to benefit primary and secondary cavity nesting birds, mammals, reptiles, and amphibians.

- Selected large diameter trees on the edge of the construction right-of-way and ATWS areas will be flagged by EIs to save/protect as green recruitment or habitat/shade trees, where feasible.

- Implement the Visual Resources Plan (Section 20), which will reduce visual impacts by employing "feathering" of the right-of-way edge in certain locations, and replanting woody vegetation in the construction right-of-way .

Where ground skidding is used, the following measures will be implemented to minimize soil disturbance:

- Low ground weight (pressure) vehicles will be used, where feasible.

- The removal of soil duff layers will be avoided to maintain a cushion between the soil, logs, and logging equipment. Proper supportive surfacing material will be operated on during timber removal. Soil quality standards will be maintained and detrimental soil disturbance will be avoided. Proper skid roads will be constructed if needed to ensure safe operations and protection of resources on site. Use of skid roads will not cause soil movement resulting in erosion and sedimentation. Since skid roads will lie within the limits of the pipeline construction work area, such areas will be restored as part of the pipeline construction restoration effort.

- Designed skid trails will be used to restrict detrimental soil disturbance (e.g., compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area. Detrimental soil disturbance will be defined by FSH 2550. Class 2 and Class 3 disturbances will be mitigated to return proper function to the soil resource. All skid trails will be identified in the logging plan to be submitted for the review and approval of the USFS, and must be in compliance with the respective Forest's LRMP.

4.7.2 Additional Mitigation Measures for Forest Service Lands

On USFS lands, additional measures will be implemented, in conformance with LRMP standards and guidelines. If a general mitigation measure is more stringent than its counterpart Forest mitigation measure below, the more stringent measure will be applied.

4.7.2.1 Monongahela National Forest

- Whole trees will not be yarded without approval from the CO (MNF LRMP TR05).
- Slash will be removed from permanent roads and recreation trails. Slash may be retained in wildlife openings in brush piles if approved by the CO (MNF LRMP TR08). Slash will not be windrowed or left in a manner that creates an obstruction. Slash may be chipped and blown off the right-of-way outside wetlands or stream channels.
- USFS roads will not be used for skidding (MNF LRMP TR09).
- USFS roads will not be used as log landings unless approved by the CO. Any wildlife openings used as log landings will be restored similarly to all pipeline construction work areas upon completion of construction (MNF LRMP TR10).
- Log landings and other concentrated timber removal activities will be located outside channel buffers (MNF LRMP TR11).
- Skid trails will be kept to the minimum necessary to yard the logs (MNF LRMP TR13).
- Right-of-way edges will be "feathered" in irregular patterns to blend in with the landscape in the immediate foreground, foreground or midground of visually sensitive areas (MNF LRMP TR20).
- Access roads identified for pipeline access will be used for timber removal activities as well (see Table 2.1.1-1). To the extent possible, landings will be sited at locations where extra workspace for pipeline construction is needed, to avoid disturbing more area than is necessary.
- No timber removal activities will take place outside work areas authorized by the USFS; this will avoid impacts to any threatened and endangered plant populations outside the workspace.

4.7.2.2 George Washington National Forest

- Inventory any stands proposed for timber harvest for existing old growth conditions using the criteria in Appendix B (Guidance for Conserving and Restoring Old Growth Forest Communities on National Forests in the Southern Region (Forestry Report R8-FR62, June, 1997)). Any stands in Old Growth Forests Type 1 (Northern Hardwood), 2a (Hemlock-Northern Hardwood), 2b (White Pine-Northern Hardwood), 2c (Spruce-Northern Hardwood), 5 (Mixed Mesophytic), 10 (Hardwood Wetland Forests), 22 (Dry and Xeric Oak Forest), 24 (Xeric Pine and Pine-Oak Forest and Woodland), 28 (Eastern

Riverfront) that meet the age criteria for old growth will be unsuitable for timber production, regardless of whether they meet the other criteria for existing old growth. Stands in Old Growth Forest Types 21 (Dry Mesic Oak), or 25 (Dry and Dry-Mesic Oak Pine) may be suitable for timber harvest. Decisions to harvest these stands would be made after consideration of the contribution of identified patches to the distribution and abundance of the old growth community type and to the desired condition of the appropriate prescription during project analysis. **(GWNF LRMP FW-85).** Note: GWNF has identified this standard as potentially requiring a project-specific LRMP amendment, depending upon the results of old growth forest surveys.

- Advanced harvesting methods (such as cable or helicopter) will be used on sustained slopes greater than 35 percent (**GWNF LRMP FW-125).**

- Log landings will be located outside of riparian corridors. **(GWNF LRMP FW-139).**

- All equipment used for harvesting and hauling operations will be serviced outside of riparian corridors **(GWNF LRMP FW-140).**

- Unless otherwise authorized by the Forest CO, log landings will be ripped to a depth of 6-8 inches to break up compaction, and to ensure soil productivity and the successful reestablishment of vegetation. **(GWNF LRMP FW-141).**

- Skid trails will cross riparian corridors only at Forest-designated crossings. If crossing a perennial or intermittent stream is unavoidable, temporary bridges will be used. All streams will be crossed as close to a right angle as possible. Stabilization of skid trails will occur as soon as possible after use, to minimize soil movement downslope. **(GWNF LRMP FW-142).**

- Skidding of trees will be directed in a manner that prevents creation of channels or gullies that concentrate water flow to adjacent streams. **(GWNF LRMP FW-143).**

- Temporary stream crossings associated with timber harvest operations will be removed and rehabilitated. **(GWNF LRMP FW-144).**

- Dips or waterbars or other dispersal methods will be constructed and maintained to direct stormwater off skid trails and reduce potential sediment flow to streams. **(GWNF LRMP FW-145).**

- Designated trails will not be used as skid trails. Crossing of designated trails will occur at right angles to the extent feasible. Designated trail treads and profiles will be restored upon completion of pipeline construction. **(GWNF LRMP FW-146).**

- Right-of-way edges will be shaped or “feathered” in irregular patterns to blend in with the existing landscape in High and Moderate SIO areas. At the direction of the Forest CO, some edges may not need feathering to meet the Scenic Integrity Objectives. Geometric shapes will not be utilized. **(GWNF LRMP FW-184).**

- If visible within a 100-foot zone of Concern from Level 1 & 2 travelways and use areas, slash will be removed, burned, chipped or lopped. These treatments result in an average slash height of 2 feet off the ground. **(GWNF LRMP FW-186).** Slash will not be windrowed or left in a manner that creates an obstruction. Slash may be chipped and blown off the right-of-way outside wetlands or stream channels.

- To the extent practical, log landings, access roads and bladed skid trails will be located out of view to avoid bare mineral soil observation from Concern Level 1 travel routes and viewing platforms. **(GWNF LRMP FW-190).**

- Access roads identified for pipeline access (see Table 2.1.1-1) will be used for timber removal activities as well. To the extent possible, landings will be sited at locations where extra workspace for pipeline construction is needed, to avoid disturbing more area than is necessary.

- No timber machinery shall cross the ANST nor operate between the HDD entry and exit points or, if the contingency direct drill approach is employed, between the direct drill entry and exit points.

- All woody material will be moved, lopped, and/or scattered so as not to be visible from the ANST or its associated features.

5.0 FIRE PREVENTION AND SUPPRESSION PLAN

5.1 PURPOSE

The purpose of this Fire Plan is to identify BMPs for preventing fires on USFS lands and responding to inadvertent fires that occur during construction of the ACP on or near USFS lands. It is based upon the Fire Plan prepared in connection with Atlantic's application to the FERC for the entire Project. This Fire Plan focuses on USFS lands. It incorporates elements that are applicable across the Project as well as elements specific to either or both National Forests crossed by the ACP (the MNF and the GWNF). It incorporates by reference both Forests' standards and guidelines pertaining to fire prevention and suppression (Attachment E).

The Fire Plan identifies responsibilities and procedures for suppressing fire ignitions, responding to and reporting fire emergencies, and working with emergency response agencies in the event of fire, regardless of cause. The Fire Plan is designed to be consistent with applicable Federal and state/commonwealth laws, regulations, plans, and policies, including Chapter 14 of the 2003 International Fire Code (Combustible Dust-Producing Operations) and Section A104 of the International Wildland-Urban Interface Code (Ignition Source Control).

The Fire Plan provides an implementation strategy to ensure immediate and aggressive action to suppress inadvertent fires that occur during construction of the Project and establishes protocols and lines of communication for reporting fires that occur. Implementation of the Fire Plan will ensure that proper types and quantities of safety and fire extinguishing equipment are available in construction areas to suppress fires, and that construction workers are adequately trained for response to fires. The Plan will be used to familiarize ACP personnel with basic fire emergency planning, response, and evacuation procedures, and their individual roles in fire prevention and suppression. Planning and training will help ACP personnel respond effectively in the event of a fire, thereby avoiding or minimizing injuries and/or damage to property or the environment.

5.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC Plan and Procedures, other construction, restoration, and mitigation plans, including this Fire Plan; and applicable permit conditions. In addition, Atlantic and DTI will provide large-group training sessions before each work crew begins construction with periodic follow-up training for groups of newly assigned personnel.

Training for fire suppression and response will include:

- the chain of command and fire reporting process;
- emergency contacts and numbers;
- basic fire prevention behavior controls;
- basic uses of hand tools, water backpacks, and other fire suppression equipment;
- fire suppression procedures and precautions; and
- emergency response and evacuation procedures.

5.3 RESPONSIBILITIES

Atlantic will be responsible for fire prevention during construction of the Project. Atlantic along with the appropriate emergency response or jurisdictional agencies will be responsible for fire suppression and investigation. All ACP personnel, including contractors, will be responsible for complying with applicable laws and regulations for fire prevention and suppression as well as the measures described in this Fire Plan.

5.3.1 Interagency Coordination

Interagency coordination of wildfire management in the southeastern United States is overseen by the Southern Area Multi-Agency Coordination Group (SACG), which includes representation from Federal land managing agencies and state/commonwealth forestry agencies. The SACG and an adjunct organization, the Southern Area Coordination Center, encompass Virginia and North Carolina. Virginia and North Carolina also have their own centers for coordination of wildfire management.

Interagency coordination of wildfire management in the northeastern United States is overseen by the Eastern Area Coordination Group (EACG), which includes representation from Federal land managing agencies and state/commonwealth forestry agencies. The EACG and an adjunct organization, the EACC, encompasses West Virginia. The EACC and an adjunct organization, the Central Appalachian Dispatch Center, provides interagency coordination for wildfire management on the Monongahela National Forest.

Each of the states/commonwealths crossed by the Project has fire prevention and suppression laws, regulations, and programs. Responsible agencies include the West Virginia Division of Forestry and the Virginia Department of Forestry. Each of these agencies participates in the appropriate SACG and EACG for coordination of wildfire management.

When a fire is initially reported, local and partner firefighting agencies initially respond to the emergency. A local agency can ask for support from the appropriate state/commonwealth or a regional coordination center if a fire could or does exceed the response capabilities of the local agency. The state/commonwealth or regional coordination center may in turn request support from the National Interagency Coordination Center if a regional center exhausts its fire suppression resources.

During a fire emergency, coordination is implemented through the Incident Command System (ICS), which is part of the National Incident Management System. ICS is a standard incident management system used by firefighters and emergency medical teams to establish an organizational structure for management. A chain of command initially is established by the local response agencies to direct the response. As an incident progresses, personnel with higher authority and training assume responsibility for directing the response. ICS and National Incident Management System provide a framework that assists agencies, non-governmental organizations, and the private sector in preventing, responding to, and mitigating the effects of incidents and ensuring an appropriate response based on the capabilities of response agencies.

5.3.2 ACP Project Responsibilities

The construction contractors working on the Project will be required to implement the provisions of this Fire Plan. Additionally, each contractor will be required to prepare and implement an individual fire control plan, which will identify responsibilities and describe actions to be implemented by the contractor in the event of an inadvertent fire. Copies of each fire control plan will be appended to this Fire Plan.

The key persons responsible for fire prevention and suppression during construction of the Project are the Construction Site Supervisor, Spread Superintendents, Field Safety Officers (FSO), EIs, Fire Authorized Officers (FAO), and Station Managers. Contact information for these persons will be appended to the "issued-for-construction" Fire Plan prior to the start of construction. At a minimum, each construction spread for the pipelines and each aboveground facility site will have one FSO trained in accordance with National Fire Protection Standards 1521, Chapter 4, Responsibilities for a Health and Safety Officer.

Construction Site Supervisor

The Construction Site Supervisor will be responsible for oversight of all activities along the pipeline, including fire prevention and suppression.

Spread Superintendents

Spread Superintendents will be responsible for general construction operations associated with their individual spreads including compliance with this Fire Plan. Spread Superintendents will be in communication with Construction Site Supervisors, FSOs, EIs, FAOs, and local emergency response, as necessary, to ensure that construction personnel are aware of fire hazards and prevention methods. Spread Superintendents will coordinate with Federal, state/commonwealth, and local emergency responders during periods of high or severe fire conditions to ensure that appropriate preventive measures are in place during construction. Spread Superintendents also will be responsible for:

- monitoring construction areas to identify fire hazards and risks;
- developing and implementing fire protection strategies;
- ensuring adequate firefighting equipment is deployed to high risk areas and that equipment is visible and accessible; and
- ensuring that all firefighting equipment is inspected on a regular basis and maintained in good condition.

Field Safety Officers

The FSOs will be responsible for managing on-site fire suppression documentation, ensuring that fire suppression equipment is available and maintained, ensuring that construction personnel are trained to use equipment properly, and communicating fire hazards and threat levels to construction personnel. Additional responsibilities of the FSOs include:

- reporting all uncontrolled fires within or in the vicinity of the construction area, regardless of source, to the Spread Superintendent, emergency responders, and nearest fire dispatch;
- conducting weekly inspection of tools, equipment, personal protective equipment, and first aid kits;
- developing and maintaining a register of emergency equipment;
- conducting weekly inspections of flammable materials;
- posting “No Smoking” and “Designated Smoking Area” signs and fire rules at appropriate locations within the construction area;
- providing initial response support in the event of a fire and supervising fire suppression activities until relieved;

- providing and gaining approval of site-specific burn and smoke management plans for pre-planned controlled fires that will be implemented in accordance with Federal, state/commonwealth, and Local requirements;
- providing written burning and blasting schedules, as required, to the appropriate Federal, state/commonwealth, and Local fire control jurisdiction;
- monitoring construction areas where activities may present for safety issues, such as blasting;
- complying with regulatory requirements in the storage and handling of flammable substances and maintaining a registry of flammable substances;
- establishing facilities for on-site chemical management and maintaining Safety Data Sheets (formerly known as Material Safety Data Sheets) for flammable materials;
- establishing controls that minimize exposure to flammable materials;
- ensuring that flammable substances are removed from the construction area when not in use or when the location is unattended;
- training and instructing workers in the use, handling, and storage of flammable materials;
- ensuring that construction personnel have been trained in the requirements of this Fire Plan; and
- monitoring compliance with applicable Federal, state/commonwealth, and Local laws, ordinances, and regulations regarding fire prevention and suppression.

Environmental Inspectors

EIs provide environmental regulatory guidance and oversight. This oversight includes fire prevention and suppression within and in the vicinity of construction areas. EIs will be familiar with Federal, state/commonwealth, and Local rules and regulations pertaining to fire prevention and response. In the event of a fire emergency, EIs will assist with fire suppression.

Fire Authorized Officer (FAO)

The FAO may include Interagency Dispatch Centers or staff from land managing agencies. FAO will provide information on current fire danger ratings, the presence of other fires in the vicinity of construction areas, natural disaster warnings, and temporary restrictions on construction activities due to fire or other emergencies. If extreme fire danger is identified by a land managing agency, the FAO may direct the Construction Site Supervisor or Spread Superintendents to increase the level of fire monitoring, install additional fire prevention or suppression equipment, or stop work, if necessary.

The Construction Site Supervisor , Spread Superintendents, FSOs, EIs, FAOs, and local fire authorities have the authority to stop or reduce construction activities or operations that pose a fire hazard until appropriate measures are implemented to minimize risk. The FSOs will accompany Spread Superintendents, FAOs, or third-party CMs on fire inspections and take corrective action when observing or having been notified that fire protection measures have not been properly installed or maintained.

5.4 EMERGENCY NOTIFICATION

In the event of a fire or other emergency, construction personnel on the scene will notify the appropriate Spread Superintendent and FSO immediately. The Spread Superintendent will be responsible for immediately notifying the appropriate fire dispatch center and FAO or land managing agency, where appropriate. In the case of a serious injury, first aid treatment will be provided onsite. The FSO or another supervisor will coordinate with local emergency responders if additional support is required. In the event of a fire emergency, personnel will contact 911 or the nearest emergency response center. Contact information for emergency responders will be appended to the "issued-for-construction" version of this Fire Plan.

A fire emergency is defined as an incident requiring a coordinated response from one or more agencies. When a response is required, the Spread Superintendent or person in charge will communicate the location and extent of the fire and steps underway to control or suppress the fire.

5.5 FIRE DANGER RATINGS

Fire danger ratings based on standard vegetation fuel models will be used by the USFS to determine required fire prevention, control, and monitoring efforts. Based on the fire danger ratings, certain activities such as blasting, welding, or grinding may be restricted at the discretion of the USFS. Additionally, the land managing agency or local fire authority may modify or change requirements based on changes in fire restriction notices or localized hazards or risks.

On USFS Lands, fire danger ratings and associated precautions relevant to the Project include:

- No Fire Restrictions – normal fire precautions.
- Planning Levels 1 or 2 Fire Restrictions – normal fire precautions, except that designated smoking areas and permits for burning are required.
- Planning Levels 3 or 4 Red Flag Warning – special fire precautions including:
- Extra precautions such as designating a fire watch, using a spark shield, or wetting work areas down prior to active construction.
- Machine treatment of slash, skidding, yarding, blasting, welding, metal cutting, and offloading are subject to land managing agency requirements.
- No slash burning is allowed.
- Power saws must be shut down from 1:00 p.m. to 8:00 p.m. local time.
- Hauling trucking must stay on the right-of-way or surfaced roads after 6:00 p.m. local time.
- Additional personnel, equipment, and prevention measures are required.
- Stage 3 Fire Restrictions – special fire precautions including:
- All restrictions listed above.

- Shutdown of all construction activities except operations on soil or graded areas, watering, grading, trench excavation, padding, backfilling, and clean-up.

- Activities such as blasting and welding require an exemption from the FAO unless these activities are completed on the graded portions of the right-of-way.

The FSOs will contact the USFS Duty Officer(s) through the Dispatch Center(s) for each Forest as appropriate to obtain information on fire danger ratings. Contacts will be daily when conditions are favorable for fires and weekly at other times. The FSOs will communicate the fire danger ratings to the Construction Site Supervisor, Spread Superintendents, Station Managers, EIs, and construction crews. The FSOs will contact the USFS Fire Dispatch Center(s) to continue consultation with the USFS.

5.6 FIRE PREVENTION

5.6.1 Blasting

Procedures for blasting are discussed in Atlantic's and DTI's *Blasting Plan*. Additional measures to be implemented in blasting areas are described below.

When fire danger is high, a two-person fire watch will patrol the blast area for a period of one hour after the completion of blasting.

If blasting occurs when the fire danger rating is Planning Levels 2 or 3, an FSO will be on site during the operation and remain on site for one hour after the completion of blasting. At least one Size 0 or larger shovel and one water-filled backpack pump or fire extinguisher will be on site. In addition, a fire watch will be assigned to each crew utilizing blasting equipment.

When the fire danger rating is Planning Levels 3 or 4, blasting will be prohibited unless an exemption is granted by the local fire authority. If an exemption is granted, additional fire prevention equipment and personnel will be on site prior to blasting. Equipment may include water trucks, fire tankers, shovels, backpack pumps, bulldozers, etc. A fire watch will remain on site for at least two hours after the completion of blasting activities.

5.6.2 Welding

During fire season, welding, cutting, or drilling of metal components of the ACP will require the approval of the Spread Superintendent and the Construction Site Supervisor. In areas where approval has been granted, vegetation will be cleared at a minimum diameter of 30 feet around the center of the work area unless the area has been watered to eliminate the fire danger. Each welding crew will be outfitted with at least one Size 0 or larger shovel, one water-filled backpack pump, and one five-pound dry powder ABC fire extinguisher.

When the fire danger rating is Planning Levels 2 or 3, a fire watch will be assigned to each crew utilizing cutting and welding equipment. The fire watch will remain on site for one hour after the completion of welding activities.

When the fire danger rating is Planning Levels 3 or 4, an exemption by the FAO will be required prior to welding activities unless the activities are performed within the graded portions of the right-of-way or other work areas. If an exemption is granted, all Planning Levels 2 or 3 measures will be implemented. In addition, a water tanker and bulldozer will be required to be on site during welding operations, and a fire watch will remain on site for at least two hours after the completion of welding activities.

When the fire danger rating is Stage 3, welding activities will require approval from the FAO. If an approval is granted, all Planning Levels 2, 3 and 4 measures will be implemented.

Fire restriction measures also apply to welding operations performed for equipment maintenance. All welding activities require a permit from the jurisdictional agency as per 29 CFR 1910 Subpart Q (welding) and 29 CFR 1910 Subpart I (personal protective equipment).

5.6.3 Equipment

The construction contractor will develop a list of equipment to be used during construction. All equipment will be subject to inspection by USFS personnel. The equipment may be used only while in good operating order.

5.6.3.1 Fire Extinguishers

The FSAs will inspect fire extinguishers on a monthly basis to verify that:

- each extinguisher is in its designated place, clearly visible, and not blocked by equipment or other objects that could interfere with access to the fire extinguisher during an emergency;
- the nameplate with operating instructions is legible and facing outwards;
- the pressure gauge is showing that the extinguisher is fully charged;
- the pin and tamper seal are intact; and
- the extinguisher is in good condition, showing no signs of physical damage, corrosion or leakage.

The FSO performing the monthly inspection will initial and date each extinguisher inspection tag. Defective units will be taken out of service and replaced immediately.

Fire extinguishers will be used in accordance with 29 CFR 1910.157. Use of fire extinguishers by construction personnel to suppress fires will only be undertaken if:

- the fire is small and is not spreading to other areas;
- escaping the area is possible;
- the fire extinguisher is in working condition and the individual understands how to use it; and
- the fire extinguisher has been professionally inspected and tagged annually;

5.6.4 Spark Arrestors

Spark arresters used for portable equipment, such as chainsaws, will be in good working condition. Light trucks and cars with factory installed or equivalent mufflers, in good condition, may be used on roads where the roadway is cleared of vegetation.

Vehicles equipped with catalytic converters and modern diesel engines with “regeneration systems” or diesel particulate filters are potential fire hazards. These vehicles will be inspected and cleaned, as necessary, and parked on areas cleared of vegetation.

All vehicles operating in vegetation-covered areas will maintain clean and clear undercarriage and exhaust systems, with no chaff, grass, or brush lodged in the exhaust system and skid plates. Cross-country driving outside designated work areas will be prohibited.

5.6.5 Equipment Parking and Storage

Equipment parking areas and small stationary engine sites will be cleared of all extraneous flammable materials. Gas and oil storage areas will be cleared of extraneous flammable material and "No Smoking" signs will be posted within these areas.

All used and discarded oil, oil filters, oily rags, or other waste will be disposed of in approved and marked containers. Containers will be stored in approved locations and removed from the site by licensed contractors or approved personnel and disposed of or recycled at approved facilities. Glass containers will not be used to hold gasoline or other flammable materials.

5.6.6 Power Saws

All gasoline-powered saws will be provided with approved spark arresters/mufflers and maintained in good operating condition. Chainsaw operation will comply with the following:

- the arrester/muffler will contain a 0.023-inch mesh, stainless steel screen;
- a fire extinguisher or water backpack and shovel will be available during chainsaw operations;
- chainsaws will be moved at least 10 feet from the place of fueling before starting; and
- chainsaw fuel and oil will be carried in safety cans designed for that purpose.

5.6.7 Warning Devices

Highway flares or other devices with open flames will not be allowed in the construction area because of the danger for fire. Contractors will only use electric or battery-operated warning devices within the construction area.

5.6.8 Warming and Cooking Fires

Warming and cooking fires will be prohibited on the right-of-way.

5.6.9 Smoking

Smoking is allowed only in areas designated by the FSO. Smoking signs visible to all personnel will be posted at designated areas. The supervisory personnel will be responsible for enforcing smoking restrictions. "No Smoking" signs will be posted in all refueling areas and in areas where flammable materials are used, stored, or discarded.

5.6.10 Refueling

All fuel trucks will be equipped with a 35-pound minimum ABC fire extinguisher. If used, helicopter refueling trucks will be electrically grounded to the helicopter during refueling. Storage areas will be cleared of all extraneous flammable materials. All discarded oil, oil filters, oily rags, or other potentially flammable wastes will be disposed of or as described in Section 5.6.5 above. Only

Department of Transportation-approved and properly maintained containers will be used to store or transport flammable liquids.

5.7 BURNING

Burning of slash or non-merchantable wood is not currently anticipated. If burning is deemed necessary, it will be done only after Atlantic has acquired all applicable permits and approvals, including specific authorization from the FAO. In West Virginia, such burning would require an Approval to Conduct Open Burning for Land Clearing Debris from the West Virginia Department of Environmental Protection. In Virginia, burning on Federal lands would not be subject to the Virginia Department of Forestry's Burn Law. Virginia counties may enact bans on outdoor burning, but such ordinances do not apply to Federal lands Any burning on USFS lands will be done in accordance with standards contained in USFS' Management Direction for Fire Management, and with the Fire Plan. This would entail preparation of a project-specific Burn Plan for USFS approval. If the burn is approved, ACP will notify the West Virginia Department of Forestry and or Virginia Department of Forestry, the Monongahela National Forest and/or George Washington Duty Officer, the appropriate county 911 center, and the local fire department at least 24 hours prior to ignition.

5.8 FUEL LOADING

The USFS has identified fire-related concerns associated with potential increased fuel loadings on the proposed right-of-way if un-utilized woody material is left on the right-of-way. Atlantic will work with the MNF and GWNF to determine the proper balance between the increased fuel loading risks that this may represent and the beneficial uses of some of this material for wildlife habitat, OHV blocking, reduction of visual impacts, and erosion control/restoration purposes. Measures such as lopping and scattering tops and/or burning some of the material on site will be evaluated.

5.9 FIRE AND EMERGENCY RESPONSE EQUIPMENT

5.9.1 Construction Vehicles

All foreman vehicles and crew buses assigned to the construction area will be equipped with one 10-pound ABC fire extinguisher, one shovel, and an operable backpack water pump of four-gallon capacity.

During blasting "red flag warnings" and a fire danger rating of Planning Levels 3 or 4, one water truck per construction spread will be outfitted with a pressure pump, adjustable nozzle, threaded rubber-lined hose with a minimum of 300 feet of 1½-inch cotton jacket, and have a minimum water storage capacity of 1,500 gallons. Water trucks on the right-of-way will be able to help with wildfire fighting in the vicinity of the Project.

The construction companies use water trucks that typically have a 4,000-gallon capacity and 150 feet of 1½-inch water hose that would support fire suppression activities. Many of these vehicles have water cannons mounted on the roof. All vehicles and auxiliary equipment will be equipped with properly functioning and baffled exhaust systems.

5.9.2 Fire Fighting Tools

At least three 10-person tool caches will be maintained per spread. One cache will be placed in an EI's vehicle. The second cache will be located with the Spread Superintendent, or Station Manager. The third cache will be assigned to the FSO. Tool boxes will be red in color, sealed with metal box-car-type seals, and labeled "For Fire Fighting Only." The tool caches will contain the following:

- ten electric headlamps with batteries;
- one first aid kit, 10-person unit;
- two knapsacks;
- five pulaskis with sheaths;
- five long-handled, round-point, Size 0 shovels;
- five fire rakes; and
- ten one-gallon canteens, filled with water.

The Spread Superintendent will expedite delivery of the tool caches upon request of the FSO or FAO or when alerted to an emergency requiring the tools.

In case a tool cache or first aid kit has been used, it will be immediately replenished. All replenished tool caches or first aid boxes will be inspected by the FSO. These will then be resealed before being returned to the construction site.

5.9.3 Field Safety Officer

The FSO vehicle will maintain the following required equipment at all times, although suitable substitutions may be made as necessary:

Item	Description	Quantity
1	Pickup Truck	1
2	Two-Way Mobile Radio Operating (Administrative Unit) Frequency	1
3	Fire-Fighting Tool Cache (see above)	1
4	Axe, Double Bit, Cruiser Type	1
5	Sheath for Axe	1
6	Round-Point Shovel Size 0	2
7	Hard Hat	2
8	Backpack Pump, Complete (filled with water)	2
9	Hoses: Cotton Jacket, 1-1/2 inches (NS Thread) Cotton Jacket, 1 inch (IP Thread) High Pressure, 1 inch (IP Thread) Suction, 1-1/2 inch	 200 feet 400 feet 250 feet 24 feet
10	Hose Fittings: R-F Forester Nozzles R-S Nozzle, Tips (a) Fog (b) Straight Stream Reducer, 1-1/2-inch NS to 1-inch IP Strainer, Suction, 1-1/2 inch Siamese, 1-1/2-inch NS Thread, both Male and Female	 2 6 6 4 1 1 1
11	Tools: Spanner-Wrench, Large, 1-1/2-inch Hose Spanner-Wrench, Small, 1-inch Hose Carpenter Hammer Pliers, Slip Joint	 1 1 1 1
12	Fire Extinguishers ABC, 35-pound minimum	 1

5.10 EVACUATION

During an emergency evacuation, the Project will depend upon response teams, consisting of trained personnel, to attend to injured and/or trapped victims. Construction workers providing medical attention will not help beyond their capability.

Atlantic will establish an emergency communications system utilizing cell phones, hand-held radios, and/or satellite phones to notify workers of emergencies and contact local law enforcement and fire departments. If an immediate evacuation of a construction work area is required, the Construction Site Supervisor, Spread Supervisor, FSO, EI, or other supervisor will direct the evacuation via the nearest escape route to a "safe area." Otherwise, evacuations will be directed by local emergency responders. Designated evacuation wardens will be assigned to each spread or station to account for all personnel present before, during, and after the evacuation. Construction workers will not return to an evacuated work area until emergency responders have deemed it safe and the Construction Site Supervisor, Spread Supervisor, or Station Manager has given an "all-clear" signal.

5.11 PIPELINE OPERATIONS AND FIRES

Most prescribed fire and wildfire management activities undertaken on USFS lands will not be affected by operation of the proposed ACP. The principal concerns for these activities with respect to pipeline safety have to do with: 1) excavation or removal of cover on the right-of-way, and 2) excessive loadings over the pipeline. While the amount of cover over the pipeline would be sufficient to protect the line from fire, grading or excavation on the right-of-way that might be associated with fire management or firefighting activities would not be allowed, other than planned activities coordinated with and supervised by the pipeline operator. Such activities, for example, may require the addition of extra cover over the pipeline at selected crossing locations. Fire management activities not directly affecting the pipeline right-of-way would not be restricted, unless the activity may indirectly cause or contribute to undermining or erosion of the right-of-way.

Any issues associated with planned or unplanned fire management activities that may affect the pipeline right-of-way should be referred to **[Contact Number to be Inserted in Final Document]**

6.0 BLASTING PLAN

6.1 PURPOSE

Based on an analysis of the Natural Resource Conservation Service's Soil Survey Geographic Database, approximately 5.0 miles of the proposed ACP pipeline route on the MNF and 12.8 miles on the GWNF will cross areas with bedrock at depths of less than 60 inches. Some of this bedrock is considered paralithic (soft) and may not require blasting during construction. About 3.6 miles on the MNF and 7.9 miles on the GWNF cross soils with a lithic contact (hard bedrock) within 60 inches of the surface that may require blasting or other special construction techniques during installation of the proposed pipelines.

This *Blasting Plan* is based on the blasting plan prepared in connection with Atlantic's application to the FERC for the entire ACP. The plan outlines the procedures and safety measures that Atlantic will adhere to while conducting blasting activities required for the construction of the ACP. Before blasting, a site-specific Blasting Specification Plan, which is consistent with the provisions in this *Blasting Plan*, will be submitted by the Contractor to Atlantic for approval. Approval of a site-specific Blasting Specification Plan does not relieve the Contractor from responsibility or liability.

6.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC Plan and Procedures, other construction, restoration, and mitigation plans, including this *Blasting Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

6.3 GENERAL REQUIREMENTS

Blasting for grade or trench excavation will be used where deemed necessary by the Contractor, and approved by an Atlantic representative, after examination of the site. Blasting operations will be conducted by or under the direct and constant supervision of personnel legally licensed and certified to perform such activity in the jurisdiction where blasting occurs. Prior to any blasting activities, the Contractor will provide Atlantic with appropriate information documenting the experience, licenses, and permits associated with blasting personnel. Atlantic will provide such information to the USFS.

Blasting-related operations will comply with applicable federal and/or state/commonwealth, and local regulations, permit conditions, and the construction contract. These operations include:

- obtaining, transporting, storing, handling, loading, detonating, and disposing of blasting material;
- drilling; and
- ground-motion monitoring.

6.4 PRE-BLASTING REQUIREMENTS

Prior to the initiation of blasting operations, the Contractor will comply with the following:

- The Contractor will obtain all required federal, state/commonwealth, and local permits relating to the transportation, storage, handling, loading, and detonation of explosives.
- The Contractor will be responsible for the protection of existing underground facilities.
- Before performing any work on, or accessing the construction right-of-way within either Forest, the Contractor will verify with an Atlantic representative that the USFS, specifically the MNF and/or the GWNF have been notified of the upcoming construction activities. The Contractor will notify all such parties at least 48 hours prior to blasting.
- Atlantic will submit the Contractor's site-specific Blasting Specification Plan to the USFS prior to the execution of blasting.

6.5 SITE-SPECIFIC BLASTING PLANS

For each area determined to require blasting, a site-specific Blasting Specification Plan will be prepared by the Contractor. This plan will include, at a minimum, the following information:

- blaster's name, company, copy of license, and statement of qualifications;
- seismograph company, names, equipment and sensor location;
- site location (milepost and stationing), applicable alignment sheet numbers, and associated rock type and geological structure (solid, layered, or fractured);
- copies of all required federal, state/commonwealth, and local permits;
- methods and materials, including explosive type, product name and size, weight per unit, and density; stemming material; tamping method; blasting sequence; use of non-electrical initiation systems for all blasting operations; and magazine type and locations for storage of explosives and detonating caps;
- site dimensions, including explosive depth, distribution, and maximum charge and weight per delay; and hole depth, diameter, pattern, and number of holes per delay;
- global positioning system (GPS) coordinates of blasting location(s), distance and orientation to nearest aboveground and underground structures, and dates and hours blasting will be conducted;
- blasting procedures for:
    - storing, handling, transporting, loading, and firing explosives;
    - prevention of misfires, fly-rock, fire prevention, noise, and stray current accidental-detonation;
    - signs, flagmen, and warning signals prior to each blast;

- o locations where the pipeline route:
  - ▪ parallels or crosses an electrical transmission corridor, cable, or pipeline;
  - ▪ parallels or crosses a highway or road;
  - ▪ approaches within 500 feet of a water well or within 150 feet of an oil and gas well; or
  - ▪ approaches within 1,000 feet of any residence, building, or occupied structure;
- o local notification;
- o inspections after each blast;
- o disposal of waste blasting material; and
- o blasting considerations of steep slopes.

6.6 MONITORING

During blasting operations, the Contractor will be required to monitor operations in the following manner:

- The Contractor will provide seismographic equipment to measure the peak particle velocity (PPV) of all blasts in the vertical, horizontal, and longitudinal directions.
- The Contractor will measure the PPV at any existing pipelines, domestic structures, water supply wells, oil and gas wells, electrical transmission tower footings, and other utilities within 150 feet of the blasting. If none of these structures/facilities are present, the Contractor will measure the PPV at the edge of the construction right-of-way.
- The Contractor will complete a Blasting Log Record immediately after each blast and submit a copy to an Atlantic representative upon completion of blasting activities at each blasting site.

6.7 SAFETY

6.7.1 Protection of Aboveground and Underground Structures

Where blasting is determined to be required, Atlantic will identify any municipal water mains proposed for crossing, and will consult the local water authority. Reports of identified crossings will include location by milepost, owner, and status and results of contacts with the water authority.

The Contractor will exercise control to prevent damage to aboveground and underground structures including pipelines, domestic structures, water supply wells, oil and gas wells, electrical transmission tower footings, and other utilities. The Contractor will implement the following procedures:

- If blasting occurs within 500 feet of an identified water well, water flow performance and water quality testing will be conducted before blasting. If the water well is damaged as a result of ACP blasting, and upon confirmation through a damage claim investigation, the well will be repaired or otherwise restored or the well owner will be compensated for damages. Atlantic will provide an alternative potable water supply to the landowner until repairs occur

- If blasting occurs within 150 feet of aboveground structures, the Contractor and an Atlantic representative will inspect and photograph the structures before blasting. In the event that blasting damage to the aboveground structure is confirmed, the owner will be compensated.

- Blasting will not be allowed within 15 feet of an existing pipeline, unless specifically authorized by an Atlantic representative.

- Holes that have contained explosive material will not be re-drilled. Holes will not be drilled where danger exists of intersecting another hole containing explosive material.

- Blasting mats or padding will be used on all shots where necessary to prevent scattering of loose rock onto adjacent property and to prevent damage to nearby structures and overhead utilities.

- Blasting will not begin until occupants of nearby buildings, stores, residences, places of business, places of public gathering, and farmers have been notified by the Contractor in advance to protect personnel, property, and livestock. The Contractor will notify all such parties at least 48 hours prior to blasting.

- Blasting in or near environmentally sensitive areas, such as streams and wildlife areas, may include additional restrictions. Blasting in streams will only take place after any surface flow has been diverted around the work area. When blasting in streams, the following protocol will be used. These protocols may include fish alert tactics, such as:

    - Prior to the initiation of the designed blast and following audible warning signals, a single cap will be initiated in the stream to alert fish to move away from blasting area.

    - Removing fish from blasting area and relocating them downstream (will only be used in smaller streams).

    - In larger streams a boat can be used both up and down stream to alert fish to move away from the blasting area. This tactic can be used only if the operators of the boat can retreat a safe distance from the blast zone as determined by the Blaster in Charge.

- When blasting on steep slopes the following measures will be taken to minimize blasting impacts:

    - A safety berm may be created at the base of each shot to minimize the shot material movement down the slope after initiation if practical.

    - A catch berm may be created at the base of the hill to stop material from leaving the right-of-way, if practical.

  - Berms may be constructed on the right-of-way to direct any rolling material away for the offside boundaries.

  - Shots will be initiated from the lowest elevation of the trench.

  - The blaster will conduct test blasts on areas without slope with a reduction of powder factor that will fracture the material while keeping it in place. Tight digging and higher vibrations may be associated with this adjustment.

  - Decking the holes may be considered to lower the pounds per delay.

  - Where multiple trench shots are to be initiated, the shot material will stay in place and remain muck bound. This will hold the following shots in place.

- All blasting will be subject to the following limitations:

  - Maximum PPV of 12.0 inches per second, or the maximum PPV in accordance with state/commonwealth or local regulations, in any of three mutually perpendicular axes measured at the lesser distance of the nearest facility or the edge of the permanent easement.

  - Maximum drill size will be 2.5 inches unless otherwise approved by an Atlantic representative.

  - Maximum quantity of explosive per delay will be governed by the recorded measurements as influenced by the test blast program or a scaled distance formula.

  - Explosive agents and ignition methods will be approved by an Atlantic representative. Ammonium nitrate/fuel oil and other free flowing explosives and blasting agents are not acceptable and will not be used.

  - Drill holes will not be left loaded overnight.

  - Approved stemming material will be used in all holes.

- The drilling pattern will be set in a manner to achieve smaller rock fragmentation (maximum 1 foot in diameter) to use as much as possible of the blasted rock as backfill material after the pipe has been padded in accordance with the specifications. The Contractor will submit the proposed drilling pattern to an Atlantic representative for approval.

- Under pipeline crossings and all other areas where drilling and blasting is required within 15 feet of existing facilities:

  - Drill holes will be reduced to a maximum of 2 inches or less in diameter.

  - The number of holes shot at one time will be limited to three unless otherwise approved by an Atlantic representative.

  - Appropriate delay between charges will be used to attain desired fragmentation.

6.7.2 Protection of Personnel

The Contractor will include in its procedures all Federal, state/commonwealth, and local safety requirements for blasting. The Contractor's procedures will address, at a minimum, the following requirements:

- Blasting will be performed during daylight hours only.
- Only authorized, qualified, and experienced personnel will handle explosives.
- No explosive materials will be located where they may be exposed to flame, excessive heat, sparks, or impact. Smoking, firearms, matches, open flames, and heat- and spark-producing devices will be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.
- A code of blasting signals will be established, posted in conspicuous places, and utilized during blasting operations. Employee training will be conducted on the use and implementation of the code.
- The Contractor will use every reasonable precaution including, but not limited to, visual and audible warning signals, warning signs, flag persons, and barricades to ensure personnel safety.
- Warning signs, with lettering a minimum of 4 inches in height on a contrasting background, will be erected and maintained at all approaches to the blast area.
- Flaggers will be stationed on all roadways and trails passing within 1,000 feet of the blast area to stop all traffic during blasting operations.
- Both workers involved in the detonation and personnel not involved in the detonation will stand back at a distances determined by the person in charge from the time the blast signal is given until the "ALL CLEAR" is sounded.
- No loaded holes will be left unattended or unprotected. No explosives or blasting agent will be abandoned.
- In the case of a misfire, the blaster will provide proper safeguards for personnel until the misfire has been re-blasted or safely removed.
- The exposed areas of the blast will be matted wherever practicable. In cases where such a procedure is not deemed to be feasible, the Contractor will submit an alternative procedure for review by an Atlantic representative and the site in question will be visited and examined by the consultant before any approval is granted.
- Atlantic may employ two-way radios for communication between vehicles and office facilities. The Contractor will advise Atlantic and other Contractors of any need to cease use of such equipment during blasting activities.
- All loading and blasting activity will cease and personnel in and around the blast area will retreat to a position of safety during the approach and progress of an electrical storm irrespective of the type of explosives or initiation system used. This is a major safety

precaution and will always be observed. All explosive materials, all electrical initiation systems, and all non-electric initiation systems are susceptible to premature initiation by lightning.

- Previous blast areas must be inspected to verify the absence of misfires. No drilling may commence until such inspection occurs. If a misfire occurs adjacent to a hole to be drilled, the misfire will be cleared by the blaster using reasonable techniques required for the situation prior to commencement of drilling. If a misfire occurs at some distance from the drilling area, drilling may be stopped while clearing preparations are underway. When the misfire is to be cleared by re-shooting, drilling will be shut down and personnel evacuated to a place of safety prior to detonation.

- All transportation of explosives will be in accordance with applicable Federal, state/commonwealth, and local laws and regulations. Vehicles used to transport explosives will be in good working condition and equipped with tight wooden or non-sparking metal floor and sides. If explosives are carried in an open-bodied truck, they will be covered with a waterproof and flame-resistant tarp. Wiring will be fully insulated to prevent short-circuiting and at least two fire extinguishers will be carried. The vehicle will be plainly marked to identify its cargo so that the public may be adequately warned. Metal, flammable, or corrosive substances will not be transported in the same vehicle with explosives. There will be no smoking, and unauthorized or unnecessary personnel will not be allowed in the vehicle. Competent, qualified personnel will load and unload explosives into or from the vehicle.

- No sparking metal tools will be used to open kegs or wooden cases of explosives. Metallic slitters will be used to open fiberboard cases, provided the metallic slitter does not come in contact with the metallic fasteners of the case. There will be no smoking, no matches, no open lights, or other fire or flame nearby while handling or using explosives. Explosives will not be placed where they are subject to flame, excessive heat, sparks, or impact. Partial cases or packages of explosives will be re-closed after use. No explosives will be carried in the pockets or clothing of personnel. The wires of an electric blasting cap will not be tampered with in any way. Wires will not be uncoiled. The use of electric blasting caps will not be permitted during dust storms or near any other source of large charges of static electricity. Uncoiling of the wires or use of electric caps will not be permitted near radio-frequency transmitters. The firing circuit will be completely insulated from the ground or other conductors.

- No blast will be fired without a positive signal from the person in charge. This person will have made certain that all surplus explosives are in a safe place; all persons, vehicles, and/or boats are at a safe distance; and adequate warning has been given. Adequate warning of a blast will consist of, but not be limited to, the following:

  - notifying nearby homeowners and local agencies, if necessary;

  - stopping vehicular and/or pedestrian traffic near the blast site; and

  - signaling with an air horn, whistle, or similar device using standard warning signals.

- Only authorized and necessary personnel will be present where explosives are being handled or used.

- The condition of the hole will be checked with a wooden tamping pole prior to loading. Surplus explosives will not be stacked near working areas during loading. Detonating fans will be cut from spool before loading the balance of charge into the hole. No explosives will be forced into a bore hole past an obstruction. Loading will be done by a blaster holding a valid license or by personnel under his direct supervision.

- Fly-rock leaving the right-of-way will be collected immediately and disposed of at disposal sites approved by Atlantic. This work will not be left to the cleanup crew.

- If any blasting is necessary within 2,000 feet of the Appalachian National Scenic Trail, flaggers will be stationed on the Trail to stop traffic during the blasting operations. Hikers could be delayed a maximum of 15 minutes.

6.7.3 Lightning Hazard

A risk of accidental detonation caused by lightning strikes exists at any time the workplace is experiencing an electrical storm and there are loaded holes on site. If this hazard is judged to exist by an Atlantic representative, work will discontinue at all operations and workers will be moved to secure positions away from the loaded holes. Furthermore, workers will not return to the work site until the storm has passed and an Atlantic representative has indicated it is clear to return.

The Contractor will have on site an approved lightning instrument capable of measuring the degree of electrical activity as a storm approaches, and the distance to the storm front from the instrument on the right-of-way.

6.8 KARST

In accordance with Atlantic's *Karst Terrain Assessment, Construction, Monitoring and Mitigation Plan* (Attachment H), and in addition to the measures described above, the following procedures will be implemented in areas of karst terrain:

- Blasting will be conducted in a manner that will not compromise the structural integrity or alter the karst hydrology of known or presumed habitat for federally listed threatened and endangered species in the subterranean karst environment (e.g. Madison cave isopod). Blasting will not occur within areas in close proximity to known threatened, endangered, sensitive, or locally rare species habitat unless pre-approved by the USFW and the USFS AO.

- Excavations will be inspected for voids, openings or other tell-tale signs of solution (karst) activity.

- If rock removal intercepts an open void, channel, or cave, construction activities will cease in the vicinity of the void, channel, or cave until a remedial assessment is performed by a qualified geologist or engineer with experience in karst terrain.

- Use of explosives will be limited to low-force charges designed to transfer the explosive force only to the rock which is designated for removal (e.g., maximum charge of 2 inches per second ground acceleration).

- If the track drill used to prepare drill holes for explosive charges encounters a subsurface void larger than 6 inches within the first 10 feet of bedrock, or a group of voids totaling more than 6 inches within the first 10 feet of bedrock, then explosives will not be used until a subsurface exploration is conducted to determine if the voids have connectivity to a deeper karst structure. The subsurface exploration will be carried out with track drill probes, coring drill, electrical resistivity, or other techniques capable of resolving open voids in the underlying bedrock. If a track drill or coring rig is used, then all open holes will be grouted shut after the completion of the investigation.

- It is not expected that the limestone found within USFS lands along the pipeline route will fracture in such a way as to cause ground displacement. Following each blast, the area will be examined for signs of ground cracking. Any indication of "overbreak" (i.e.. cracks greater than half the distance to the edge of the construction right-of-way) will be brought to the attention of the blaster and noted on the blast report. The shot pattern and/or loading will be adjusted to minimize or eliminate overbreak. Signature hole analysis will be performed to determine optimum timing for the specific geology. The signature hole data will be interpreted by the Blasting company engineers who will specify timing to the blasters for in field detonator programming. Ongoing signature hole analysis will be necessary to adapt to the changing geology. How often this is completed will depend on site specific conditions.

- Site specific erosion and sediment control plans will be submitted to USFS prior to any drilling activities in karst topography.

6.9 BLASTING ON STEEP SLOPES

Blasting on steep slopes and landslide-prone slopes will be accomplished using conventional trench blasting methods. Blasting may also be required during the right-of-way grading operation.

A drill will be lowered down the slope using conventional winching techniques. The drilling program will be based on 2 or 3 rows of 2-1/2" to 3 1/2" inch diameter holes drilled with a grid spacing of approximately 4-5 feet by 4-5 feet along the ditch line. The drill pattern will be established using a powder factor of about 3.0-4.0 pounds per cubic yard to achieve the desired explosive energy ratio needed to break the rock and pull the ditch. This shot pattern may be adjusted on a site-specific basis to compensate for different geology, nearby structures, utilities or other sensitive areas. A signature hole analysis will be performed to determine optimum timing for the specific geology. The signature hole data will be interpreted by the blasting company engineers who will specify timing to the blasters for in field detonator programming. Ongoing signature hole analysis will be necessary to adapt to the changing geology. How often this is completed will depend on the site specific conditions. The amount of cartridge type explosives per borehole will be limited by the proximity of existing structures and utilities.

All shots will be carefully designed by the licensed blaster to control flyrock. All hole loading activity will be supervised by the licensed blaster. The licensed blaster will communicate with the drillers to obtain geological information for each shot. Matting and or padding may be utilized at the discretion of the licensed blaster.

Several methods will be taken to minimize blasting impacts on these slopes.

1. Trench

    a. Decking the holes may be considered to lower the pounds per delay.

b. The blaster will calculate the average powder factor currently used on the project. By increasing the stemming height the blast may achieve a reduction of 5 percent to 25 percent in powder which will minimize vertical and horizontal movement.

c. Where multiple trench shots are to be initiated, the shot material will stay in place and remain muck bound. This will hold the following shots in place.

2. Right-of-way

a. Decking the holes may be considered to lower the pounds per delay.

b. The blaster will calculate the average powder factor currently used on the project. By increasing the stemming height the blast may achieve a reduction of 5 to 30 percent in explosives which will minimize vertical and horizontal movement.

c. Where multiple Right-of-ways shots are to be initiated, the area will remain muck bound. This will hold the following shots in place.

- A safety berm may be created at the base of each shot to minimize the shot material movement down the slope after initiation if practical.
- A catch berm may be created at the base of the hill to stop material from leaving the right-of way, if practical.
- Berms may be constructed on the right-of-way to direct any rolling material away for the offside boundaries.
- Shots will be initiated from the lowest elevation of the trench.
- The blaster will conduct test blasts on areas without slope with a reduction of powder factor that will fracture the material while keeping it in place. Tight digging and higher vibrations may be associated with this adjustment.
- Decking the holes may be considered to lower the pounds per delay.
- Where multiple trench shots are to be initiated, the shot material will stay in place and remain muck bound. This will hold the following shots in place.

6.10 STORAGE REQUIREMENTS

All explosives, blasting agents, and initiation devices will be stored in locked magazines that have been located, constructed, approved, and licensed in accordance with Federal, state/commonwealth, and local regulations. Magazines will be dry, well ventilated, reasonably cool (painting of the exterior with a reflective color), bullet and fire resistant, and kept clean and in good condition.

Initiation devices will not be stored in the same box, container, or magazine with other explosives. Explosives, blasting agents, or initiation devices will not be stored in wet or damp areas; near oil, gasoline, or cleaning solvents; or near sources of heat radiators, steam pipes, stoves, etc. No metal or metal tools will be stored in the magazine. There will be no smoking, matches, open lights, or other fire or flame inside or within 50 feet of storage magazines or explosive materials.

Magazines will be constructed and located in accordance with Federal, state/commonwealth, and local regulations. Magazines will be marked in minimum 3-inch-high letters with the words "DANGER – EXPLOSIVES" prominently displayed on all sides and roof, and be kept locked at all times unless explosives are being delivered or removed by authorized personnel. Admittance will be restricted to the magazine keeper, blasting supervisor, or licensed blaster.

Accurate and current records will be kept of the explosive material inventory to ensure that oldest stocks are utilized first, satisfy regulatory requirements, and for immediate notification of any loss or theft. Magazine records will reflect the quantity of explosions removed, the amount returned, and the net quantity used at the blasting site.

When explosive materials are taken from the storage magazine, they will be kept in the original containers until used. Small quantities of explosive materials may be placed in day boxes, powder chests, or detonator boxes. Any explosive material not used at the blast site will be returned to the storage magazine and replaced in the original container as soon as possible.

6.11 SPECIFIC USFS GUIDELINES

The MNF's LRMP includes several standards regarding the use of explosives in the Forest. In addition to aforementioned blasting procedures citied in this document, Atlantic will also adhere to the following standards:

- Explosives shall not be used within 200 feet of hibernacula, maternity colonies, or bachelor colonies unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat. Explosives outside of this area shall not be used when such use has potential to damage the cave or disturb the bat. **(MNF LRMP TE20).**

- Explosives may be allowed within the primary range if it can be demonstrated that this activity will not have an adverse effect on bat populations or habitat. **(MNF LRMP TE39).**

- Explosives shall not be used within 200 feet of hibernacula, within key areas, or within 2.5 miles of active maternity sites, unless analysis can demonstrate that this activity will not have an adverse effect on bat populations or habitat. Explosives outside of these areas shall not be used when such use has potential to damage the cave or disturb the bat. **(MNF LRMP TE50).**

The GWNF's LRMP does not offer specific standards, goals, or guidelines that addressed blasting or the use of explosives.

7.0 TRAFFIC AND TRANSPORTATION MANAGEMENT PLAN

7.1 PURPOSE

The purpose of the Transportation Plan is to identify BMPs that Atlantic will implement during construction of the Project to minimize impacts on roadways and traffic. This plan is based on the Transportation Plan prepared in connection with Atlantic's application to the FERC for the entire ACP. This Transportation Plan incorporates elements that are applicable to construction across roads and highways, commuting of the construction workforce, maintenance of traffic, movement of construction vehicles and delivery of equipment and materials within both National Forests crossed by the ACP.

Operation and maintenance of the proposed facilities will not affect traffic flow on roads and highways on USFS lands. Periodic maintenance and inspection procedures along the pipeline will involve a low frequency of light vehicle movement on and off roadways. Therefore, no impacts on roads or traffic are expected during operation of the Project.

7.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Atlantic and Contractor personnel. The training program will focus on the FERC Plan and Procedures , other construction, restoration, and mitigation plans, including this *Traffic and Transportation Management Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

In developing the project environmental and safety training programs, Atlantic will review all traffic and transportation requirements relevant to the work of the Contractors or Atlantic personnel, and determine content and delivery strategies aimed at ensuring all project staff and Contractors understand how the requirements intersect with their functions. USFS staff's input will be invited in preparing the training programs, and USFS staff participation in the actual training sessions is encouraged. With respect to traffic and transportation issues, it is likely that special emphasis will be given to the following:

1. The importance of using only approved and posted project access roads.
2. Avoiding driving or parking outside the limits of approved access roads.
3. Obeying posted speed limits.
4. Use of flaggers where construction traffic is likely to encounter public traffic.
5. Other road safety-related requirements.

Atlantic conducts company-wide driver safety programs for its field operations personnel. When the project has been put into service and is ready to be turned over to Operations, requirements relevant to operating the pipeline system on USFS lands, such as this COM Plan, will be transitioned to DTI Operational staff. The hand-off to Operations will entail meetings and training sessions to ensure Operations staff understands all relevant requirements.

7.2.1 General Requirements

Prior to construction, Atlantic will obtain applicable Federal, state/commonwealth, and local road use and crossing permits. ACP personnel will comply with all permit requirements and conditions to provide for public safety and minimize impacts on public roads. West Virginia or Virginia guidelines will be utilized on USFS properties where there are no specific federal guidelines regarding maintenance of traffic, flagging protocol and signage. Copies of this *Traffic and Transportation Management Plan* as well as applicable state/commonwealth guideline documents will be provided to the appropriate personnel and maintained at each Contractor's field office.

Atlantic will consult with the MNF and GWNF, the West Virginia Department of Transportation (WVDOT) and the Virginia Department of Transportation (VDOT) regarding detour routes, speed/load limits, and other use limitations, conditions, or restrictions on the roads that will be utilized during construction. Before the start of construction, Atlantic will refer to the WVDOT's Manual on Temporary Traffic Control for Streets and Highways, the Virginia Work Area Protection Manual, the MNF and GWNF LRMPs and the United States Department of Agriculture (USDA) Guidelines for Road Maintenance Levels to develop maintenance of traffic plans that are acceptable to the USFS.

As discussed further in the following sections, Atlantic will place and maintain traffic control measures, such as flag persons, warning signs, lights, and/or barriers, as appropriate, to safeguard construction workers and the public and to minimize traffic congestion. The aforementioned measures will be in accordance with the WVDOT's Manual on Temporary Traffic Control for Streets and Highways, the Virginia Work Area Protection Manual, and specific temporary traffic control measures adopted by the MNF or the GWNF.

Atlantic will maintain traffic flow and emergency vehicle access on roadways and the Appalachian National Scenic Trail and will work with local law enforcement, fire departments, and emergency medical services to coordinate access for effective emergency response during construction.

The USDA Guidelines for Road Maintenance Levels, prepared for the USFS, provides guidelines for road types, and maintenance within USFS property. Atlantic will provide protective measures to avoid damage to Forest road surfaces crossed by construction equipment. Atlantic will comply with weight limitations for and restrictions pursuant to prescription guidelines on designated USFS roads.

All Forest roads crossed by the pipeline are unpaved, and will be crossed with open cut construction methods (see Section 7.5). Once construction is complete, Atlantic will repair road damage that occurs as a result of construction, and roadways will be restored to their preconstruction condition. Sediment barriers will be installed at the base of slopes adjacent to roads to prevent sediment from the construction right-of-way from being washed onto roads during rain events.

7.3 ACCESS TO THE RIGHT-OF-WAY

Atlantic has endeavored to utilize existing roads to the extent practicable to provide access to the construction right-of-way on USFS lands. Construction traffic will be limited to access roads approved by the FERC and the USFS. Prior to and throughout construction, signs will be posted to identify approved access roads for construction traffic. If additional roads are identified as necessary for construction, they will not be used without authorization of both the FERC and the USFS. A table listing the access roads planned on USFS lands is included in Table 2.1.1-1 of this COM Plan.

Some of the existing USFS roads identified for access to the pipeline right-of-way may require improvement (such as grading, widening, the addition of gravel, or removal of obstructions) to provide for proper drainage or to safely accommodate construction equipment and vehicles. Roads requiring improvements are identified in Table 2.1.1-1 of this COM Plan. Such improvements will be consistent with the USDA Guidelines for Road Maintenance Levels as well as the LRMP for the applicable National Forest.

The erosion control and restoration measures approved by the USFS, the West Virginia Division of Environmental Protection and the Virginia Department of Environmental Quality (DEQ), will be utilized for improving, using, and restoring access roads or when constructing new access roads. If culverts are required to improve an access road at stream crossings, the culverts will be adequately sized to accommodate stormwater runoff as required by federal, state, or local permits, and will be of sufficient strength to support construction and maintenance equipment.

Atlantic will perform maintenance activities during construction, including blading or filling activities, to ensure the safety and proper functioning of all access roads. Dust emissions along unpaved access roads will be controlled by applying water, as needed, and by restricting vehicle speeds. If excessive rutting takes place on access roads, Atlantic will perform maintenance activities on the road prior to continued use. Road maintenance will conform to the USDA Guidelines of Road Maintenance Levels, as well as to any standard contained in the LRMP of the MNF or the GWNF, as applicable.

Atlantic's construction contractors will be responsible for removing obstructions affecting access roads, if present, within the boundaries of the roadway (up to a width of approximately 30 feet centered on the road centerline). Such obstructions will be cleared using the following methods, as appropriate.

- The removal of trees, limbs, brush, and other obstructions will be limited to those obstructing the driver's sight distance or within 15 feet of vertical clearance above the roadway.
- Limbing will be accomplished by the use of pruning saws, power saws, nippers, bow saws, or crosscuts. Limbs will be pruned flush with the trunk of the tree, except for portions of overhanging limbs. Use of axes for limbing will be prohibited.
- Material removed will be disposed of in approved areas or at the direction of the landowner or land managing agency.

During winter, snow will be removed, as necessary, from approved access roads to allow safe access to the construction right-of-way. Plowing of access roads will continue as necessary through the end of active construction. See Atlantic's *Winter Construction Plan* (Attachment D) for additional information regarding plowing.

If existing Forest roads are damaged during construction, Atlantic will restore the roads to their maintence prescription guideline as described in the USDA Guidelines for Road Maintenance Levels. All construction access roads will also be used for pipeline operation and maintenance purposes. Further information regarding planned improvements to access roads are included in Attachment F.

7.4 ROAD CROSSINGS

Construction across state maintained roads will be conducted in accordance with permits received from the WVDOT and the VDOT. Temporary traffic measures, such as flagging and maintenance of traffic flow, will be conducted in a manner consistent with the WVDOT Manual on Temporary Traffic Control for Streets and Highways and the Virginia Work Area Protection Manual. Construction planned across Forest roads will adhere to USFS standards. Table 7.4-1 lists Forest roads crossed by the ACP. Some roads, such as MNF Road 55, must be crossed more than once, due to terrain conditions where the road lies; avoidance of road crossings at these locations would typically require sidehill cuts and correspondingly greater ground disturbance.

As shown in Table 7.4-1, Forest roads will be crossed by open cut methods, will require temporary closure of the road to traffic and establishment of detours. Pre-construction conditions of the road will be photo-documented, as an aid to restoration. Most open-cut road crossings will be completed and the road restored in one or two days, depending on the nature of any rock that may be encountered or other unforeseen difficulties. The same type of sub-bed and surface material as the original construction, or flowable fill material, will be used to backfill the pipe and restore the road surface. Additional gravel will be brought in if necessary to ensure to safe, firm surface for passage. Atlantic will follow the appropriate signage protocol and maintenance of traffic planning pursuant to the posting signs at open-cut road crossings for safety and to minimize traffic disruptions. If the USFS does not have specific protocols for one-lane operation, Atlantic will utilize the applicable state Department of Transportation standards.

If road closures are necessary, a road closure schedule will be arranged with the USFS prior to the closure. Landowners, land managing agencies, and local businesses that could be affected by the closure, as well as law enforcement agencies, will be notified in advance of the closure.

TABLE 7.4-1

U.S. Forest Service Roads Crossed by the Atlantic Coast Pipeline

U.S. Forest Road No.	Approximate Milepost	Road Crossing Method
MNF Road 1014 (Shock Run)	83.2	Open Cut
MNF Road 1017 (Upper Shock Run)	83.3	Open Cut
MNF Road 55 (Allegheny Road)	83.7	Open Cut
MNF Road 55 (Allegheny Road)	83.8	Open Cut
MNF Road 55 (Allegheny Road)	83.8	Open Cut
GWNF Road 281C	96.3	Open Cut
GWNF Road 281 (Tower Mt. Road)	96.3	Open Cut
GWNF Road 1748	97.1	Open Cut
GWNF Road 1748	97.2	Open Cut
GWNF Road 348.1	116.5	Open Cut
GWNF Road 449	117.0	Open Cut
GWNF Road 449	117.1	Open Cut
GWNF Road 449A	118.7	Open Cut
GWNF Road 449A	118.8	Open Cut
GWNF Road 449B	119.1	Open Cut
GWNF Road 466A	120.2	Open Cut
GWNF Road 466	120.4	Open Cut
GWNF Road 1755	121.2	Open Cut
GWNF Road 1755	121.5	Open Cut
GWNF Road 1755	121.7	Open Cut

Where construction crosses roads necessary for access to private residences or businesses and no alternative entrance exists, Atlantic will implement measures (e.g., plating over the open portion of the trench or a temporary bridge) to maintain passage for landowners and emergency vehicles. Atlantic will place and maintain traffic control measures during construction, and use flaggers, warning signs, lights, and barriers, as appropriate, for safety and to minimize traffic congestion.

Within USFS lands, Atlantic will adhere to applicable federal traffic control standards, however, in the absence of specific federal standards, Atlantic will defer to the applicable sections of the WVDOT's Manual on Temporary Traffic Control for Streets and Highways or the Virginia Work Area Protection Manual for flagging, signage, road closures, and maintenance of traffic.

Once construction is complete, Atlantic will repair road damage that occurs as a result of construction, and roadways will be restored to their preconstruction condition.

7.5 MOVEMENT OF PERSONNEL, EQUIPMENT, AND MATERIALS

The movement of construction equipment, materials, and personnel will cause a temporary increase in traffic volumes along USFS maintained roadways. Impacts are expected to be minor and short term because construction spreads and personnel will be geographically dispersed and personnel will commute to and from work areas in early mornings and late evenings during non-peak traffic hours.

Contractor yards will be used to stage construction, store materials, and park equipment when not on-site. Construction equipment will be moved from the contractor yard and delivered to the construction right-of-way. Once on the right-of-way, construction equipment will move in a linear manner along the right-of-way as work progresses, minimizing traffic on local roads. The amount of equipment moved by hauling from site to site will be reduced due to the accessibility created by the construction right-of-way. Traffic control measures consistent with the WVDOT/VDOT and the USFS will be implemented to further minimize impacts to traffic on roadways and park service roads, to assist with transportation of construction equipment and materials, and to provide for public safety. The construction contractors will post caution signs on roads, where appropriate, to alert motorists of pipeline construction and warn them of slow traffic caused by construction across roadways. Flaggers, signs, barricades, guardrails, safety fence, and/or signals will be placed and maintained at road crossings as required by federal, state, or local permits. Flaggers will be equipped with high visibility green/yellow safety vests and stop/slow signs pursuant to WVDOT or VDOT standards will be used on each side of the road when equipment is working on or crossing over the road. Posted speed limits will be observed on all roads or as specified by the USFS.

7.6 SPECIFIC FEDERAL GUIDELINES

7.6.1 U.S. Forest Service

The ACP will cross roads and utilize access roads on USFS lands in the MNF in West Virginia and the GWNF in Virginia. Traffic and transportation management and maintenance activities on these lands will conform to the standards and guidelines contained within the USDA Guidelines for Road Maintenance Levels and the LRMPs of the MNF and GWNF for road use, maintenance, and construction as well as WVDOT and VDOT standards where applicable. Potentially applicable federal standards and guidelines are listed below.

7.6.1.1 Monongahela National Forest Land and Resource Management Plan

- Roads shall be constructed to the standard appropriate to their intended use, considering safety and other resource concerns. **(MNF LRMP RF04).**

- Cooperators or permittees may be allowed to locate, design, and build special purpose roads on USFS lands. The USFS shall review all such locations and designs, and approve them where appropriate. Location and standards shall be coordinated with the needs for management and for protection of other resources. **(MNF LRMP RF05).**

- New road construction shall avoid wetlands where feasible. If a wetland cannot be avoided, road construction may be allowed as long as the subsurface drainage patterns can be preserved and maintained. Any road that would cross a wetland shall cross in a way that minimizes disturbance to the wetland. **(MNF LRMP RF06).**

- Where new roads cross streams or high-risk areas, disturbed soils shall be stabilized and designed drainage structures shall be installed as soon as practical. High-risk areas include landslide prone areas, steep slopes, and highly erosive soils (**MNF LRMP RF07).**

- The process to determine road maintenance levels should evaluate the purpose of the road, the type of vehicles expected, the duration and frequency of use, and necessary environmental protection measures. **(MNF LRMP RF11)**

- Temporary roads may be constructed and used to provide for short-term management access needs. **(MNF LRMP RF14)**

- Temporary roads shall be rehabilitated and returned to productivity following their use. (**MNF LRMP RF15).**

- Vehicle use on closed roads by permittees, contractors, or other cooperators may be authorized to conduct official business or to perform resource management activities. **(MNF LRMP RF20)**

7.6.1.2 George Washington National Forest

- Roads shall be designed and constructed to the standard necessary to provide access and manage resources according to management prescription desired conditions and public safety. **(GWNF LRMP FW-230).**

- All new and reconstructed roads will blend into the landscape to the extent practical. **(GWNF LRMP FW-232).**

- Apply the level of maintenance needed to protect the investment, facilitate resource management, and provide for user safety. **(GWNF LRMP FW-234).**

- Closed system roads are planted with native or desirable non-native wildflowers, forbs, shrubs, and/or grasses. **(GWNF LRMP FW-235).**

- Specify management requirements for permittee access roads in the designated use permit, where roads are included in the authorization. **(GWNF LRMP FW-248).**

7.6.2 United States Department of Agriculture Guidelines for Road Maintenance Levels

- Maintenance prescription guidelines for roads level 1 through level 5
- Road Management Strategies

8.0 UPLAND EROSION CONTROL PLAN

8.1 PURPOSE

This ESCP has been prepared for use by Atlantic and its contractors as a guidance manual for minimizing erosion of disturbed soils and transportation of sediments off the construction right-of-way and into sensitive resource and residential areas during natural gas pipeline construction. The procedures developed in this plan, which represent Atlantic's BMPs, are designed to accommodate varying field conditions while achieving compliance with regulatory requirements and protecting environmentally sensitive areas.

This ESCP is designed to provide guidelines, BMPs, and typical techniques for the installation and implementation of soil erosion and sediment control measures while permitting adequate flexibility to use the most appropriate BMP measures based on site-specific conditions. The intent of the ESCP is to provide general information on the pipeline construction process and sequence, and to describe specific measures that will be employed during and following construction to minimize impacts to the environment.

The goal of the ESCP is to preserve the integrity of the construction area and environmentally sensitive areas and to maintain existing water quality by:

- Minimizing the extent and duration of disturbance;
- Diverting runoff to stabilized areas;
- Installing temporary and permanent erosion control measures; and
- Establishing an effective inspection and maintenance program.

All land-disturbing activities will conform, at a minimum, to the FERC Plan and Procedures. Atlantic will also prepare and comply with SWPPPs that meet each state's requirements. The SWPPPs are currently being prepared. Atlantic will also prepare Construction Alignment Sheets depicting the locations of erosion and sediment controls in construction work areas, consistent with the FERC Plan and Procedures, as well as the West Virginia Department of Environmental Protection, Division of Water and Waste Management, *Erosion and Sediment Control Best Management Practice Manual*[13] (2006), the Virginia Department of Environmental Quality's *Virginia Erosion and Sediment Control Handbook* (VESCH) [14] (1992), Virginia's *Forestry Best Management Practices for Water Quality Technical Manual*, DTI's 2016 *Annual Standards and Specifications for Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Linear Gas Transmission Pipeline* (Standards and Specifications), and Dominion's Slope Stability Policy and Procedure (Attachment C).

In addition, the MNF and GWNF are managed under LRMPs issued in 2011 and 2014, respectively. The LRMPs are comprehensive planning documents designed to guide land management decisions within the National Forest boundaries. The LRMPs describe desired conditions and outline Management Prescriptions to be pursued to achieve those conditions.

The Virginia Department of Forestry's *Virginia's Forestry Best Management Practices for Water Quality, Technical Manual,* 2011 was also consulted during selection of erosion and sediment control measures.

---

13 An online copy is available on the West Virginia Department of Environmental Protection website at: https://apps.dep.wv.gov/dwwm/stormwater/BMP/index.html

14 Hardcopy 1992 editions identify this as a Virginia Department of Conservation and Recreation document; the online version identifies this as a Virginia Department of Environmental Quality document.

Atlantic selected the more stringent or protective of the erosion and sediment control requirements set forth by FERC, West Virginia, Virginia, and the USFS to include in this ESCP. Consultation with USFS staff regarding specific control and restoration measures to be used in the MNF and GWNF is ongoing.

8.2 SOILS

An Order 1 Soil Survey (Survey) was performed between May 9 and June 22, 2016 along the available sections of the approximately 21.4-mile portion the route between MP 47 and MP 115. The Survey included approximately 5.2 miles of the route within the Marlinton Ranger District in the MNF, and 15 miles in the Warm Springs and North River Districts in the GWNF.

The Survey activities were conducted in a manner compliant with the requirements outlined in special use permit #GBR205003for surveys in the MNF, and special use permit #GWP433201T for surveys in the GWNF.

8.2.1 Soil Survey

The Survey was conducted in four phases: (1) Desktop Study, (2) Preliminary Field Reconnaissance, (3) Team Training, and (4) Field Investigation. Background information was obtained during the desktop study to help identify the prevalent soil-landscape relationships across the proposed pipeline route within the Project area. The background information was also used by the soil scientist team to identify preliminary test pit locations and develop strategies for conducting the Survey. Preliminary GIS-generated maps were prepared for planning and field use. This section outlines the objectives and accomplishments of each phase. The Survey Report and results are found in Attachment G.

8.3 CONSTRUCTION WORK AREAS

Construction work areas include the construction right-of way, additional temporary work space, access roads, temporary pipe storage and contractor yards, and aboveground facilities.

8.3.1 Pipeline Right-of Way

For the AP-1 mainline, the construction corridor in non-agricultural uplands will measure 125 feet in width, with a 40-foot-wide spoil side and an 85-foot-wide working side. In areas where full width topsoil segregation is required (e.g., agricultural areas), an additional 25 feet of temporary construction workspace will be needed on the working side of the corridor to provide sufficient space to store topsoil. In wetlands, the width of the construction right-of-way will be reduced to 75 feet, with 25 feet on the spoil side and 50 feet on the working side. Over short distances and where topography allows, it may be possible to reduce the width of the corridor to a minimum of 75 feet in ecologically sensitive areas to minimize impacts. Atlantic will work with the USFS to determine where the width of the construction right-of-way can be reduced, and where the additional corresponding ATWS on each side of the narrowed section will be located. Following construction, a 53.5 foot-wide permanent easement will be maintained for operation of the pipeline.

During construction of the pipeline, the top width of the excavated pipe trench in most areas will typically range from 10 to 15 feet. This assumes that construction personnel will not be required to work in the trench, which is typical for most installations. In areas with steep terrain, construction personnel will be required to work in the trench to weld the pipeline. In these areas, the top of the trench will typically be 30 feet wide to provide sufficient space for construction personnel to work in the trench safely. The additional spoil from excavation of a wider trench will be stockpiled in the temporary construction right-of-way and ATWS.

Refer to Attachment A for typical construction right-of-way diagrams showing general land-disturbing boundaries and construction techniques.

8.3.2 Additional Temporary Workspace

In addition to the construction right-of-way, ATWS will be required to stage construction activities and store equipment, materials, spoil and topsoil where required at wetland, waterbody, and road crossings. ATWS will also be required in areas with steep side slopes or where special construction techniques are implemented as well as at tie-ins with existing pipeline facilities, utility crossings, truck turnaround areas, and spread mobilization/de-mobilization areas.

ATWS measuring 50 by 150 feet will typically be required on both sides of the corridor and both sides of the crossing at wetlands, waterbodies measuring greater than 10 feet in width, two lane roads, and railroads. ATWS measuring 25 by 100 feet will typically be required on both sides of the corridor and both sides of the crossing at waterbodies measuring less than 10 feet in width and single lane roads. Consistent with the LRMPs, ATWS will be set back 100 feet from in-stream waterbody crossings on USFS lands. Locations of ATWS are shown on the alignment sheets (Attachment B).

8.3.3 Access Roads

Atlantic has identified roads to be used to provide access to the right-of-way during construction and operation of the Project. Atlantic will mostly utilize existing roads, but eight new roads are proposed to be constructed on USFS lands (see Section 2.1.1.4). Some existing roads will require improvement (such as grading, gravelling, replacing or installing culverts, minor widening, and/or clearing of overhead vegetation) to safely accommodate construction equipment and vehicles.

8.4 CRITICAL AREAS

Atlantic developed and implemented the Slope Stability Policy And Procedure (updated in September, 2016) to avoid, minimize, and mitigate potential landslide issues in slip prone areas prior to, during, and after construction. The Slope Stability Policy And Procedure (Attachment C) applies to both Virginia and West Virginia. It includes considerations for slips associated with pipeline construction during routing, engineering design, preconstruction planning, construction, and post construction.

8.4.1 Steep Terrain

Atlantic recognizes the increased risk in slips associated with pipeline construction particularly while traversing steep slopes. Special construction procedures and erosion and sediment control measures will be used in steep terrain areas, as described in Section 8.7.2. Additionally, Atlantic has developed and implemented a BIC Program to proactively manage construction and operation in steep slope areas, as described in Section 8.7.2.

Atlantic will:

- ensure that the erosion and sediment control measures in West Virginia are in compliance with an approved SWPPP or the *West Virginia Erosion and Sediment Control Best Management Practice Manual*;

- ensure that the erosion and sediment control measures in the Commonwealth of Virginia are in compliance with an approved SWPPP or the following regulations:
- Virginia Erosion and Sediment Control Regulations, (9 Virginia Code [VAC] VAC 25-840 et seq., as amended);
- Virginia Erosion and Sediment Control Certification Regulations (9 VAC25-850 et seq. as amended);
- Virginia Department of Environmental Quality (VDEQ), VESCH, Third Ed., 1992, as amended;
- VDEQ, Virginia Stormwater BMP Clearinghouse Stormwater Design Specifications, 2013, as amended;
- Virginia Stormwater Management Program Regulations (9 VAC 25-870 et seq., as amended);
- VDEQ, *Virginia Stormwater Management Handbook*, First Edition, 1999, as amended;
- conduct monthly inspections to assess potential concerns and document and remediate identified slope failures;
- complete a geotechnical analysis to evaluate the causes of past slope failures along its pipeline right-of-way;
- identify procedures and measures to identify, prevent, contain, and remediate slope failures; and
- develop and implement policy and procedures to address slip prone areas.

8.4.2 Karst Geological Formations

A Karst Monitoring and Mitigation plan was developed for the proposed Project and is included as Attachment H.

8.4.3 Waterbodies and Wetlands

A Stream and Wetland Crossing Procedure Plan was developed for the proposed Project and is located in Section 9 of this COM Plan.

8.4.3.1 Virginia Requirements

The Environmental Protection Agency (EPA) issued the Chesapeake Bay Total Maximum Daily Load (TMDL) on December 29, 2010. The Chesapeake Bay TMDL addresses all segments of the Bay and its tidal tributaries and establishes wasteload allocation to reduce nitrogen, phosphorus and sediment discharges into the Bay. The portion of the ACP Project within the GWNF lies within the Chesapeake Bay TMDL Watershed and may be subject to additional Chesapeake Bay TMDL watershed measures during construction, in addition to ESC measures outlined in Sections 8.5 and 8.8.

8.5 EROSION AND SEDIMENT CONTROL MEASURES

Cross-country pipeline construction typically proceeds in assembly line fashion, with multiple stages of construction occurring simultaneously at different locations to minimize the time needed to complete the Project. The stages of construction include survey and flagging, clearing and mowing, grubbing and grading, trenching, pipe assembly (including stringing, bending, welding, testing, coating, and lowering-in), backfilling, hydrostatic testing, final grading, and restoration. The locations of the erosion and sediment control measures to be installed for each of these stages are described below. Detailed typical drawings of general erosion and sediment control measures are provided in Attachment I, and are also shown on the Construction Alignment Sheets in Attachment B.

8.5.1 Site Preparation

- Survey and flag the construction right-of-way and mark environmentally sensitive areas;
- Install rock access pads during grading;
- Conduct initial clearing, limited to that necessary to install temporary sediment barriers;
- Install all perimeter BMPs immediately after any bulk earth-moving activity;
- Conduct progressive clearing with installation of temporary sediment barriers and temporary equipment bridges keeping pace with clearing;
- Modify access roads by grading and installing stone where needed;
- Grade the right-of-way, and segregate topsoil where necessary; and
- Install temporary slope breakers, also referred to as interceptor dikes, also called temporary right-of-way diversions or water bars, as needed to reduce runoff velocity and divert water off the construction right-of-way.

8.5.2 Pipe Installation

- Excavate new trench to accommodate new/replacement pipeline segment;
- String pipe, bend the pipe joints;
- Weld the pipe, inspect welds;
- Lower the pipe into the trench;
- Install permanent trench plugs;
- Backfill the trench;
- Install hydrostatic test dewatering structures;
- Hydrostatically test the pipe and dewater;
- Bring the pipeline to gas service;

- Final grade right-of-way and temporary workspaces to original contours to the extent practicable;
- Install permanent interceptor dikes; and
- Replace segregated topsoil.

8.5.3 Restoration

- Conduct right-of-way finish grading and cleanup. As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they must be stabilized;
- Apply soil amendments, permanent seed, mulch and/or erosion control fabric;
- Restore temporary access roads or any paved surfaces to original condition; and
- Remove temporary sediment barriers from an area when replaced by permanent erosion control measures or when the area has been successfully restored to uniform 70 percent perennial vegetation. Temporary erosion control BMPs will not be removed until inspection by the EI to confirm site stabilization.
- Reseed/replant work areas with native and pollinator species as provided in the Restoration and Rehabilitation Plan (Section 10) and the Visual Resources Plan (Section 20).

8.5.4 Survey and Flagging

- The limits of the approved work areas, boundaries of environmentally sensitive areas, and the location of the facilities must be marked in the field prior to the start of mechanized activities. Environmentally sensitive areas are those that are more susceptible to serious erosion problems and thus may require enhanced erosion and sediment control measures. Examples of such areas may include steep slopes and sinkholes down-gradient of Project activities. Examples of specialized controls that may be used in these areas include specialized pipeline construction methods that combine several construction stages, thereby reducing earth disturbance.
- The limits of approved work areas (i.e. the construction right-of-way, including ATWS and staging areas) will be established and visibly marked before clearing. The locations of approved access roads will be flagged and marked with signs.
- Signs and highly visible flagging will also be used to mark the boundaries of sensitive resource areas, including waterbodies and wetlands, and/or areas with special requirements along the construction work area, in accordance with the Construction Alignment Sheets. Orange plastic fencing may be more useful than flagging to assure that equipment operators stay out of critical areas. Only unavoidable work should take place within critical areas and their buffers.
- Safety fencing will be installed as needed during grading at public access points or around open unattended excavations to warn pedestrians of possible hazards. In addition, lights, signs and other warnings are required at road entrances and road crossings (see West Virginia or VDOT permits and regulations).

- Safety fencing may also be used to identify sensitive areas to be protected during construction or to highlight hazards along the right-of-way (e.g., a single-strand electric fence). Safety fencing may not be substituted for wire fencing in active pastures.

- Flagging or marking shall be maintained throughout construction.

- Other large diameter trees on the edge of the construction right-of-way and ATWS areas will be flagged by EIs to save/protect as green recruitment or habitat/shade trees, where feasible.

Virginia Requirements

Refer to Virginia Erosion and Sediment Control (E&S) Handbook for further details on the following requirement:

- Per Virginia Standard & Spec 3.38 (Tree Preservation and Protection), at a minimum the limits of clearing shall be located outside the drip line of any tree to be retained. In addition, heavy equipment, vehicular traffic, or stockpiles shall not be permitted within the drip line of any tree to be retained.

8.5.5 Construction Entrance

A construction entrance will be constructed at any point where construction equipment leaves the right-of-way and enters a paved public road or other paved surface. Typically, a construction entrance consists of filter fabric overlain by 6 inches of coarse aggregate extending a minimum of 70 feet from the edge of the pavement. It must extend the full width of the vehicular ingress and egress area and have a minimum 12-foot width. Conveyance of surface water through culverts under the entrance shall be provided, as necessary.

The construction entrance must function to remove mud from vehicles and equipment leaving the right-of-way. As mud accumulates on the entrance, clean stone must be added or the tire mats lifted and shaken to remove mud. Any mud that is carried onto the pavement must be thoroughly removed by the end of the day by shoveling or sweeping. The mud will be returned to the right-of-way. The use of water to remove sediment tracked onto roadways is not permitted.

If the majority of the mud is not removed by the vehicles traveling over the stone, then tires of the vehicles must be washed before entering the public road.

Maintenance of the construction entrance may require periodic top dressing with additional stone and cleanout of any structures used to trap sediment. If any inadvertent sediment tracking occurs on the public roadway, the road shall be cleaned thoroughly by the end of each day.

Virginia Requirements

Refer to Virginia E&S Handbook for further details on the following requirement:

- In accordance with VESCH Std. & Spec 3.02 (Stone Construction Entrance), a construction entrance will be constructed at any point where construction equipment leaves the right-of-way and enters a paved public road or other paved surface. Typically, a construction entrance is comprised of filter fabric overlain by 6 inches of coarse aggregate (VDOT #1) extending a minimum of 70 feet from the edge of the pavement.

The area of the entrance must be excavated 3 inches prior to laying the filter fabric underliner. The entrance must extend the full width of the vehicular ingress and egress area and have a minimum 12-foot width. Conveyance of surface water through culverts under the entrance will be provided, as necessary. If such as conveyance is impossible, the construction of a “mountable” berm with 5:1 slopes will be permitted.

8.5.6 Clearing

Clearing operations include the removal of vegetation within the construction right-of-way. The Timber Removal Plan (Section 4) provides additional information regarding timber removal.

- Clearing will be confined to within the construction right-of-way shown on the Construction Alignment Sheets;

- Trees will be felled into the construction right-of-way to minimize damage to trees and structures adjacent to the right-of-way. Trees that inadvertently fall beyond the edge of the right-of-way will be immediately moved onto the right-of-way and disturbed areas will be immediately stabilized, per landowner approval;

- Slash will be ground up and used as mulch, hauled to an approved disposal site, or burned.

- Stumps excavated from the trench line that are not ground to mulch onsite will be placed along the edge of the construction right-of-way or in temporary extra workspaces. Stumps will be hauled from the extra workspaces to an approved disposal site, used on the right-of-way for restoration purposes, burned, or disposed of according to USFS requirements.

- Felled merchantable timber will be moved to a landing for trucking to nearby mills. Non-merchantable timber will be chipped, hauled off-site, or salvaged for use during restoration activities, or by burning, if permitted. After it is cut, non-merchantable timber that will be retained for restoration purposes will be placed along the edge of the construction right-of-way or temporary work area.

- Existing surface drainage patterns shall not be altered by the placement of timber or brush piles at the edge of the construction right-of-way.

- Where ground skidding is used, the following measures will be implemented to minimize soil disturbance:

    - Low ground weight (pressure) vehicles will be used, where feasible.

    - The removal of soil duff layers will be avoided to maintain a cushion between the soil, logs, and logging equipment.

    - Designed skid trails will be used to restrict detrimental soil disturbance (e.g., compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area.

- Erosion and sediment control measures shall be installed immediately following mechanized clearing of trees, brush and vegetation.

Virginia Requirements

- According to VESCH Std. & Spec. 3.38, fires will not be permitted within 100 feet from the drip line of any trees to be retained. Fires will be limited in size to prevent adverse effects on trees, and kept under surveillance.

8.5.7 Install Temporary Sediment Barriers and Diversions

Sediment barriers, which are temporary sediment controls intended to minimize the flow and deposition of sediment beyond approved workspaces or into sensitive resource areas, shall be installed following vegetative clearing operations. The primary sediment barrier methods to be used on the ACP Project will include silt fencing, temporary diversion dikes, and sediment traps. Sediment traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place. General requirements are as follows:

- Install temporary sediment barriers at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a road crossing, waterbody and/or wetland until revegetation is complete. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition. For silt fencing, an effort should be made to locate the fencing at least 5 feet to 10 feet beyond the toe of the slope.

- Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as shown on the construction alignment sheets.

- Inspect temporary sediment barriers daily in areas of active construction to ensure proper functioning and maintenance. In other areas with no construction or equipment operation, sediment barriers will be inspected and maintained on a weekly basis throughout construction and within 24 hours of each 0.5 inch of rainfall event.

- Sediment removed from erosion controls will be disposed by adding to existing onsite soil stockpiles and stabilizing, or will be reused onsite within the construction right-of-way and outside of any wetlands, streams or riparian areas.

- Maintain all temporary sediment barriers in place until permanent revegetation measures are successful or the upland areas adjacent to wetlands, waterbodies, or roads are stabilized.

- Remove temporary sediment barriers from an area when replaced by permanent erosion or sediment control measures or when the area has been successfully restored to perennial vegetation.

- Erosion barriers should be constructed of synthetic materials, clean straw bales, or other Forest Service-approved material free of seeds or viable parts of invasive plants.

8.5.7.1 West Virginia Requirement

Refer to West Virginia BMP Manual for further details for the following requirement:

- Remove temporary sediment barriers from an area when replaced by permanent erosion or sediment control measures or when the area has been successfully restored to uniform 70 percent perennial vegetation.

8.5.7.2 Virginia Requirement

Refer to Virginia E&S Handbook for further details for the following requirement:

- Per Virginia Minimum Standard 2, during construction of the project, soil stock piles and borrow areas will be stabilized or protected with sediment trapping measures. Atlantic is responsible for the temporary protection and permanent stabilization of soil stockpiles on site as well as borrow areas and soil intentionally transported from the project site.

- Per Virginia Minimum Standard 3, permanent vegetation will not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion. Remove temporary sediment barriers from an area when replaced by permanent erosion or sediment control measures or when the area has been successfully restored to perennial vegetation. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

8.5.8 Silt Fencing

- The following specifications can be found in the DEQ Virginia Erosion & Sediment Control Field Manual and are consistent with the FERC Plan and Procedures. Silt Fencing constructed of synthetic filter fabric stretched across and attached to supporting posts, and in some cases a wire support fence, will be placed across or at the toe of a slope or in a minor drainage way to intercept and detain sediment and decrease flow velocities from drainage areas of limited size. Silt fencing is applicable where sheet and rill erosion or small concentrated flows may be a problem.

- Silt fencing will be used where the size of the drainage area is not more than one quarter acre per 100 feet of silt fence length; the maximum slope length behind the barrier is 100 feet; and the maximum gradient behind the barrier is 50 percent (2:1).

- Silt fencing can be used in minor swales or ditches where the maximum contributing drainage area is no greater than 1 acre and flow is no greater than 1 cubic feet per second. In ditches or swales where higher velocity flow is expected, rock check dams should be used in place of silt fence.

- Silt fencing will not be used in areas where rock or some other hard surface prevents the full and uniform depth anchoring of the barrier.

- If steel posts are utilized, they must have a minimum weight of 1.33 pounds per linear foot and have a minimum length of 5 feet. Posts will be placed a maximum of 6 feet apart.

- The height of the fence shall be a minimum of 16 inches above grade and shall not exceed 34 inches above ground elevation.

- Filter cloth shall be spliced together only at support posts with a minimum 6-inch overlap.

- A trench shall be excavated approximately 4-inches wide and 4-inches deep on the upslope side of the proposed location of the measure.

- When wire support is not used, extra-strength filter fabric shall be fastened to the upslope side of the posts using one inch long (minimum) heavy-duty wire staples or tie wires and the fabric shall be extended into the trench. The posts shall be placed a maximum of 6 feet apart.

- When wire support is used, the wire mesh fence must be fastened securely to the upslope side of the posts using heavy duty wire staples at least one inch long, tire wires or hog rings. The wire will extend into the trench a minimum of two inches and will not extend more than 34 inches above the ground surface. The standard-strength fabric will be stapled or wired to the wire fence, and 8 inches of the fabric will be extended into the trench. The posts will be placed a maximum of 10 feet apart.

- If silt fence is to be constructed across a ditch line or swale, the measure must be of sufficient length to eliminate end flow and the configuration shall resemble an arc with the ends oriented upslope. Extra-strength filter fabric must be used for ditch lines or swales with a maximum 3-foot spacing of posts.

- The 4-inch by 4-inch trench shall be backfilled and the soil compacted over the filter fabric.

- Remove accumulated sediments when sediment reaches ½ the above-ground height of the fence.

- On USFS lands, all silt fences will be removed and discarded properly after project completion. Soils will be stabilized and seeded as per the Restoration and Rehabilitation Plan (Section 10). Permanent erosion control protective measures will be utilized if seeding alone will not stabilize the site and provide soil stability.

8.5.8.1 Belted Silt Retention Fence (BSRF)

The primary silt fence product planned for use on the ACP Project is a patented Belted Silt Retention Fence (BSRF) product which is available in two designs used to address different site conditions, as follows:

- BSRF Priority 1 (green band) is a heavy-duty silt fence constructed with a 36-inch, non-woven, spun-bond fabric with an internal scrim incorporated into the fabric for additional strength and durability. The system utilizes wood stakes spaced at 4-feet and a specific method of attachment. The system is functionally equivalent to wire back and metal steel post silt fence and is designed for the protection of high priority areas, including wetlands and waterbodies.

- BSRF Priority 2 (black band) is a medium-duty silt fence constructed with a 36-inch, non-woven, spun-bond fabric that is calendared on one side. The system utilizes wood stakes spaced at 6-feet and a specific method of attachment.

An estimated 125,000 feet of silt fence is anticipated to be needed on USFS lands.

8.5.9 Temporary Diversion Dike

A temporary ridge of compacted soil constructed at the top of a sloping disturbed area will be used to divert stormwater runoff from upslope drainage areas away from the unprotected slope. Temporary diversion dikes can also be constructed at the base of a slope to protect adjacent and downstream areas by diverting sediment-laden runoff from a disturbed area to a sediment-trapping control measure. A temporary diversion dike is a good choice when the control limits of a silt fence are exceeded. The temporary diversion dike must be installed as a first step in the land-disturbing activity at locations shown on the Construction Alignment Sheets and must be functional prior to upslope land disturbance.

- The maximum allowable drainage area is 5 acres.
- The minimum height measured on the upslope side of the dike is 18 inches.
- The dike should be compacted to prevent failure and have side slopes 1.5:1 or flatter with a minimum base width of 4.5 feet.
- The channel behind the dike shall have a parabolic or trapezoidal cross-section shape to avoid high velocity flow which could arise in a v-shaped ditch. The channel will have a positive grade to a stabilized outlet.
- The diversion dike and channel will be stabilized <u>immediately</u> following installation with temporary or permanent vegetation. Where channel slope is greater than 2 percent, Rolled Erosion Control Product (RECP) will be used to stabilize soil until vegetation is established.
- The temporary diversion dike will be inspected and repairs made to the dike, flow channel, outlet or sediment trapping area, as necessary. Once every day in active construction areas, whether a storm event has occurred or not, the measure shall be inspected and repairs made if needed. Damages caused by construction traffic or other activity must be repaired before the end of each working day.

8.5.9.1 West Virginia Requirements

Refer to West Virginia BMP Manual for detailed specifics on the following requirements.

- Temporary (less than 6 months) diversions must be designed to handle peak discharge from a 2-year/24-hour storm.
- The side slopes shall be no steeper than 2:1
- The design shall include a 10 percent settlement factor.

8.5.9.2 Virginia Requirements

In accordance with VESCH Std. & Spec 3.09 (Temporary Diversion Dike), refer to Virginia E&S Handbook for detailed specifics on the following requirements.

- The minimum height measured on the upslope side of the dike is 18 inches.
- The dike should be compacted to prevent failure and have side slopes 1.5:1 or flatter with a minimum base width of 4.5 feet.

8.5.10 Temporary Sediment Trap

A temporary ponding area formed by constructing an earthen embankment with a stone outlet may be used to detain sediment-laden runoff from small disturbed areas (where total drainage area is less than three acres) to allow sediment to settle out prior to discharge. The sediment trap may be constructed either independently or in conjunction with a temporary diversion dike as a suitable option for outlet control. The temporary sediment trap must be installed as a first step in the land-disturbing activity at locations shown on the Construction Alignment Sheets and must be functional prior to upslope land disturbance.

- The maximum useful life of a temporary sediment trap is 18 months. Traps will be replaced should the construction period exceed 18-months. Sediment traps may need to be replaced sooner than 18 months (on an as-needed basis) if at any time they cease to be effective. This will be determined based on the regularly scheduled inspections of these traps. Erosional control inspection and maintenance will continue on all parts of the project until the landscape is deemed stable. Permanent features will replace temporary features if the erosional feature does not become stable in the short term (less than 18 months.
- Topsoil will not be used for constructing sediment barriers of any kind.
- The total contributing drainage area to a sediment trap is less than 3 acres
- The sediment trap must be designed to have an initial storage volume of 134 cubic yards per acre of drainage area with a minimum 2:1 length to width ratio, if possible.
- Side slopes of the excavated area should be no steeper than 1:1 and the maximum depth of excavation within the wet storage area should be 4 feet.
- Outlet requirements include a combined coarse aggregate/riprap stone section of the embankment. Filter cloth shall be placed at the stone-soil interface. The length of the stone outlet will be detailed on the Construction Alignment Sheets (Attachment A) and will be designed at 6 feet times the total drainage area in acres. The crest of the stone outlet must be at least 1.0 foot below the top of the embankment.
- The maximum height of the embankment shall be 5 feet measured to the base of the stone outlet. Side slopes of the embankment shall be 2:1 or flatter.
- Fill material shall be selected from material that is are free of roots or other woody vegetation, large stones, or organic matter and compacted in 6-inch lifts.
- The temporary sediment trap will be stabilized immediately following installation with temporary or permanent vegetation.

- Remove accumulated sediments when sediment reaches ½ the design storage volume. Sediment removed will be deposited in a disturbed area in a manner that it will not erode and cause sedimentation problems.

- Stone will be replaced if it becomes choked with sediment.

- Subsoil used to create these features will need to be de-compacted prior to replacing it in the pipeline trench, within the right-of-way, or within an approved ATWS.

8.5.10.1 West Virginia Requirements

Refer to West Virginia BMP Manual for further details for the following requirement:

- The sediment trap should have a storage volume of 3600 cubic feet per acre of drainage area. (WV BMP 3.29).

8.5.10.2 Virginia Requirements

Refer to Virginia E&S Handbook for further details for the following requirement:

- Per VESCH Std. & Spec 3.13 (Temporary Sediment Trap), outlet requirements include a combined coarse aggregate/riprap stone section of the embankment (VDOT #3, #357 or #5 Coarse Aggregate and Class I riprap). The length of the stone outlet will be detailed on the Construction Alignment Sheets (Attachment B).

8.5.11 Grubbing and Grading

The construction right-of-way will be graded as needed to provide a level workspace for safe operation of heavy equipment used in pipeline construction. The following procedures will be standard practice during grading.

8.5.12 Topsoil Segregation

During construction, topsoil and subsoil will be disturbed by grading of the right-of-way, trench excavation, and by heavy equipment moving along the right-of-way. Atlantic will conduct topsoil segregation in accordance with the FERC Upland Erosion Control, Revegetation and Maintenance Plan.

In areas where full width topsoil segregation is required, an additional 25 feet of temporary construction workspace would be needed on the working side of the corridor to provide sufficient space to store topsoil. Because of the increased need for additional right-of-way width and loss of additional forestland, and need to remove stumps, which would increase topsoil mixing with the subsoil and the increase the potential for erosion, topsoil segregation is generally not conducted in forested areas.

Either the "ditch plus spoil side" or the "full right-of-way" segregation method would be used where topsoil segregation is necessary.

In areas where topsoil segregation is performed on the MNF and GWNF, the O and A horizons will be segregated from the transition soil horizons AB/ BA. O horizon soils are defined as a soil layer containing a high percentage of organic matter. A horizon soils are defined as the dark subsoil below the O horizon. AB/BA horizon soils are defined as light colored subsoils located below the O and A horizons.

- Prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area ("ditch plus spoil side" method).

- Segregate at least 12 inches of topsoil in deep soils with more than 12 inches of topsoil. In soils with less than 12 inches of topsoil, make every effort to segregate the entire topsoil layer.

- Within wetlands, segregate the top 12 inches of topsoil within the trenchline, except in areas where standing water is present or soils are saturated.

- Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

- Leave gaps in the topsoil piles and spoil piles for the installation of temporary slope breakers to allow water to be diverted off the construction right-of-way.

- Topsoil will not be used for constructing sediment barriers of any kind. In addition, topsoil will never be used for padding the pipe, improving or maintaining roads, or as fill material.

- Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, or functional equivalents.

- Topsoil operations (stripping and replacement) should not be performed when the soil is excessively wet or frozen.

- All perimeter dikes, berms, sediment basins, and other sediment controls shall be in place prior to stripping. These practices must be maintained during topsoiling.

- Side slopes of the stockpile shall not exceed 2:1.

- Perimeter controls must be placed around the stockpile immediately.

- Prior to dumping and spreading topsoil, the subgrade shall be loosened by discing or scarifying to a depth of at least 4 inches to ensure bonding of the topsoil and subsoil.

- Topsoil shall be uniformly distributed to a minimum compacted depth of 2 inches on 3:1 slopes or steeper slopes and 4 inches on flatter slopes.

- Topsoil containing Non-Native Invasive Species (NNIS) will be left undisturbed to the degree possible. Cleared vegetation and segregated topsoil from areas of invasive plant infestations will be maintained adjacent to the areas from which they were removed to eliminate the transport of soil-borne propagules to other areas along the right-of-way. The stockpiles will be identified as invasive plant species stockpiles with signs. During reclamation, the materials will be returned to the areas from which they were obtained.

8.5.12.1 West Virginia Requirements

Refer to West Virginia BMP's Handbook for detailed information for the following requirements:

- Seeding of stockpile shall be completed within 7 days of the formation of the stockpile if it is to remain dormant for longer than 21 days in accordance with West Virginia Std & spec 3.10 (Temporary Seeding). Stabilization of stockpiles with a temporary cover (i.e. mulch) in accordance with West Virginia Std & spec 3.12 (Mulching) is also acceptable.

- In areas which are not going to be mowed, the surface should be left rough by not fine grading in accordance with West Virginia Std &Spec 3.08 (Surface Roughening).

8.5.12.2 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirements:

- Per VESCH Std & Spec 3.31 (Temporary Seeding) and Virginia Minimum Standard #1 and #2, seeding seeding of stockpile shall be completed within 7 days of the formation of the stockpile if it is to remain dormant for longer than 14 days in accordance with Virginia Std & Spec 3.31 (Temporary Seeding) and Minimum Standard #1 and #2. Stabilization of stockpiles with a temporary cover (i.e. mulch) in accordance with Virginia Std & Spec 3.35 (Mulching) is also acceptable.

- In areas which are not going to be mowed, the surface should be left rough by not fine grading in accordance with Virginia Std &Spec 3.29 (Surface Roughening).

8.5.13 Tree Stump Removal and Disposal

- Remove tree stumps in upland areas along the entire width of the permanent right-of-way to allow adequate clearance for the safe operation of vehicles and equipment. Stumps within the temporary right-of-way will be removed or ground below the surface in accordance with Atlantic construction specifications to allow the safe passage of equipment, as determined by the Construction Site Supervisor or EI.

- In wetlands, limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Construction Site Supervisor and/or EI determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

- Dispose of stumps by one of the following methods with the approval of the AO:

- Burned on construction right-of-way, if permitted;

- Chipped, spread across the construction right-of-way in upland areas, and plowed in;

- Used as erosion control or OHV blocking material;

Hauled off-site for disposal at an appropriately-licensed disposal facility.

8.5.14 Rock Management

Rock, including blast rock, will be used, removed or disposed of in one of the following ways:

- Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. (Rock that is not returned to the trench shall be considered construction material or waste, unless approved for use as mulch or for some other use on the construction work areas by the land owner or land managing agency);

- Windrowed on the edge of the right-of-way per AO approval;

- Used to create wildlife habitat as directed by the AO;

- Burying of large rock within the construction right-of-way;

- Removed and disposed of at an authorized disposal site;

- Used as riprap for streambank stabilization if permitted by USFS and other regulatory agency(ies) such as the U.S. Army Corps of Engineers (USACE), and provided the rock is uncontaminated and free of soil and other debris. Atlantic has not proposed, and does not currently anticipate the use of riprap for streambank stabilization on USFS lands.

Virginia Requirements:

- Per VESCH Std. & Spec. 3.19 (Riprap), stone for riprap will consist of field stone or rough unhewn quarry stone of approximately rectangular shape. The stone will be hard and angular and of such quality that it will not disintegrate on exposure to water or weathering and it will be suitable in all respects for the purpose intended. The specific gravity of the individual stones will be at least 2.5. Rubble concrete may be used provided it has a density of at least 150 lbs. per cubic foot, and otherwise meets the requirement of the VESCH standard and specification.

8.5.15 Temporary Slope Breakers

Temporary slope breakers, also called temporary right-of-way diversions and water bars, are temporary erosion control measures intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope breakers may be constructed of materials such as compacted soil, silt fence, or sand bags. Segregated topsoil may not be used for constructing temporary slope breakers.

- Install temporary slope breakers on all disturbed areas as necessary following topsoil removal and grading operations to avoid excessive erosion. Unless otherwise specified by permit conditions, temporary slope breakers must be installed on slopes at the recommended spacing interval indicated below.

- The temporary diversion should be constructed across the disturbed portion of the right-of-way;

- Positive grade with less than 2 percent slope should be provided to a stabilized outlet; steeper grading may be utilized as necessary to promote positive drainage.

- Direct the outfall of each slope breaker to a stable, well vegetated area or construct an energy-dissipating device (silt fence, staked weed-free straw bales, erosion control fabric) at the end of the slope breaker.

- Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive resource areas.

- Each diversion should exit onto stabilized ground. It should never exit onto the right-of-way where it can run down to the next diversion. These stabilized areas will be reinforced if necessary, and routinely inspected and maintained to prevent erosion off the right-of-way.

- Install temporary slope breakers on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings.

- Minimum allowable height of the diversion is 18 inches, installed by machine or hand-compacted in 8-inch lifts.

- Side slopes should be 2:1 or flatter to allow the passage of construction traffic, along with a minimum base width of 6 feet.

- Inspect temporary slope breakers daily in areas of active construction to insure proper functioning and maintenance. In other areas, the slope breakers will be inspected and maintained on a weekly basis throughout construction, and following every rainfall.

- Slope breakers which will not be subject to construction traffic should be stabilized with temporary seeding.

8.5.15.1 West Virginia Requirements

Refer to West Virginia BMP Manual for detailed specifics on the following requirements.

- Closer spacing may be used if determined necessary by the EI. The WV BMP Manual spacing requirements are recommended since they are more stringent than FERC Plan requirements (see Table 8.5.5-1):

TABLE 8.5.5-1

Recommended Spacing and Materials for Permanent Slope Breakers [a]
(WV BMP Manual Std & spec 3.18)

Trench Slope	Distance (feet)
Less than 5%	300
10%	175
15%	125
20%	100
Greater than 25%	75

[a] Slope breaker spacing in areas of steep terrain may be decreased as a result of the steep slopes BIC Program described in Section 2.1.9.5. Accordingly, this table may be revised to reflect more stringent spacing requirements.

8.5.15.2 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirements:

- Closer spacing may be used if determined necessary by the EI. The VESCH spacing requirements are recommended since they are more stringent than FERC Plan requirements (see Table 8.5.5-2):

TABLE 8.5.5-2

Recommended Spacing and Materials for Permanent Slope Breakers [a]
(VESCH Std & Spec 3.11)

Trench Slope	Distance (feet)
Less than 7%	100
7–25%	75
25–40%	50
Over 40%	25

[a] Slope breaker spacing in areas of steep terrain may be decreased as a result of the steep slopes BIC Program described in Section 2.5.6. Accordingly, this table may be revised to reflect more stringent spacing requirements.

8.5.16 Timber Mat Stabilization

Atlantic utilizes construction timber mats to provide access through areas such as wetlands and waterbodies, some agricultural fields, and other areas as determined by the Construction Supervisor. This practice reduces soil compaction and provides a stable travel lane for contractors along the Project right-of-way, thus minimizing land disturbance. This practice may be incorporated in addition to the WV BMP and VESCH practices and requirements.

The use of construction timber mats generally does not constitute soil disturbance or a change in hydrology. Therefore, the installation of timber mat access roads and work pads is not considered a regulated land-disturbing activity and these areas are generally not included in land disturbance area calculations.

8.5.17 Temporary Stabilization

West Virginia Requirements

When acceptable final grade cannot be achieved (e.g. during winter or early spring construction), when permanent seeding cannot be applied due to adverse soil and weather conditions, or any time an area will remain idle for more than 21 days, temporary stabilization (temporary seed, mulch, additional sediment barriers as directed by the EI) must be applied within seven (7) days to that area. E&S measures will be monitored and maintained until conditions improve and final restoration can be completed.

Virginia Requirements

When acceptable final grade cannot be achieved (e.g. during winter or early spring construction), when permanent seeding cannot be applied due to adverse soil and weather conditions, or any time an area will remain idle for more than 14 days, temporary stabilization (temporary seed, mulch, additional sediment barriers as directed by the EI) must be applied within seven (7) days to that area. Erosion and sediment control measures will be monitored and maintained until conditions improve and final restoration can be completed.

The seed mixtures and application rates, seeding dates, soil amendment recommendations, and planting recommendations are currently pending additional consultation with the USFS staff.

8.5.17.1Trenching

The trench centerline will be staked after the construction right-of-way has been prepared. In general, a trench will be excavated to a depth that will permit burial of the pipe with a minimum of 3 feet of cover.

The following procedures will be standard practice during ditching:

- Flag drainage tiles damaged during ditching activities for repair;
- Place spoil in additional extra work areas or at least 10 feet away from the waterbody's edge in the construction right-of-way. Spoil will be contained with erosion and sediment control devices to prevent spoil materials or sediment-laden water from transferring into waterbodies and wetlands or off of the right-of-way;
- If temporary erosion or sediment controls are damaged or removed during trenching, they shall be repaired and/or replaced before the end of the work day;
- Excavated material shall be placed on the uphill side of trenches.

8.5.17.2Trench Breakers

Permanent sacks of sand, polyurethane foam, bentonite clay, or possibly cement bags (in areas of steep terrain) installed around the pipe will remain in the trench to prevent subsurface channeling of water along the trench. Topsoil will not be used in trench breakers. Trench breakers are not employed in trenchless pipeline construction such as HDD or for non-linear facilities (e.g. compressor stations, metering and regulating stations).

The need for and spacing of trench breakers will be indicated on the Construction Alignment Sheets (Attachment B). Trench breakers will be installed at the same spacing as and upslope of permanent slope breakers unless determined otherwise by the certifying Professional Engineer.

Permanent trench breakers will be installed at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland.

Trench breakers must be installed at wetland boundaries or the trench bottom must be sealed, as specified in the Procedures. Trench breakers will not be installed within a wetland.

8.5.17.3 Trench & Site Dewatering

Dewatering may be periodically conducted to remove accumulated groundwater or precipitation from the construction right-of-way, including from within the trenchline. The need for erosion controls as well as the type of control used will vary depending on the type and amount of sediment within the water, and volume and rate of discharge. Section 8.5.20 sets forth criteria for discharge to a well-vegetated area of sufficient length. The Karst Plan (Attachment H) outlines the requirements of site dewatering within karst areas. Karst features will not be utilized for the disposal of water.

8.5.17.4 Dewatering Filter Bag

No discharge of hydrostatic test water is planned on USFS lands. However, trench dewatering on USFS lands may be necessary at locations along the pipeline, for example, if a high water table is encountered. Atlantic utilizes filter bags for dewatering and velocity reduction on a majority of pipeline construction Project in accordance with the dewatering practices illustrated in the WV BMP Manual (Std. & Spec. 3.22 Dewatering) and VESCH (Std. & Spec. 3.26 Dewatering Structure). Design criteria and specifications vary by dewatering bag manufacturer. A variety of filtering dewatering bag products are available on the market. All manufacturers' guidance on the use, design, sizing, maintenance and application of the geotextile dewatering bag shall be followed.

- Conduct dewatering (on or off the construction right-of-way) in a manner that does not cause erosion and does not result in heavily silt-laden water flowing into any waterbody, wetland, or off-site property.
- Elevate and screen the intake of each hose used to withdraw the water from the trench to minimize pumping of deposited sediments.
- Remove dewatering structures as soon as practicable after the completion of dewatering activities. If sediment build-up prevents the bag from functioning properly, or the bag becomes half full of sediment, the bag will be discarded and replaced.

8.5.17.5 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirements:

- If discharging to a well-vegetated area, then per VESCH Std. & Spec 3.26, a minimum filtering length of 75 feet must be available in order for such a method to be feasible. A de-watering bag may not be needed if there is a well-stabilized, vegetated area on-site to which water can be discharged. The area must be stabilized so that it can filter sediment and at the same time withstand the velocity of the discharged water without eroding.
- As warranted by site conditions, a standard dewatering structure may be used per the construction and maintenance specifications in VESCH Std. & Spec 3.26 (Dewatering Structure), including the use of a portable sediment tank, filter box, or straw bale/silt fence pit. The dewatering structure must be sized (and operated) to allow pumped water to flow through the filtering device without overtopping the structure. The filtering devices must be inspected frequently and repaired or replaced once the sediment build-up prevents the structure from functioning as designed. The accumulated sediment removed from a dewatering device must be spread on-site and stabilized or disposed of at an approved disposal site.

8.5.17.6Pipe Installation

During all phases of the pipe installation process, ensure that all roadway crossings and access points are safe and accessible conditions. Repair damaged temporary erosion controls by the end of the work day. If portions of slope breakers are removed from the travel lane to facilitate safe work conditions, they shall be restored prior to the end of the work day. Pipe installation will commence according to Atlantic construction and implementation plans and generally consists of stages such as stringing and bending, welding, and lowering-in and tie-ins.

8.5.17.7Backfilling

Backfilling consists of covering the pipe with the earth removed from the trench or with other fill material hauled to the site when the existing trench spoil is not adequate for backfill. Backfilling will follow lowering-in of the pipeline as close as is practical.

In areas where the trench bottom is irregularly shaped due to consolidated rock or where the excavated spoil materials are unacceptable for backfilling around the pipe, padding material may be required to prevent damage to the pipe. This padding material will generally consist of sand, crushed limestone, or screened spoil materials from trench excavation. Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.

8.5.17.8Hydrostatic Testing

While hydrostatic testing will occur on all pipeline sections of the Project, including those of USFS lands, there will be no hydrostatic test water appropriations or test water discharges on USFS lands.

8.5.24 Restoration and Final Cleanup

Restoration of the right-of-way will begin after pipeline construction activities have been completed. Restoration measures include the re-establishment of final grades and drainage patterns as well as the installation of permanent erosion and sediment control devices to minimize post-construction erosion. Property shall be restored as close to its preconstruction condition as practical unless otherwise specified by the landowner. All temporary ESC measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed. Trapped sediment will be removed or stabilized onsite. Disturbed soil resulting from removal of the BMPs or vegetation will be permanently stabilized. Per Virginia Minimum Standard 3, permanent stabilization is achieved when vegetation is established that is uniform, mature enough to survive, and will inhibit erosion.

- The Contractor shall make every reasonable effort to complete final cleanup of an area (including final grading, topsoil replacement and installation of permanent erosion control structures) within 20 days after backfilling the trench in that area (within 10 days in residential areas). If seasonal or other weather conditions prevent compliance with these timeframes, continue to inspect and maintain temporary erosion and sediment controls (i.e. temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

- As soon as slopes, channels, ditches, and other disturbed areas reach final grade, they must be stabilized. The disturbed right-of-way will be seeded as soon as possible and within no more than 7 days of final grading, weather and soil conditions permitting.

- Grade the right-of-way to pre-construction contours, with the exception of the installation of any permanent measures required herein.

- Grading practices such as stair-stepping or grooving slopes or leaving slopes in a roughened condition by not fine-grading will be used on all slopes steeper than 3:1 in accordance with West Virginia Standard & Specification 3.08 (Surface roughening) and Virginia Standard and Specification 3.29 (Surface roughening) on all slopes steeper than 3:1 or that have received final grading but will not be stabilized immediately.

- Spread segregated topsoil back across the graded right-of-way to its original profile.

- The size, density, and distribution of rock on the construction right-of-way shall be similar to adjacent areas not disturbed by construction, or as approved by the AO.
- A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion and sediment control structures are installed, regularly inspected and maintained. When access is no longer required, the travel lane must be removed and the right-of-way restored.
- Remove all construction debris (used filter bags, skids, trash, etc.) from all construction work areas unless the landowner or land managing agency approves leaving material onsite for beneficial reuse, stabilization, or habitat restoration. Grade or till the right-of-way to leave the soil in the proper condition for planting.
- For construction activities occurring in winter, conditions such as frozen soils or snow cover could delay successful soil compaction mitigation or seeding activities. In these conditions, Atlantic will follow its *Winter Construction Plan* (Attachment D) and resume clean-up and restoration efforts the following spring. Atlantic will monitor and maintain temporary erosion controls (e.g., temporary slope breakers, sediment barriers, or mulch) until conditions allow for completion of cleanup and installation of permanent erosion control structures.
- NNIS measures, as described in Section 11.

8.5.17.9 West Virginia Requirements

Refer to West Virginia BMP Manual for detailed information for the following requirements:

Final site stabilization means that all soil-disturbing activities are completed, and that either a permanent vegetative cover with a density of 70 percent or greater has been established or that the surface has been stabilized by hard cover such as pavement or buildings. It should be noted that the 70 percent requirement refers to the total area vegetated and not just a percent of the site.

8.5.17.10 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information for the following requirement.

Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.

8.5.17.11 Permanent Slope Breakers

Permanent slope breakers will be installed during final grading, where required, to slow runoff velocity and direct water off the right-of-way and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.

- Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing shown on the Construction Alignment Sheets.

- Spacing for permanent slope breakers will be the same as temporary slope breakers described in Section 8.5.15.

- Construct permanent slope breakers with a minimum of a 2 to 8 percent outslope to divert surface flow to a stable vegetative area without causing water to pool or erode behind the slope breaker; steeper grading may be utilized as necessary to promote positive drainage. In the absence of a stable vegetative area, install an energy-dissipating device at the end of the breaker.

- Slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where permanent breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey and permit requirements.

- Where drainage is insufficient in upland areas, install a rock-lined drainage swale as approved by the EI. The drainage swale is generally 8 feet wide and a maximum of 18-24 inches deep.

8.5.17.12 Soil Stabilization Blankets and Matting

Erosion control fabric or blankets are used during restoration, including as mulch, to slow down stormwater and stabilize soil until vegetation becomes established. Care will be taken to avoid areas of steep slopes as much as practical; however, areas which could not be avoided will be addressed with slope breakers and RECP. RECPs must be consistent with WV BMP Manual Standard and Specification 3.13 for RECPs and VESCH Standard and Specification 3.36 for Soil Stabilization Blankets and Matting. RECPs are also suitable as an effective vegetation stabilization technique on waterbody banks, vegetated channels, and the swale side of permanent slope breakers where moving water is likely to wash out new plantings.

- As shown on the detail drawings, soil stabilization blankets must be installed vertically downslope on steep slopes and on shallow slopes the mats can be installed across the slope.

- Slope surface must be smooth with minimum rocks, lumps, grass and sticks such that the blanket can be placed flat on the surface for uniform soil contact.

- Seed is applied to the graded slope prior to installation of the blanket. Seed should be lightly raked into the soil;

- The blanket will be rolled from the top of the slope or top of the channel downgradient toward the toe of the slope or channel outlet and keyed into a minimum 6 inch deep trench at the top of the slope.

- Upslope ends will be buried in an anchor slot not less than 6-inches deep and tamped to firmly embed the material.

- The blankets will be anchored with staples or other appropriate devices in accordance with the manufacturers' recommendations.

- On highly erodible soils and on slopes steeper than 4:1, erosion check slots may be made by inserting a fold of a separate piece of material into a 6-inch trench and tamping firmly.

Staple the fold to the main blanket at minimum 12-inch intervals across the up-gradient and down-gradient portion of the blanket. The need for and spacing of check slots will based on manufacturers' recommendations.

- The terminal end of the material is folded with 4 inches of material underneath and stapled every 12 inches at minimum.

8.5.17.13 Seeding will be done in accordance with Section 10, the Restoration and Rehabilitation Plan. West Virginia Requirements

Refer to West Virginia BMP Manual for detailed information on the following requirements:

- Adjacent blankets will be overlapped, or by abutting product as defined by the manufacturer, and stapled together.

- Join a new roll of material by creating an anchor slot as with the upslope ends and overlapping the end of the up-gradient roll and stapling across the end of the previous roll just below the anchor slot.

8.5.17.14 Virginia Requirements

Refer to Virginia E&S Handbook for detailed information on the following requirements:

- Soil stabilization blankets will be mechanically fastened and used on slopes of 3:1 or greater and in stormwater conveyance channels.

- Adjacent blankets will be overlapped and stapled together.

- Join a new roll of material by creating an anchor slot as with the upslope ends and overlapping the end of the upgradient roll and stapling across the end of the previous roll just below the anchor slot.

8.5.17.15 Soil Compaction

A Restoration and Rehabilitation Plan has been prepared for the ACP to address post-construction restoration rehabilitation activities on USFS lands. Soil Compaction is addressed in Section 10.3.1.3 of the COM Plan.

8.5.17.16 Revegetation

A Restoration and Rehabilitation Plan has been prepared for the ACP to address post-construction restoration and rehabilitation activities on USFS lands. Revegetation is addressed in Section 10.3.1.2 of the COM Plan.

8.5.17.17 Mulching

A Restoration and Rehabilitation Plan has been prepared for the ACP to address post-construction restoration and rehabilitation activities on USFS lands. Mulching is addressed in Section 10.3.1.9 of the COM Plan.

8.5.18 Vegetative Streambank Stabilization

Streambanks are always vulnerable to new damage and repairs are periodically required. During construction, banks shall be checked after every high-water event. Gaps in the vegetative cover should be fixed at once, and mulched if necessary. Fresh cuttings from other plants on the bank may be used to fill gaps, or they may be taken from mother-stock plantings if available.

Virginia Requirement:

Vegetative streambank stabilization will be used to protect streambanks from the erosive forces of flowing waters. Vegetative streambank stabilization will be implemented along banks in creeks, streams and rivers subject to erosion from excess runoff. This practice is generally applicable where bankfull flow velocity does not exceed 5 feet per second (ft./sec.) and soils are erosion resistant. Above 5 ft./sec., structural measures are generally required. In accordance with VESCH Std. & Spec 3.22 (Vegetative Streambank Stabilization), Atlantic will adhere to the following design criteria:

- Ensure that channel bottoms are stable before stabilizing channel banks.
- Keep velocities at bankfull flow non-erosive for the site conditions.
- Provide mechanical protection such as rip-rap on the outside of channel bends if bankful stream velocities approach the maximum allowable for site conditions.
- Be sure that requirements of other Commonwealth or federal agencies are met in the design in the case that other approvals or permits are necessary.

8.5.19 Structural Streambank Stabilization

Structural streambank stabilization is applicable to streambank sections which are subject to excessive erosion due to increased flows or disturbance during construction. This practice is generally applicable where flow velocities exceed 5 ft./sec. or where vegetative streambank protection is inappropriate. Any non-biodegradable fabric used for bank stabilization will be removed when vegetation is re-established. Although structural streambank stabilization is not anticipated to be necessary to stabilize streambanks; in the event that it is deemed appropriate, Atlantic will consult with the USFS and seek the AO's approval and other permits as necessary.

Virginia Requirement:

In accordance with VESCH Std. & Spec 3.23 (Structural Streambank Stabilization), Atlantic will adhere to the following general construction and maintenance specifications, where appropriate:

Streambank Protection Measures:

- Riprap - heavy angular stone placed or dumped onto the streambank to provide armor protection against erosion. Installation should be in accordance with Std. & Spec. 3.19 (Riprap)
- Gabions - Rectangular, rock-filled wire baskets are pervious, semi-flexible building blocks which can be used to armor the bed and/or banks of channels or to divert flow away from eroding channel sections. At a minimum, they should be constructed of a

hexagonal triple twist mesh of heavily galvanized steel wire. The design water velocity for channels utilizing gabions should not exceed that given below in Table 8.5.19-1:

TABLE 8.5.19-1

Recommended Gabion Thickness

Gabion Thickness (feet)	Maximum Velocity (feet per second)
1/2	6
3/4	11
1	14

- Deflectors (groins or jetties) - Structural barriers which project into the stream to divert flow away from eroding streambank sections.
- Reinforced Concrete - may be used to armor eroding sections of the streambank by constructing retaining walls or bulk heads. Positive drainage behind these structures must be provided.
- Log Cribbing - a retaining structure built of logs to protect streambanks from erosion. Log cribbing is normally built on the outside of stream bends to protect the streambank from the impinging flow of the stream.
- Grid Pavers - modular concrete units with interspersed void areas which can be used to armor the streambank while maintaining porosity and allowing the establishment of vegetation. These structures may be obtained in pre-cast blocks or mats, or they may be formed and poured in place.

All structures should be maintained in an "as built" condition. Structural damage caused by storm events should be repaired as soon as possible to prevent further damage to the structure or erosion of the streambank.

8.6 ACCESS ROAD CONSTRUCTION

Atlantic has identified roads which will be used to provide access to the proposed ACP pipeline right-of-way and other facilities during construction and operation of the Project. Atlantic will primarily utilize existing roads. Section 2.1.1.4 provides information regarding new access roads proposed to be constructed on USFS lands.

The following conditions apply to the use of all access roads:

- During construction and restoration activities, access to the right-of-way is limited to the use of new or existing access roads identified on the construction drawings.
- The only access roads that can be used in wetlands, other than the construction right-of-way, are those existing roads requiring no modification or improvements, other than routine repair, and posing no impact on the wetland.
- The construction right-of-way may be used for access across wetlands when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., timber matting). However, access is not allowed through wetlands that would not otherwise be impacted by the Project.

- In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

- Maintain safe and accessible conditions at all road crossings and access points during construction and restoration. Access road maintenance through the construction sequence may include grading and the addition of gravel or stone when necessary.

- Maintain access roads in a stable manner to prevent off- right-of-way impacts, including impacts to adjacent and/or nearby sensitive resource areas, and implement all appropriate erosion and sediment control measures for construction/improvement of access roads.

- Minimize the use of tracked equipment on public roadways.

- Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions.

- Repair any damages to roadway surfaces, shoulders, and bar ditches.

- All access roads across a waterbody must use an equipment bridge.

- For access through environmentally sensitive areas such as saturated wetland or waterbodies, use timber mats or an equivalent, unless otherwise authorized by agency permits.

- Limit construction equipment operating in wetland areas to that needed to clear the right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way. All other construction equipment shall use access roads located in upland areas to the maximum extent practical.

- In some cases, existing roads will require improvement (such as grading, gravelling, replacing or installing culverts, minor widening, and/or clearing of overhead vegetation) to safely accommodate construction equipment and vehicles.

- Traffic will be restricted on access roads during unfavorable conditions, such as saturated soil. Gravel, wooden mats or a combination of geotextile and gravel may be used to help facilitate operations during wet periods.

- Roads will be surfaced with gravel or another suitable material to provide a non-erodible running surface.

- Cut-banks and fill-slopes will be stabilized as soon as feasible to a non-erodible condition using vegetation, rock, geotextile material or other suitable material.

- Silt fence or rip rap outlet protection will be constructed at outlets of drainage structures.

- Do not side-cast fill material if there is a chance that it will enter a stream, or if side slope exceeds 60 percent. Full bench construction with end hauling material to a suitable location is recommended when side slopes exceed 60 percent.

- When access roads intersect public highways, the contractor will use a combination of geotextile and gravel (temporary stone construction entrance) to help keep mud off highway entrances.

- Will maintain road so that water can flow freely from the road surface.

Virginia Requirements:

- In accordance with VESCH Std. & Spec 3.03 (Road Stabilization),

- Temporary access roads should be at least 14 feet wide for one-way traffic and 20 feet wide for two-way traffic.

- All cuts and fills will be 2:1 or flatter to the extent possible. A 6-inch course of VDOT #1 Course Aggregate will be applied immediately after grading.

- Temporary access roads will follow the contour as much as possible with grades between 2-10 percent. Steep gradients that exceed these grades may be necessary when boundary lines or buffer areas require such a deviation. In these instances of steep terrain, additional BMPs will be necessary to mitigate the disturbance. Road grades will vary frequently to help reduce road surface erosion.

- In accordance with VESCH Std. & Spec 3.20 (Rock Check Dam), Atlantic will adhere to the following construction and maintenance specifications:

- Use VDOT #1 coarse aggregate alone when the drainage area of the ditch or swale is less than 2 acres. Use a combination of Class I riprap and VDOT #1 coarse aggregate when the drainage area is between 2 and 10 acres.

- Maximum height of the check dam will be 3 feet.

- The center of the check dam must be at least 6 inches lower than the outer edges to create a weir effect.

- Key the check dam into the soil approximately 6 inches for added stability

- Filter cloth may be used under the stone to provide a stable foundation and to facility the removal of the stone.

- The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

- Sediment should be removed from behind the check dams when it has accumulated ½ of the original height of the dam. Erosion caused by high flows around the edges of the dam should be corrected immediately.

- Unless incorporated into a permanent stormwater management control, check dams are to be removed when their useful life has been completed. In temporary ditches and swales, check dams should be removed and the ditch filled in when they are no longer needed. In permanent ditches and swales, check dams should be removed when the grass has matured sufficiently to protect the ditch or swale. The area beneath the check dam should be seeded and mulched immediately after removal.

- Per VESCH Std & Spec 3.17 (Stormwater Conveyance Channel), Atlantic will apply the following general specifications to the construction and maintenance of roadside ditches:
- Trees, stumps, roots and obstructions will be removed and disposed properly;
- The channel will be excavated and graded to the proper grade and cross section;
- Fill will be well compacted;
- Excess soil will be removed and disposed of properly;
- The method used to establish grass in the ditch or channel will depend upon the severity of the conditions encountered. Methods available for grass establishment are set forth in VESCH Std & Spec 3.32 (Permanent Seeding);
- During the initial establishment, grass-lined channels should be repaired immediately and grass re-established if necessary. After grass has become established, the channel should be checked periodically to determine if the grass is withstanding flow velocities without damage. If the channel is to be mowed, it should be done in a manner that will not damage the grass; and
- For riprap-lined channels: riprap will be installed in accordance with VESCH Std. & Spec. 3.19 (Riprap). Riprap-lined channels should be inspected periodically to ensure that scour is not occurring beneath the fabric underlining of the riprap layer. The channel should also be checked to determine that the stones are not dislodged by large flows.

8.7 SPECIAL CONSTRUCTION PROCEDURES

Sensitive areas (e.g. wetland/water body crossings or residential developments) or areas requiring specialized construction measures (e.g. boring or directional drilling) will be treated as separate construction entities. Sensitive areas require additional erosion and sediment control procedures. Specialized construction often combines several construction stages into one and reduces earth disturbance, reducing the amount of erosion and sediment control measures.

8.7.1 Winter Construction

Atlantic has developed and filed a Project-specific winter construction plan with the FERC application; it is included as Attachment D.

The plan addresses:

- Winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);
- Stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and

- Final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

8.7.2 Steep Terrain and Best in Class (BIC) Program

8.7.2.1 Steep Terrain

Atlantic recognizes the increased risk of instability associated with pipeline construction particularly while traversing steep slopes. As a baseline, Atlantic developed a program for use on projects within steep terrain. The program outlines the following engineering design methods which will apply to slip prevention and correction during construction:

- drainage improvement that may include providing subsurface drainage at seep locations through granular fill and outlet pipes, incorporating drainage into trench breakers using granular fill, and/or intercepting groundwater seeps and diverting them from the right-of-way;
- buttressing slopes with bagged concrete mix trench breakers;
- changing slope geometry;
- benching and re-grading with controlled backfill;
- using alternative backfill;
- chemical stabilization of backfill;
- Geogrid reinforced slope that consists of benching existing slope, installing subsurface drains, and incorporating Geogrid reinforcement into compacted backfill; and/or
- retaining structures.

Selection of the most appropriate engineered prevention measure or combination is dependent on the individual site conditions and constraints during the time of construction.

For the ACP Project, Atlantic is also committed to identifying mitigation measures beyond standard practices through the BIC Program. The focus of the BIC Program is to proactively address steep slopes (defined as slopes with an inclination greater than 30 percent and greater than 100 feet in length) and landslide hazards related to pipeline construction, compressor station, and metering and regulation facilities that could potentially impact environmental resources, in particular streams, wetlands, and waterbodies. The BIC program is intended to incorporate the permit requirements from West Virginia and Virginia, and then exceed these regulatory standards, in order to mitigate for potential erosion and sediment discharges related to steep slope and landslide hazards.

The ultimate goal of the BIC Program is to develop project-specific engineering mitigation recommendations and thereby support preparation of steep slope control measures and site-specific ESCP for the ACP Project. The BIC Program has achieved this by assembling a team of internal Dominion stakeholders along with supporting external subject matter experts to develop project- specific mitigation recommendations and in the field determinations, by using a process-based approach that includes: hazard identification and assessment (i.e. find and then understand the hazard), engineering mitigation design (i.e. targeted design measures that mitigate the hazard), monitoring (i.e. track performance to understand if additional mitigation is needed), and operational measures (i.e. monitor and maintain and operate the system, as needed).

The BIC Program Team convened in a series of design workshops to examine the identified hazards and supporting information along the pipeline alignment. The hazards were initially identified by studies such as the Geohazards Assessment or the karst study, and/or from other targeted studies such as the order 1 soil survey. These studies identify and assess or support the review of the hazard, and provide a basis to select the most applicable and robust BIC mitigation response to minimize or eliminate the hazard, and then monitor the hazard through ongoing operations.

The conceptual work-flow process of the BIC Program (see FiguresA-1/2 through A-4) is organized around four general steps, briefly described as follows:

- Hazard Identification - Geologic hazards are systematically identified during the Geohazards Analysis Program through desktop analysis and field reconnaissance as well as by supporting evaluations (e.g. karst studies and soil surveys).

- Hazard Characterization, Assessment, and Threat Classification - As part of the Geohazards Analysis Program, the nature of the geohazards and their potential impacts on the pipeline and environmental resources are assessed. A semi-quantitative ranking of hazard threat level to the proposed pipeline from various geohazards is used to identify areas for further investigation to determine where appropriate mitigation and monitoring measures may need to be designed and implemented during construction.

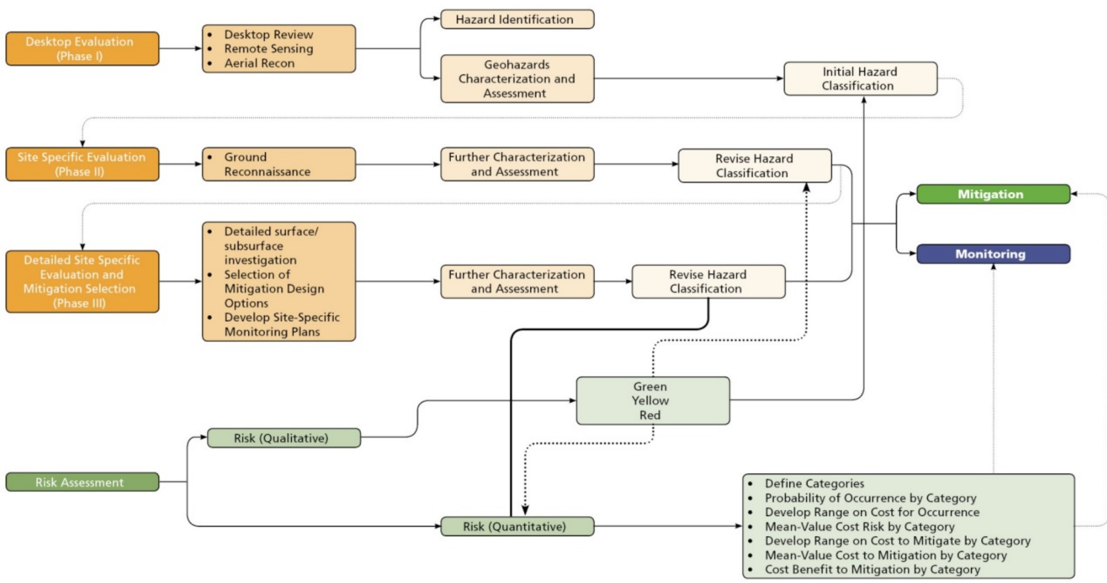
- Hazard Mitigation - Areas for mitigation are selected based upon potential risk to the pipeline, environment, and operations and maintenance. Overall hazard reduction techniques may include BIC construction practices and/or best management practices.

- Site and hazard specific plans have been developed based on the recommendations of the Geohazards Analysis Program and mitigation techniques selected by a BIC team of experts. The site and hazard specific plans will address the specific geologic hazard (e.g., slip, stream scour, ground displacement) with detailed mitigation measures, as applicable, for construction and/or operation of the Project. Atlantic will incorporate these measures into ESCP and corresponding SWPPPs.

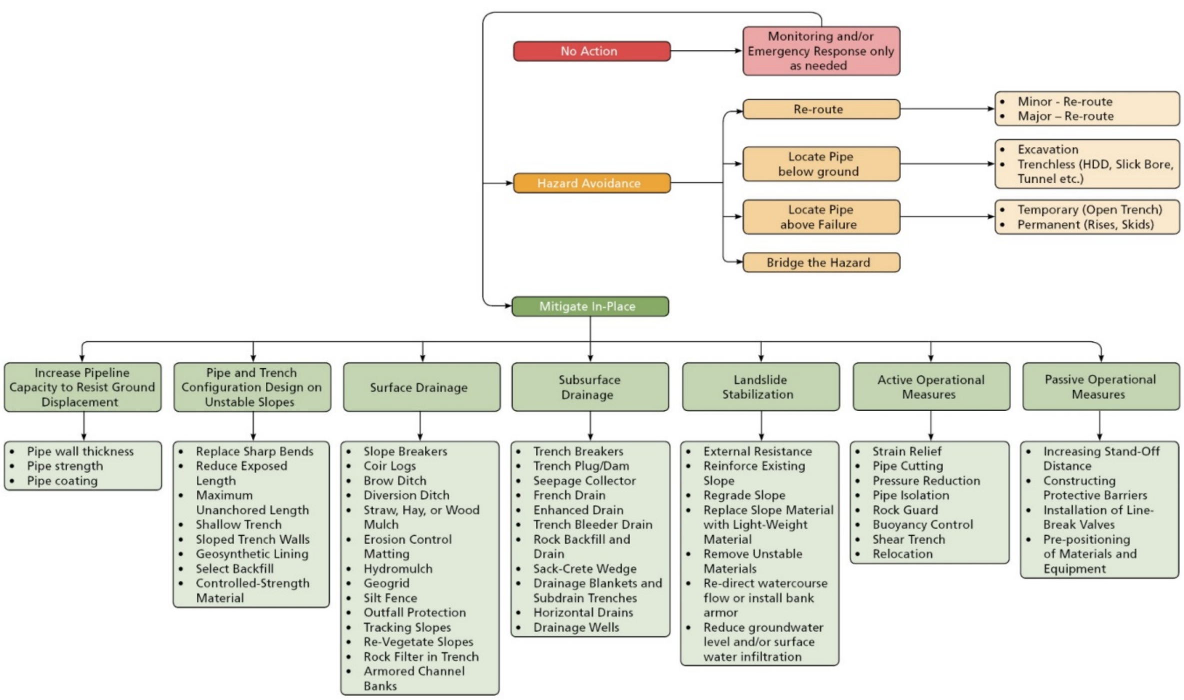
- Hazard Monitoring - Atlantic will monitor mitigation techniques to assess their effectiveness and the need for further mitigation, if appropriate.

The ultimate goal of the BIC Program is to develop project-specific engineering mitigation recommendations targeting un-authorized discharges to water bodies resulting from steep slope, landslide and erosion hazards. The locations where the BIC Program will be implemented are identified on the construction alignment sheets (Attachment A) and on plans developed for a select group of the most challenging and unique steep slopes requiring site-specific designs (Attachment G).

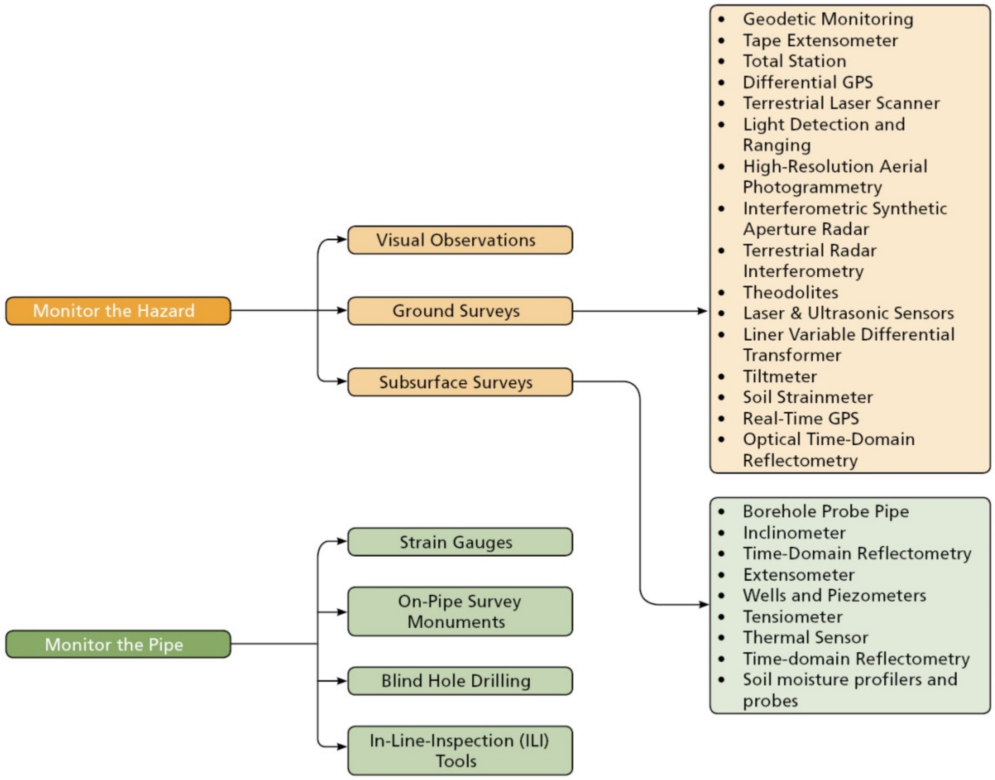
A-1/2: Hazard Identification and Assessment



A-3: Hazard Mitigation



A-4: Hazard Monitoring



Atlantic will provide specific employee training which will be developed from the BIC program. Atlantic personnel with responsibility for pipeline routing, construction, or operation must be trained in this procedure on an annual basis. The training may be completed by an online learning management system module or may be conducted by Energy Infrastructure Environmental Services personnel, or Atlantic Engineering Management. At a minimum, the following personnel will be trained;

- Engineering Directors and Managers;
- Design and construction engineers;
- Operations Directors, Managers and Supervisors;
- Construction supervisors; and
- Construction and operations ECC.

The training must include the following;

- Types and causes of slope failures;
- Routing avoidance and desktop methods;
- Field reconnaissance;
- Risk prioritization;
- Pipeline design and engineering to prevent slope failures;
- Addressing slope failures during construction;
- Addressing slope failures post construction; and
- Reporting requirements.

8.7.3 Seeps

In the event that subsurface flow is encountered, an under drain will be utilized, as necessary, to divert water away from the right-of-way. If encountered, seeps can be mitigated by using seep collectors placed down-slope of areas showing seepage. Armored fill placed at the toe of the slope may be used in areas of steep slopes in addition to a perforated drain pipe to divert subsurface water away from the cut slope. These structures may be kept in place or re-installed after construction in a manner that avoids seepage concentrations from the right-of-way while minimizing overall changes to subsurface flow. On steep slopes these seeps, as identified during construction, would go through an incremental layer of field review, per the BIC Program, to determine if additional erosion controls would be required.

8.8 INSPECTION FREQUENCY

Inspection of temporary erosion and sediment control measures with occur at least:

- On a daily basis in areas of active construction or equipment operation;
- On a twice-weekly basis in areas with no construction or equipment operation; and
- Within 24 hours of each stormwater event (runoff from precipitation, snowmelt, surface runoff and drainage, including rainfall events resulting in 0.5 inches or more).

8.8.1 Virginia Requirements

In accordance with CGP condition Part I.B.4, the following will be implemented for construction activities within the Chesapeake Bay TMDL Watershed:

1. Permanent or temporary soil stabilization will be applied to denuded areas within 7 days after final grade is reached on any portion of the site;

2. Nutrients will be applied in accordance with manufacture's recommendations or an approved nutrient management plan and will not be applied during rainfall events; and

3. Inspection requirements are as follows:

    a. Inspections will be conducted at a frequency of (i) at least once every four business days or (ii) at least once every five business days and no later than 48 hours following a measurable storm event (a measurable storm event is defined as a rainfall event producing 0.25 inches of rain or greater over 24 hours). In the event a measurable storm event occurs when there are more than 48 hours between business days, the inspection will be conducted on the next business day; Note that Atlantic will follow a more stringent or protective inspection frequency stipulated by FERC (see above), and

    b. Representative inspections used by linear construction projects will include all outfalls discharging to surface waters identified as impaired or for which a TMDL wasteload allocation has been established and approved prior to the term of the CGP. Representative inspections occur once temporary or permanent soil stabilization has been installed and vehicle access may compromise the temporary or permanent soil stabilization and potentially cause additional land disturbance increasing the potential for erosion. Runoff from the temporary or permanently stabilized pipeline right-of-way will generally occur as sheet flow and will not be discharged through discrete outfalls. In the event that an outfall is present along the pipeline right-of-way, representative inspections within the Chesapeake Bay Watershed will include those discrete outfalls. The proposed access roads located within the TMDL watershed will be covered under the general inspections, outlined in Section 8.1, due to accessibility to the roadway.

8.9 CORRECTIVE ACTION

DIT and/or their contractors will take corrective action to any of the inspected areas that have reported deficiencies to the control measures in place. Repairs will be made within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts.

8.10 REPORTING

Section 3.8 of the COM Plan discusses general inspection reporting requirements. Additional reporting requirements specific to the ESCP are as follows:

- Atlantic will maintain records that identify by milepost:
  - method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;
  - acreage treated;
  - dates of backfilling and seeding;
  - names of landowners requesting special seeding treatment and a description of the follow-up actions;
  - the location of any subsurface drainage repairs or improvements made during restoration; and
  - any problem areas and how they were addressed.
- Atlantic will submit quarterly reports to the USFS documenting the results of follow-up inspections; any problem areas,; and corrective actions taken for at least 2 years following construction.

8.11 POST-CONSTRUCTION ACTIVITIES AND MAINTANANCE

8.11.1 Monitoring Program

Atlantic and/or their contractors will follow the following post-construction monitoring and maintenance guidelines.

- Restoration will be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed , revegetation is successful, and proper drainage has been restored.
- Once final stabilization is conducted, Atlantic and/or their contractors will conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of

revegetation and address landowner concerns. At a minimum, Atlantic will conduct inspections after the first and second growing seasons.

- NNIS monitoring/treatment will be done in accordance with Section 11, the Non-Native Invasive Plant Species Management Plan.

- Revegetation efforts will continue until revegetation is successful (see Section 10.4).

- Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.

8.11.2 Monitor and record the success of wetland revegetation annually until wetland revegetation is successful, as described in Section 9.5.3. Maintenance

- The permanent pipeline right-of-way will be maintained in an herbaceous state. Woody vegetation within the permanent right-of-way will be cleared periodically, in order to maintain accessibility of the right-of-way for maintenance and to accommodate pipeline integrity surveys, In uplands, trees and brush will be cleared over the entire width of the permanent right-of-way on an as-needed basis not to exceed once every 3 years. In wetlands and riparian areas, a 10-foot-wide corridor centered over the pipeline will be cleared at a frequency necessary for the corridor to be permanently maintained in an herbaceous state, as allowed by the Procedures. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating may be selectively cut and removed from the permanent right-of-way. stateIn no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the FWS.

- Atlantic will not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Atlantic will not conduct routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

- Atlantic will not use herbicides or pesticides in or within 100 feet of a stream or wetland, except as allowed by the appropriate federal or state agency.

- Within 3 years after construction, Atlantic will file a report with the FERC identifying the status of the wetland revegetation efforts and documenting success. For any wetland where revegetation is not successful at the end of 3 years after construction, Atlantic will develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Atlantic will continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

- Atlantic will make efforts to control unauthorized off-road vehicle use, as described in Section 18, the Off-Highway Vehicle Blocking Plan (Blocking Plan).

8.12 STORMWATER MANAGEMENT

Where pre-development land cover conditions are changed significantly triggering requirements for post-construction stormwater quality and quantity requirements, post-construction BMPs may be required to comply with water quality and water quantity criteria and MS-19 of the Erosion and Sediment Control Regulations.

8.12.1 West Virginia Requirements

The West Virginia Department of Environmental Protection recognizes that construction of aboveground and underground linear utilities may not result in changes to the post-development runoff characteristics of the land surface after the completion of the construction and final stabilization. The installation of the ACP pipeline is an example of such a Project where the areas disturbed will be returned to their pre-development condition. Therefore, the preparation and implementation of post-construction stormwater management measures for the pipeline portion of the Project is not warranted.

Within the MNF, forest/open space or managed turf will be returned to a vegetative state and characteristics of stormwater runoff should remain unchanged. Therefore, post-construction stormwater management will not be required for the portion of the Project within the MNF.

8.12.2 Virginia Requirements

The VDEQ recognizes that construction of aboveground and underground linear utilities may not result in changes to the post-development runoff characteristics of the land surface after the completion of the construction and final stabilization. The installation of the ACP pipeline is an example of such a Project where the areas disturbed will be returned to their pre-development condition. Therefore, the preparation and implementation of post-construction stormwater management measures for the pipeline portion of the Project is not warranted.

Within the GWNF, forest/open space or managed turf will be returned to a vegetative state and characteristics of stormwater runoff should remain unchanged. Therefore, post-construction stormwater management will not be required for the portion of the Project within the GWNF.

8.13 VARIANCE TO OPEN TRENCH LENGTH

The Virginia Erosion and Sediment Control Law Minimum Standard 16a requires that no more than 500 feet of trench remain open at one time. However, this requirement would significantly slow construction and increase the amount of time the work area remains disturbed. In accordance with 9 VAC 25-870-50, Atlantic will request that VDEQ approve open trench work greater than 500 feet where necessary to facilitate efficient and effective construction in compliance with Virginia Erosion and Sediment Control Law.

Any other variances to this plan or the State Minimum Standards must be approved prior to implementation. The EI will monitor any variance-related activities.

8.14 ADDITIONAL MITIGATION MEASURES FOR U.S. FOREST SERVICE LANDS

On USFS lands, additional measures will be implemented in conformance with the applicable standards and guidelines identified in the MNF and GWNF LRMPs. If a general mitigation measure as described above is more stringent than an applicable standard or guideline, the more stringent measure will be applied.

8.14.1 Monongahela National Forest

- Maintain, restore, or improve soil quality, productivity, and function. Manage soil disturbances from management activities such that they do not result in long-term loss of inherent soil quality and function. (**MNF LRMP SW01**).

- Disturbed soils dedicated to growing vegetation shall be rehabilitated by fertilizing, liming, seeding, mulching, or constructing structural measures as soon as possible, but generally within 2 weeks after Project completion, or prior to periods of inactivity, or as specified in contracts. Rip compacted sites when needed for vegetative re-establishment and recovery of soil productivity and hydrologic function. The intent is to minimize the time that soil is exposed on disturbed sites or retained in an impaired condition. (**MNF LRMP SW03**).

- Erosion prevention and control measures shall be used in program and Project plans for activities that may reduce soil productivity or cause erosion. (**MNF LRMP SW04**).

- Severe rutting resulting from management activities shall be confined to less than 5 percent of an activity area. (**MNF LRMP SW06**). Note: MNF is considering a project-specific LRMP amendment to this standard,

- Use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site area conditions:

    - Steep Slopes (40 to 50 percent) – Operation on these slopes shall be analyzed on a case-by- case basis to determine the best method of operation while maintaining soil stability and productivity.

    - Very Steep Slopes (more than 50 percent) – Use is prohibited without recommendations from interdisciplinary team review and line officer approval.

    - Susceptible to Landslides – Use on slopes greater than 15 percent with soils susceptible to downslope movement when loaded, excavated, or wet is allowed only with mitigation measures during periods of freeze-thaw and for one to multiple days following significant rainfall events. If the risk of landslides during these periods cannot be mitigated, then use is prohibited.

- Soils Commonly Wet At Or Near The Surface During A Considerable Part Of The Year, Or Soils Highly Susceptible To Compaction. Equipment use shall normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur. (**MNF LRMP SW07**). Note: MNF is considering a project-specific LRMP amendment to this standard,

    - Management actions that have the potential to contribute to soil nutrient depletion shall be evaluated for the potential effects of depletion in relation to on-site acid deposition conditions. (**MNF LRMP SW08**).

- Inventory the soil resource to the appropriate intensity level as needed for Project planning and/or design considerations. (**MNF LRMP SW10**).

- Soil stabilization procedures should take place as soon as practical after earth-disturbing activities are completed or prior to extended periods of inactivity. Special revegetation measures may be required. (**MNF LRMP SW11**).

- Use Forest-wide soils map(s) and county soil survey report interpretations to help determine soil characteristics and protection needs. (**MNF LRMP SW12**).

- Topsoil should be retained to improve the soil medium for plant growth on areas to be disturbed by construction. Topsoil should be salvaged from an area during construction and stockpiled for use during subsequent reclamation, or obtained from an alternate site. On some areas, soil material may have to be added to obtain vigorous plant growth. Soil to be used for this purpose should have chemical tests made to determine its desirability for use. (**SW15**).

- Where the removal of vegetative material, topsoil, or other materials may result in erosion, the size of the area may be limited from which these materials are removed at any one time. (**MNF LRMP SW16**).

- Management activities that may result in accelerated erosion and loss of organic matter should have one or more of the following practices applied to mitigate potential effects:

  - Limiting mineral soil exposure,

  - Appropriately dispersing excess water,

  - Ensuring sufficient effective groundcover,

  - Stabilizing disturbed soils through revegetation, mulching, or other appropriate means,

  - Preventing or minimizing excessive compaction, displacement, puddling, erosion, or burning of soils, and

  - Preventing or minimizing the initiation or acceleration of mass soil movement (e.g., slumps, debris flows, or landslides). (**MNF LRMP SW19**)

- Where new roads and skid roads cross stream channels, channel and bank stability shall be maintained. (**MNF LRMP SW35**).

- When stream crossing structures are removed, stream channels shall be restored to their near natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces). Disturbed soil shall be stabilized. (**MNF LRMP SW36**).

- New structures (culverts, bridges, etc.) shall be designed to accommodate storm flows expected to occur while the structures are in place. Use scientifically accepted methods for calculating expected storm flows. (**MNF LRMP SW46**).

- Ground disturbance should be avoided within seeps, vernal pools, bogs, fens, and other wetlands during Project implementation. These areas should be managed to protect wet soils and rare plants and provide wildlife watering sources using the following protection:

- No new system roads or skid roads should be located within these areas except at essential crossings. Such crossings should be designed to minimize disturbance to the extent practical.
- Logs should not be skidded through these areas. Keep slash and logs out of them.

- For protection of cold water fisheries, apply the following to the channel buffers of perennial trout streams (stocked and native) during the period of October 1 to June 1:
  - Potential sediment-producing ground disturbance exceeding two consecutive days shall only be initiated after consultation with a Forest fisheries biologist.
  - Sediment-producing ground disturbance during this period shall use additional erosion control measures and seeding or mulching, applied concurrently with the activity. (**MNF LRMP WF14**).

- Work with USDA state and private forestry and county extension agents to identify or develop sources for weed-free straw and mulch. (**MNF LRMP VE20**).

8.14.2 George Washington National Forest

- On all soils dedicated to growing vegetation, the organic layers, topsoil and root mat will be left in place over at least 85 percent of the activity area and revegetation is accomplished within 5 years. (The activity area is the area of potential soil disturbance expected to produce vegetation in the future, for example: timber harvest units, prescribed burn area, grazing allotment, etc.). **(GWNF LRMP FW-5)**. Note: GWNF is considering a project-specific LRMP amendment to this standard,

- Locate and design management activities to avoid, minimize, or mitigate potential erosion. **(GWNF LRMP FW-6)**

- Use ditchlines and culverts when new permanent road construction grades are more than 6 percent and the road will be managed as open for public use. **(GWNF LRMP FW-7)**

- Where soils are disturbed by management activities, appropriate revegetation measures should be implemented. When outside the normal seeding seasons, initial treatments may be of a temporary nature, until permanent seeding can be applied. Revegetation should be accomplished within 5 years. For erosion control, annual plants should make up >50 percent of seed mix when seeding outside the normal seeding season and the area should be reseeded with perennials within 1½ years. **(GWNF LRMP FW-9)**

- Clearcutting is not allowed where high risk soils (as described in Chapter 3-Management Approach for Soils and in the Glossary) are identified. **(GWNF LRMP FW-12)**

- Motorized vehicles are restricted in the channeled ephemeral zone to designated crossings. Motorized vehicles may only be allowed on a case=by-case basis, after site-specific analysis, in the channeled ephemeral zone outside of designated crossings. **(GWNF LRMP FW-15)** Note: GWNF is considering a project-specific LRMP amendment to this standard,

- Management activities expose no more than 10 percent mineral soil in the channeled ephemeral zone. **(GWNF LRMP FW-16)** Note: GWNF is considering a project-specific LRMP amendment to this standard,

- Favor use of native grasses and wildflowers beneficial as wildlife foods when seeding temporary roads, skid roads, log landings and other temporary openings when slopes are less than 5 percent. On slopes greater than 5 percent, favor use of vegetation that best controls erosion. **(GWNF LRMP FW-93)**

- A contractor's sources of fill, soil, shale, and related materials will be pre-approved. Contractors will submit a description of the source. The Project inspector or a qualified designee will inspect the supply source. Use of the source will be prohibited if contaminated by transferable agents of invasive species. **(GWNF LRMP FW-95)**

- The soils of riparian corridors have an organic layer (including litter, duff, and/or humus) of sufficient depth and composition to maintain the natural infiltration capacity, moisture regime, and productivity of the soil (recognizing that floods may periodically sweep some areas within the floodplain of soil and vegetation). **(GWNF LRMP DC 11-03)**

- Exposed mineral soil and soil compaction from human activity may be present but are dispersed and do not impair the productivity and fertility of the soil. Any human-caused disturbances or modifications that cause environmental degradation through concentrated runoff, soil erosion, or sediment transport to the channel or waterbody are promptly rehabilitated or mitigated to reduce or eliminate impacts. **(GWNF LRMP DC 11-04)**

- Management activities expose no more than 10 percent mineral soil within the Project area riparian corridor. **(GWNF LRMP DC 11-003)**

- To minimize the length of streamside disturbance, ensure that approach sections are aligned with the stream channel at as near a right angle as possible. Locate riparian corridor crossings to minimize the amount of fill material needed and minimize channel impacts. Generally, permanent structures or temporary bridges on permanent abutments are provided when developing new crossings on perennial streams. Permanent structures, temporary bridges or hardened fords are used when crossing intermittent streams. **(GWNF LRMP DC 11-050)**

- If culverts are removed, stream banks and channels must be restored to a natural size and shape. All disturbed soil must be stabilized. **(GWNF LRMP DC 11-054)**

- For activities not already covered in the above standards, ground disturbing activities are allowed within the corridor if the activity will cause more resource damage if it were located outside the corridor, on a case-by-case basis following site-specific analysis. Any activity allowed under these conditions is minimized and effective sediment trapping structures such as silt fences, brush barriers, straw bale barriers, gravelling, etc., are required. Sediment control, prior to, or simultaneous with, the ground disturbing activities, is provided. **(GWNF LRMP DC 11-058)**

9.0 STREAM AND WETLAND CROSSING PROCEDURES

9.1.1 PURPOSE

The intent of these Procedures is to identify mitigation measures for minimizing the extent and duration of Project-related disturbance on wetlands and waterbodies in the MNF and GWNF. The Stream and Wetland Crossing Procedures are based on Project-wide wetland and waterbody measures developed by the FERC, modified to take into account standards and guidelines from both Forests' LRMPs. Tables 2.1.1-4 and 2.1.1-5 show waterbodies crossed on MNF and GWNF lands, respectively. Only two wetlands are crossed; both on the GWNF. Wetlands are discussed in Section 9.5. If, prior to Project construction, Atlantic identifies individual measures in the FERC's standard wetland and waterbody procedures considered unnecessary, technically infeasible, or unsuitable due to local conditions, it may request variations to the FERC procedures (and to this COM Plan). Any such request will fully describe alternative measures, and explain how those alternative measures would achieve a comparable level of mitigation.

9.1.2 DEFINITIONS

- "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:
    - "minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing;
    - "intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing; and
    - "major waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of crossing.
- "Wetland" includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

9.2 PRECONSTRUCTION FILING

For any wetlands and waterbodies on USFS lands, the following information will be submitted to the AO prior to the beginning of construction, for the review and written approval by the AO. Such information must also be approved in writing by the FERC:

- site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland; and
- site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.

9.3 ENVIRONMENTAL INSPECTORS

At least one EI having knowledge of the wetland and waterbody conditions in the Project area is required for each construction spread. The number and experience of EIs assigned to each construction spread will be appropriate for the length of the construction spread and the number/significance of resources affected. The responsibilities of the EI are outlined in the Plan.

9.4 WATERBODY CROSSINGS

9.4.1 NOTIFICATION PROCEDURES AND PERMITS

Atlantic will do the following:

- Apply to the USACE, or its delegated agency, for the appropriate jurisdictional wetland and waterbody crossing permits.

- Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

- Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

- Notify appropriate federal and state authorities, including the USFS, at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

9.4.2 INSTALLATION

9.4.2.1 Time Window for Construction

Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, will occur during the following time windows:

Monongahela National Forest

- coldwater fisheries - June 1 through September 15; and
- warmwater fisheries - July 1 through March 31.

George Washington National Forest

- Virginia Brook Trout fisheries – April 1 – September 30

The MNF specifies that stream crossing construction on temporary and permanent roads should be completed as soon as practical, with mitigation as needed to minimize the potential for sedimentation **(MNF LRMP SW-62).** The GWNF specifies that construction of crossings is completed on all channeled ephemerals as soon as possible after work has started on the crossing. Permanent and temporary roads on either side of crossings within the channeled ephemeral zone are to be graveled **(MNF LRMP SW-24).**

The Project will comply with **GWNF LRMP 11-048**, which stipulates that for any road construction within riparian corridors, in-stream use of heavy equipment or other in-stream disturbance activities is limited to the amount of time necessary for completion of the project, that construction of crossings is completed on all streams as soon as possible after work has started on the crossing, and that permanent and temporary roads on either side of stream crossings within the riparian corridor are graveled. The Project will comply with **GWNF LRMP 11-049**, which stipulates that when constructing roads within the riparian corridor, each road segment will be stabilized prior to starting another segment, and that stream crossings will be stabilized before road construction proceeds beyond the crossing.

9.4.2.2 Extra Work Areas

Atlantic will do the following:

- Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 100 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

- Submit for review and written approval by the AO, site-specific justification for each extra work area with a less than 100-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification will specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected. Such information must also be approved in writing by the FERC.

- Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

9.4.2.3 Crossing Procedures

Atlantic will do the following on all USFS lands:

- Comply with the USACE, or its delegated agency, permit terms and conditions.

- Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

- Where pipelines parallel a waterbody, maintain buffers of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact. These buffer widths are 100 feet for perennial streams, and large intermittent streams (i.e. >50 acre drainage areas), 50 feet for small intermittent streams (i.e. <50 acre drainage area) and 25 feet for ephemeral streams. These buffer widths may be adjusted based on site-specific conditions, upon review and approval of the USFS.

- Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

- Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

- Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) will be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

- Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the EI verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, Atlantic will comply with all applicable Procedure requirements for “waterbodies”.

The following standards apply to MNF lands:

- Design crossings so stream flow does not pond above the structure during normal flows to reduce sediment deposition and safely pass high flows **(MNF LRMP SW60).**
- Provide passage for fish and other aquatic organisms at all new or reconstructed stream crossings of existing or potential fish-bearing streams. Exceptions may be allowed to prevent the upstream migration of undesired species **(MNF LRMP WF21).**
- Allow pipelines within channel buffers but limit them to essential crossings **(MNF LRMP MG41).**
- Avoid construction of pipelines running parallel to streams **(MNF LRMP MG40).**
- Restore steam channels when stream crossing structures are removed to their near-natural morphology (width, depth, and gradient associations for streambeds, streambanks, floodplains, and terraces). Stabilize disturbed soil **(MNF LRMP SW36).**

The following standards apply to GWNF lands:

- Improve connectivity of stream systems through replacement of standard culverts with crossing structures that allow for full passage of all aquatic organisms **(GWNF LRMP Strategy).**
- In the channeled ephemeral zones, up to 50 percent of the basal area may be removed down to a minimum basal area of 50 square feet per acre. Removal of additional basal area is allowed on a case=by=case basis when needed to benefit riparian-dependent resources. **(GWNF LRMP FW-17)** Note: GWNF is considering a project-specific LRMP amendment to this standard,
- Tree removals from the core of the riparian corridor may only take place if needed to: enhance the recovery of the diversity and complexity of vegetation native to the site; rehabilitate both natural and human-caused disturbances; provide habitat improvements for aquatic or riparian species; or threatened, endangered, sensitive, and locally rare species; reduce fuel build-up; provide for public safety; for approved facility construction/renovation; or as allowed in standards 11-015 or 11-024. **(GWNF LRMP 11-019).** Note: GWNF is considering a project-specific LRMP amendment to this standard,
- Use culverts, temporary bridges, hardened fords, or corduroy where needed to protect channel or bank stability when crossing channeled ephemeral streams **(GWNF LRMP FW-23).**

9.4.2.4 Spoil Pile Placement and Control

All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings will be placed in the construction right-of-way at least 10 feet from the water’s edge or in additional extra work areas as described in Section 8.2.2. Atlantic will use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

9.4.2.5 Equipment Bridges

Only clearing equipment and equipment necessary for installation of equipment bridges will cross waterbodies prior to bridge installation. Atlantic will limit the number of such crossings of each waterbody to one per piece of clearing equipment. Atlantic will construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

- equipment pads and culvert(s);
- equipment pads or railroad car bridges without culverts;
- clean rock fill and culvert(s); and
- flexi-float or portable bridges.

Additional options for equipment bridges may be utilized by Atlantic that achieves the performance objectives noted above. Atlantic will not use soil to construct or stabilize equipment bridges.

Atlantic will design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place and align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

Atlantic will design and maintain equipment bridges to prevent soil from entering the waterbody and remove temporary equipment bridges as soon as practicable after permanent seeding. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, Atlantic will remove temporary equipment bridges as soon as practicable after final cleanup.

Culverts and bridges will be designed to accommodate storm flows expected to occur while the structures are in place and use scientifically accepted methods for calculating expected storm flows (MNF SW46). Atlantic will construct stream crossings and bridges to withstand major storm and runoff events (GWNF Climate Change Strategy).

9.4.2.6 Roads and Skid Trails

During watershed or Project-level analysis, Atlantic will assess existing or proposed road stream crossings for effects to stream channel form and function, including channel stability, passage of storm flows and associated debris, and passage of aquatic organisms. It will prioritize crossings to address or correct identified concerns **(GWNF LRMP SW32).**

Where new roads cross stream channels, channel and bank stability shall be maintained **(MNF LRMP SW35).** Where new roads cross streams or high-risk areas, disturbed soils will be stabilized and designed drainage structures will be installed as soon as the soil is disturbed, in concert with the beginning of the work. High-risk areas include landslide prone areas, steep slopes, and highly erosive soils **(MNF LRMP RF07).**

Skid trails used for logging may cross riparian corridors at designated crossings. If crossing a perennial or intermittent stream is unavoidable, Atlantic will use a temporary bridge or other approved method within the state BMP. Stabilization of skid trails will occur as soon as possible to minimize soil movement downslope (GWNF FW-142). Skidding of trees should be directed in a manner that prevents creation of channels or gullies that concentrate water flow to adjacent streams **(GWNF LRMP FW143).**

9.4.2.7 Dry-Ditch Crossing Methods

Unless approved otherwise by the appropriate federal or state agency, Atlantic will install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally- designated as critical habitat.

Dam and Pump

The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage. Implementation of the dam-and-pump crossing method will meet the following performance criteria:

- use sufficient pumps, including on-site backup pumps, to maintain downstream flows;
- construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
- screen pump intakes to minimize entrainment of fish;
- prevent streambed scour at pump discharge; and
- continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

Flume Crossing

The flume crossing method requires implementation of the following steps:

- install flume pipe after blasting (if necessary), but before any trenching;
- use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);
- properly align flume pipe(s) to prevent bank erosion and streambed scour;
- do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and
- remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

9.4.2.8 Temporary Erosion and Sediment Control

Atlantic will install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures will be implemented at stream crossings:

- install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or driveable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;

- where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and

- use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

9.4.2.9 Trench Dewatering

Atlantic will dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Atlantic will remove the dewatering structures as soon as practicable after the completion of dewatering activities.

9.4.3 RESTORATION

Atlantic will do the following:

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, it will complete streambed and bank stabilization before returning flow to the waterbody channel.

3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the EI

4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Atlantic will not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

5. Comply with the USACE or its delegated agency, permit terms and conditions in the application of riprap for bank stabilization.

6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

7. Revegetate disturbed riparian areas with native species of conservation grasses, pollinator-friendly species, legumes, and woody species, similar in density to adjacent undisturbed lands.

8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the EI, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

Numbers 3 through 7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

Atlantic will maintain, enhance, or restore vegetation conditions that provide (**MNF LRMP SW31):**

- Ecological functions of riparian, wetland, and aquatic ecosystems.
- Canopy conditions that regulate riparian and stream temperature regimes for native and desired non-native fauna and flora.
- Natural recruitment potential for large woody debris and other sources of nutrient inputs to aquatic ecosystems.
- Bank and channel stability and structural integrity.
- Habitat and habitat connectivity for aquatic and riparian-dependent species and upland species that use riparian corridors.
- Buffers to filter sediment.

If culverts are removed, banks and channel will be restored to a natural size and shape. All disturbed soil will be stabilized **(GWNF LRMP FW-25).** Temporary stream crossings will be removed and rehabilitated **(GWNF LRMP FW-144).**

9.4.4 POST-CONSTRUCTION MAINTENANCE

The permanent pipeline right-of-way will be maintained in an herbaceous state. Woody vegetation within the permanent right-of-way will be cleared periodically, in order to maintain accessibility of the right-of-way for maintenance and to accommodate pipeline integrity surveys, In uplands, trees and brush will be cleared over the entire width of the permanent right-of-way on an as-needed basis not to exceed once every 3 years. In wetlands and riparian areas, a 10-foot-wide corridor centered over the pipeline will be cleared at a frequency necessary for the corridor to be permanently maintained in an herbaceous state, as allowed by the Procedures. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating may be selectively cut and removed from the permanent right-of-way.

Atlantic will not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points. Atlantic will not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

9.5 WETLAND CROSSINGS

Wetland crossings shall minimize disturbance to the wetland **(MNF LRMP MG33).**

New road construction will avoid wetlands where feasible. If a wetland cannot be avoided, road construction may be allowed as long as the subsurface drainage patterns can be preserved and maintained. Any road that would cross a wetland will cross in a way that minimizes disturbance to the wetland (MNF RF06).

Atlantic will route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, Atlantic will route the new pipeline in a manner that minimizes disturbance to wetlands.

Atlantic will limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the AO will be sought where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Such requests must also be approved in writing by the FERC.

Wetland boundaries and buffers will be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

Ground disturbance will be avoided to the extent practicable within seeps, vernal pools, bogs, fens, and other wetlands during Project implementation. These areas will be managed to protect wet soils and rare plants and provide wildlife watering sources using the following protection (**MNF LRMP SW51):**

- No new road will be located within these areas except at essential crossings. Such crossings should be designed to minimize disturbance to the extent practical.
- Logs will not be skidded through these areas and slash and logs will be kept out of them.
- Where available, a canopy of 60-100 percent crown closure will be maintained within and adjacent to these areas, unless a more open canopy is needed for Threatened, Endangered, and Protected species or Regional Forest Sensitive Species management.
- Mast trees or shrubs may be planted in seeps if mast plants are currently lacking.

9.5.1 INSTALLATION

9.5.1.1 Extra Work Areas and Access Roads

Atlantic will locate all extra work areas (such as staging areas and additional spoil storage areas) at least 100 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

Atlantic will submit to the AO for review and written approval, site-specific justification for each extra work area with a less than 100-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification will specify the site-specific conditions that will not permit a 50 foot setback and measures to ensure the wetland is adequately protected. Such requests must also be approved in writing by the FERC.

The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right- of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats). Severe rutting resulting from management activities shall be confined to less than 5 percent of an activity area **(MNF LRMP SW06).**

In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing will use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, Atlantic will limit all other construction equipment to one pass through the wetland using the construction right-of-way.

The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

9.5.1.2 Crossing Procedures

Atlantic will comply with U.S. Army Corps of Engineers permit terms and conditions. It will assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe. Atlantic will use “push-pull” or “float” techniques to place the pipe in the trench where water and other site conditions allow. Atlantic will minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.

Atlantic will limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

Atlantic will cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

Atlantic will limit pulling of tree stumps and grading activities to directly over the trenchline. It will not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Construction Site Supervisor and EI determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

Atlantic will segregate the top 1 foot of topsoil from over the trenchline within wetland areas, except in areas where standing water is present or soils are saturated. Immediately after backfilling is complete, Atlantic will restore the segregated topsoil to its original location.

Atlantic will not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

If standing water or saturated soils are present or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, Atlantic will use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

Atlantic will remove all Project-related material used to support equipment on the construction right-of-way upon completion of construction.

9.5.1.3 Temporary Sediment Control

Atlantic will install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in this Section, Atlantic will maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

Atlantic will install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, Atlantic will install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

Atlantic will install sediment barriers along the edge of the construction right-of- way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.

If soils are commonly wet at or near the surface during a considerable part of the year, or if soils are highly susceptible to compaction, equipment use will normally be avoided or mitigated by Atlantic when soils are saturated or when freeze-thaw cycles occur **(MNF LRMP SW07d).**

9.5.1.4 Trench Dewatering

Atlantic will dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Atlantic will remove the dewatering structures as soon as practicable after the completion of dewatering activities.

9.5.2 RESTORATION

Where the pipeline trench may drain a wetland, Atlantic will construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology. Atlantic will restore pre-construction wetland contours to maintain the original wetland hydrology.

For each wetland crossed, Atlantic will install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. It will install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, Atlantic will install sediment barriers as outlined in the Plan. In some areas, with the approval of the EI, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

Atlantic will not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

Atlantic will consult with the appropriate federal or state agencies to develop a Project- specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of non-native invasive species and noxious weeds (e.g., purple loosestrife), and monitoring the success of the revegetation and weed control efforts. Atlantic will provide this plan to the FERC staff upon request.

Atlantic will ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.

Atlantic will remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.

9.5.3 POST-CONSTRUCTION MAINTENANCE AND REPORTING

The permanent pipeline right-of-way will be maintained in an herbaceous state. Woody vegetation within the permanent right-of-way will be cleared periodically, in order to maintain accessibility of the right-of-way for maintenance and to accommodate pipeline integrity surveys, In uplands, trees and brush will be cleared over the entire width of the permanent right-of-way on an as-needed basis not to exceed once every 3 years. In wetlands and riparian areas, a 10-foot-wide corridor centered over the pipeline will be cleared at a frequency necessary for the corridor to be permanently maintained in an herbaceous state, as allowed by the Procedures. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating may be selectively cut and removed from the permanent right-of-way. Atlantic will not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

Atlantic will not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.

Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.

Atlantic will monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

Wetland revegetation will be considered successful if all of the following criteria are satisfied:

- the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);
- vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;
- if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and
- non-native invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

For any wetland where revegetation is not successful at the end of 3 years after construction, Atlantic will develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Atlantic will continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

9.6 HYDROSTATIC TESTING

9.6.1 NOTIFICATION PROCEDURES AND PERMITS

No hydrotest water withdrawals or discharges are planned on USFS lands.

10.0 RESTORATION AND REHABILITATION PLAN

10.1 PURPOSE

This Restoration and Rehabilitation Plan was prepared for the ACP to address post-construction restoration and rehabilitation activities on USFS lands and describes the processes and measures that will be implemented to mitigate the impacts to habitats and scenery. USFS lands are managed in accordance with various management directives, including standards and guidelines for restoration and revegetation activities. This Restoration and Rehabilitation Plan has been written to conform to FERC requirements and procedures and industry-accepted practices and standards, and guidelines contained within the MNF and GWNF LRMPs and site-specific requirements and recommendations for restoration developed in consultation with USFS staff. Furthermore, the Restoration and Rehabilitation Plan will be implemented in conjunction with the 2013 versions of the FERC Plan and Procedures as well as other relevant sections of this COM Plan.

Atlantic has consulted with the USDA's Natural Resources Conservation Service and is still in the process of consulting with the USFS and state/commonwealth land managing agencies, to identify appropriate seed mixes, soil amendments, and cultural practices for use during restoration. Based on consultations with the USFS to date, a variety of seed mixes, including natives and pollinator-friendly species, and seeding techniques appropriate to the various conditions expected to be found along the pipeline route in the MNF and GWNF are provided.

10.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC's Plan and Procedures; other construction, restoration, and mitigation plans, including this *Restoration and Rehabilitation Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

Training for environmental inspectors will also include:

- emergency contacts and numbers;
- pipeline right-of-way rehabilitation and restoration techniques specific for the NFS lands;
- seeding techniques on steep slope sites; and
- erosion minimization and control measures.

10.3 RESTORATION AND REHABILITATION

This section provides a description of restoration and rehabilitation measures and BMPs that would be used to restore the pipeline right-of way on USFS lands. These measures and BMPs are based on FERC requirements and industry-accepted practices, in addition to site-specific requirements and recommendations for restoration developed in conjunction with USFS staff.

10.3.1 Restoration and Rehabilitation Measures and Best Management Practices

10.3.1.1 Erosion Control

Construction of the pipeline will be followed by restoration of the right-of-way, stabilization of the soil, and seeding (where needed). Atlantic will complete final grading and installation of permanent erosion control structures (e.g., trench breakers or permanent slope breakers) generally within 20 days after backfilling the trench (10 days in residential areas), seasonal or other weather conditions permitting. For construction activities occurring in winter, conditions such as frozen soils or snow cover could delay successful soil compaction mitigation or seeding activities. In these conditions, Atlantic will resume clean-up and restoration efforts the following spring. Atlantic will monitor and maintain temporary erosion controls (e.g., temporary slope breakers, sediment barriers, or mulch) until conditions allow for completion of cleanup and installation of permanent erosion control structures.

Temporary erosion control measures and permanent erosion control devices to be employed during and after construction are described in Section 8 – Upland Erosion Control Plan.

During construction, the effectiveness of temporary erosion control devices will be monitored by Atlantic's EI. The USFS will also employ its own compliance monitors. Monitoring reports will identify follow-up actions; subsequent inspection/reporting will ensure the follow-up action has been completed, and that erosion control devices continue to function. Where appropriate for local resource priorities, the role of the EI may be filled by agricultural or horticultural monitors. The effectiveness of revegetation and permanent erosion control devices will be monitored by Atlantic operating personnel during the long-term operation and maintenance of the pipeline systems.

10.3.1.2 Soil Restoration

Successful revegetation is dependent on appropriate soil conditions and can be influenced by several factors, including soil texture, soil compaction (density), soil microbial health, drainage class, salinity, and acidity. Unless otherwise approved by the USFS, soil restoration will include:

- removal of excavated rock as described in Section 2.1.6– Lowering-in and Backfilling;
- distribution of rock on the work area as described in Section 2.1.6– Lowering-in and Backfilling;
- grading of the right-of-way to restore preconstruction contours to the extent practicable; and
- preparation of the soil for revegetation as described in Section 10.3.1.8.

10.3.1.3 Soil Compaction

Soil compaction resulting from construction activities may reduce the potential for successful revegetation. Fine-textured soils with poor internal drainage that are moist or saturated during construction are the most susceptible to compaction and rutting. Atlantic will minimize impacts by implementing the mitigation measures for compaction and rutting as described in the Atlantic's Upland Erosion Control Plan (see Section 8). Atlantic will test for soil compaction:

- in areas requested by the USFS;
- in all areas prior to topsoil replacement;
- in undisturbed areas adjacent to the construction workspace with the same soil type under similar moisture conditions to approximate preconstruction conditions; and

- in areas identified by the EIs, who will be responsible for conducting subsoil and topsoil compaction testing and determining the need for corrective measures.

Compaction impacts will be mitigated through the use of tillage equipment during restoration activities such as a paraplow or similar implement. In areas where topsoil segregation occurs, plowing with a paraplow or other deep tillage implement to alleviate subsoil compaction will be conducted before replacement of the topsoil. In rocky or heavily rooted soils, a representative compaction measurement may be difficult to obtain. If compaction testing is impeded by rock or roots, Atlantic will investigate the use of other methods to measure compaction (e.g., use of pocket penetrometer) or may conclude that there is a suitable amount of large material in the soil to rectify potential compaction. Soil compaction will be remediated prior to re-spreading of salvaged topsoil.

10.3.1.4 Topsoil Segregation, Replacement, and Soil Conditioning

The potential mixing of topsoil or surface soil with the subsoil from construction activities could result in a loss of soil fertility. To prevent mixing of the soil horizons or incorporation of additional rock into the topsoil, topsoil will be:

- segregated as described in the Plan and Procedures;
- stockpiled on the right-of-way; and
- excluded from materials used for padding the pipe.

Topsoil will be layered above subsoil where seeds stored in the soil will be encouraged to grow.

10.3.1.5Measures to prevent the spread of non-native invasive plant species are provided in Section 11, the Non-Native Invasive Plant Species Management Plan. Re-Contouring

Grading will be conducted prior to construction where necessary to provide a reasonably level work surface. Upon completion of construction, Atlantic will:

- restore the ground surface as closely as practicable to original contours to restore natural overland water flow patterns, aquifer recharge, and drainage patterns;

- re-contour disturbed areas in a fashion designed to stabilize slopes, remove ruts and scars, and support successful revegetation; and

- restore drainage ditches and culverts that are diverted or damaged during construction to their original or better condition.

10.3.1.6 Steep Slope Areas

Areas with steep slopes along the pipeline route may make the establishment of vegetation more difficult due to the increased potential for erosion by water. Slopes greater than 35 percent will be restored to natural contours to the extent practicable, or in accordance with specific requests from the USFS. Restoration of steep terrain may include:

- grading to the natural conditions;

- installation of permanent erosion control devices (i.e., slope breakers) designed to reduce runoff velocity, divert water from the surface of the right-of-way, and encourage retention of soils; and

- the use of additional structural materials (e.g., rock or woody debris) to provide an anchor for revegetation and deposition of soil.

In addition to these general measures, Atlantic will develop and implement other additional site-specific measures, where warranted, to address land movement, surface erosion, backfill erosion, general soil stability when backfilling the trench, and restoring of the right-of-way in steep slope areas (see Section 8.7.3 for details). Atlantic is committed to employing BIC measures to protect the environment in steep slope areas. Best in Class is defined as the most efficient and/or protective design or configuration with the least environmental impact providing reliable construction and operations.

Atlantic will implement the Slope Stability Policy and Procedure and is conducting geotechnical studies along the proposed pipeline routes in West Virginia, and western Virginia in steep terrain areas to assess the potential for landslides and landslips to occur during construction and operation of the Project.

The following lists some of the special design and construction mitigation measures that will be implemented if a problem is encountered during construction in steep slope areas:

- targeted management and diversion of surface water around landslide sites, including the use of ditches, berms, slope breakers, and/or grading;

- mitigation of surface erosion by armoring or otherwise stabilizing surface soils using riprap, coir cloth, hydroseeding, mulching, and/or tracking

- targeted management of water sources along the trench, including the use of trench breakers and/or added drainage piping in the trench;

- targeted mitigation of seeps, springs, or other subsurface water encountered along the right-of-way using subsurface drains or other special drainage measures;

- engineering of the backfill around or within steep slope areas to dry the backfill, add compaction, improve backfill soil strength, and reduce saturation;

- installation of targeted structures to stabilize backfill using engineered fill, retaining walls, bagged concrete mix, key trenches, and/or shear trenches; and

- reduction in surcharge on steep slope areas by reducing excess or saturated backfill.

10.3.1.7 Site Preparation and Seeding

Atlantic will complete final grading and permanent erosion control measures within 20 days after backfilling of the trench, seasonal or other weather conditions permitting. In the event that this timeframe cannot be met or construction or restoration activities are interrupted for an extended period, mulch will be spread prior to seeding. In these cases, slopes within 100 feet of wetlands or waterbodies will be mulched at a rate of 3 tons per acre (FERC, 2013a). In accordance with the USFS requirements, the mulch material will not include the use of hay. Instead, materials may include clean straw, wood or paper fiber, coconut fiber, synthetic mulch, or other USFS-approved material that is not likely to contain seeds or viable parts of invasive plants..

10.3.1.8 Seedbed Preparation

Proper preparation of the soil surface and seedbed is essential for rapid and healthy revegetation (Virginia DEQ, 1992). Successful germination of seed is enhanced by a well-prepared seedbed, the suitability of which decreases rapidly after rainfall.

Seedbed preparation starts immediately after soil has been replaced on the right-of-way and final grading, contouring, and de-compaction activities are complete. Seedbed preparation will be conducted immediately prior to seeding to prepare a firm seedbed conducive to proper seed placement. Seedbed preparation will also be performed to break up surface crusts and to reduce weeds that develop between the initial ground clearing and final seeding.

Unless otherwise specified by the USFS, the seedbed will be prepared in disturbed areas to a depth of 3 to 4 inches using appropriate equipment (e.g., cultipacker roller) to provide a seedbed that is firm, yet rough. Atlantic will imprint exposed soils with a sheepsfoot, landfill compactor, tractor with studded tires, or land imprinter equipment. Soil imprinting, or tracking, leaves divots on the ground surface that trap moisture and seeds, creating catchments for native plant material to be spread across the seeded area (West Virginia Department of Environmental Protection, 2012). In addition, a seedbed with a rough surface is conducive to the capturing or lodging of seed when broadcasted or hydroseeded, and can reduce runoff and erosion potential. The rough seedbed surface will also retain soil moisture for seedling germination and promote faster establishment of vegetation.

In compacted areas, additional measures such as chisel plowing or disking may be necessary to improve water infiltration and soil aeration necessary to prepare an adequate seedbed. When hydroseeding, Atlantic will scarify the soil surface prior to seeding to anchor the seed to the soil surface and encourage germination.

10.3.1.9 Lime and Fertilizer Application

In general, and in accordance with the Plan and Procedures, upland areas will have a fertilizer and pH supplement (i.e., lime) mixed in to the upper two inches of topsoil. No lime or fertilizer will be used within 100 feet of wetlands or waterbodies or within 300 feet of karst features. In upland areas without specific fertilization requirements, Atlantic will:

- Provide soil nutrient additions where suggested by soil chemistry or soil fertility data. However, in absence of this data, the USFS recommends the application of 600 – 800 pounds per acre of 10-20-10 (Nitrogen, Phosphorous, and Potassium), 400 pounds per acre of 15-30-15, or 800 -1,000 pounds per acre of10-10-10 fertilizer. Lime will be applied at the rate of 1,500 - 4,000 pounds per acre (pelletized or dust) or 4,000 pounds per acre as hydro Lime.

- avoid fertilizer drift through restricted application times that exclude periods of high winds or heavy rains; and

- store and mix all fertilizers in upland areas and away from karst features, where contamination of wetlands, waterbodies, or karst features will be avoided.

Mulching and Binders

In general, and in accordance with the Plan, Atlantic will apply mulch to slopes immediately after seeding to prevent erosion or as specified by the USFS. Mulch materials will be anchored to the soil with stakes or liquid mulch tackifiers. No tackifiers will be used within 100 feet of wetlands and waterbodies or within 300 feet of karst features.

Possible mulch materials and application techniques are described below.

- salvaged wood materials, including slash and non-merchantable timber, will be retained in forested areas and placed on the right-of-way after final grading, re-contouring, and seeding is complete. Woody debris is expected to support revegetation while preventing erosion and providing micro-habitat for various species.

- native wood chip materials will be used in forested systems and will be generated from cleared materials that are chipped and stockpiled on the edge of the right-of-way. Native wood chips are expected to aid in the successful revegetation of disturbed areas.

- wood fiber hydromulch may be used in shrubby areas to augment biomass salvaged during clearing. Hydromulch is evenly distributed and absorbs water quickly, which enhances seed survival rates and discourages erosion during regeneration of shrubby species.

- bonded fiber matrix (BFM), a type of hydromulch designed to control erosion on steep slopes, may also be used where appropriate. BFM slurry contains thermally processed wood fibers (approximately 80 percent), water (approximately 10 percent), and tackifiers and polymer-based binding agents that are quick to dry upon application. BFM is hydraulically applied, which allows for controlled application on steep slopes where access may be difficult. BFM will only be applied to stable slopes where final grading has been completed and water runoff has been diverted from the slope face. Once BFM has had 24 to 48 hours to cure, an erosion-resistant blanket is formed that is flexible, absorbent, and biodegradable, and that will accelerate plant growth. BFM may be used in conjunction with slope breakers and other erosion control devices on slopes longer than 70 feet. BFM application rates will depend on manufacturers specifications, based upon the slope of the disturbed areas (Terra Novo, 2016).

- Weed-free straw will be used to preserve the soil base in areas where native salvaged material is not available. In areas that are seeded by drill, Atlantic will apply one bale of clean straw per 1,000 square feet. Where broadcast seeding is used, Atlantic will apply two bales of clean straw per 1,000 square feet, or in accordance with requirements specified by the USFS.

Additional guidelines and specifications recommended by USFS to be implemented in the MNF and GWNF are described below:

- Materials must be certified weed free or be accompanied by vendor’s test results for noxious weed content.

- Seeded areas can be mulched with weed free straw at a rate of 2,000 – 4,000 pounds per acre, hand spread or blown, fiber mulch hydroseeded at 1500 - 2000 pounds per acre, or other appropriate material.

- natural biodegradable products are preferred. Materials must be demonstrated to be free of invasive species, including but not limited to plants, pests, and pathogens.

- hydraulic erosion control products must be suitable for wildlife.

- if the use of stabilization netting is required/permitted, wildlife friendly geotextiles must be used. These products must either not contain netting, or netting must be made of 100 percent biodegradable non-plastic materials such as jute, sisal, or coir fiber. Plastic netting (such as polypropylene, nylon, polyethylene, and polyester), even if advertised as biodegradable, is not an acceptable alternative. Any netting used must also have a loose-weave design with movable joints between horizontal and vertical twines to reduce the chance for wildlife entanglement, injury, or death.

- avoid the use of silt fences reinforced with metal or plastic mesh.

- when no longer required, (after soils are stable and the vegetative cover is established), temporary erosion control and sediment control products should be promptly removed.

- any products that require mixing with water need to have a Forest Service-approved water source. The source of water must not be contaminated with non-native invasive organisms that could spread into streams.

Hydroseeding

- wood-fiber hydraulic mulches are generally short-lived and require a 24-hour period to dry before rainfall occurs.

- wood fiber naturally has tackifying properties, but fiber alone may not be sufficient on steep slopes. In those cases the addition of a tackifier will help keep the seeds in contact with the soil.

- as wood chips, shredded woody materials, and other high-carbon materials decompose, they remove plant nutrients such as nitrogen from the soil. This can reduce soil fertility and make it difficult for grasses to grow. This should be taken into account when planning restoration seeding.

10.3.1.10 Revegetation

The goal of the revegetation is to address the stabilization of the right-of-way post-construction by using appropriate seed mixes. Initially, the primary goal of seeding is to establish a vegetative cover to minimize surface erosion and sedimentation resulting from precipitation and surface flow. The secondary goal is the establishment of an assortment of native species beneficial for wildlife and pollinators.

Atlantic has consulted with the USFS and State/Commonwealth land managing agencies, to identify appropriate seed mixes and other cultural practices for use during restoration. Based on discussions with the MNF and GWNF to date, a variety of seed mixes, including native and pollinator-friendly species, and seeding techniques appropriate to the various conditions expected to be found along the pipeline route are provided.

Atlantic will perform seeding of permanent vegetation during the fall of the year construction is completed, within the recommended seeding dates, and within six working days of final grading, weather and soil conditions permitting. Atlantic will prioritize seeding and other restoration work in high-elevation areas, in an attempt to avoid restoration delays due to winter-related weather and field conditions. If seeding cannot be done within recommended fall timeframes, appropriate temporary erosion control measures will be installed and temporary grass cover will be seeded. If temporary grass cover is used, seeding of permanent vegetation will occur at the beginning of the next recommended seeding season.

In the MNF and GWNF appropriate seasons for seeding can vary dramatically depending on elevation. Spring seeding can be conducted from March 15th – June 1st, and fall seeding can be done from August 15th – October 15th, but neither timeframe is appropriate in its entirety at all elevations. Atlantic will consult with the USFS for the most appropriate timeframes for specific elevations and for seeding or treatments outside normal or appropriate seasons.

Seed Mix Recommendations

- The recommended USFS guidance and application techniques, and seed mixtures prescriptions tailored for the MNF and GWNF for temporary and permanent erosion control and special site conditions and habitats are provided below.
    - Seed shall be Virginia- or West Virginia- certified seed (bag tags attached; seed certification shall meet each state's standards for their certified seed classification) or alternative seed sourced from approved distributors.
- All leguminous seed shall be either be pre-inoculated from a supplier, or mixed with inoculant specified for use on that particular seed according to manufacturer's directions. Inoculants shall be manually applied at double the manufacturer's rate. Inoculant shall be mixed with legume seed prior to mixing with other seeds. For hydroseeding, use a minimum of five times the dry seeding rate of inoculant.
- When using native seed, use as local an ecotype as is available, in the following order of preference: from within state; from mountain regions of an adjoining state; or from within 100 miles, as long as it is within the Appalachian mountain ecosystem.
- A minimum of 100 pounds per acre of seed will be applied when seeding for permanent erosion control, unless otherwise specified by the seed mix provider.
- All seeding must occur promptly after construction halts, either temporarily or permanently. Erosion control seed mixtures must be sufficient to stabilize sites for varying lengths of time, and seed mixes may need to vary depending on that timeframe.
- Areas to be planted with species beneficial for wildlife after pipeline installation will be treated with temporary erosion control mix during a normal seeding season.
- Areas not to be treated with wildlife seed species will be treated with permanent erosion control seeding during a normal seeding season.
- Seeding rates should be doubled when hydroseeding.

Recommended Seed Mixtures by habitat area:

Temporary Erosion Control Seed Mixes

Table 10.3.1-1 provides a summary seed mixtures and application rates by slope class recommended to be used in disturbed areas on NFS lands for temporary erosion control under the following conditions:

- wherever erosion control is needed outside of normal seeding seasons;
- concurrent with permanent erosion control; and
- prior to permanent seeding with wildlife mixes, where such follow-up is appropriate.

TABLE 10.3.1-1

Seed Mix FS01: Recommended Seed Mixes for Temporary Erosion Control by Slope Class

Seed Mix/Slope Class	Common Species Name	Scientific Name	Number of Seeds (seeds/feet^2) [a]	Seeding Application Rate (lbs/acre/PLS) [b]
0 to 30 Percent Slope				
1	Annual Rye Grass	*Lolium multiflorum*	34.87	7.00
	Cereal Rye	*Secale cereale*	18.60	45.00
	Brown Top Millet	*Panicum ramosum*	13.77	8.00
Total				60.00
31 to 50 Percent Slope				
2	Annual Rye Grass	*Lolium multiflorum*	52.31	10.50
	Cereal Rye	*Secale cereale*	27.89	67.50
	Brown Top Millet	*Panicum ramosum*	20.66	12.00
Total				90.00
50 to ≥ 70 Percent Slope				
3	Annual Rye Grass	*Lolium multiflorum*	78.46	15.75
	Cereal Rye	*Secale cereale*	41.84	101.25
	Brown Top Millet	*Panicum ramosum*	30.99	18.00
Total				135.00

Source: USFS, 2016; Roundstone, 2017.

[a] Seeds per square feet.

[b] lbs/acre/PLS = pounds per acre of pure live seed

Permanent Erosion Control Seed Mix

Table 10.3.1-2 provides a summary of seed mixtures and application rates that are recommended to be used in disturbed areas on NFS lands for permanent erosion control under the following conditions:

- only during normal seeding season in Spring and Fall;
- on slopes too steep or inaccessible for planting equipment, i.e., in slopes 50 percent or greater; or
- on areas planned to be left not in final grade for more than 1 year.

TABLE 10.3.1-2

Seed Mix FS02: Recommended Seed Mix for Permanent Erosion Control

Type	Common Species Name [a]	Scientific Name	Number of Seeds (seeds/feet^2) [a]	Seeding Application Rate (lbs/acre/PLS) [b]
Non-native	Creeping Red Fescue	*Festuca rubra*	2.58	0.250
	Oats [c]	*Avena sativa*	14.25	32.000
Native – Highly Preferred	Indian Grass	*Sorghastrum nutans*	16.07	4.000
	Purple Top	*Tridens flavus*	18.68	1.750
Native - Preferred	Upland Bentgrass	Agrostis perennans	11.48	0.063
	Canada Wild Rye	*Elymus canadensis*	5.23	2.000
	Deer Tongue Grass	*Panicum clandestinum*	8.03	1.000
	Spiked Blazing Star	*Liatris spicata*	0.82	0188
	New England Aster	Aster novae-angliae	3.44	0.125
	False Sunflower	Heliopsis helianthoides	1.81	0.750
	Canada Tick Trefoil	*Desmodium canadense*	0.83	0.500
	Slender Lespedeza	*Lespedeza virginica*	1.00	0.250
	Slender Mountain Mint	*Pycnanthemum tenuifolium*	8.61	0.063
	Virginia Wild Rye	Elymus virginicu	4.59	2.000
	Bergamot	Monarda fistulosa	2.17	0.250
	Wild Senna	Senna marilandica	0.45	0.750
Native – Moderately Preferred	Partridge Pea	Cassia fasciculata	0.65	0.375
	Blackeyed Susan	Rudbeckia hirta	9.18	0.250
	Switchgrass	Panicum virgatum	4.46	0.750

Source: USFS, 2016; Roundstone, 2017.

[a] Seeds per square feet.

[b] lbs/acre/PLS = pounds per acre of pure live seed.

[c] Use Spring Oats instead of Cereal Rye as a nurse crop because it is less competitive with Native species.

Special Site Conditions Seed Mixes (Native Species for Wildlife and Pollinators)

Seed mixtures FS03 – for Dry Uplands or Highlands (Table 10.3.1-3), FS04 – for Riparian Habitat Areas (Table 10.3.1-4), FS05 – for Wetland Habitat Areas (Table 10.3.1-5), and FS06 for Dry Low pH Habitat Areas (Table 10.3.1-6) are provided below, and are to be applied as permanent vegetation in areas accessible to necessary drill or other planting equipment (in areas where slopes are less than 40 percent).

TABLE 10.3.1-3

Seed Mix FS03: Recommended Seed Mix for Dry Uplands or High Elevation Habitat Areas [a]

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/feet^2) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Non-native	Oats [d]	*Avena sativa*	14.25	32.000
Native	Indian Grass	*Sorghastrum nutans*	16.07	4.000
	Switchgrass	*Panicum virgatum*	4.46	0.750
	Virginia Wild Rye	*Elymus virginicus*	5.74	2.500
	Purple Top	*Tridens flavus*	16.01	1.500
	Canada Wild Rye	*Elymus canadensis*	6.54	2.500
	Deer Tongue Grass	*Panicum clandestinum*	6.03	0.750
	Upland Bentgrass	*Agrostis perennans*	11.48	0.063
	Blackeyed Susan	*Rudbeckia hirta*	9.18	0.250
	Common Milkweed	*Asclepias syriaca*	0.28	0.250
	False Sunflower	*Heliopsis helianthoides*	1.81	0.750
	Partridge Pea	*Cassia fasciculata*	0.86	0.500
	Canada Tick Trefoil	*Desmodium canadense*	0.83	0.500
	Slender Mountain Mint	*Pycnanthemum tenuifolium*	8.61	0.083
	Bergamot	*Monarda fistulosa*	5.38	0.188
	Tall Goldenrod	*Solidago altissima*	4.02	0.250
	New England Aster	*Aster novae-angliae*	3.44	0.125
	Wild Senna	*Senna marilandica*	0.30	0.500

Source: USFS, 2016; Roundstone, 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent. “High Elevation” areas are habitat sites with elevations higher than 3,000 feet above sea mean level.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

[d] Use Spring Oats instead of Cereal Rye as a nurse crop because it is less competitive with Native species.

TABLE 10.3.1-4

Seed Mix FS04: Recommended Seed Mix for Riparian Habitat Areas [a]

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/fee$^{t2)}$ [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Non-native	Oats [d]	*Avena sativa*	14.25	32.000
Native - Grasses	Upland Bentgrass	*Agrostis perennans*	11.48	0.063
	Big Bluestem	*Andropogon gerardii*	13.22	4.000
	Indian Grass	*Sorghastrum nutans*	8.03	2.000
	Virginia Wild Rye	*Elymus virginicus*	9.18	4.00
	Deer Tongue Grass	*Panicum clandestinum*	16.07	2.000
Native - Forbs	Boneset	*Eupatorium perfoliatum*	5.74	0.125
	Sneezeweed	*Helenium autumnale*	5.74	0.125
	Joe-Pye Weed	*Eupatorium fistulosum*	8.61	0.188
	Wild Senna	*Senna marilandica*	0.30	0.500
	New York Ironweed	*Vernonia noveboracensis*	0.86	0.125
	Swamp Milkweed	*Asclepias incarnata*	0.10	0.063
	American Senna	*Senna hebecarpa*	0.25	0.500
	Canada Tick Trefoil	*Desmodium canadense*	0.83	0.500
	Slender Mountain Mint	*Pycnanthemum tenuifolium*	17.22	0.125
	Bergamot	*Monarda fistulosa*	5.38	0.188
	Tall Goldenrod	*Solidago altissima*	4.02	0.250
	New England Aster	*Aster novae-angliae*	3.44	0.125

Source: USFS, 2016; Roundstone, 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

[d] Use Spring Oats instead of Cereal Rye as a nurse crop because it is less competitive with Native species.

TABLE 10.3.1-5

Seed Mix FS05: Recommended Seed Mix for Wetland Habitat Areas [a]

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/feet2) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Non-native	Oats [d]	*Avena sativa*	14.25	32.000
Native - Grasses	Bottlebrush Grass	*Elymus hystrix*	0.86	0.500
	Deer Tongue Grass	*Panicum clandestinum*	10.04	1.250
	Nodding Sedge	*Carex crinita*	4.13	0.250
	Path Rush	*Juncus tenuis*	25.83	0.250
	Red Top Panicum	*Panicum rigidulum*	27.38	1.500
	Soft Rush	*Juncus effusus*	51.65	0.5000
	Squarrose Sedge	*Carex squarrosa*	2.30	0.250
	Switchgrass	*Panicum virgatum*	4.46	0.750
	Wool Grass	*Scirpus cyperinus*	51.65	0.250
Native - Forbs	Blue False Indigo	*Baptisia australis*	0.30	0.500
	Great Blue Lobelia	*Lobelia siphilitica*	11.48	0.063
	New York Ironweed	*Vernonia noveboracensis*	1.72	0.250
	Wild Senna	*Senna marilandica*	0.45	0.750
	Sweet Joe-Pye Weed	*Eupatorium purpureum*	1.93	0.125
	Spotted Joe-Pye Weed	*Eupatorium maculatum*	8.03	0.250
	Swamp Milkweed	*Asclepias incarnata*	0.30	0.188
	American Senna	*Desmodium canadense*	0.38	0.750

Source: USFS, 2016; Roundstone, 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

[d] Use Spring Oats instead of Cereal Rye as a nurse crop because it is less competitive with Natives.

TABLE 10.3.1-6

Seed Mix FS06: Recommended Seed Mix for Dry Acidic Habitat Areas [a]

Type	Common Species Name	Scientific Name	Number of Seeds (seeds/fee^{t2}) [b]	Seeding Application Rate (lbs/acre/PLS) [c]
Non-native	Oats [d]	*Avena sativa*	14.25	32.000
Native - Grasses	Indian Grass	*Sorghastrum nutans*	16.07	4.000
	Purple Top	*Tridens flavus*	18.68	1.750
	Purple Love Grass	*Eragrostis spectabilis*	5.74	0.250
	Canada Wild Rye	*Elymus canadensis*	5.23	2.000
	Deer Tongue Grass	*Panicum clandestinum*	14.06	1.750
	Virginia Wild Rye	*Elymus virginicus*	4.59	2.000
	Splitbeard Bluestem	*Andropogon ternarius*	1.24	0.250
	Switchgrass	*Panicum virgatum*	4.46	0.750
Native - Forbs	Tall Goldenrod	*Solidago canadensis*	6.03	0.375
	New England Aster	*Aster novae-angliae*	3.44	0.125
	False Sunflower	*Heliopsis helianthoides*	0.90	0.375
	Canada Tick Trefoil	*Desmodium canadense*	0.41	0.250
	Slender Lespedeza	*Lespedeza virginica*	0.50	0.125
	Slender Mountain Mint	*Pycnanthemum tenuifolium*	8.61	0.063
	Bergamot	*Monarda fistulosa*	5.38	0.188
	Wild Senna	*Senna marilandica*	0.30	0.500
	Partridge Pea	*Cassia fasciculata*	0.54	0.313
	Blackeyed Susan	*Rudbeckia hirta*	9.18	0.250

Source: USFS, 2016; Roundstone 2017.

[a] Reduce planting application rate by 5 percent for each slope class (i.e., 0 - 8, 8 -15, or 15 – 30 percent) below slope class 30 – 50 percent.

[b] Seeds per square feet.

[c] lbs/acre/PLS = pounds per acre of pure live seed.

[d] Use Spring Oats instead of Cereal Rye as a nurse crop because it is less competitive with Native species.

Seeding Methods

Seeding may be conducted with the use of a seed drill, a mechanical broadcast seeder, or by hydroseeding. In the absence of requirements to the contrary, the standard application method will be seeding with a seed drill equipped with a cultipacker in areas with slopes less or equal to 40 percent. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by an EI. Broadcast or hydroseeding at double the recommended seeding rates may be used in lieu of drilling in areas with slopes with slopes greater than or equal to 40 percent. In problematic areas, ACP will consult with the USFS staff and develop an alternative method to seed a problematic area, usually in areas with slopes between 40 to 50 percent or greater..

Broadcast seeding will be used for areas with minimal to moderate slopes and will be performed by dry dispersal or wet broadcast seeding. Wet broadcast seeding is an effective treatment for temporary erosion control and may be used when hydroseeding late in the season or on certain site conditions where hydroseeding is not practical. To support successful seed germination, seed will be broadcast once soil compaction has been rectified and soil composition includes proper aeration and water percolation to support plant development. Where seed is broadcast, the seedbed will be restructured with a cultipacker or imprinter after seeding. Once seed is broadcast, Atlantic will rake the area lightly to encourage plant establishment and minimize the seed that migrates from the site.

Hydroseeding involves the mixing of slurry (i.e., seed, water, fertilizer, tackifier, or mulch) in a truck-mounted mixing tank and ground application via a pressurized pump. Hydroseeding is the preferred method of seed dispersal on steep slopes greater than 50 percent (on USFS lands – areas inaccessible to drill or planting equipment), where site conditions require seed adherence to the disturbed soil. Prior to hydroseeding, Atlantic will scarify the seedbed to facilitate lodging and germination of seed. Tackifiers will be applied where necessary so that seed adheres to soil. Polymer binders, if selected, will be used in accordance with manufacturer's specifications to ensure proper compatibility with fertilizers and to avoid foaming that might otherwise result from excessive agitation. All chemical components will be mixed and administered in accordance with manufacturer guidelines. In addition, hydroseeding near wetlands or waterbodies will only be conducted in accordance with the FERC Plan and Procedures and other applicable USFS regulations.

Visual Resource-Related Plantings

Pending discussions with MNF and GWNF staff, Atlantic will address the supplementation of seeding with the planting of tree seedlings or small shrubs. While no additional supplemental plantings are anticipated or proposed for the permanent or temporary right-of-way, supplemental plantings are being considered based on consultation with USFS to mitigate visual impacts. The planting of additional shrubs along the right-of-way would help to reduce the contrast between the right-of-way and surrounding areas. Other measures being considered to minimize visual impacts include feathering of the cleared construction corridor edges. Right-of-way feathering and the planting of woody vegetation in temporary construction areas are discussed in Section 20.

10.3.2 Additional Restoration Mitigation Measures for U.S. Forest Service Lands

On USFS lands, additional measures will be implemented, in conformance with LRMP standards and guidelines, and recommendations from USFS staff. If a mitigation measure or BMP is more stringent than its counterpart USFS mitigation measure below, the more stringent measure will be applied.

10.3.2.1 Monongahela National Forest

- use of wheeled and/or tracked motorized equipment may be limited on soil types that include the following soil/site area conditions: d) soils commonly wet at or near the surface during a considerable part of the year, or soils highly susceptible to compaction. Equipment use shall normally be prohibited or mitigated when soils are saturated or when freeze-thaw cycles occur (MNF LRMP SW07). MNF is considering a project-specific LRMP amendment to this standard.

- management actions that have the potential to contribute to soil nutrient depletion shall be evaluated for the potential effects of depletion in relation to on-site acid deposition conditions (MNF LRMP SW08).

- inventory the soil resource to the appropriate intensity level as needed for Project planning and/or design considerations (MNF LRMP SW10). consider liming soils with a surface pH of less than 5.5 on seeding project, except where there is an objective to maintain acidic ecosystems (MNF LRMP SW13). topsoil should be salvaged from an area during construction and stockpiled for use during subsequent reclamation, or obtained from an alternate site. On some areas, soil material may have to be added to obtain vigorous plant growth. Soil to be used for this purpose should have chemical tests made to determine its desirability for use (MNF LRMP SW15).

- Mulch must be applied to all disturbed soils in the MNF.
- On USFS lands where topsoil will be segregated, O and A horizons and transition soil horizons AB and BA are considered topsoil.
- Post-construction and post-disturbance monitoring for revegetation should be conducted in perpetuity, for the life of the Project on USFS lands.

10.3.2.2 George Washington National Forest

- where soils are disturbed by management activities, appropriate revegetation measures should be implemented. When outside the normal seeding seasons, initial treatments may be of a temporary nature, until permanent seeding can be applied. Revegetation should be accomplished within 5 years. For erosion control, annual plants should make up >50 percent of seed mix when seeding outside the normal seeding season and the area should be reseeded with perennials within 1½ years (GWNF LRMP FW-9).
- clearcutting is not allowed where high risk soils (soils very susceptible to nutrient depletion and acidification) are identified (GWNF LRMP FW-12).
- on USFS lands where topsoil will be segregated, O and A horizons and transition soil horizons AB and BA are considered topsoil.
- post-construction and post-disturbance monitoring for revegetation should be conducted in perpetuity, for the life of the Project on USFS lands.

10.3.3 Riparian Restoration

Following initial stream bank stabilization, Atlantic will restore the banks of waterbodies to preconstruction contours to the extent practicable. In steep-slope areas, re-grading may be required to reestablish stable contours capable of supporting preconstruction drainage patterns. Riparian areas will be revegetated with native species across the entire width of the construction corridor. Restoration of riparian areas will be designed to:

- restore stream bank integrity, including both shore crossings up to the ordinary high water mark;
- withstand periods of high flow without increasing erosion and downstream sedimentation; and
- include temporary erosion control fencing, which will remain in place until stream bank and riparian restoration is complete.

Permanent bank stabilization and erosion control devices (e.g., natural structures, rock riprap, and/or large woody debris) will be installed as necessary on steep banks in accordance with permit requirements to permanently stabilize the banks and minimize sediment deposition into waterbodies.

10.3.3.1 Forested Riparian Areas

Restoration of forested riparian areas will include seeding as discussed above, and may include supplemental plantings of tree seedlings and shrubs. Clearing of riparian trees in forested areas will reduce shade near streams, and may allow for an increase in local water temperature. Large woody debris, where available and appropriate habitat conditions exist, will be placed adjacent to waterbody crossings to add shade and fish habitat. Forested riparian areas will be restored and enhanced using plantings of native shrubs and trees, excluding the permanent easement, which will be retained in an herbaceous state. On a site-specific basis and in consultation with the USFS, Atlantic will design riparian revegetation with the use of fast growing native trees and shrubs placed closest to the bank top to provide canopy recovery as quickly as possible to shade and overhang the waterbodies.

10.3.4 Wetland Restoration

Restoration of wetland areas will include seeding as discussed above. Atlantic will employ clearing and construction techniques designed to support regeneration of existing wetland vegetation, including the following:

- clearing vegetation at ground level in all non-forested wetland areas outside of the trench line to leave existing root systems intact to help stabilize soils, preserve existing ground elevations, and promote revegetation through sprouting and from existing seed stocks;
- using equipment mats to prevent soil compaction and allow intact root systems to regrow;
- replacing the topsoil segregated from the trenchline in unsaturated wetlands to promote reestablishment of existing wetland species and preserving the vegetative propagules (i.e., seeds, tubers, rhizomes, and bulbs) within the soil, which will have the potential to germinate or sprout when the topsoil is replaced; and
- limiting the removal of stumps to the trench area in forested wetlands, except where safety considerations necessitate additional stump removal, as retained stumps will facilitate reestablishment of woody species by enabling re-sprouting from existing root structures.

In accordance with the Procedures, sediment barriers will be installed immediately following clearing activities occurring within wetlands or adjacent upland areas along the pipeline right-of-way. Where necessary, sediment barriers will be installed across the construction right-of-way immediately upslope of the wetland boundary to prevent sediment flow into wetlands. Sediment barriers will be properly maintained throughout construction, reinstalled as necessary, and removed after restoration is complete and revegetation has stabilized the disturbed areas.

right-of-way Scrub-shrub and forested wetlands will not be allowed to fully reestablish within portions of the permanent right-of-way centered over the pipeline trench lines. Atlantic will periodically remove woody species from wetlands to facilitate post-construction inspections of the permanently maintained right-of-way. Where the pipeline crosses wetlands, Atlantic will maintain a 10-foot-wide corridor centered over the pipeline in an herbaceous condition, and remove deep rooted trees within a 30-foot-wide corridor centered over the pipeline.

10.3.5 Exposed Bedrock

In areas with exposed bedrock or bedrock, Atlantic will restore the area using crushed rock rather than attempting to revegetate the area.

10.4 RESTORATION MONITORING AND MAINTENANCE

10.4.1 Restoration Monitoring

The purpose of the monitoring program is to evaluate the long-term status and effectiveness of restoration efforts and to determine locations where additional maintenance may be required. Restoration monitoring on USFS lands will include both qualitative and quantitative evaluations. The primary objectives of restoration monitoring are to:

- assess of the effectiveness of the temporary and permanent erosion control structures to ensure the stability of the right-of-way and to ensure that runoff is naturally controlled in place, with no accelerated erosion or wash-outs. The monitoring of the right-of-way for significant and/or new erosion will be conducted regularly by routine aerial surveillance or site reconnaissance surveys. It is anticipated that any active erosion will be apparent during the first two years following restoration or after the first runoff event.

- monitor to assess, through quantitative analysis, the success of reseeding and planting efforts for years 3 through 5. Monitoring plots will be used to measure plant ground cover.

- monitor the survival of any special planting for visual impact mitigation, if applicable, and the extent to which the restored right-of-way blends in with the adjacent undisturbed areas.

10.4.1.1 Revegetation Performance Criteria/Standard

The long-term goal of restoration is to restore structure and function on disturbed areas that will eventually lead to the establishment of self-sustaining native or introduce plant community. To determine whether disturbed areas are progressing toward this goal, the following performance criteria will be used to assess restoration success along restored sites on USFS lands. If the performance criteria or performance is met on a restored area in a five-year time, or earlier if deemed appropriate, the restored area will be released from restoration maintenance. On USFS lands, monitoring of vegetation will be conducted for the life-span of the pipeline operations.

- Restoration will be considered successful if ground cover (plant cover) of native or introduced plant species (see section above regarding seed mix recommendations provided by USFS to be used in the USFS lands) is equal to or greater than 80 percent ground cover.

10.4.1.2 Qualitative Monitoring

Qualitative monitoring will be conducted in years 1 to 5 at all restored areas on USFS lands. The goal of the qualitative monitoring is to document and evaluate the need for remediation to ensure the restored areas are progressing toward the performance success standard.

During monitoring, the extent of plant ground cover is estimated at each restored site. Other site characteristics that are monitored in addition to ground cover include soil erosion, natural recruitment of native plant species, reproduction, non-native invasive plant species abundance, wildlife use, and pattern of established vegetation (i.e., pattern of large interspaces). Lack of erosion at a site provides evidence that the soils have been adequately stabilized. Natural recruitment and/or reproduction indicates that important functional processes are in place that facilitate regeneration, such as pollination and seed dispersion. Non-native invasive plant species potentially compete with the seeded species and relatively high abundance can have negative effects on site conditions. Evidence of wildlife use is an indicator that habitat conditions are being restored.

Based on monitoring observations, the restored site is given a success rating and determinations are made regarding activities, which include reseeding the site, spot seeding, or erosion control. Recommendations could also include waiting another year or two prior to any remediation to allow for favorable re-establishment conditions. Photography will also be used to help document the status of the recovery of all sites.

10.4.1.3 Quantitative Monitoring

Performance of the revegetation success will be measured on restored areas in the third growing season (or sooner if deemed appropriate) to determine if the restoration performance standard described above have been met. Sample locations within the restored areas will be randomly selected. Sample size adequacy will be calculated to ensure sufficient samples are taken to estimate the mean success parameters with an appropriate level of confidence.

Revegetation success will be monitored by using a quadrant (1 x1 meters in size) sampling method to assess plant cover in the monitoring plots. Quadrants will be randomly placed in each of the monitoring plots in each of the six revegetation seeding mixes areas (see Seeding Mixes Recommendations Section above) to measure plant ground cover. The location and number of monitoring plots will be determined and agreed upon in consultations with the USFS.

10.4.1.4 Reporting

Atlantic will document its observations of restoration success following the field inspections and monitoring and will provide summary reports to USFS and FERC. Areas that need remedial action will be identified by milepost and will include a description of additional erosion controls or restoration work anticipated. Reports, including a summary of corrective actions proposed, will be submitted within three months of identifying these conditions. Areas where control applications for noxious weeds are needed will be reported.

10.4.2 Permanent Right-of-Way Maintenance

The permanent pipeline right-of-way will be maintained in an herbaceous state. Woody vegetation within the permanent right-of-way will be cleared periodically, in order to maintain accessibility of the right-of-way for maintenance and to accommodate pipeline integrity surveys, In uplands, trees and brush will be cleared over the entire width of the permanent right-of-way on an as-needed basis not to exceed once every 3 years. In wetlands and riparian areas, a 10-foot-wide corridor centered over the pipeline will be cleared at a frequency necessary for the corridor to be permanently maintained in an herbaceous state, as allowed by the Procedures. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of the pipeline coating may be selectively cut and removed from the permanent right-of-way. Atlantic will use mechanical mowing or cutting along their right-of-way for normal vegetative maintenance. Atlantic will monitor the right-of-way for infestations of non-native invasive species that may have been created or exacerbated by construction, restoration, or maintenance activities, and will treat such infestations in consultation with applicable agencies in accordance with its *Non-Native Invasive Plant Species Management Plan*.

11.0 NON-NATIVE INVASIVE PLANT SPECIES MANAGEMENT PLAN

11.1 PURPOSE

The areas crossed by the ACP (Project) contain widespread populations of many noxious weeds and other non-native invasive plant species. The purpose of this *Non-Native Invasive Plant Species Management Plan* is to describe methods to prevent and control the introduction or spread of non-native invasive plant species during and following construction of the Project on USFS lands. Atlantic and its Contractors[15] will be responsible for implementing the procedures described in this plan.

11.1.1 Training

Prior to the start of construction, Atlantic will conduct environmental training for Company and Contractor personnel. The training program will focus on the FERC's Plan and Procedures; other construction, restoration, and mitigation plans, including this *Non-Native Invasive Plant Species Management Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

11.2 JURISDICTION

Noxious weeds are plant species designated by federal, state/commonwealth, or county/city governments as injurious to public health, agriculture, recreation, wildlife, or property (Sheley et al., 1999). The more general term "non-native invasive species" is used for species that are non-native to an ecosystem and whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112). Non-native invasive plants include not only noxious weeds, but other plants that are not native to an area. Both noxious weeds and non-native invasive plants are considered opportunistic species that flourish in disturbed areas and prevent native plants from establishing successive communities.

Under Executive Order 13112, a Federal agency shall not authorize, fund, or carry out actions likely to cause or promote the introduction or spread of non-native invasive species in the United States or elsewhere unless it has been determined that the benefits of such actions outweigh the potential harm caused by non-native invasive species, and that all feasible and prudent measures to minimize the risk of harm will be implemented.

The non-native invasive species found on the MNF and GWNF are monitored by the USFS as outlined in the respective Forests' LRMPs. The results of the non-native invasive species surveys along the proposed route on USFS lands have been included in this report as Attachment J.

11.3 NON-NATIVE INVASIVE PLANT SPECIES SURVEYS

Atlantic conducted field surveys for USFS-listed non-native invasive plant species within a 300-foot-wide corridor along the proposed ACP pipeline route. A list of the non-native invasive plant species identified through July 2016 in the ACP survey corridors is provided in Table 11.3-1. The milepost locations of non-native invasive plant species identified through July 2016 are provided in Attachment J.

---

15 Contractor refers to the company or companies retained by Atlantic or another contractor to construct the proposed facilities.

TABLE 11.3-1

Non-Native Invasive Plant Species Identified Within the Monongahela and George Washington National Forests

Latin Name	Common Name	Atlantic Coast Pipeline
Acer platanoides	Norway maple	
Ailanthus altissima	Tree of heaven	
Alliaria petiolata	Garlic mustard	X
Amaranthus hybridus	Common pigweed or green amaranth	
Ampelopsis brevipendunculata	Porcelain berry	
Anthoxanthum odoratum	Sweet vernal grass	
Arctium minus	Lesser burrdock	
Arthraxon hispidus	Jointed grass or small carpetgrass	
Barbarea vulgaris	Winter cress or yellow rocket	
Berberis thunbergii	Japanese barberry	X
Bidens aristosa	Ozark tickseed sunflower	
Bromus commutatus	Hairy chess or meadow brome	
Bromus inermis var. inermis	Smooth brome	
Bromus sterilis	Barren bromegrass or poverty brome	
Bromus tectorum var. tectorum	Downy chess or cheatgrass	
Butomus umbellatus	Flowering rush	
Carduus crispus	Curled thistle	
Carduus nutans	Musk Thistle	
Celastrus orbiculata	Oriental bittersweet	
Centaurea biebersteinii (C. maculosa)	Spotted knapweed	
Chrysanthemum leucanthemum	Ox-eye daisy	
Cichorium intybus	Chicory	
Cirsium arvese	Canada thistle	
Cirsium vulgare	Bull thistle	
Clerodendrum trichotomum	Harlequin glorybower	
Coronilla varia	Crown vetch	
Daucus carota	Queen Anne’s lace	
Dioscorea oppositifolia	Chinese yam	
Dipsacus laciniatus	Cut-leaved teasel	
Echium vulgare	Viper’s bugloss	
Elaeagnus angustifolia	Russian olive	
Elaeagnus umbellata	Autumn olive	X
Elytrigia repens	Quackgrass	
Epipactis helleborine	Broadleaf hellborine	
Festuca aruninacea	Kentucky 31 fescue	
Festuca elatior	Tall fescue	
Festuca pratensis	Meadow fescue	
Glechoma hederacea	Ground ivy or gill-over-the-ground	
Heracleum mantegazzianum	Giant hogweed	
Heracleum mantegazzianum	Giant hogweed	
Hesperis matronalis	Dame’s rocket	
Hieracium pretense	King devil or field hawkweed	
Holcus lanatus	Velvet grass	
Hydrilla verticillata	Hydrilla	
Hydrilla verticillata	Hydrilla	
Hypericum perforatum	Common St. John’s wort	
Iris pseudacorus	Yellow iris or yellow flag	
Lespedeza bicolor	Japanese bushclover	

TABLE 11.3-1

Non-Native Invasive Plant Species Identified Within the Monongahela and George Washington National Forests (cont'd)

Latin Name	Common Name	Atlantic Coast Pipeline
Lespedeza cuneata	Sericea lespedeza	
Ligustrum obtusifolium	Regal privet or border privet	
Ligustrum vulgare	European privet or common privet	
Lonicera spp.	Japanese amur, Morrow's, Tartarian, or Bell's honeysuckle	
Lysimachia nummularia	Moneywort or creeping jenny	
Lythrum salicaria	Purple loosestrife	
Melilotus alba	White sweet clover	
Melilotus officinalis	Yellow sweet clover	
Microstegium vimineum	Japanese stiltgrass	X
Muscari botryoides	Grape hyacinth	
Myriophyllum spicatum	Eurasian water-milfoil	
Orinthogalum umbellatum	Star of Bethlehem	
Orithogalum nutans	Drooping star of Bethlehem	
Paulownia tomentosa	Princess-tree	
Perilla frutescens	beefstakeplant	
Phleum pretense	Timothy	
Phragmites australis	Common reed	
Plantago major	Great plantain	
Poa compressa	Canada bluegrass	
Poa pratensis	Kentucky bluegrass	
Poa trivialis	Rough bluegrass	
Polygonum aviculare	Knotweed	
Polygonum cespitosum var. longisetum	Asiatic water pepper	
Polygonum cuspidatum	Japanese knotweed	
Polygonum sachalinense	Sachaline or giant knotweed	
Poncirus trifoliate	Hardy orange	
Potamogeton crispus	Curly pondweed	
Pueraria lobate	Kudzu	
Ranunculus ficaria	Lesser celandine or fig buttercup	
Rhamnus cathartica	Common buckthorn	
Rhodotypos scandens	Jetbead	
Rorippa sylvestris	Creeping yellow cress	
Rosa multiflora	Multiflora rose	X
Rubus phoenicolasius	Wineberry	
Rumex acetosella	Sheep sorrel	
Rumex crispus	Yellow dock or curly dock	
Sorghum halepense	Johnsongrass	
Spiraea japonica	Japanese spiraea	
Stellaria media	Common chickweed	
Tussilago farfara	Colt's-foot	X
Verbascum Thapsus	Great mullein	
Vinca minor	Periwinkle	

11.4 NON-NATIVE INVASIVE PLANT SPECIES MANAGEMENT

The non-native invasive plant species management program for the ACP is designed to:

- identify areas supporting non-native invasive plants prior to construction;
- prevent the introduction and spread of non-native invasive plants from construction equipment moving along the right-of-way;
- contain non-native invasive plant propagules by preventing segregated topsoil from being spread to adjacent areas along the construction right-of-way; and
- address non-native invasive plant infestations that develop during restoration and operation of the Project.

Attachment J identifies the primary and alternative treatment methods for non-native invasive species identified during survey in the ACP Project area. The primary and/or alternative treatment method will be used based on the growing stage and prevalence of the non-native invasive species. Methods may vary based on proximity to environmental features (e.g., wetlands, open water, sensitive species locations, and agricultural fields), in accordance with USFS regulations, and MNF and GWNF LRMPs. Atlantic has reached out to the West Virginia Natural Heritage Program for herbicide treatment recommendations adjacent to sensitive features, but has not yet received a response. Recommendations from the Virginia Natural Heritage Program have been incorporated into the COM Plan. Populations of *Regional Forester's Sensitive Species and Occurrence Analysis Results* species found adjacent to non-native invasive plant species and their recommended herbicide treatment/application are included in Attachment J. Identification of Problem Areas

As noted above, Atlantic conducted surveys for non-native invasive plant species within the ACP Project area. Additional areas supporting non-native invasive plant species may be identified during preconstruction inspections by Atlantic's EIs[16]. Prior to construction, the EIs will mark areas of non-native invasive plant infestations by using color-coded flagging, staking, and/or signs on the construction right-of-way. Atlantic will, in consultation with the USFS, determine whether soil disturbance can reasonably be avoided within infested areas, for example by not topsoiling in these areas. Identification of existing non-native invasive plant locations will alert EIs and construction personnel to implement control measures during construction.

11.4.1 Treatment Measures

11.4.1.1 Pre-Treatment

Prior to clearing and grading operations, pre-treatment of non-native invasive plant infestations may be conducted if it will aid in controlling the spread of non-native invasive plant species during construction. In general, pre-treatment will be used when the plant species has not yet gone to seed for the year and has the possibility of producing seed prior to removal during construction.

Control measures to be implemented may include the application of herbicide or mechanical measures such as mowing. The control measure chosen will be the best method available for the time, place, and species, as determined through consultation with the USFS.

[16] The role and responsibilities of an EI are defined in the FERC Plan.

Herbicide application is an effective means of reducing the size of non-native invasive plant species populations. Herbicide treatment methods will be based on species-specific and area-specific conditions (e.g., annual vs. perennial species; proximity to wetlands, open water, riparian areas, or agricultural areas; and time of year), and will be coordinated with the USFS prior to implementation. Hand application methods (e.g., backpack spraying) will be used to treat occurrences of non-native invasive species within the right-of-way and in other work areas. Within 60 feet of any identified sensitive plant species, only hand-pulling on NNIS species will be permitted. Preconstruction treatment of infestation areas will be controlled, as described in Section 7.0, to minimize impacts on surrounding vegetation.

Only herbicides and application methods approved by the USFS will be used on USFS lands, subject to USFS permission and coordination. Application of herbicides will be completed in accordance with label directions and applicable chemical contact times (as specified by the manufacturer) in advance of clearing and grading within the construction right-of-way. Treatment may be restricted in areas that are not readily accessible (e.g., difficult topography, saturated/inundated soils) or where there are documented occurrences of protected species that could be adversely impacted by herbicide applications; such instances will be evaluated on a case-by-case basis with the USFS. Atlantic will continue to work with the USFS to address non-native invasive plant species control options where protected species and their habitats occur along the ACP.

In accordance with 18 CFR 380.15(f)(3), herbicides will not be used as a treatment unless authorized by the landowner or land managing agency. Atlantic will obtain permission from the USFS prior to applications of herbicides within the right-of-way or other work areas. Additionally, Atlantic will use products that are approved by the EPA for use as herbicides, and applications of these products will be in accordance with applicable regulations.

In addition to complying with 18 CFR 380.15(f)(3), Atlantic will: 1) use herbicides which are registered with the EPA; 2) apply herbicides according to specifications of the *Federal Insecticide, Fungicide, and Rodenticide Act*; and 3) use only certified applicators to apply herbicides.

Mechanical control (e.g., mowing or disking) can also be an effective control measure for annual species. The efficacy of mechanical control measures is dependent upon proper timing to cut the vegetation prior to the maturation of seed and may require multiple treatments during the growing season.

11.4.1.2 Preventive Measures during Construction

The following measures will be implemented to prevent the spread of non-native invasive plant species during construction activities.

- Atlantic will direct its Contractors to clean equipment and vehicles prior to initial arrival at contractor yards and staging areas.
- All equipment (including timber mats) will be cleaned prior to arriving on the construction site. The equipment will be inspected by the Contractor and EI to verify that it is clean of soil and debris, which are capable of transporting non-native invasive plant propagules, prior to working on the Project.
- Atlantic will install wash stations for construction equipment near the entrance and exit points of each contiguous USFS tract, outside the Forest boundaries.
- Cleaning will be conducted using high pressure washing equipment, compressed air, and/or manually to remove excess soil and debris from the tracks, tires, and blades of equipment.

- Wash water will be managed on site at the wash station. The water will be filtered or contained so that it does not transport non-native invasive plant species seeds or plant parts off-site and does not contaminate soil, groundwater, or surface water. If any hydro or petro-chemicals are present in the wash water, it will not be released on USFS lands, but taken to an approved West Virginia/Virginia waste disposal site.

- The Contractor and EI will maintain logs documenting the cleaning history of each piece of equipment. The EI will use stickers or other visual marking to identify that equipment has been cleaned and an inspection has been completed.

- Cleared vegetation and segregated topsoil from areas of non-native invasive plant infestations will be maintained adjacent to the areas from which they were removed to eliminate the transport of soil-borne propagules to other areas along the right-of-way. The stockpiles will be identified as non-native invasive plant species stockpiles with signs. The Contractor will install sediment barriers (e.g., silt fence) around the stockpiles to ensure the material is not transported to adjacent areas. During reclamation, the materials will be returned to the areas from which they were obtained.

- Equipment required for initial vegetation clearing and/or topsoil segregation in areas of non-native invasive plant infestation will be cleaned prior to leaving the area. Once the topsoil has been segregated, subsequent equipment will not require cleaning as it will not come into contact with non-native invasive plant species or topsoil potentially containing propagules. Equipment required for topsoil replacement during restoration activities will also be cleaned prior to moving out of an area of infestation.

- All equipment that comes in contact with soils potentially contaminated with non-native invasive species will be cleaned prior to being transported from ACP work sites to other job sites.

- Materials used for erosion control (e.g., straw mulch) will be certified as weed free.

11.4.1.3 Post-Construction Treatment Methods

Atlantic's objective is to comply with regulatory and Project-specific requirements to prevent the spread of non-native invasive plant species and to treat areas of the right-of-way where, in comparison to adjacent areas, non-native invasive plant species form a significant portion of the vegetation community. Atlantic will utilize established restoration procedures to prevent the establishment of non-native invasive plant species in areas disturbed by construction.

In non-frozen soil conditions, the construction Contractor will implement restoration procedures on disturbed lands immediately following construction. In frozen soil conditions, restoration activities will be delayed until the spring or summer following construction. In either case, ongoing revegetation and monitoring efforts will ensure adequate vegetative cover to discourage the establishment of non-native invasive plant species.

Following construction, the ACP Project area will be monitored in accordance with the Plan and Procedures. In the event that non-native invasive plant species become established in the right-of-way, Atlantic will implement measures (e.g., mowing or treatment with herbicides) to control non-native invasive plants within the right-of-way and prevent the spread of non-native invasive plants to adjacent lands which do not contain non-native invasive species. In addition, Atlantic will implement control measures at the aboveground facility sites to prevent the spread of non-native invasive plant species onto adjacent properties. Weed infestations that develop during operations as a result of construction will be treated using approved herbicides or mechanical methods (e.g., mowing) as appropriate for the species and in accordance with applicable laws and regulations. The method selected will be the best available for the time, place, and species as determined through consultation with the USFS.

Post-construction herbicide applications will be conducted prior to seed maturation where possible and where necessary. Applications will be controlled to minimize impacts on surrounding vegetation. Herbicide treatment methods will be based on species-specific and area-specific conditions as described above and will be coordinated with the USFS as applicable. Hand application methods (e.g., backpack spraying) will be used to treat occurrences of non-native invasive species within the right-of-way and in other work areas. Following treatment, the need for supplemental seeding will be determined in consultation with the USFS. If supplemental seeding is determined to be appropriate it will implemented in a manner consistent with the *Restoration and Rehabilitation Plan*. The timing of subsequent revegetation efforts will be based on the persistence of the herbicide.

Mechanical methods entail the use of equipment to mow or disk non-native invasive plant species populations. Mechanical treatments will be conducted prior to seed maturation where required. If such a method is used, subsequent seeding will be conducted, if necessary, to re-establish a desirable vegetative cover that will stabilize the soils and slow the potential reoccurrence of non-native invasive plant species.

Where warranted, Atlantic will consult with the USFS regarding the use of biological and alternative non-native invasive plant control methods. The implementation of these measures will require approval from the USFS.

11.4.1.4 Monitoring

Following construction, non-native invasive plant infestations will be monitored as part of Atlantic's restoration monitoring activities as described in the Restoration and Rehabilitation Plan. NNIS control measures shall be considered successful if upon visual survey the density and cover of non-NNIS are similar in density and cover to nearby non-forested, undisturbed lands. NNIS and noxious weeds are absent, unless they are abundant in areas that were not disturbed by construction.

Atlantic will continue NNIS monitoring and treatment until the conditions articulated above are achieved. Atlantic's operations staff will monitor and treat non-native invasive plant species as part of its normal operations and maintenance activities in accordance with applicable USFS regulations.

11.5 HERBICIDES

11.5.1 Herbicide Application and Handling

To comply with the MNF and GWNF LRMPs, a selective herbicide application method will be utilized. Herbicide application will be based on information gathered from field surveys and consultations with the USFS. Before application, Atlantic or its Contractors will obtain required USFS approval. Herbicide application will be conducted in accordance with applicable laws and regulations by a licensed contractor. Hand application methods (e.g., backpack spraying) will be used to treat occurrences of non-native invasive species within the right-of-way and in other work areas. Calibration checks of equipment will be conducted at the beginning of spraying and periodically to ensure proper application rates.

Herbicides will be transported to the site with the following provisions:

- on-site herbicide quantities will be limited where practical;

- concentrate will be transported in approved containers only, in a manner that will prevent tipping or spilling, and in a compartment that is isolated from food, clothing, and safety equipment;
- mixing will be conducted in an upland area and at a distance greater than 100 feet from waterbodies or wetlands; greater than 200 feet from private wells, private land, riparian corridors, open water, or other sensitive areas;
- herbicides will not be ground applied within 60 feet of any known threatened, endangered, proposed, or sensitive plant, buffers will be clearly marked, and physical barriers must be sufficient to protect the non-target vegetation from herbicide drift and flow;
- storage and handling of all herbicides and equipment will be in accordance with all applicable regulations; and
- all herbicide equipment and containers will be maintained as needed and inspected for leaks on a daily basis.

11.5.2 Herbicide Spills

Atlantic has prepared and will implement a SPCC Plan to avoid or minimize the potential impact of hazardous material spills during construction and operation of the Project. In accordance with this plan, herbicide contractors will be responsible for keeping spill kits in their vehicles and in herbicide storage areas to allow for quick and effective response to spills. Response to an herbicide spill will vary depending on the material spilled, and the size and location of the spill. The order of priorities after discovering a spill are to protect the safety of personnel and the public, minimize damage to the environment, and conduct cleanup and remediation activities.

All herbicide contractors will obtain and have readily available copies of the appropriate Safety Data Sheets (formerly known as Material Safety Data Sheets) and labels for the herbicides used. All herbicide spills will be reported in accordance with applicable laws and requirements. Further information regarding spill response and reporting is provided in the SPCC Plan.

11.6 OTHER CONTROL MEASURES

As outlined in the MNF and GWNF LRMPs, Atlantic will use a secondary treatment method in the event the temperature requirements have been exceeded and/or the wind speed has been exceeded on the day of application. Other control measures like hand pulling, and/or basal spot treatment may be utilized. Treatment methods would be species specific or based on proximity to sensitive features. Stem-specific treatments should be used on rock outcrops or sinkholes. Atlantic will ensure soil-active herbicides will not be used on slopes over 45 percent or on aquifer recharge zones. These areas will be marked by buffers. Atlantic will continue to coordinate with the USFS during construction to ensure these treatment measures are implemented as an alternative to the primary method of herbicide application.

11.7 TREATMENT SCHEDULE

Atlantic will provide the USFS with a treatment schedule once the Project nears the construction timeframes.

12.0 SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

12.1 PURPOSE

The purpose of this SPCC Plan is to identify preventive measures, such as training, equipment inspection, and refueling procedures, to reduce the likelihood of spills; and mitigation measures, such as containment and cleanup, to minimize potential impacts should a spill occur. Atlantic's construction Contractors, [17] whose activities could result in a spill of fuel or other hazardous materials, will be required to adopt the following protocols for spill prevention, cleanup, and reporting during construction of the ACP.

Transportation and temporary storage of hazardous materials, including fuels, oils, hydraulic fluid, and blasting materials, could be required on USFS lands. The locations of temporary storage areas for these materials on USFS lands will be determined in consultation with USFS staff and discussions with the construction contractor.

12.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC Plan and Procedures; other construction, restoration, and mitigation plans, including this SPCC Plan; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

Experienced, well-trained personnel are essential for the successful implementation of the SPCC Plan. Contractors will provide spill prevention and response training to their work crews. The training program will be designed to improve awareness of safety requirements, pollution control laws, and proper operation and maintenance of equipment. Contractors will train all employees who handle fuels and other regulated substances to prevent spills and to quickly and effectively contain and cleanup spills that may occur in accordance with applicable regulations and the provisions of this plan.

12.3 ROLES AND RESPONSIBILITIES

A. **Spill Coordinator –** Each Contractor will appoint a Spill Coordinator who will be responsible for coordinating Contractor Work Crews for spill cleanup, conducting site investigations, and completing spill reports. The Spill Coordinator will report spills to an EI, who will initiate the spill reporting process (see Section 12.6). The Spill Coordinator will be responsible for completing a Spill Report Form (Attachment K) within 24 hours of the occurrence of a spill, regardless of the size of the spill.

B. **Contractor Work Crews –** Contractor Work Crews will comply with this SPCC Plan and will notify the crew foreman or Spill Coordinator immediately of a spill of fuel or other hazardous material, regardless of the volume of the spill.

C. **Environmental Inspectors –** The EIs will monitor the Contractors' compliance with the provisions of the SPCC Plan to ensure that spill resources are allocated and cleanup is accomplished in accordance with this plan and applicable regulatory requirements. The EIs will work in conjunction with Atlantic's environmental team to promptly report spills to appropriate federal, state/commonwealth, and local agencies, as required, and to

[17] Contractor or Contractors refer to the company or companies retained by Atlantic or another contractor to construct the proposed facilities.

coordinate with these agencies regarding contacting additional parties or agencies as may be required.

12.4 PREVENTIVE MEASURES

Contractors will minimize the potential for a spill during construction activities by implementing appropriate measures to prevent and contain spills. Equipment and materials will be located onsite to meet the provisions of this plan. The Contractors will comply with applicable environmental and safety laws and regulations, and the standards within the MNF and GWNF LRMPs. Contractors will ensure that a copy of this plan is available onsite to all Construction Work Crew members and Forest Service Fire Management personnel (**GWNF LRMP FW-149; MNF LRMP FM01**). All cleanup and other construction-related spill activities will be completed by the appropriate Contractors.

Spill prevention measures are described below.

12.4.1 Staging Areas and Facility Sites:

A. Prior to construction, the Contractors will provide site-specific descriptions and maps depicting locations of fixed and mobile hazardous material containers and the types of materials located within containers. The site-specific descriptions and maps will identify the direction, rate of flow, and total quantity of petroleum or hazardous liquid that could be discharged from containers or from major equipment failures.

B. Contractors will visually inspect aboveground storage containers for leaks and spills on a regular basis and whenever containers are refilled. Contractors will maintain inspection records for every container.

C. Contractors will construct secondary containment structures (e.g., temporary liners and seamless impermeable berms) around aboveground single wall, storage containers so that liquids will be contained and collected in specified areas isolated from waterbodies in the event of a leak or spill. Double wall containers will not require secondary containment. Storage containers will not be placed in areas subject to periodic flooding and washout.

D. Secondary containment structures must provide a containment volume equal to a minimum of 110 percent of the maximum storage volume of the storage container for single wall containers.

E. Secondary containment structures must be constructed so that no outlet is provided and a spill will be contained within the containment structure. Accumulated rainwater may be removed if authorized by the EI. Accumulated water with a visible sheen will be collected for proper storage, transport, and disposal.

F. Contractors will remove all secondary containment structures at the conclusion of the Project. Contractors also will be responsible for returning the storage impoundment area to its original contours and appearance upon completion of the Project.

G. Hazardous materials, including chemicals, fuels, and lubricating oils, will be stored only at designated staging areas and in appropriate service vehicles. Containers will be located in a manner that minimizes the possibility of contamination to water resources, including drinking water, groundwater dependent ecosystems, karst areas, and cave soils and their natural hydrology. The storage areas will be located at least 100 feet away from wetlands, waterbodies, and springs; at least 200 feet away from private water supply wells; at least 300 feet away from karst features; and at least 400 feet away from municipal water supply wells unless a larger buffer is required by regulatory agencies. Containers will not be located within 500 feet of a developed recreation area or Scenic Area.

H. Storage containers will display labels that identify the contents of the container and whether the contents are hazardous. Contractors will maintain and provide to Atlantic, when requested, copies of all Safety Data Sheets (formerly known as Material Safety Data Sheets). All containers used for the storage of hazardous materials, including chemicals, fuels, and lubricating oils, will be of material and construction compatible with the material stored and the conditions of storage such as pressure and temperature. All containers will be in good condition.

I. Contractors will conduct routine equipment maintenance, such as oil changes, in staging areas and will dispose of waste oil in an appropriate manner (e.g., the Contractors will collect the waste oil in labeled, sealed containers and transport the waste oil to a recycling facility).

J. Contractors will correct visible leaks in storage containers as soon as possible. Leaks outside of secondary containment, regardless of volume, will be reported to the Spill Coordinator and an EI.

K. Drain valves on temporary storage containers will be locked to prevent accidental or unauthorized discharges from the containers.

L. All fuel nozzles will be equipped with functional automatic shut-off valves.

M. The drivers of tank trucks will be responsible for spill prevention and the provision of secondary containment during tank truck unloading. Procedures for loading and unloading tank trucks will meet the minimum requirements established by applicable law and associated regulations. Drivers will observe and control the fueling operations at all times to prevent overfilling. Contractors will be responsible for training drivers of tank trucks to comply with these provisions.

N. Prior to departure of a tank truck, all outlets of the vehicle will be closely examined by the driver for leakage and tightened, adjusted, or replaced, as necessary, to prevent liquid leakage while in transit. Contractors will be responsible for training drivers of tank trucks to comply with these provisions.

O. Pumps operating within 100 feet of a waterbody or wetland boundary will utilize appropriate secondary containment systems to prevent spills

P. All machinery will arrive on the right-of-way in a clean, washed condition, maintained free of fluid leaks. All equipment will be in good working order and inspected on a regular basis.

Q. Overnight parking of equipment, as well as refueling and servicing of construction equipment, will be restricted to upland areas at least 100 feet away from waterbodies, wetlands, and springs; at least 200 feet from private water-supply wells; at least 300 feet from karst features; and at least 400 feet from municipal water-supply wells. Where this is not practicable, and where the EI finds in advance no reasonable alternative, the equipment will be fueled by designated personnel with specific training in refueling, spill containment, and cleanup, under the supervision of an EI. Prior to refueling, appropriate steps will be taken (including deployment of secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill.

R. Fuel trucks transporting fuels to construction areas will only travel on approved access roads.

S. Contractors will keep a spill kit onsite and on all equipment in case of machinery leaks or spills. If a spill kit is used, it will be replaced within 24 hours.

1. Restricted Refueling Areas will be identified in the field with flagging or signs. A site-specific plan and written approval from an EI will be required to refuel in restricted areas.

2. Approval must be received from an Atlantic representative and, where necessary, appropriate regulatory permits must be obtained, prior to refueling in Restricted Refueling Areas.

3. In large wetlands where no upland site is available for refueling, auxiliary fuel tanks may be mounted to equipment to minimize the need for refueling.

4. Trained Contractor personnel must be available for refueling, and an EI or another trained Atlantic representative must be present.

5. Equipment such as large, stationary pumps will be fitted with auxiliary tanks as appropriate. The auxiliary tanks will be placed within secondary containment which provides for a containment volume equal to a minimum of 110 percent of the volume of the auxiliary tanks.

6. Refueling within Restricted Refueling Areas will take place in areas designated by an EI. Fuel trucks with a capacity in excess of 300 gallons will not be allowed within a Restricted Refueling Area unless adequate secondary containment is provided.

7. Refueling of dewatering pumps, generators, and other small, portable equipment will be performed using approved containers with a maximum volume of 5 gallons.

12.4.2 Staging Areas and Facility Sites:

A. Contractors will stock a sufficient supply of sorbent and barrier materials at construction staging areas to allow the rapid containment and recovery of a spill. Sorbent and barrier materials will also be used to contain runoff from spill areas.

B. Shovels and 55 gallon drums will be kept at each individual staging area. If small quantities of soil become contaminated within the staging area, they will be collected and placed in the drums. The drums will be labelled to indicate the contents of the drum, including the spilled/recovered material.

C. Large quantities of contaminated soil will be collected using heavy equipment and will be stored in drums or other suitable containers prior to disposal. The drums will be labelled to indicate the contents of the drum, including the spilled/recovered material.

D. The Contractors will dispose of all contaminated soil in accordance with applicable state/commonwealth and Federal regulations.

E. Right-of-way

1. Each construction crew will have adequate absorbent materials and containment booms on hand to enable the rapid and complete cleanup of spills, as well as sufficient tools and materials to stop leaks.

2. Contractors must maintain spill kits containing a sufficient quantity of absorbent and barrier materials to adequately contain and recover foreseeable spills. These kits may include, but are not limited to: absorbent pads, straw bales, absorbent clay, sawdust, floor drying agents, spill containment barriers, plastic sheeting, skimmer pumps, and 55 gallon drums. The equipment will be located near fuel storage areas and other locations, as necessary, to be readily available in the event of a spill.

3. All fuel equipment, and where practicable, service trucks, will carry adequate spill response materials. Spill response materials present on trucks will consist of absorbent pads, absorbent material, plastic bags, and a shovel.

4. The Spill Coordinator will inform the EIs and all Contractor personnel of the location of spill control equipment and materials, and have them readily accessible while construction activities are occurring.

5. If a spill kit is used, it will be replaced within 24 hours.

F. Concrete Coating

1. Concrete coating activities and washout activities will not be performed within 100 feet of wetlands, waterbodies, or springs, or with 300 feet of karst features unless the location is an existing industrial site designated for such use.

G. Hydrostatic Testing

1. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, secondary containment and refueling of these pumps will be addressed in site-specific procedures will be developed to prevent, contain and clean potential spills.

12.5 SPILL RESPONSE

A. The first priorities after discovering a spill are to protect the safety of personnel and the public and to minimize damage to the environment. Actions to be taken immediately following a spill will include the following:

1. The safety of the situation (including the surrounding public) will be assessed.

2. Sources of ignition will be removed from the area by trained personnel if safe to do so.

3. The source of the spill will be shut off by trained personnel if safe to do so.

4. Efforts to contain the spill immediately will be initiated by trained personnel if safe to do so.

5. Cleanup activities will be initiated as soon as possible after the spill is contained using properly trained and protected personnel with adequate spill cleanup materials and equipment (see Section 12.7).

6. As necessary, Dominion will deploy one of several emergency response contractors it has under contract in West Virginia and Virginia to further contain and clean up the spill.

12.6 SPILL REPORTING

A. All spills will be reported immediately to Atlantic. Reports will include the following information (found on the Spill Report Form):

1. Date, time, and location of the spill.

2. Type of material spilled.

3. Amount of material spilled.

4. Extent of spill area.

5. Whether the material has reached or has the potential to reach a wetland, waterbody, or karst feature.

6. Status of spill containment and cleanup.

7. Circumstances leading up to the spill.

B. Atlantic's environmental team will report the spill to the MNF or GWNF, as appropriate, as well as the applicable state regulatory agencies if the spill meets or exceeds a reportable threshold. Table 12.6-1 lists the federal and state/commonwealth agencies that would be contacted if a spill meets or exceeds a reportable threshold.

C. Federal standards for reportable quantities (RQ) of hazardous materials are listed at 40 CFR 302.4, which is incorporated into this SPCC Plan by reference. Additional requirements by state/commonwealth are as follows:

1. West Virginia:

a. Hazardous waste spills must be reported when equal to or exceeding the Federal RQs at 40 CFR 302.4 (see e.g., W. Va. CSR § 60-3-5).

b. Oil spills must be reported when "causing a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines" (see CWA 111; 40 CFR 110.3(b); and, by analogy, W. Va. Legislative Rules § 31-1).

c. Toxic air pollutant spills must be reported when exceeding (i) 1 pound for ethylene oxide and vinyl chloride, (ii) 10 pounds for acrylonitrile and butadiene, or (iii) 50 pounds for all others (W. Va. CSR § 45-27-10.4).

TABLE 12.6-1

Agency Notification List

Agency	Program	Contact Information	Hours of Operation	Applicable Areas Served
Federal				
Environmental Protection Agency	National Response Center	800-424-8802	24-hour hotline	All Areas
West Virginia				
Department of Environmental Protection (WVDEP)	Emergency 24-hour Hotline for Hazardous Waste Release	800-642-3074	24-hour hotline	Entire State
WVDEP	Elkview Emergency Response Unit	304-558-5938	Monday – Friday 8:00 am – 4:00 pm	Entire State
Virginia				
DEQ	Pollution Response Program- Valley Regional Office	540-574-7800	Monday – Friday 8:30 am – 4:30 pm	Augusta, Highland, and Nelson Counties
DEQ	Pollution Response Program- Blue Ridge Regional Office	540-562-6700	Monday – Friday 8:30 am – 4:30 pm	Buckingham, Cumberland, Prince Edward, and Nottoway Counties
DEQ	Pollution Response Program- Piedmont Regional Office	804-527-5020	Monday – Friday 8:30 am – 4:30 pm	Dinwiddie, Brunswick, and Greensville Counties
DEQ	Pollution Response Program- Tidewater Regional Office	757-518-2000	Monday – Friday 8:30 am – 4:30 pm	Southampton County and Cities of Suffolk and Chesapeake
DEQ	Pollution Response Program – Online Reporting System	Online form at: http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness/PollutionReportingForm.aspx	24-hour online reporting option	Entire Commonwealth
Department of Emergency Management	Virginia Emergency Response Team	800-468-8892 or 804-674-2400	24-hour hotline	Entire Commonwealth

2. Virginia:

a. Oil discharges to land must be reported in amounts equal to or greater than 25 gallons (or less if certain recordkeeping and clean-up requirements are not met) (Va. Code § 62.1-44.34:19).

b. An oil spill that discharges or may reasonably be expected to discharge into commonwealth waters must be reported, regardless of amount (Va. Code § 62.1-44.34:19).

c. Hazardous waste spills must be reported when equal to or exceeding Federal RQs at 40 CFR 302.4 (see 9 Virginia Code 25-880-70, generally describing applicable reporting quantities).

D. Contractors are responsible for assisting Atlantic and DTI with preparing follow-up written incident reports to regulatory agencies upon request.

12.7 SPILL CONTAINMENT AND CLEANUP

A. Land Spill

1. Berms will be constructed with available equipment to physically contain the spill and sorbent materials will be applied to the spill area. Traffic on contaminated soils will be prevented to the extent practicable. Some traffic on contaminated soils may be necessary to avoid impacts on adjacent or sensitive resources (e.g., wetlands).

2. Contaminated soils and vegetation will be removed and disposed of at a properly licensed waste disposal facility.

3. Waste materials from the spill will be disposed of according to applicable regulatory requirements.

4. The following information will be provided to an EI and Atlantic and DTI as available following containment and cleanup (but no later than 24 hours after transport and disposal of the contaminated waste material):

a. The amount of the spilled material that was recovered during cleanup.

b. Proposed reclamation of remaining contaminated areas.

c. Storage method for the contaminated waste material before transport and disposal.

d. Transport and disposal documentation for the contaminated waste material.

5. If necessary, an Emergency Response Contractor will be secured for large spills to further contain and clean up the spill.

B. **Wetland or Waterbody Spill**: The following measures will be implemented immediately to control a spill into a wetland or waterbody:

1. For spills in standing water, floating booms, skimmer pumps, and holding tanks will be readily available and used, as appropriate, by the Contractors to recover and contain released materials on the surface of the water.

2. Berms and/or trenches will be constructed in upland areas to contain a spill before it enters a wetland or waterbody. Deployment of booms, skimmers, and sorbent materials will be utilized if the spill reaches a waterbody. The spilled product will be retrieved and the contaminated area cleaned-up in accordance

with recommendations from the Spill Coordinator and applicable regulations and guidelines.

3. If necessary, an Emergency Response Contractor will be secured for large spills in wetlands or waterbodies to further contain and clean up the spill.

4. Approvals or permits from regulatory agencies may be required to place equipment into a wetland or waterbody. Therefore, Contractors must receive written permission from Atlantic or DTI before placing equipment into a wetland or waterbody for the purpose of spill cleanup.

C. Karst: In addition to the measures described above, the following procedures will be implemented in areas of karst terrain:

1. Buffers of 300 feet around karst features (e.g., sinkholes, caves, sinking or losing streams, ponors, pinnacled bedrock, and large springs) within or adjacent to the construction right-of-way will be marked with signs and/or highly visible flagging until construction related ground disturbing activities are completed.

2. Equipment refueling will not be permitted within flagged or marked buffer areas for karst features or areas draining into karst features, except by hand-carried cans (5 gallon maximum capacity), when necessary.

3. Equipment servicing and maintenance areas will be sited outside of flagged or marked buffer areas for karst features or areas draining into karst features.

4. Erosion and sediment controls will be implemented, as appropriate, to prevent runoff resulting from construction equipment washing operations (if applicable) to directly enter a karst feature by locating these operations outside of karst buffer areas.

5. Construction equipment, vehicles, materials, hazardous materials, chemicals, fuels, lubricating oils, and petroleum products will not be parked, stored, or serviced within 300 feet of a karst feature.

6. Equipment will be checked for leaks daily by the Contractors prior to beginning work in karst areas; and damaged or defective equipment will be removed or repaired prior to use in karst areas.

7. Atlantic or DTI will notify the National Response Center and either the West Virginia Department of Environmental Protection or Virginia DEQ if a reportable spill impacts a karst feature .

12.8 CERTIFICATION BY A PROFESSIONAL ENGINEER

This SPCC Plan has been certified by a professional engineer in accordance with 40 CFR 112.7 – *General Requirements for Spill Prevention, Control, and Countermeasure Plans*.

Professional Engineer　　　　　　　　　　Date

12.9 CERTIFICATION BY THE CONTRACTOR

The Contractor listed below agrees to follow the requirements of Atlantic's *Spill Prevention, Control, and Countermeasure Plan* during all work activities conducted for Atlantic.

____ ________________________

Contractor Date

____ ________________________________

Responsible Official (Print Name) Title

____

Responsible Official (Signature)

13.0 CONTAMINATED MEDIA PLAN

13.1 BACKGROUND

Atlantic searched federal and state/commonwealth databases to identify contaminated sites in the vicinity of the proposed ACP facilities. The EPA's Facility Registry System map service was used to locate sites within 1 mile of the proposed facilities that are listed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) and the Assessment, Cleanup and Redevelopment Exchange System (ACRES) (EPA, 2014).[18] In addition, various map services and databases for known contaminated sites were reviewed for each state/commonwealth.

Review of EPA records identified no Federal Brownfield sites and three Federal Superfund sites within one mile of the proposed ACP facilities, none of which are in the MNF or GWNF. Sites identified in the state/commonwealth databases consist of landfills, solid waste sites, and Leaking Underground Storage Tanks (LUST). No landfills, solid waste sites, or LUST sites were identified in the MNF or GWNF.

The locations of the contaminated sites listed in Table 13.1-1 are based on publicly available geospatial point data. Point data alone are insufficient for identifying the boundaries and extent of contamination at each site. Atlantic has submitted information requests to the EPA and state/commonwealth agencies for additional information regarding the location and extent of contamination at the sites. If contaminated sites are found to be crossed or impacted by the proposed routes, Atlantic will investigate options for avoiding these sites, including route variations. This *Contaminated Media Plan* will be updated, as appropriate, based on the results of the information requests.

[18] CERCLIS and ACRES sites are commonly known as Federal Superfund and Brownfield sites, respectively.

TABLE 13.1-1

Contaminated Sites, Landfills, and Leaking Underground Storage Tanks Near the Atlantic Coast Pipeline [a]

County/ City and State/ Commonwealth	Pipeline Segment	Nearest Milepost	Site Name	Distance and Direction from Centerline (ft)	Facility Type	Surface Drainage Direction from Project [c]	Open or Closed Status [d]
ATLANTIC COAST PIPELINE							
CERCLIS and ACRES Sites Identified within 1 mile of the Centerline and Aboveground Facilities							
Chesapeake, VA	AP-3	81.9	Money Point Creosote Site	4,109 N	Superfund Site	Down Gradient	Active
Chesapeake, VA	AP-3	81.9	Eppinger & Russel Co Inc.	4,472 N	Superfund Site	Down Gradient	Active
Chesapeake, VA	AP-3	82.4	Borden Smith Douglass	54 S	Superfund Site	Side Gradient	Active
Landfill and Solid Waste Sites Identified within 0.5 mile of the Centerline and Aboveground Facilities							
Augusta, VA	AP-1	141.5	Jolivue Landfill/Augusta Regional Landfill	915 NE	Closed MSW Landfill and Active MSW Landfill Complex	Up Gradient	Closed
Chesapeake, VA	AP-3	81.0	Dominion Chesapeake Energy Center	317 E	Closed Industrial Landfill and Active Industrial Landfill	Side Gradient	Closed
Chesapeake, VA	AP-3	82.5	Atlantic Aggregate Recyclers	884 NE	Inert Landfill	Up Gradient	Closed
Southampton, VA	AP-3	34.5	SPSA-Boykins Transfer Station	131 SW [b]	Active Waste Transfer Station	Down Gradient	Open
Southampton, VA	AP-3	34.5	SPSA-Franklin Transfer Station	137 SW [b]	Closed Waste Transfer Station	Up Gradient	Closed
Leaking Underground Petroleum Storage Tank (LUST) Sites within 1000 feet of the Centerline and Aboveground Facilities							
Highland, VA	AP-1	87.6	Bussard Residence	207 N [b]	LUST	Up Gradient	Closed
Highland, VA	AP-1	109	VDOT McDowell Area Headquarters	52 E [b]	LUST	Up Gradient	Closed
Highland, VA	AP-1	109	VDOT McDowell	173 N [b]	LUST	Up Gradient	Closed
Augusta, VA	AP-1	134.0	Deerfield Grocery	833 S	LUST	Down Gradient	Closed
Augusta, VA	AP-1	143.9	Starkey Residence	148 SW	LUST	Side Gradient	Closed
Nelson, VA	AP-1	194.5	Ridge Crest Baptist Church	980 SW	LUST	Up Gradient	Closed
Buckingham, VA	AP-1	235.2	Betty Brown Property	646 E	LUST	Up Gradient	Closed
Brunswick, VA	AP-1	301.4	Russel Residence	992 E	LUST	Side Gradient	Closed
Southampton, VA	AP-3	23.6	Cooke Residence	889 NW	LUST	Up Gradient	Closed
Suffolk, VA	AP-3	62.0	City of Suffolk Pump Station 11	244 NW	LUST	Side Gradient	Closed
Chesapeake, VA	AP-3	78.6	Deep Creek Pharmacy	160 S	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	78.8	Mid Atlantic Repair, Inc.	535 S	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	78.8	Watkins Motor Lines, Inc.	363 S	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	80.1	Deep Creek Pumping Station	725 N	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.1	Chesapeake Energy Center	923 E	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.2	IMTT-Chesapeake Terminal	626 NW	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.5	Chesapeake Energy Center	698 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.6	Chesapeake Energy Center	748 S	LUST	Up or Side Gradient	Open

TABLE 13.1-1

Contaminated Sites, Landfills, and Leaking Underground Storage Tanks Near the Atlantic Coast Pipeline [a] (cont'd)

County/ City and State/ Commonwealth	Pipeline Segment	Nearest Milepost	Site Name	Distance and Direction from Centerline (ft)	Facility Type	Surface Drainage Direction from Project [c]	Open or Closed Status [d]
Leaking Underground Petroleum Storage Tank (LUST) Sites within 1000 feet of the Centerline and Aboveground Facilities							
Chesapeake, VA	AP-3	81.6	Chesapeake Energy Center	730 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.6	Chesapeake Energy Center	720 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	81.7	Chesapeake Energy Center	850 S	LUST	Up or Side Gradient	Closed
Chesapeake, VA	AP-3	82.0	One Steel Recycling	899 N	LUST	Down Gradient	Closed
Chesapeake, VA	AP-3	82.4	Quest Transport LLC	305	LUST	Side Gradient	Closed
Chesapeake, VA	AP-3	82.4	Former Smith Douglass Plant	431 S	LUST	Side Gradient	Closed

[b] Sites are nearest to aboveground facilities not the centerline. Mileposts for these sites are identified for the nearest milepost in a direct line to the centerline.

[c] USGS topographic maps were reviewed to evaluate the topographic disposition of each site in relation to the Project.

[d] Active = Superfund sites are reported as active in EPA files; however, an active status does not necessarily mean that any ongoing investigations or cleanups are taking place or are planned to take place at the site.

Closed = specific requirements for site closure varies between states/commonwealths, but generally speaking, this means that the tank has been removed, the site has been remediated, and any remaining contaminant concentrations do not pose an unacceptable risk to human health or the environment.

13.2 PURPOSE

Atlantic recognizes the potential for encountering unknown contaminated soil or groundwater during construction. This *Contaminated Media Plan* describes the steps that Atlantic and its Contractors[19] will implement in the event that suspected contaminated soil or groundwater is encountered during construction.

13.3 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Atlantic and Contractor personnel. The training program will focus on the FERC Plan and Procedures; other construction, restoration, and mitigation plans, including this *Contaminated Media Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew commences construction with periodic follow-up training for groups of newly assigned personnel.

13.4 IDENTIFICATION OF CONTAMINATED MEDIA AND INITIAL RESPONSE

Contractor personnel and Atlantic's EIs will observe work areas during construction for signs of potential contamination, including:

- discoloration of soil;
- chemical-like odors from soil or water;
- oily sheens or puddles on soil;
- oily sheens on water;
- buried drums or other waste containers;
- buried waste (e.g., garbage, debris, ash, medical waste, or clinical containers);
- discolored surface water;
- differences in vegetation growth (phytotoxicity); and/or
- evidence of waste treatment practices.

If signs of contamination are encountered on USFS lands, the Contractor will stop work in the vicinity of the suspected contamination; restrict access to the suspected contamination site; and notify the crew foreman, an EI, the Spill Coordinator (identified in the SPCC Plan), and Atlantic. The EI will immediately notify the designated USFS representative.

13.5 CONTAINMENT AND CHARACTERIZATION

The Contractor will initiate measures to avoid the spread of contaminants until the type of contaminant, its concentration, potential exposure routes, and management options are evaluated. If signs of potential contamination are observed during construction, the following response actions will be implemented.

A. If potentially contaminated soil or groundwater is exposed during excavation activities, excavation will stop in the area of potential contamination and an EI and Atlantic representative will be contacted immediately.

[19] Contractor refers to the company or companies retained by Atlantic or another contractor to construct the proposed facilities.

B. If potentially contaminated soil will not be backfilled, the soil will be placed on an impervious surface or 10-mil polyethylene and covered with 10-mil polyethylene to prevent rainfall run-on and run-off. The potentially contaminated soil will not be moved from the site by the Contractor unless approved to do so by the EI and/or Atlantic representative.

C. If potentially contaminated groundwater is draining from the sides of the excavation and standing in the trench, temporary trench plugs will be installed to avoid the migration of the potentially contaminated groundwater to uncontaminated areas within the trench. Potentially contaminated groundwater will not be pumped from the trench.

D. If a trench or excavation will be left open and precipitation may occur, measures will be implemented to prevent precipitation run-off from entering the trench (e.g., by installing waterbars to divert runoff from the trench and trench plugs to prevent the flow of contaminated water in the trench).

Concurrent with the management of the contaminated media, representative soil and groundwater samples, as applicable, will be collected for chemical analysis. Appropriate tests or analyses will be conducted by a qualified laboratory. Initial testing will be based on field observations and the suspected nature of the contamination. Laboratory analyses could include: total petroleum hydrocarbons, oil and grease, pH, volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls, and/or metals.

Depending on the nature and extent of the contamination, Atlantic will notify the MNF or GWNF, as appropriate, and the appropriate federal, state/commonwealth, and local regulatory agencies. Appropriate agencies include, but are not be limited to, the following:

A. West Virginia Department of Environmental Protection at 1-800-642-3074 (24-hours).

B. Virginia Department of Emergency Management at 1-800-468-8892 (24-hours, in-state calls only) or at 1-804-674-2400 (24-hours, out-of-state calls). Online spill reporting for non-emergency releases can be completed at http://www.deq.virginia.gov/Programs/PollutionResponsePreparedness/PollutionReportingForm.aspx.

C. National Response Center (Washington, D.C.) at 1-800-424-8802 (24 hours).

13.6 AVOIDANCE OR RESPONSE PLANS

If the contaminant identified is found to be a health or safety hazard or harmful to the pipeline or operation of its CP system, a route variation may be considered to avoid the area of contamination. Applicable permits and regulatory approvals will be obtained prior to proceeding with a route variation.

If the contaminant does not pose a health or safety concern and will not otherwise interfere with the pipeline, a written plan for completing construction within the contaminated area will be prepared. Test pits or borings may be excavated within the right-of-way to assess the extent of the contamination. Depending on the nature and extent of contaminated media, site-specific measures will be identified to complete construction across the contaminated area. These measures may include:

- storing excavated soil on an impervious surface or a sheet of 10-mil polyethylene;
- avoiding water withdrawals from the trench;
- removing and disposing of contaminated media at an approved disposal facility;
- replacing contaminated soil with clean backfill; and/or

- implementing staged withdrawal and disposal of standing trench water during backfilling to avoid overflow and runoff.

Contaminated soil will not be placed back in the trench unless approved by the appropriate regulatory agency and by Atlantic in writing. Site-specific construction plans for areas of contamination will be developed in accordance with environmental regulations, and approval of the plans by appropriate regulatory agencies will be obtained prior to implementation of the plans.

14.0 CULTURAL RESOURCES

14.1 PURPOSE

The purpose of this section is to summarize the cultural resources studies conducted to date, remaining studies which are yet to be completed, and procedures that should be followed if an unanticipated discovery occurs.

14.2 SUMMARY OF CULTURAL RESOURCES INVESTIGATIONS ON USFS LANDS

In order to minimize the potential during construction for accidental discovery of cultural resources, Atlantic contracted GAI Consultants, Inc. (GAI) to conduct Phase I archaeological survey and historic architectural reconnaissance of the Project's defined Area of Potential Effect (APE) in the GWNF and the MNF. The studies encompass locations associated with the proposed undertaking where there will be alteration and disturbance of surface and subsurface soils that contain or have potential to contain archaeological sites, including proposed construction areas, access roads, staging areas, etc. The APE along the pipeline consists of a 91.4-meter) (300-foot) corridor centered on the proposed pipeline. The APE for access roads consists of a 15.2 meter (50-foot) corridor centered on the proposed/existing roadways. An APE wider than the proposed limit of disturbance was studied for both the pipeline and access roads to allow flexibility in final design. Any project changes that would result in ground disturbance outside the current APE would be subject to supplemental field surveys.

In the MNF, cultural resources studies have been completed for the proposed Project to date and a combined technical report has been reviewed and accepted by the MNF.

In the GWNF, field studies are in progress in the area of Ft. Lewis, including a section of the proposed pipeline corridor and a few access roads. Further, study of portions of an additional access road (GWNF Road 1755) is pending survey permission. An addendum report for these sections will be submitted after fieldwork is completed. Phase I Cultural Resources Survey has been completed for the remainder of the proposed Project and a combined technical report has been reviewed and accepted by GWNF personnel. To date, GAI recorded four new pre-contact-period archaeological sites, two new historic-era archaeological sites, and six pre-contact-period isolated finds. GAI also re-identified two previously recorded pre-contact-period archaeological sites, but was unable to re-identify two other previously recorded archaeological sites. Four newly-identified sites (44AU0914, 44AU0915, 44AU0917, 44AU0918) and two previously recorded sites (44AU0780, 44AU0781) were determined to warrant additional study. Phase II Archaeological Testing was conducted at these six sites. All six sites contain precontact-period lithic scatters. A few pieces of precontact-period ceramic were also recovered from Site 44AU0781. A small historic-period artifact scatter, as well as remains of a charcoal hearth related to iron furnace fuel production, were encountered at Site 44AU0917. A Phase II technical report for these six sites is in progress and is planned to be submitted to the GWNF in January 2017. To date, no architectural resources have been recorded.

A separate detailed Unanticipated Discoveries Plan (UDP) has been prepared for each the GWNF (Attachment L) and the MNF (Attachment M) in order for Atlantic to comply with the relevant state and federal regulations concerning the protection of cultural resources. Procedures outlined in the UDPs must be followed during construction. As per the UDP, EIs and possibly Archaeological Monitors will have the responsibility to monitor altered and disturbed areas for potential archaeological remains throughout construction. The EI and the Archaeological Monitor will be responsible for advising the construction contractor's personnel on the procedures to follow in the event that an unanticipated discovery is made. A copy of each UDP will be maintained by the EI, the Archaeological Monitor, and at the construction field office. Training will occur as part of the pre-construction on-site training program for foremen, company inspectors, and construction supervisors. The EI will advise all operators of equipment involved in grading, stripping, or trenching activities to:

- Stop work immediately if they observe any indications of the presence of cultural materials, animal bone, or possible human bone.
- Immediately contact the EI (if not available contact the Construction Site Supervisor).
- Treat human remains with dignity and respect.

.

15.0 THREATENED AND ENDANGERED PLANTS AND ANIMALS

Information on threatened and endangered plants and animals as well as USFS species of concern is contained within the Biological Evaluation submitted to the USFS in November, 2016 and an updated report is scheduled to be filed in February, 2017. The Biological Evaluation is incorporated by reference into this COM Plan.

16.0 FUGITIVE DUST CONTROL AND MITIGATION PLAN

16.1 PURPOSE

The purpose of this *Dust Control Plan* is to identify potential sources of fugitive dust emissions arising from construction activities and to provide direction to Contractors [20] on measures for avoiding, minimizing, and controlling fugitive dust. This plan is based on the *Fugitive Dust Control & Mitigation Plan* prepared in connection with Atlantic's application to the FERC for the entire ACP. Fugitive dust includes total suspended particulates, particulate matter with an aerodynamic diameter less than 10 micrometers, and particulate matter with an aerodynamic diameter less than 2.5 micrometers (collectively, "fugitive dust").

Fugitive dust will result from land clearing, grading, excavation, concrete work, and vehicle traffic on paved and unpaved roads. The amount of fugitive dust generated at any given time will be a function of construction activity, soil type, soil moisture content, wind speed, precipitation, vehicle traffic, vehicle types, and roadway characteristics. Fugitive dust emissions will be greater during dry periods and in areas of fine-textured soils subject to surface activity. The ACP will employ proven BMPs to control and limit releases of fugitive dust, such as the application of water to disturbed surfaces or roads.

16.2 TRAINING

Prior to the start of construction, Atlantic will conduct environmental and safety training for Company and Contractor personnel. The training program will focus on the FERC Plan and Procedures; other construction, restoration, and mitigation plans, including this *Dust Control Plan*; and applicable permit conditions. In addition, Atlantic will provide large-group training sessions before each work crew begins construction with periodic follow-up training for groups of newly assigned personnel.

EIs and/or construction supervisors will be responsible to ensure that contractor personnel are complying with all dust control measures and have authority to enforce and require compliance with this plan.

16.3 FUGITIVE DUST SOURCES

Fugitive dust is generated by the mechanical disturbance of granular material exposed to air. Dust from open sources is termed "fugitive" because it is not discharged to the atmosphere in a confined flow stream.

The following construction activities have the potential to generate fugitive dust:

- vehicle and equipment movement on paved and unpaved surfaces;
- vegetation removal;
- clearing, grading, and excavation;
- soil stabilization; and
- bulk/pile material loading, unloading, and hauling.

[20] Contractor refers to the company or companies retained by Atlantic or another contractor to construct the proposed facilities

16.4 DUST CONTROL MEASURES

16.4.1 Application of Water or Other Dust Suppressant

Atlantic will make all practicable efforts to minimize fugitive dust emissions from construction activities. Atlantic will have one or more water trucks available per spread that will load water from approved permitted sources to spray areas for dust control. Disturbed and trafficable areas will be kept sufficiently damp during working hours in dry conditions to minimize wind-blown or traffic-generated dust emissions.

Areas to be watered include, but are not limited to, the following:

- the construction corridor for each pipeline, including ATWS;
- contractor yards and staging areas;
- access roads;
- aboveground facility sites;
- active grading areas;
- un-stabilized areas;
- soil stockpiles; and
- parking areas.

The frequency at which water trucks will spray construction areas will vary based on weather and site conditions. More frequent applications will be required in dry conditions and where dust generation is likely.

16.4.2 Use of Approved Access Roads

Atlantic will install signs to direct traffic to designated access roads for construction of the ACP. Any traffic that deviates from designated access roads will be redirected to designated access roads and reported to the appropriate supervisor and an EI for corrective action. [21] All vehicles and equipment leaving a work site will implement BMPs to prevent dirt or mud from being transferred or tracked to public roads. For example, track-out onto paved public roads will be cleaned up as needed and in a timely manner using street sweeping or an equivalent method.

16.4.3 Enforcing Speed Limits

All vehicle and equipment traffic will be limited to a speed limit of 15 miles per hour on or in designated access roads, the construction right-of-way, contractor yards, and other work areas. Atlantic will post speed limit signs on designated access roads to ensure that all equipment/vehicle operators are aware of the speed limit on the road that is being travelled. Any observations of excessive speeds will be reported to the appropriate supervisor and an EI for corrective action. EIs will have the authority to adjust speed limits for individual operations based on site-specific conditions to minimize fugitive dust.

16.4.4 Best Management Practices for Open-body Haul Trucks

If excessive dust is generated from open-body haul trucks, corrective measures will be implemented to mitigate the generation of dust. Corrective measures may include: adjusting speed limits along designated haul roads during periods where conditions contribute to excessive dust; misting/wetting

[21] The role and responsibilities of an EI are defined in the Federal Energy Regulatory Commission's *Plan.*

soils or other materials prior to loading into haul trucks; or covering open-body haul trucks to prevent fugitive dust emissions.

16.4.5 Restoration of Disturbed Areas

All disturbed areas will be stabilized and restored as soon as practicable, which will minimize conditions favorable to dust generation (see Section 8, the Erosion Control and Sedimentation Plan, and Section 10, the Restoration and Rehabilitation Plan).

16.4.6 Maintenance of Spoil Stockpiles

If construction is inactive for more than 7 days, the Contractor will cover or stabilize spoil piles with a soil binder, tackifier, mulch, vegetation, or equivalent method in accordance with applicable permit requirements and regulations. If sustained winds are likely in areas susceptible to dust, temporary fencing may be installed to reduce wind speeds around spoil piles and minimize dust.

17.0 PUBLIC ACCESS PLAN

17.1 PURPOSE

The purposes of this *Public Access Plan* are to:

- Identify measures for informing casual users of the MNF and GWNF about construction of the ACP.
- Identify measures to inform specific user groups whose activities may intersect ACP construction about any closures, detours, restrictions, alternative access routes, etc. associated with ACP construction.
- Ensure the safety of recreational users of MNF and GWNF lands, while at the same time minimizing impacts to recreational use, during the period of pipeline construction.

17.2 RESPONSIBILITIES

The following individuals are responsible for developing and coordinating ACP Project information to be used to inform the public about Project construction on the National Forests.

ACP Public Affairs:
Name: ______________________________
Phone: ______________________________
E-mail: ______________________________

Monongahela National Forest Public Affairs:
Name: ______________________________
Phone: ______________________________
E-mail: ______________________________

George Washington National Forest Public Affairs:
Name: ______________________________
Phone: ______________________________
E-mail: ______________________________

17.3 PROJECT WIDE MEASURES

The ACP Project website, found at https://www.dom.com/corporate/what-we-do/atlantic-coast-pipeline, provides general information about the Project. The website also provides a telephone hotline, allowing members of the public to speak to a Project representative. Prior to the start of construction, ACP will add contact information for FERC and USFS representatives to its website as well.

17.4 NATIONAL FOREST-SPECIFIC MEASURES

- Prior to and during construction, ACP public affairs representatives will work with public affairs specialists from both the MNF and GWNF as necessary to provide updated Project information for communication to Forest users.

- ACP public affairs representatives will work with public affairs specialists from the MNF and GWNF to plan and implement any targeted outreach to particular groups of Forest users, e.g. hiking, hunting or fishing organizations, and the general public, etc.

- Prior to ACP construction activity in any particular part of either Forest, ACP will post temporary signs on Forest roads used as construction access roads alerting road users to the presence of logging and construction vehicles on the roads.

- Prior to construction, ACP will work with both Forests to identify any specific road or trail closures or detours necessary to facilitate pipeline construction and ensure safety of the public.

- On roads and trails that cross the pipeline right-of-way, ACP will post temporary signs informing road and trail users of any closures, detours, or other restrictions associated with crossing the construction zone. All signage will be developed in consultation with the Forest public affairs specialists.

- On Forest roads remaining open during construction, ACP will employ flagmen during periods of active construction at road/pipeline right-of-way intersections, when construction equipment or vehicles may be crossing the road.

- On Forest trails that cross the pipeline right-of-way, ACP will post temporary signs at trailheads informing trail users of any closures, detours, or other restrictions associated with crossing the construction zone. All signage will be developed in consultation with the Forest public affairs specialists and trails specialists.

- On Forest trails that cross the pipeline right-of-way that remain open during construction, ACP will erect exclusion fencing on either side of such trails where they cross the construction zone, with appropriate signage warning hikers to stay on the trail. During periods of active construction when vehicles and equipment may be crossing over the trail, ACP will employ flagmen/spotters to escort hikers safely across the construction zone. If temporary trail detours are employed, detour routes will be developed in consultation with Forest recreational specialists, and the routes will be prominently demarcated.

- At portions of the construction right-of-way between road and trail crossings, ACP will post signs at or near the edge of the work area, at approximate 200 feet spacings or as dictated by terrain and visibility, warning the public that the construction right of way is closed to public entry.

- In areas of active blasting, signage and flaggers will be posted in accordance with the *Blasting Plan.* This includes providing 48-hour notice to surrounding residents and businesses, posting of warning signs at approaches to the blast area, with minimum 4-inch lettering on a contrasting background, and stationing of flaggers at roads and trails at least 1,000 feet from the entrance to any areas of active blasting.

18.0 OFF HIGHWAY VEHICLE BLOCKING PLAN

18.1 PURPOSE

The purpose of this Blocking Plan (Blocking Plan is to prevent OHV travel along the proposed pipeline, proposed access roads, and onto adjacent or nearby USFS lands. OHV travel along the proposed pipeline and access roads could lead to unauthorized entrance to restricted areas, could damage sensitive biological and cultural resources, could create or exacerbate erosion, could impede right-of-way restoration, and could compromise the integrity of the right-of-way. Consequently, both of the Forests and the pipeline operator have an interest in preventing unauthorized OHV use along the proposed pipeline and its access roads.

The Blocking Plan identifies a process for determining where OHV blocking measures are necessary, for identifying approaches appropriate at specific locations, and for follow-up monitoring to assess the effectiveness of the measures, and adjust accordingly. Examples of methods that may be used include boulders, stumps, berms, gates, visual marking, downed woody debris, visual screening, and rough road access.

18.2 OHV USE ON USFS LANDS

The ACP Project crosses through no areas of either the MNF or the GWNF where OHV use is authorized. The pipeline right-of-way will be maintained in an herbaceous state for pipeline surveillance and maintenance purposes. In predominantly forested areas where the right-of-way crosses Forest roads, the right-of-way can present a tempting linear path for some OHV users, despite Forest rules prohibiting such use. While such unauthorized use is difficult to stop entirely, measures to discourage OHV use of the right-of-way are appropriate.

The blocking measures must take into consideration that access to every point along the pipeline by maintenance and repair crews is necessary. Blocking measures must be designed to avoid creating unreasonable impediments to pipeline maintenance vehicles or larger equipment that must access the right-of-way in emergency events or major maintenance work.

18.3 LOCATIONS REQUIRING BLOCKING MEASURES

Blocking measures will be considered at all Forest roads crossed by the ACP, and other locations determined by the AO to be likely access points for OHVs to travel along the pipeline. These locations are provided in Table 18.3-1.

TABLE 18.3-1

Potential OHV Blocking Locations a

Forest Road No.	Approximate Milepost	Access Road No.	Road Crossing Method
Un-numbered road connecting with MNF Road 212	81.8	05-001-E064.AR1	N/A
MNF Road 1014 (Shock Run)	83.2	N/A	Open cut
MNF Road 1017 (Upper Shock Run)	83.3	05-001E064.AR3	Open cut
MNF Road 55 (Allegheny Road)	83.7	N/A	Open cut
MNF Road 55 (Allegheny Road)	83.8	N/A	Open cut
MNF Road 55 (Allegheny Road)	83.8	N/A	Open cut
Un-numbered road connecting with Highway 84	85.0	06-001-B001.AR3	N/A
Un-numbered road connecting with Highway 84	85.4	06-001-B001.AR4	N/A
GWNF Road 124	93.6	36-014-AR2	N/A
Un-numbered Road connecting with GWNF Road 614	94.1	36-014.AR3	N/A
GWNF Road 281C	96.3	N/A	Open Cut
GWNF Road 281	96.3	36-026.AR1	Open cut
GWNF Road 1748	97.1	N/A	Open Cut
GWNF Road 1748	97.2	N/A	Open Cut
GWNF Road 309	99.6	36-016.AR2	N/A
GWNF Road 348.1	116.5		Open cut
GWNF Road 449	117.0	N/A	Open cut
GWNF Road 449	117.1	N/A	Open cut
New road connecting to GWNF Road 449	117.2	07.001-AR1-AR4	N/A
Un-numbered road connecting to GWNF Road 449A	118.0	07-001.AR1-AR 6	Open Cut
GWNF Road 449A	118.7	07-001-AR3	Open cut
GWNF Road 449A	118.8	N/A	Open cut
GWNF Road 449B	119.1	N/A	Open cut
GWNF Road 466A	120.2	07-001.AR1-AR8	Open cut
GWNF Road 466	120.4	07-001.AR1-AR9	Open cut
GWNF Road 1755	121.2	07-001-AR1-AR7	Open cut
GWNF Road 1755	121.4	N/A	Open cut
GWNF Road 1755	121.8	N/A	Open cut

[a] Best current estimate of blocking locations; will be updated in consultation with USFS

18.4 BLOCKING MEASURES

The following blocking measures will be considered for installation at each of the locations listed in Table 18.3-1. The site-specific measures, and placement of any physical barriers, will be approved by the AO.

- Berms. Berms will be placed across the right-of-way where it intersects an existing road. Berm slopes shall not exceed 30 per cent. Berms will be placed across the right-of-way as part of erosion control, strategically placed to reduce visibility and mimic local topography.

- Rock and woody material distribution. Large rocks, stumps, limbs, and related material removed and stockpiled during construction will be strategically placed, without making it appear as a challenging obstacle course. The placement will be done in a manner to present a physical barrier as well as to erase visual cues signaling the presence of the right-of-way from the access point.

- Utilize existing vegetation. At locations where the pipeline has been bored beneath paved roads, vegetation between the bore pits and the road way will be left in place, except for sufficient clearing to allow access by construction vehicles and equipment.

- Surface preparation. At locations where the pipeline has open cut across the access point (as opposed to where the pipeline has been bored beneath paved roads), the right-of-way will be back-bladed or raked by bulldozer or by hand, to erase the traces of the intersection of the pipeline right-of-way with the access point.

- Gates. Where deemed appropriate by the AO, locking gates may be installed according to USFS specifications. Gate openings will be a minimum of 16 feet wide to accommodate pipeline maintenance vehicles and equipment.

- Signs. Signs warning the public that OHV use is prohibited along the pipeline right-of-way will be installed if requested by the USFS. Signs may dissuade some OHV users, but they may also call attention to the right-of-way, so their effectiveness is best judged by USFS recreation staff.

18.5 POST-CONSTRUCTION MONITORING

The Project EI will document the establishment of OHV blocking measures at each crossing location upon completion. The documentation will identify what measures were installed, the date of completion, and will include photographs of the sites. In conjunction with its post-construction restoration monitoring, Atlantic will monitor each site for two years following completion of construction activities on the specific spread, and will annually prepare a report documenting their effectiveness. Each OHV blocking location will be visited to photograph the site, assess whether OHV use appears to be occurring and what, if any corrective measures are recommended. Any necessary corrective measures will be determined in consultation with USFS staff.

After two years, the locations will be monitored periodically by USFS and pipeline operations staff to determine whether further corrective action is warranted. Regular aerial patrols[22] will also note changed conditions on the right-of-way, such as the appearance of vehicle tracks that may provide evidence of unauthorized OHV use along the pipeline.

[22] ACP pipelines are currently scheduled for aerial surveillance on a monthly basis.

19.0 WATER QUALITY MONITORING PLAN

The purpose of this plan is to describe how water quality monitoring activities will be conducted on USFS lands where stream crossings are planned. Stream crossing methods are designed to minimize stream bank and bed erosion thus preventing the release of sediment into streams, and are short-term in duration. Streams less than 10-feet-wide will be crossed within 24 hours and streams 10-feet-wide to 100-feet-wide will be crossed in 48 hours, unless rock is encountered and requires blasting or other rock removal methods. Atlantic will install the pipeline using dry-ditch methods for crossings of waterbodies on the MNF and GWNF (dam and pump or flume crossing methods), which further limits sediment release and elevated turbidity downstream of crossing areas.

This plan augments the other construction, restoration, and mitigation plans prepared for the Project. Atlantic will install stream crossings in accordance with the FERC Procedures, which stipulate how crossings are planned, constructed, restored and monitored.

19.1 JURISDICTIONS

The MNF lies in West Virginia and GWNF is located in Virginia. Only West Virginia has numeric standards applicable to turbidity. This Water Quality Monitoring Plan has been written to conform to the West Virginia numeric standards and will be applicable to both National Forests. Virginia provides narrative guidance with respect to erosion and sediment control[23], and these guidelines have also been incorporated in the procedures described in this plan.

19.2 BACKGROUND AND PURPOSE

Excess turbidity in aquatic systems can adversely affect aquatic life or other beneficial use of a waterbody. The biological effects of excess turbidity are exerted primarily as a result of reduced light penetration or as a smothering effect associated with reduced dissolved oxygen. Turbidity is a measure of the ‘cloudiness’ of water, which is analytically measured as the degree to which light is scattered and absorbed by suspended sediment. Turbidity is most commonly measured using a nephelometric instrument called a turbidimeter and expressed in terms of Nephelometric Turbidity Units (NTU) (Oregon DEQ, 2010). Most published criteria for turbidity in the United States and Canada are in the form of a limited increase above background.

The purpose of this Water Quality Monitoring Plan is to monitor and address chronic impacts to water quality. Corrective actions utilizing BMPs will be implemented when necessary to address sources of chronic turbidity.

19.3 NUMERIC STANDARD

As articulated in West Virginia guidance, chronic turbidity should not exceed 10 NTUs over background turbidity when the background is 50 NTUs or less, or have more than a 10 percent increase in turbidity (plus 10 NTU minimum) when the background turbidity is more than 50 NTUs averaged over any four-day period. The turbidity standard does not contain an acute criterion for cold or warm waters designations. This standard will apply to all stream crossings as measured 50 feet above (background) and 50 feet below the crossing area for streams $\leq$ 30 feet in width.

Construction related to stream crossings will adhere to timing restrictions related to aquatic life according to agency guidelines or specifications contained in state water quality permits. Timing restrictions are based on readily available data from agency consultation letters or online data. Additional

[23] http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx

consultations with state and federal agencies, as well as field survey data for protected species will occur to further refine timing restrictions.

19.4 INSPECTION AND MONITORING

As articulated in the *Stream and Wetland Crossing Procedures*, one or more EIs having knowledge of the wetland and stream conditions in the project area is required for each construction spread. The EIs will be responsible for the inspection of all in-stream activities (e.g. setting of flumes or dam and pump operations, and their removal) and to take all required water quality measurements.

Measurements of turbidity will occur at all stream crossings that are state-designated as either coldwater or significant coolwater or warmwater fisheries. Monitoring will be accomplished through the use of a hand held turbidity meter (e.g., YSI 6600 V2-2 data sonde, or similar), for short term continuous monitoring and grab samples. The turbidity meter will be calibrated prior to the commencement of construction and as required throughout the duration of the monitoring activities.

Monitoring will occur at a minimum rate of 4 times per day during the period when active construction is occurring, in both the background location (50 feet above activity) and downstream location (50 feet below activity). The first monitoring event will occur approximately 30 minutes prior to the commencement of construction, and the second will occur a minimum 2-4 hours after start of instream construction. Measurements of turbidity grab samples will continue during instream pipeline installation activities. Once the crossing is complete and restoration occurs, monitoring will be conducted for four days at a minimum rate of 1 time per day. Should the chronic turbidity reading (4-day average) exceed standards, remediation of the source will occur and monitoring will continue once per day until the source is addressed and readings are within water quality standards.

Attached is an example of a daily Turbidity Monitoring Data Sheet. All incidents of exceeding the numeric limits identified in Section 6.0 shall result in the prompt implementation of mitigation measures (described below).

19.5 CONSERVATION MEASURES

Atlantic will implement the following BMPs for all stream crossings to reduce impacts:

- develop and implement a state-approved ESCP;
- installing sediment barriers;
- appropriately site sediment filtering devices associated with trench dewatering activities;
- reducing the volume of large equipment operating in or near the waterbody; and/or
- halting work, if necessary to address issue or implement corrective actions.

In addition, Atlantic will develop site-specific BMPs to address steep slopes and unique crossing conditions.

19.6 REPORTING

The EI will complete a Turbidity Monitoring Data Sheet daily, and is responsible for identifying, documenting, and overseeing corrective actions, as necessary. Daily Turbidity Monitoring Data Sheets will be submitted to the ECC to be included with a final construction report and will be made available to the USFS within two weeks of the crossing.

Turbidity Monitoring Data Sheet

Project Name & Permit Number: __________

Site Address (Location): __________

Monitor Name: __________

Company: __________

Phone Number: __________

Date & Time of Sample: __________

Weather Conditions: __________

Upstream Location* / Reading (NTU)	Downstream Location* / Reading (NTU)	Turbidity Increase (Downstream - Upstream) (NTU)	Allowable Turbidity Increase (NTU)	Turbidity Increase Above Standard? (Y/N)	Contractor Notified of results? (Y/N)

Upstream Location* / Reading (NTU)	Downstream Location* / Reading (NTU)	Turbidity Increase (Downstream - Upstream) (NTU)	Allowable Turbidity Increase (NTU)	Turbidity Increase Above Standard? (Y/N)	Contractor Notified of results? (Y/N)

Upstream Location* / Reading (NTU)	Downstream Location* / Reading (NTU)	Turbidity Increase (Downstream - Upstream) (NTU)	Allowable Turbidity Increase (NTU)	Turbidity Increase Above Standard? (Y/N)	Contractor Notified of results? (Y/N)

Mitigation Measures Taken By Contractor (if turbidity increase is above standard): [continue on back]

____

____

____

* Number of feet from activity; **Source**: City of Bellevue, Department of Planning & Community Development, P.O. Box 90012 Bellevue, Washington 98009

20.0 VISUAL RESOURCES PLAN

The LRMP for the GWNF includes the following standard:

The Forest Scenic Integrity Objectives are met for all new projects (including special uses). Existing conditions may not currently meet the assigned Scenic Integrity Objective. **(GWNF LRMP FW-182).**

The GWNF is considering whether a project-specific LRMP amendment may be necessary, based on the results of visual analyses that have been submitted separately to the GWNF.

20.1 FEATHERING VEGETATION CLEARING ON THE RIGHT-OF-WAY

At the request of the USFS, Atlantic is considering "feathering" the edges of the right-of-way during construction on USFS lands. Feathering the edges of the right-of-way refers to the selective clearing of trees and vegetation at specific locations along the edges of the right-of-way such that existing vegetation, including fully grown trees, are left up to 10 feet within the boundaries of the construction right-of-way to create a visually uneven edge along both sides of the right-of-way (Figure 20-1). When viewed axially or along the length of the right-of-way at these locations, there are no parallel, straight edges and the cleared right-of-way appears more natural. Atlantic is considering applying this process within long straight line tangents of pipeline corridor where immediate foreground and foreground views (i.e., from trail or road crossings) and middleground and background views (i.e., from highways) of the pipeline corridor would be present from publicly accessible locations.

If implemented, vegetation that is left standing within the edges of the construction right-of-way would extend 5 to 10 feet into the right-of-way, and would occur periodically along both edges of the right-of way in the selected areas. These areas would be identified and mapped by Atlantic on drawings, and the trees to be left standing would be flagged in the field and reviewed with the USFS prior to construction.

20.2 REPLANTING THE RIGHT-OF-WAY

Atlantic will replant the entire construction right-of-way with seed mixes that it has selected in consultation with the USFS. These seed mixes consists of a selection of warm season native grasses, some select cool season grasses in steep slope areas, and various native flowering forbs/pollinator species. Where it crosses USFS land, the temporary construction right-of-way will have a nominal width of 125 feet, including the 53.5-foot-wide permanent right-of-way that is centered on the installed pipeline. To reduce the time required for revegetation of the construction right-of-way with woody vegetation, and thus reduce the visual contrast of the cleared construction right-of-way on USFS lands, Atlantic is also considering active replanting of the outer most 20 feet of the working side of the construction right-of-way and the remaining outer 13 feet of the spoil side of the construction right-of-way, including all additional temporary extra workspace areas, with a combination of indigenous tree and shrub seedlings (Figure 20-2). If replanting is conducted, tree and shrub species, seed stocks, and planting densities used within these areas will be selected based on availability within the project area, as well as consultations with USFS staff. Atlantic would monitor the planted areas for successful growth of the seedlings, but would not plan to actively maintain or mange the planted areas, which would allow natural revegetation from surrounding forest species and sprouting of stumps to occur and supplement the growing seedlings. Atlantic will limit stump removal to those areas requiring extensive grading and the area in the immediate trench vicinity. Stumps that have been ground to below grade would maintain their root systems, which not only helps stabilize the soil but allows many trees to regenerate from their stumps, facilitating restoration progress.

Additionally, in the area between the edge of the 53.5-foot-wide permanent right-of-way and the replanted area described above (about 38 feet on the working side of the construction right-of-way), Atlantic will allow the natural regrowth and succession of trees and shrubs following the initial planting after construction of grasses and forbs. During operation of the ACP pipeline, only the 53.5-foot-wide permanent right-of-way will be periodically mowed and maintained in an herbaceous state.

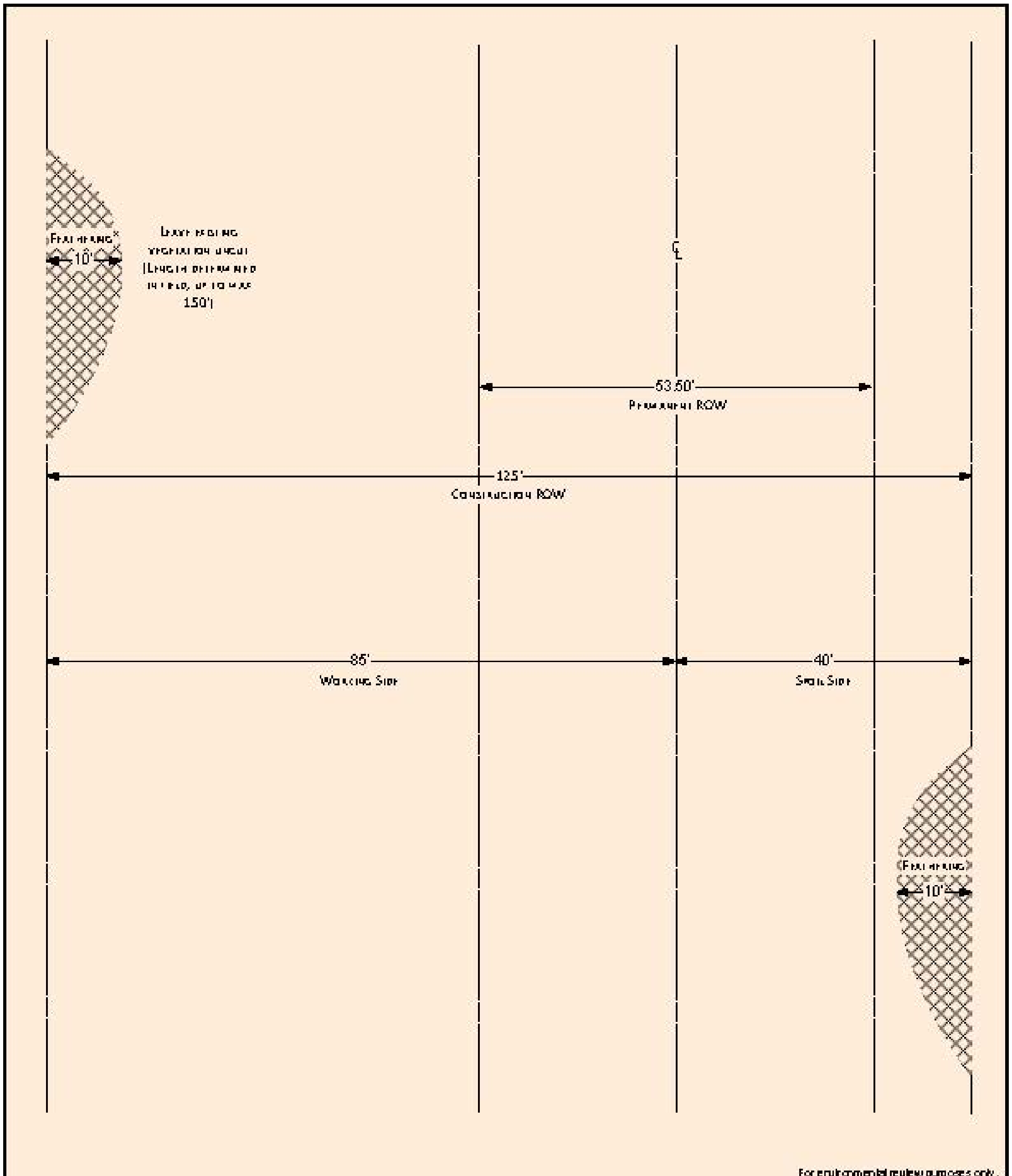
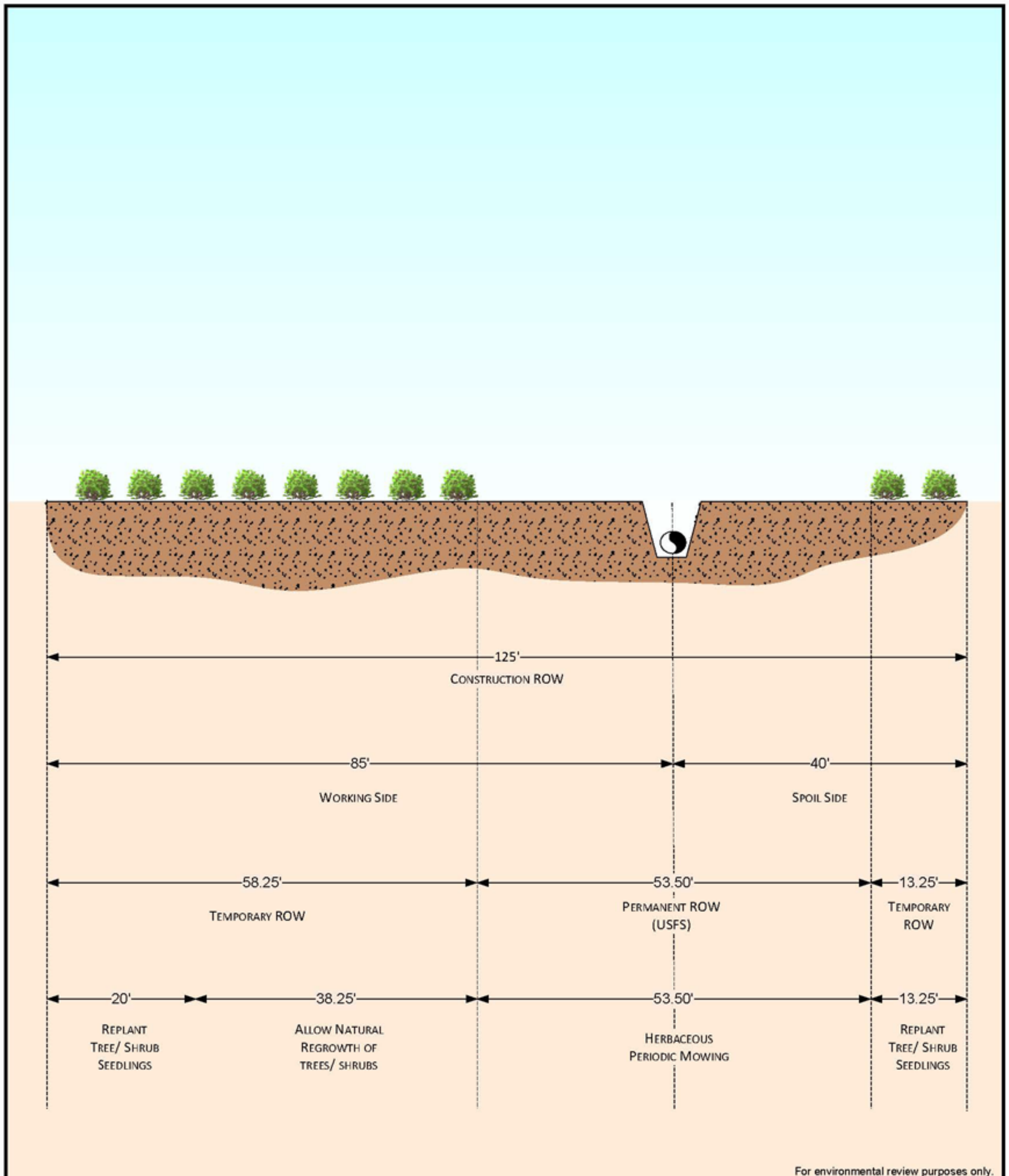


Figure 20-1
Atlantic Coast Pipeline
Plan View – Edge Feathering on Construction Right-of-Way

Atlantic Coast Pipeline

ERM



Atlantic Coast Pipeline
AP-1 (42" Outside Diameter)
Figure 20-2
Revegetation Planting of Construction Right-of-way
on Forest Service Lands

\\USMINFS01\DATA\TEAM\DMMV\GIS\TYPICALS_CLIENT_PROJECTS\D-F\DOM\ACP\TYPICAL_CONSTRUCTION\TYP_CON_REVEG_PLANTING.VSD, Date: 5/23/2007, REVISED: 1/18/2017 DRAWN BY: GIS

21.0 REFERENCES

Dominion Transmission, Inc., 2016 Annual Standards and Specification, Erosion and Sediment Control and Stormwater Management for Construction and Maintenance of Pipeline Project in Virginia. February 2016.

Federal Energy Regulatory Commission. 2013a. Upland Erosion Control, Revegetation, and Maintenance Plan. Available online at: http://www.ferc.gov/industries/gas/enviro/plan.pdf.

Federal Energy Regulatory Commission. 2013b. Wetland and Waterbody Construction and Mitigation Procedures. Available online at: http://www.ferc.gov/industries/gas/enviro/procedures.pdf

Jones, J., Daniel, J.B., Glennon, B., Lawrence, C., Faulkner, D., Gordon, S., and C. Wentz. 2014. USDA-NRCS Virginia Plant Establishment Guide. Revised 2014.

Natural Resource Conservation Service. 2011. National Conservation Practice Standard - Critical Area Planting, Code 342.

Natural Resource Conservation Service. 2014. Conservation Practice Standard - Mulching, Code 484. Technical Guide Section IV: 484-VA-1.

Oregon Department of Environmental Quality. 2010. Turbidity Technical Review Summary of Sources, Effects, and Issues Related to Revising the Statewide Water Quality Standard for Turbidity. Last Updated: 09/7/10. By: Aron Borok. 10-WQ-022.

Sheley, R., J. Petroff, M. Borman. 1999. *Introduction to Biology and Management of Noxious Rangeland Weeds*, Corvallis, OR.

Soil Survey Staff. 2015a. Web Soil Survey. Natural Resources Conservation Service, U.S. Department of Agriculture. Available online at: http://websoilsurvey.nrcs.usda.gov/. Accessed June 2015.

Soil Survey Staff. 2015b. Official Soil Series Descriptions. Natural Resources Conservation Service, U.S. Department of Agriculture. USFS, Region 8, Revised land and Resource Management Plan: George Washington National Forest, R8-MB 143A, November 2014.

U.S. Department of Agriculture. 2014. *Introduced, Invasive, and Noxious Plants*. Available online at: http://plants.usda.gov/java/noxiousDriver. Accessed December 2014.

U.S. Forest Service, *Land and Resource Management Plan: Monongahela national Forest*, September 2006, Updated 2011.

U.S. Forest Service, Region 8, *Revised Land and Resource Management Plan: George Washington National Forest*, R8-MB 143A, November 2014

U.S. Forest Service. 2016. *Non-native invasive species.* Available online at: http://www.fs. usda. gov/Internet/FSE_DOCUMENTS/stelprdb5090755.pdf. Accessed June 2016.

U.S. Forest Service. George Washington National Forest. 2014. *Revised Land and Resource Management Plan.* Available online at: http://www.fs.fed.us/gwjeff/core/2014-GWNF-Revised-Forest-Plan-full-document.pdf. Accessed November 2015.

U.S. Forest Service. Monongahela National Forest. 2011. *Land and Resource Management Plan*. Available online at: http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5330420.pdf. Accessed November 2015.

Virginia Department of Environmental Quality. 1992. Virginia Erosion and Sediment Control Handbook. Available online at: http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx. Accessed June 2015.

Virginia Department of Environmental Quality. 1992. Virginia Erosion and Sediment Control Handbook. Available online at: http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx. Accessed June 2015.

Virginia Department of Forestry. *Virginia's Forestry Best Management Practices for Water Quality*. Technical Manual, Fifth Edition. March 2011.

West Virginia Department of Environmental Protection, 2012. West Virginia Erosion and Sediment Control Field Manual. Office of Oil and Gas. Available online at: http://www.dep.wv.gov/oil-and-gas/Documents/Erosion%20Manual%2004.pdf. Accessed June 2015.

West Virginia Department of Environmental Protection, Division of Water and Waste Management, *Erosion and Sediment Control Best Management Practice Manual*, 2006.

NOTE: ATTACHMENTS ARE PROVIDED UNDER SEPARATE COVER EXCEPT WHERE NOTED

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT A

Right-of-Way Configurations

Referenced in Section 2

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT B

Alignment Sheets

Referenced in Section 2

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT C

Slope Stability Policy and Procedure

Referenced in Sections 2, 6 and 8

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT D

Winter Construction Plan

Referenced in Sections 2 and 8

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT E

Fire Prevention and Suppression Standards

Referenced in Section 5

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT F

Access Road Improvement Maps

To Be Provided at a Later Date

Referenced in Sections 2, 4, 7, and 8

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT G

Soil Survey

Referenced in Sections 2, 8 and 10

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT H

Karst Monitoring and Mitigation Plan

Referenced in Sections 2, 6, and 8

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT I

Typical Erosion & Sedimentation Control Details

Referenced in Section 8

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT J

Non Native Invasive Plant Species Table and Map

Referenced in Sections 8 and 11

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT K

Spill Report Form

Referenced in Section 11

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT L

George Washington National Forest Unanticipated Discovery Plan

Referenced in Section 14

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT M

Monongahela National Forest Unanticipated Discovery Plan

Referenced in Section 14

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT N

Permit List

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT O

Appalachian National Scenic Trail HDD Plan and Profile Drawings

Referenced in Section 2

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT P

Appalachian National Scenic Trail Crossing Contingency Plan

Referenced in Section 2

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Construction, Operations, and Maintenance Plan

ATTACHMENT Q

Timber Cruise Plan

Referenced in Section 4

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

BIOLOGICAL EVALUATION

APPENDIX D

Monongahela National Forest
Regional Forester Sensitive Species (RFSS)
Likelihood of Occurrence and Determination of Impact Table

TABLE 1

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
MAMMALS						
Eastern Small-Footed Bat *(Myotis leibii)*	G3/N3N4/S1	Roosts in crevices of rocky habitats (e.g., talus slopes, rock fields, cliff faces) within eastern deciduous and coniferous forests;and man-made structures (e.g., bridges, etc.) throughout the MNF; generally hibernates in caves and mines, but also may hibernate in box culverts and deep crevices in rocky habitats across the landscape. Forages in forested and open habitat in ridges, valleys, and around water; in Fayette, Grant, Greenbrier, Hardy, Mercer, Monongalia, Monroe, Morgan, Nicholas, Pendleton, Pocahontas, Preston, Randolph, Tucker, and Webster Counties, WV.	Y	Two areas with suitable rocky roosting habitat based on field surveys. Potential foraging habitat present based on general habitat conditions. No portal/cave hibernacula based on field survey.	No	MIINLT
Little Brown Bat *(Myotis lucifugus)*	G5/N3/S2	Roosts in buildings and other man-made structures as well as trees, rocks, and wood piles during summer; generally hibernates in large numbers in caves and mines; Abundant throughout WV	Y	Foraging and roosting habitat present based on general habitat conditions. No portal/cave hibernacula based on field survey.	No	MIINLT
Tri-colored Bat *(Perimyotis subflavus)*	G5/N3N4/S2	Associated with forested landscapes;foraging occurs near the forest perimeter and along waterways; Summer roosting occurs in tree foliage in forests; they generally winter (hibernate) in caves/mines;	Y	Foraging and roosting habitat present based on general habitat conditions. No portal/cave hibernacula based on field survey.	N/A	MIINLT
West Virginia Northern Flying Squirrel (*Glaucomys sabrinus fuscus*)	G5T2/N2/S2	Mature red spruce forests and high elevation (above 3300 feet) spruce and mixed conifer northern hardwood forests with an abundance of snags.	Y	Regenerating spruce forest habitat present in the Project area.	N/A	MIINLT
Southern Rock Vole (*Microtus chrotorrhinus carolinensis*)	G4T3/N3/S2	Cool, moist, mossy talus in cool, damp, coniferous, and mixed coniferous forests in the Appalachian Mountains, usually in or near riparian areas or undersurface water, in relatively old forests and typically dominated by yellow birch. Other species may include sugar maple, basswood, American beech, and red spruce. Found in Pocahontas County in WV.	Y	Suitable habitat present within survey corridor based on February 2017 field surveys. [redacted]	N/A	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Allegheny Woodrat *(Neotoma magister)*	G3G4/N3N4/S3	Rock areas, caves, large boulders, rock slides, mountains, woods, and swamps; in Pocahontas County, WV.	Y	Field surveys confirmed suitable habitat occurs along two rock formations near Buzzard Ridge and one rock formation on the northern extent of Cloverlick Mountain.	Field surveys documented the evidence of Allegheny woodrats along two rock formations along [redacted]	MIINLT
Eastern Spotted Skunk *(Spilogale putorius)*	G5/N4/S2	Dry oak-pine forests and mixed mesophytic forests with a dense understory, recent clear-cuts and successional fields; rock outcrops, cliffs, caves, talus hollow trees, stumps, logs, and underground burrows as den sites; high suitability habitat occurs in upper ridgelines. In Pocahontas County, WV.	Y	Suitable habitat present within survey corridor based on February 2017 field surveys. One area with high potential suitability, three areas with moderate suitability, and one area with low suitability were identified.	N/A	MIINLT
Long-Tailed Shrew (*Sorex dispar*)	G4/N4/S2S3	In damp soil and under fallen logs; damp deciduous or coniferous forests with loose talus substrate, abundant leaf litter, and deep crevices on level areas and moderate to steep slopes, riparian areas along rocky mountain streams. Artificial talus created by road and mine construction may also be used. In Fayette, Mercer, Nicholas, Pocahontas, Preston, Raleigh, Randolph, Upshur, and Webster Counties, WV	Y	Suitable habitat present within survey corridor based on February 2017 field surveys. [redacted]	N/A	MIINLT
Southern Water Shrew (*Sorex palustris punctulatus*)	G5T3/N3/S1	Semi-aquatic; High elevation mountain bogs, fens, and edges of cold headwater and streams, mixed coniferous-deciduous forests with a mostly closed canopy. Found in Pendleton, Pocahontas, Preston, Randolph, and Tucker, WV	Y	Suitable habitat present within survey corridor based on February 2017 field surveys. Two areas with moderate suitability and one with low suitability were identified.	N/A	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Southern Bog Lemming (*Synaptomys cooperi*)	G5/N5/S3	Sphagnum bogs, marshes, and meadows with abundant graminoids; also inhabits in upland successional communities with thick humus layer. Found in Boone, Brooke, Fayette, Greenbriar, Jackson, Kanawha, Logan, Marion, Mason, Mingo, Monongalia, Pendleton, Pocahontas, Preston, Randolph, Upshur, Wayne, Webster, Wyoming, WV	Y	No potential habitat for the southern bog lemming was identified during the desktop analysis.	N/A	NI
BIRDS						
Northern Goshawk *(Accipiter gentilis)*	G5/N4B/S1B,S1N	Mainly occurs in coniferous forests, but may occur in deciduous hardwood forest; no evidence of goshawk presence was documented during field survey; in Pocohonas County, WV.	Y	Field survey confirmed that suitable habitat occurs in two locations in the MNF: MNF Area 2 and MNF Area 3.	No	MIINLT
Henslow's Sparrow (*Ammodramus henslowii*)	G4/N1B/S1B	Open, flat fields with tall grass and a present leaf layer; Found in Brooke, Grant, Hancock, Mason, Ohio, Tucker, WV	N	No: Outside of known range	No	NI
Long-Eared Owl (*Asio otus*)	G5/N5B/S1B, S1N	Dense trees for nesting and roosting and open country for hunting; inhabits forests with extensive meadows, groves of conifers or deciduous trees in prairie country, and streamside groves.	Y	Present based on known species range.	N/A	MIINLT
Olive-Sided Flycatcher (*Contopus cooperi*)	G4/N4B/S1B	Edges of montane and northern coniferous forests, forest openings with abundant snags; Found in North Branch Potomac Watershed	N	No: Outside of known range	N/A	NI
American Peregrine Falcon *(Falco peregrinus anatum)*	G4/N3B/ S2B,S2N	Nests on ledges or cliffs, buidlings, bridges, and quarry walls; non-breeding habitat includes farmland, open country, lakshores, broad river valleys, airports, cities, prefers pigeons and ducks; in Pocahontas County, WV.	Y	Suitable habitat potentially present within the survey corridor based on general habitat conditions; no peregrine falcons were observed within a two-mile-wide aerial analysis area.	No	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact:
ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Bald Eagle *(Haliaeetus leucocephalus)*	G5/N5B/S3B,S3N	Areas close to coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water for food sources. Nests are found in tall trees except where only cliff faces or ground sites are available. Preference is for tall, sturdy conifers, but can also nest in pine, spruce, fir, cottonwood, willow, oak, beech, and others.In entire analysis area. In Berkeley, Cabell, Grant, Hampshire, Hancock, Hardy, Jackson, Jefferson, Marion, Mineral, Monongalia, Morgan, Pendleton, Pocahontas, Putnam, Raleigh, Taylor, Tucker, Tyler, Wood, WV.	Y	Field survey confirmed that potentially suitable habitat occurs in much of the analysis area: three stick nests were observed adjacent to the proposed right-of-way.	Inconclusive	MIINLT
Migrant loggerhead shrike (*Lanius ludovicianus migrans*)	G4T3Q/N3B/ S1B,S1N	Open areas with short vegetation and well-spaced thorny shrubs or low trees, In Berkeley, Grant, Greenbriar, Hampshire, Hardy, Jefferson, Mineral, Monroe, Pocahontas Counties, WV	Y	Field survey for golden-winged warbler indicates potentially suitable habitat adjacent to the MNF survey corridor.	N/A	BI
Red-headed Woodpecker *(Melanerpes erythrocephalus)*	G5/N5B/S3B,S3N	Habitats include oak savanna and mature open bottomland forest, as well as upland forests, woodlots, shelterbelts along agricultural fields; herbaceous habitats, stands with high canopy cover, and dense mid-story habitats are not typically used. In Pocahontas County, WV.	Y	Suitable habitat is present based on botany survey and general habitat conditions.	N/A	MIINLT
Vesper Sparrow (*Pooecetes gramineus*)	G5/N5B/S2B,S2N	Open habitats with tall grass, prairie, sagebrush habitat, meadows, pastures, and roadsides. Known habitat only extends north to Virginia.	No	No: Outside of known range	N/A	NI
Golden-winged Warbler *(Vermivora chrysoptera)*	G4/N4B/S1B	Brushy edge habitats, openings with saplings, forbs and grasses; also uses forested habitat adjacent to openings/scrubby habitat; in Pocahontas County, WV.	Y	Field survey confirmed that potentially suitable habitat occurs adjacent to the MNF survey corridor, as described in the survey report.	No	BI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
REPTILES						
Timber Rattlesnake *(Crotalus horridus)*	G4/N4/S3	Upland hardwood and mixed pine-hardwood forests, in areas where there are sunny, rocky slopes and ledges throughout the Appalachian Mountain Region; in Pocahontas County, WV.	Y	Field survey confirmed that no suitable habitat occurs in the survey corridor, although potentially suitable rock habitat could be exposed by Project development	No	BI
Wood Turtle (*Glyptemys insculpta*)	G4/N3/S3	Hardwood forests, forested wetlands and grasslands; in Berkeley, Grant, Hampshire, Hardy, Jefferson, Mineral, Morgan, Pendleton	N	No: Outside of known range	N/A	NI
AMPHIBIANS						
Green Salamander *(Aneides aeneus)*	G3G4/N3N4/S3	Humid cliff faces with numerous crevices; wooded rock outcrops with moist and deep crevices throughout the Appalachian Mountain Region; in Pocahontas County, WV.	Y	Field survey assessed potentially suitable habitat in seven areas; three rock outcrops found with suitable habitat.	No evidence of green salamander presence was documented during the field survey.	MIINLT
Eastern Hellbender *(Cryptobranchus alleganiensis)*	G3G4/N3N4/S2	Clear, fast-flowing and well oxygenated streams and rivers that contain rocks or debris; mainstem and tributaries of the New River drainage and in the Clinch, Powell, and Holston River tributaries of the Upper Tennessee River; in Barbour, Brooke, Cabell, Clay, Gilmer, Greenbrier, Kanawha, Marshall, Monroe, Nicholas, Pleasants, Pocahontas, Preston, Raleigh, Randolph, Ritchie, Roane, Summers, Tucker, Tyler, Upshur, Wayne, Webster, Wymoing Counties, WV	Y	No suitable habitat present in the survey corridor based on waterbody surveys.	N/A	NI
Mud Salamander (*Pseudotriton montanus*)	G5T5/N5/S1	Margins of swamps, bogs, slow moving streams with a muddy substrait; in Boone, Cabell, Fayette, Jackson, Kanawha, Logan, Mason, Mingo, Nocholas, Putnum, Raleigh, Summers, Tucker, Wayne, Webster, Wood, WV	N	No: Outside of known range	N/A	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
FISH						
Candy Darter *(Etheostoma osburni)*	G3/N3/S1	Riffles and runs of swift, rocky creeks; in Pocahontas County, WV.	Y	No suitable habitat at Project stream crossings based on desktop analysis. Potential downstream and adjacent stream habitats.	N/A	MIINLT
New River Shiner *(Notropis scabriceps)*	G4/N4/S2	Cool, clear tributaries and the upper main channel of the New River; in Pocahontas County, WV.	Y	No suitable habitat at Project stream crossings based on desktop analysis. Potential downstream and adjacent stream habitats.	N/A	MIINLT
Appalachia Darter *(Percina gymnocephala)*	G4/N4/S2	New River system above Kanawha Falls, North Carolina, Virginia, and West Virginia; fairly common in Pocahontas County, WV.	Y	No suitable habitat at Project stream crossings based on desktop analysis. Potential downstream and adjacent stream habitats.	N/A	MIINLT
Kanawha Minnow *(Phenacobius teretulus)*	G3G4/N3N4/S1	Creeks to medium sized rivers, with riffles over gravel and rubble substrait; in Greenbrier, Monrow, Nicholas, Pocahontas, Webster, WV	Y	No suitable habitat at Project stream crossings based on desktop analysis. Potential downstream and adjacent stream habitats.	N/A	MIINLT
INVERTEBRATES – ARACHNIDS						
Dry Fork Valley Cave Pseudoscorpion (*Apochthonius paucispinosus*) [c]	G1/N1/S1	Caves and Karst habitat; Endemic to Tucker, WV	N	No: Outside of known range	N/A	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact:
ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination
				Habitat Present?	Species Detected?	
INVERTEBRATES – BIVALVES						
Elktoe (*Alasmidonta marginata*)	G4/N4/S2	Shallow to medium-sized creeks or rivers; in Pocahontas County, WV.	Y	No suitable habitat at Project stream crossings based on desktop analysis. Potential downstream and adjacent stream habitats.	N/A	MIINLT
Green Floater (*Lasmigona subviridis*)	G3/N3/S2	Streams, small rivers, and canals of low to medium gradient with slow pools and eddies, fine gravel and sand bottom, and mid-range calcium concentrations; in Pocahontas County, WV.	Y	No suitable habitat at Project stream crossings based on desktop analysis. Potential downstream and adjacent stream habitats.	N/A	MIINLT
INVERTEBRATES – CRUSTACEANS						
Cannulate Cave Isopod (*Caecidotea cannula*) [c]	G2G3/N2/S1	Subterranean streams in cave and karstformations, shelters under flat rocks. Endemic to nine caves in Preston, Randolph and Tucker, WV.	N	No: Outside of known range.	N/A	NI
Holsinger's Cave Isopod (*Caecidotea holsingeri*) [c]	G5/N2/S3	Subterranean streams in cave and karst habitats, shelters under rocks in areas of moving water; Found in Barbour, Greenbrier, Monroe, Pocahontas, Randolph Counties, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT
A Cave Obligate Isopod (*Caecidotea simonini*) [c]	G1G2/N1/S1	Subterranean streams and rivers in caves, shelters under rocks in areas of moving water; Found in Randolph County, WV	N	No: Outside of known range.	N/A	NI
A Cave Isopod (*Caecidotea sinuncus*) [c]	G1G2/N1/S1	Subterranean streams and pools in cave and karst fomations; in Pendleton County, WV	N	No: Outside of known range.	N/A	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact:
ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Elk River Crayfish (*Cambarus elkensis*)	G2/N2/S2	Streams and rivers with a swift moving water over a cobble substrait, shelters under rocks; endemic to Pocahontas and Webster Counties, WV	Y	No suitable habitat at Project stream crossings based on desktop analysis. Potential downstream and adjacent stream habitats.	N/A	MIINLT
Greenbrier Cave Crayfish (*Cambarus nerterius*) [c]	G2/N2/S1?	Subterranean streams in cave formations; in Greenbrier, Pocahontas, Webster, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT
Culver's Cave Amphipod (*Stygobromus culveri*) [c]	G1G2/N1/S1	Subterranian streams in cave formations; in Randolph and Tucker Counties, WV	N	No: Outside of known range.	N/A	NI
Greenbrier Cave Amphipod (*Stygobromus emarginatus*) [c]	G3G4/N3/S3	Subterranian pools and streams in cave formations. Found in Barbour, Greenbrier, Monongalia, Monroe, Pocahontas, Randoplph, and Tucker Counties, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT
Pocahontas Cave Amphipod (*Stygobromus nanus*) [c]	G1G2/N1/S1	Endemic to subterranian pools in a single cave formation; in Pocahontas County, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Minute Cave Amphipod (*Stygobromus parvus*) [c]	G2G3/ N2N3/S1	Subterranian pools with a mud substrait; in Pocahontas, Randolph, Tucker Counties, WV	N	No: Outside of known range.	N/A	NI
INVERTEBRATES - GASTROPODS						
Organ Cavesnail (*Fontigens tartarea*) [c]	G2/N2/S2	Subterranean streams in cave formations, shelters under flat rocks; in Barbour, Greenbrier, Monroe, Pocahontas, Preston, Randolph, Tucker Counties, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. [redacted]	N/A	MIINLT
INVERTEBRATES – INSECTS						
Rapids clubtail *(Gomphus quadricolor)*	G3G4/N3N4/S3	Clear streams and brooks with a strong current over clean gravel, cobbles, or bedrock, on comparatively unproductive soils; larva develop in gravel and cobble areas and bedrock cracks; feeds on any aquatic invertebrate or fish fry they are able to capture and handle; adults feed on insects caught while flying or gleaned from vegetation. Occurs in Pocahontas County	Y	Suitable habitat potentially present based on WVDNR correspondence and waterbody survey.	N/A	MIINLT
Green-faced clubtail *(Gomphus viridifrons)*	G3G4/ N3N4/S3	Small to large moderate-gradient rivers, free flowing with high water quality; larvae burrow in silt; adults forage in trees; larva develop burrowed into silt and sand feeding on any invertebrate or fish fry they can capture and handle; adults feed on insects caught while flying or gleaned from vegetation. In Pendleton and Randolph Counties.	N	No: Outside of known range	N/A	NI
Appalachian Tiger Beetle (Cicindela ancocisconensis)	G3/N3/S3	Open areas with sand and cobble, usually along streams: in Barbour, Fayette, Grant, Greenbrier, Hampshire, McDowell, Mercer, Monongalia, Pocahontas, Preston, Raleigh, Randolph, Tucker, Webster Counties, WV	Y	No suitable habitat based on waterbody survey.	N/A	NI
Northern Barrens Tiger Beetle (Cicindela patruela)	G3/N3/S2S3	Sandy, open forest habitat dominated by pine and/or oak trees; Grant, Monongalia, Pendleton Counties, WV	N	No: Outside of known range	N/A	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Cow Path Tiger Beetle (Cicindela purpurea)	G5/N5/S3	Found in forest clearings and dirt paths through grassy areas in Fayette and Pendleton Counties, WV	N	No: Outside of known range	N/A	NI
Columbine Duskywing (Erynnis lucilius)	G4/N4/S1	Talus sloops and calcareous cliffs, pine-oak forests, grasslands; Found in Grant, Hampshire, Jefferson, Mineral, Pendleton Counties, WV	N	No: Outside of known range	N/A	NI
Cobweb Skipper (*Hesperia metea*)	G4G5/N4N5/S2	Dry oak-pine forests, grassy openings, and savanna; in Grant, Greenbrier, Pendleton, and Tucker Counties, WV	N	No: Outside of known range	N/A	NI
A Cave Beetle (*Pseudanophthalmus fuscus*) [c]	G4/N4/S2	A subterranean species found in cave formations; in Greenbrier, Monroe, Pocahontas	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT
Timber Ridge Cave Beetle (*Pseudanophthalmus hadenoecus*) [c]	G1/N1/S1	A subterranean species found in cave formations; in Pendleton County, WV	N	No: Outside of known range	N/A	NI
A Cave Beetle (*Pseudanophthalmus hypertrichosis*) [c]	G5/N3/S3	A subterranean species found in cave formations; in Pocahontas and Randolph Counties, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Dry Fork Valley Cave Beetle (*Pseudanophthalmus montanus*) [c]	G1G2/N3/S1	A subterranean species found in cave formations; in Pocahontas and Randolph Counties, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT
Northern Metalmark (*Calephelis borealis*)	G3G4/N3N4/S1	Open woodland streams near serpentine, shale, or limestone barrens; Found in Greenbrier, Mineral and Summers Counties, WV	N	No: Outside of known range	N/A	NI
Gandy Creek Cave Springtail (*Pseudosinella certa*) [c]	G1/G1/S1	A subterranean species found in cave formations; in Randolph County, WV	N	No: Outside of known range	N/A	NI
A Springtail (Pseudosinella gisini) [c]	G3G4T3/N3N4/S3	A subterranean species found in cave formations; in Greenbrier, Monroe, Pocahontas, Randolph County, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT
Southern Grizzled Skipper (*Pyrgus wyandot*)	G1G2Q/N1N2/S1	Open areas with bare rock or soil, shale barrens, pastures, slopes; Found in Greenbrier, Hampshire, Hardy, Kanawha, Mineral, and Pendleton Counties, WV	N	No: Outside of known range	N/A	NI
A Springtail (*Sinella agna*) [c]	G3G4/N3N4/S3	A subterranean species found in cave formations; in Barbour, Pocahontas, Randolph, Tucker Counties, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Boreal Fan Moth (*Brachionycha borealis*)	G4/NNR/S1	Oak-pine barrens, savannahs, dry hardwood forests, mesic conifer forests, and dry conifer forests and forest openings. In Grant, Hardy, and Pendleton Counties.	N	No: Outside of known range	N/A	NI
Bronze Copper *(Lycaena Hyllus)*	G5/N4N5/S2	Marshes, sedge meadows, moist to wet grassy meadows, ditches, fens, streamside or pondshore wetlands, or roads and right of ways through marshlands; primary larval host is water dock or curly dock, but will also use undocumented species of knotweeds. In Brooke, Cabell, Marion, Monongalia, Pocahontas, and Randolph Counties.	Y	Suitable habitat potentially present within survey corridor based on wetland survey; species specific habitat assessment pending. Host plant (curly dock) found during botany surveys.	N/A	MIINLT
Early Hairstreak (*Erora laeta*)	GU/N3N4/S2	A deciduous canopy species of hardwood forests or hardwood-northern conifer mixed forests, especially northern hardwood stands with mature beech. Larval hosts include American beech fruits, beaked hazelnut, and birch catkins. In Randolph, Pendleton, Hardy, Pocahontas, Greenbrier, Monroe, Summers, Raleigh, Kanawha, and Cabell Counties.	Y	Suitable habitat potentially present within survey corridor based botany survey: host plant (American beech) found during surveys.	N/A	MIINLT
Milne's euchlaena moth (*Euchlaena milnei*)	G2G4/N2N4/S2	Mountainous areas in the Appalachians with hardwood forests; larval hostplant(s) is unknown; others members of the genus feed on members of the rose, oak, maple, ash, birch, and willow families. In Berkeley, Grant, Greenbrier, Hampshire, Hardy, Monroe, Morgan, and Pocahontas Counties.	Y	Suitable habitat potentially present within survey corridor based botany survey: host plants (e.g., ash) found during surveys. The WVDNR noted impacts possible.	N/A	MIINLT
A Noctuid moth (*Aplectoides condita*)	G4/NNR/SH	Woodlands, old fields, and meadows. Larval food plant is starry campion (*Silene stellata*) flowers and seeds, and possibly other *Silene* species. In Pocahontas County.	Y	Suitable habitat potentially present within survey corridor based on botany survey: host plant (*Silene stellate*) found during surveys. WVDNR occurrence data nearby.	N/A	BI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
West Virginia white (*Pieris virginiensis*)	G3G4/N3N4/S3	Mixed mesophytic and northern hardwood stands. Larval hosts are toothworts, most commonly cutleaf toothwort (*Cardamine concatenata*) and two-leaved toothwort. Documented broadly in 24 counties, but mostly likely found in the mountain areas in Preston, Tucker, Randolph, Pocahontas, Pendleton, Greenbrier, and Webster Counties and adjacent areas.	Y	Suitable habitat potentially present within survey corridor based on botany survey: host plant (cutleaf toothwort) found during surveys. WVDNR occurrence data nearby.	N/A	MIINLT
Diana Fritillary (*Speyeria diana*)	G3G4/N3N4/S2	Deciduous or mixed forest with abundant violets in the understory. It prefers moist, rich deciduous woodlands with small openings, trail, and roadways. Larval host plants are violets: food plants primarily include milkweeds and thistles, but *Monarda* spp. and composites near woodland edges are also used. In Pocahontas County.	Y	Suitable habitat potentially present within survey corridor based on botany survey: host plant (violet spp.) found during surveys.	N/A	MIINLT
Greenbrier Valley Cave Millipede (*Pseudotremia fulgida*) [c]	G4/N3/S3	An obligate subterranean species found in cave and karst formations; in Greenbrier and Pocahontas Counties, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	NI
Germany Valley Cave Millipede *(Pseudotremia lusciosa)* [c]	G1G2/N1/S1	An obligate subterranean species found in cave and karst formations; in Pendleton County, WV	N	No: Outside of known range	N/A	NI
South Branch Valley Cave Millipede *(Pseudotremia princeps)* [c]	G1/N1/S1	An obligate subterranean species found in cave and karst formations; in Grant, Pendleton County, WV	N	No: Outside of known range	N/A	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact:
ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Grand Caverns Blind Cave Millipede *(Zygonopus weyeriensis)* [c]	G3G4/N3N4/S2	An obligate subterranean species found in cave and karst formations; in Greenbrier, Monroe, Pendleton, Pocahontas, and Randolph County, WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	NI
Luray Caverns Blind Cave Millipede *(Zygonopus whitei)* [c]	G3G4/N3N4/S1	An obligate subterranean species found in cave and karst formations; in Grant, Pendleton County, WV	N	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	NI
INVERTEBRATES – OTHER						
Hoffmaster's Cave Planarian (*Macrocotyla hoffmasteri*) [c]	G3G4//S2	An obligate subterranean flatworm species found in cave formations; in Greenbrier, Pendleton, Pocahontas, Randolph and Tucker WV	Y	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	NI
A Cave Obligate Planarian (Phagocata angusta) [c]	G1/N3N4/S1	An obligate subterranean flatworm species found in cave formations; in Tucker County, WV	N	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Culver's Planarian *(Sphalloplana culveri)* [c]	G1/N1/S1	An obligate subterranean flatworm species found in cave formations; in Tucker County, WV	N	Potential cave/karst habitat present in the survey area based on karst survey. Cave/karst buffers to keep habitat outside of impacted area, per the Karst Monitoring and Mitigation Plan.	N/A	NI
NON-VASCULAR PLANTS						
Ammons' Tortula Moss (*Tortula ammonsiana)*	G1/N1/S1	Mixed Northern Hardwoods, Mixed Oak, Oak-Pine Forest on rock outcrops (often with southern aspect), preferring the backwalls and shelves of overhanging cliffs, although colonies of small plants have been located on exposed cliff-faces; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
PLANTS						
Arctic Bentgrass *(Agrostis mertensii)*	G5/N5/S1	High elevation, open riparian areas or peaty and rocky soil; in Pocahontas and Randolph Counties, WV. There are 12 documented occurrences in the MNF based on MNF plant data, but none within 2 miles of the Project area.	Y	No suitable habitat present based on field surveys.	No	NI
Allegheny Onion *(Allium alleghenìense)*	G3?/N3?/S2	Oak-Pine and Mixed Oak forest with calcareous rocky outcropping: dry woods, calcareous rock outcroppings east of the Greenbrier River.	Y	Yes: field survey confirmed suitable habitat is present.	No	N
Lillydale Onion *(Allium oxyphilum)*	G2Q/N2/S2	Oak-Pine And Mixed Oak Forest: shale barrens, but this species has been noted on sandstone outcroppings; Greenbriar, Mercer, Monroe, and Summers Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Bartram Shadbush *(Amelanchier bartramiana)*	G5/NNR/S2	Mixed Northern Hardwoods And Oak-Pine: northern hardwood and mixed hardwood-coniferous forests, forest edges, opening in forests, and peatlands; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Spreading Rockcress *(Arabis patens)*	G3/N3/S2	Nothern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Riparian Corridors: moist rocky woods, limestone outcrops, and shady riverbanks in Berkeley, Grant, Hampshire, Hardy, Jefferson, and Pendleton Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Cooper's Milkvetch *(Astragalus neglectus)*	G4/N4/S1	Well-drained, sand or gravel borders of glacial lakes; open, calcareous, rocky ridges and bluffs; deep, loamy, well-drained soils, at the border between prairie and woods; and powerline rights-of-way, roadsides, and railroad beds; Grant County, WV.	N	No suitable habitat present based on field surveys.	No	NI
Blue Wild Indigo *(Baptisia australis var. australis)*	G5T3T4/NNR/S3	Early successional habitat and in gravel bars along rivers and ditches and open areas; in Pocahontas County, WV.	Y	No suitable habitat present based on lack of large river riparian corridors encountered during field surveys.	No	NI
Lanceleaf Grapefern *(Botrychium lanceolatum var. angustisegmentum)*	G5TNR/N4/S1	Appalachian Hardwoods, Northern Hardwoods: moist shady woods, margins of swamps, on hummocks in swamps, and in cool to warm, mostly rich, subacid soils; Pocahontas, Preston, and Tucker Counties, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Bluntlobe Grapefern *(Botrychium oneidense)*	G4Q/N4/S3	Mixed Northern Hardwoods, Oak-Pine Forest, Mixed Oak: low, wet, acid, secondary woods and swamps; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Roan Mountain Sedge *(Carex roanensis)*	G2G3/N2N3/S2	Mixed Oak, Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods: rich soils of mid- to high-elevation mesic forests in the southern Appalachians, including rich cove and northern hardwood forests; Pendleton, Pocahontas, and Randolph Counties, WV.	Y	Field survey confirmed that suitable habitat occurs in the following location: between [redacted] Areas found in 2015 in Pocahontas and Randolph Counties and avoided by rerouting.	Yes	MIINLT
Purple Clematis *(Clematis occidentalis var. occidentalis)*	G5T5/NNR/S2	Mixed Northern Hardwood, Mixed Oak, Mixed Appalachian Hardwoods: rocky alpine slopes and ridges, and openings in forested areas; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Bentley's Coralroot *(Corallorhiza bentleyi)*	G1G2/N2/S1	Mixed Northern Hardwood, Mixed Oak, Mixed Appalachian Hardwoods: Appalachian deciduous forest, often at edges of forest in somewhat disturbed sites; in Monroe and Pochontas Counties, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact:
ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Roundleaf Dogwood *(Cornus rugosa)*	G5/NNR/S1	Mixed Northern Hardwoods, Mixed Oak: well drained to normal moisture soil; Fayette, Mineral, and Pendleton Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Showy Lady's-slipper *(Cypripedium reginae)*	G4/N4/S1	Mixed Northern Hardwoods, Mixed Oak Associated With Riparian Corridors/Wetlands: cold northern wetlands (e.g., mossy conifer swamps of *Thuja occidentalis, Picea mariana*, or *Larix laricina*), swampy thickets, bogs, woodland glades, ravines, stream and lake edges, seepages on limestone or sandstone bluffs, damp calcareous slopes or shores, limestone quarries, wet calcareous meadows, circumneutral seep springs, forested fens, shrub borders of fens, sandy shorelines, and algific talus slopes; Greenbriar and Tucker Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Tall Larkspur *(Delphinium exaltatum)*	G3/N3/S2	Mixed Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods: woods (and edges of woods), rocky slopes, semi-open woodlands, glades, and prairie openings; Grant, Greenbrier, Hampshire, Hardy, Mercer, Mineral, Monroe, and Pendleton Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Shalebarren Wild-buckwheat *(Eriogonum allenii)*	G4/N4/S2	Shale barrens; in Pocahontas County, WV.	Y	No suitable habitat present based on field surveys.	No	NI
Darlington's Spurge *(Euphorbia purpurea)*	G3/N3/S2	Dry or moist woods; mountain glades and swampy woods; in Pocahontas County, WV.	Y	No suitable habitat in the Project area based on field surveys.	No	NI
Box Huckleberry *(Gaylussacia brachycera)*	G3/N3/S2	Mixed Oak, Oak-Pine: acidic sandy soil, woodlands and slopes, frequently associated with pine and mountain laurel, often sourwood & black gum; Greenbriar, Hardy, Monroe, and Summers Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Appalachian Oak Fern *(Gymnocarpium appalachianum)*	G3/N3/S2	Mixed Mesophytic/Cove Hardwoods, Mixed Oak: primarily in maple-birch-hemlock woods on mountain slopes and summits, on moist sandstone, talus slopes, or bouldery colluvium; Greenbrier, Hampshire, Monongalia, Pendleton, Preston, Randolph, Tucker Countes, WV.	N	Yes: field survey confirmed suitable habitat is present.	Yes	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Sweet-scented Indian-plantain *(Hasteola suaveolens)*	G4/N4/S3	Low, moist ground; in rich floodplain forests, thickets, or clearings and in calcareous fens; occasionally on calcareous bluffs; Berkeley, Greenbrier, Hancock, Mercer, Monongalia, Ohio, Pleasants, Preston, Randolph, Ritchie, Tucker Counties, WV. There is one documented occurrence in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.	N	No suitable habitat present based on field surveys.	No	NI
White Alumroot *(Heuchera alba)*	G2Q/N2/S2	Mixed Oak, Oak-Pine: rocky or shaley wooded ridgetops; in Pocahontas County, WV.	Y	Yes: field survey confirmed that suitable habitat occurs [redacted]	Yes	MIINLT
Crested Coralroot *(Hexalectris spicata)*	G5T4T5/N4?/S1	Mixed Oak, Oak-Pine, Mixed Northern Hardwoods: dry or mesic woods on basic soils; Grant, Pendleton, and Wayne Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINL
Blue Ridge St. John's-wort *(Hypericum mitchellianum)*	G3/N3/S1	Mixed Northern Hardwoods, Appalachian Hardwoods, Riparian Corridors/Wetlands: seepage slopes and spray areas near falls, at higher elevations (Radford, 1968); grassy balds, grassy openings, forests, seepages; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No, found in at Shaver's Fork in Randolph County near Cheat Bridge in 2015; avoided by rerouting	MIINL
Long-stalk Holly *(Ilex collina)*	G3/N3/S2	Herbaceous, Northern Hardwoods, Appalachian Hardwoods, Riparian Corridors: high elevation oligotrophic wetlands along streams, and streamheads from 2,120-4,815 ft; In Greenbrier, Nicholas, Pocahontas, Randolph, Webster, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No, found in 2015 in Randolph County and avoided by rerouting.	MIINL
Butternut *(Juglans cinerea)*	G4/N3N4/S3	Mixed Mesophytic/Cove Hardwoods, Riparian Corridors: rich mesophytic forests, lower slopes, ravines, and various types of bottomland, including banks and terraces of creeks and streams, and floodplain forests; in Pocahontas County, WV. There are 112 documented occurrences in the MNF, including nine within 1 mile of the Project area, based on MNF plant data.	Y	Yes: field survey confirmed suitable habitat is present.	No, 2015 occurrence avoided by rerouting, 2016 occurrence outside workspace.	MIINL

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Thread Rush *(Juncus filiformis)*	G5/N5/S2	Moist or wet habitats including sandy shores of streams and lakes, bogs and alpine meadows; Pleasants, Randolph, and Tucker Counties, WV. There is one documented occurrence in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.	N	No suitable habitat present based on field surveys.	No	NI
Highland Rush *(Juncus trifidus)*	G5/NNR/S1	Cracks in rocky outcrops and ledges in cool microsites and rocky alpine meadows; mostly restricted to high elevation sites; In Pendleton County, WV	N	No suitable habitat present based on field surveys.	No	NI
Turgid Blazing Star *(Liatris turgida)*	G3/N3/S2	Xeric environments associated with clay soils, gravel, shale barrens, and rocky (granitic, amphibolite) outcrops; Fayette, Greenbrier, McDowell, Mineral, Monroe, Nicholas Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Grooved Yellow Flax *(Linum sulcatum)*	G5T5/G5/S1	Scattered sites on sandy barrens; Grant and Jefferson Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Heartleaf Twayblade *(Listera cordata)*	G5T5/G5/S2	Cool peaty swamps; in Pocahontas County, WV.	Y	No suitable habitat present based on field surveys due to lack of large wetland complexes.	No	NI
Large-flowered Barbara's-buttons *(Marshallia grandiflora)*	G2/N2/S2	Along the flood-scoured banks of large, high-gradient rivers in the central Appalachians; the species is also reported from rocky lake shores, creek banks, bluffs and flood plains; Barbour, Fayette, Greenbrier, Marion, Monongalia, Nicholas, Preston, Randolph, Summers, Taylor, Upshur, and Webster Counties, WV. There is one documented occurrence in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.	N	No suitable habitat present based on field surveys.	No	NI
Bog Buckbean *(Menyanthes trifoliata)*	G5/N5/S1	Various wetland habitats such as fens, pools, marshes, older woods, ditches, bogs, lake shores, and swampy prairies, particularly in acid or oligotrophic conditions; in Pocahontas County, WV.	Y	No suitable habitat present based on field surveys due to lack of large wetland complexes.	No	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Smoke Hole Bergamot *(Monarda fistulosa ssp. Brevis)*	G5T1/N1/S1	Mid-appalachian cedar glades and dry limestone outcrops/barrens; often found on thin, unstable limestone slopes; Fayette, Grant, Hardy, Mercer, Nicholas, Pendleton, Summers Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Limestone Adder's-tongue *(Ophioglossum engelmannii)*	G5/NNR/S1	Mixed Northern Hardwood Forest: Limestone related habitat; Hardy and Tucker Counties, WV.	N	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Silvery Nailwort *(Paronychia argyrocoma)*	G4/N4/S3	Open, non-calcareous habitat at subalpine elevations but can also grow along low elevation riverbanks; Grant, Hardy, Jefferson, and Pendleton Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Yellow Nailwort *(Paronychia virginica)*	G4/N4/S2	Shallow, rocky soil over magnesium-rich, ultramafic rock; Grant, Hampshire, Hardy, Jefferson, and Pendleton Counties, WV. There are 13 documented occurrences in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.	N	No suitable habitat present based on field surveys.	No	NI
Canby's Mountain-lover *(Paxistima canbyi)*	G2/N2/S2	Bluffs and cliffs of limestone or dolomite, usually growing in shallow soils that form over these substrates; Grant, Greenbrier, Hampshire, Mercer, Mineral, Monroe, Pendleton Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Swamp Lousewort *(Pedicularis lanceolata)*	G5/NNR/S2	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak, Oak-Pine with Riparian Corridors/Wetlands: periodically inundated habitats, such as wet meadows, prairies, swamps, freshwater tidal marshes, and stream sides and other early-successional habitats; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Swordleaf Phlox *(Phlox buckleyi)*	G2/N2/S2	Shaly slopes in open woods and shale barrens; often occurs along roads; shales tend to be of Devonian age; in Pocahontas County, WV.	Y	No suitable habitat present based on field surveys.	No	NI
Canada Mountain Ricegrass *(Piptatherumcanadense)*	G5/N2/S1	Rocky openings just below treeline; Pendleton and Randolph Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Shriver's Frilly Orchid *(Platanthera shriveri)*	G1/N1/S1	Northern Hardwoods: partial to full shade of damp, open, mixed deciduous and coniferous woods, often along seepage springs or streams, or on roadside banks amid mosses, ferns, grasses, sedges, and/or nettles in mountains; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No, found in 2015 in Pocahontas and Randolph Counties and avoided by the GWNF-6 reroute	MIINLT
Bog Bluegrass *(Poa paludigena)*	G3/N3/S1	Northern Hardwoods, Mixed Oak, Oak-Pine, Mixed Mesiphtic/Cove Hardwoods: spring-fed swamps; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Bog Jacob's-ladder *(Polemonium vanbruntiae)*	G3G4/N3/S2	Hardwood and softwood swamps, shrub swamps, marshes, bogs, lakeshores, woodland swales and seeps, spring runs, and wet roadsides, mostly at higher elevations (at least in the southern part of the plant's range); WV populations are mostly at elevations of 2000-4000 feet; in Pocahontas County, WV.	Y	No suitable habitat present based on field surveys due to lack of large wetland complexes.	No	NI
Tennessee Pondweed *(Potamogeton tennesseensis)*	G2/N2/S2	Streams, ponds, and shallows of rivers; Greenbriar, Harrison, Ohio, and Tucker Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Beadle's Mountainmint *(Pycnanthemum beadlei)*	G2G4/N2N4/S1	Northern Hardwoods, Mixed Oak, Oak-Pine, Mixed Mesiphtic/Cove Hardwoods: open forests, forest edges, and roadsides; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Pennsylvania Buttercup *(Ranunculus pensylvanicus)*	G5/NNR/S1	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak, Oak-Pine associated wwith riparian corridors/wetlands: open to filtered light; wet to periodically flooded, including marsh edges, vernal pools, seasonally flooded riverbanks; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Lanceleaf Buckthorn *(Rhamnus lanceolata ssp. Lanceolata)*	G5T4T5/N4N5/ S1	Dry to moist, brushy thickets with dolomite near the surface, often just below cliffs; Berkeley, Grant, Hardy, and Pendleton Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Bristly Black (Prickly) Currant *(Ribes lacustre)*	G5/N5/S2	Mixed Mesophytic/Cove Hardwoods: damp soil on rocky slopes and talus areas, moist to seepy rock outcrops and cliffs, and in cool woods and swamps; in Pocahontas County, WV.	Y	Field survey confirmed that suitable habitat occurs in the following location: between [redacted]	Yes: outside Project area	MIINLT

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Rock Skullcap *(Scutellaria saxatilis)*	G3/N3/S2	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak: woods, hillsides, and moist cliffs in mountainous areas; in Pocahontas County, WV. There are 153 documented occurrences in the MNF, including 11 within 1 mile of the Project area, based on MNF plant data.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Fire Pink *(Silene virginica var. robusta)*	G5T1Q/N1/S1	Limestone related habitat; Grant and Pendleton Counties, WV. There is one documented occurrence in the MNF based on MNF plant data, although none occur within 2 miles of the Project area.	N	No suitable habitat present based on field surveys.	No	NI
Boreal Starwort *(Stellaria borealis ssp. Borealis)*	G5T5/N4N5/S1	Seeps and spring-fed streamlets, usually in wooded areas; Tucker County, WV.	N	No suitable habitat present based on field surveys.	No	NI
Mountain Pimpernel *(Taenidia montana)*	G3/N3/S3	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak: shale barrens (calcareous) and mesic and xeric open woods or dense hardwood forests; Grant, Greenbrier, Hampshire, Hardy, Mercer, Mineral, Monroe, Morgan, Pendleton, Summers, and Tucker Counties, WV. There are three documented occurrences in the MNF, including one within 1 mile of the Project area, based on MNF plant data.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Canada Yew *(Taxus canadensis)*	G5/N5/S2S3	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak: gentle to somewhat steep slopes facing southeast, at elevations ranging from 613-650 feet; soils are usually sandy loams; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Bristle-fern *(Trichomanes boschianum)*	G4/N4/S1	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak, Oak-Pine: deep shade on damp acid rocks, usually sandstone, of sheltered canyons, grottos and rock shelters at an altitude of 150 to 800 m. The rock outcrops are generally found within mesic upland forests; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Narrow-leaved Blue-curls *(Trichostema setaceum)*	G5/NNR/S2	Grassland, meadows and fields, sandplains and barrens; Fayette, Grant, Hampshire, Mineral, Morgan, and Pendleton Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI

TABLE 1 (cont'd)

USFS Regional Forester Sensitive Species Likelihood of Occurrence and Determination of Impact: ACP MP 71.2 to MP 84.0, Monongahela National Forest, WV

Species	Global/National/ State Conservation Status [a]	Suitable Habitat	Within Known Range?	Spring/Summer 2016 Field Survey Results		Effect Determination [b]
				Habitat Present?	Species Detected?	
Kate's Mountain Clover *(Trifolium virginicum)*	G3/N3/S3	Shale barrens; Berkeley, Grant, Greenbrier, Hampshire, Hardy, Mineral, Monroe, Morgan, and Pendleton Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Nodding Pogonia *(Triphora trianthophora)*	G3G4/NNR/S2	Leaf-lined depressions on gentle slopes in old-age/maturing forests dominated by *Tsuga canadensis* and *Fagus grandifolia*; Barbour, Fayette, Kanawha, Nicholas, Summers, Upshur, and Webster Counties, WV. There are two documented occurrences in the MNF, although none occur within 2 miles of the Project area, based on MNF plant data.	N	No suitable habitat present based on field surveys.	No	NI
Appalachian Blue Violet *(Viola appalachiensis)*	G4/N4/S3	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak, Oak-Pine and would be associated with riparian corridors/wetlands: occurs on rich, moist soils found on stream banks, floodplains, glades, clearings, forest edges, roadsides, old railroad grades, old fields, and pastures; often associated with some form of human disturbance; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT
Sand Grape *(Vitis rupestris)*	G3/N3/S2	Calcareous or gravelly banks, river bottoms, stream beds, washes, and scoured boulders and cobbles. It also occurs along the edges of limestone glades and barrens; Fayette, Greenbrier, Monroe, Ohio, Preston, Raleigh, and Summers Counties, WV.	N	No suitable habitat present based on field surveys.	No	NI
Netted Chainfern *(Woodwardia areolata)*	G5/N5/S2	Northern Hardwoods, Mixed Mesophytic/Cove Hardwoods, Mixed Oak, Oak-Pine: common on the coastal plain, but rare in the mountains, where it occurs in swamps and wet woods in acid soil; in Pocahontas County, WV.	Y	Yes: field survey confirmed suitable habitat is present.	No	MIINLT

Sources:

Claire, C. 2015. Allegheny woodrat (*Neotoma magister*) Distribution Across Pennsylvania. Theses and Dissertations, Paper 1254. Indiana university of Pennsylvania Knowledge Repository @ Indiana University of Pennsylvania. Available online at: http://knowledge.library.iup.edu/cgi/viewcontent.cgi?article=2155&context=etd. Accessed February 2017.

Communications with WVDNR and MNF botanists.

Carnegie Museum of Natural History. 2016. Available at http://www.carnegiemnh.org/science/. Accessed May 2016.

ESRI aerial imagery.

George Washington National Forest. 2016. Meeting between GWNF and Atlantic Coast Pipeline, LLC. March 29, 2016.

Gompper, M. and D. Jachowski. 2016. Spilogale putorius. The IUCN Red List of Threatened Species 2016: e.T41636A45211474. Available online at: http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T41636A45211474.en. Accessed February 2017.

Luensmann, Peggy. 2006. *Melanerpes erythrocephalus*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available at https://www.feis-crs.org/feis/. Accessed September 23, 2016.

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available online at http://explorer.natureserve.org/. Accessed April 2016, May 2016, July 2016.

Orrock, J.L, E.K. Harper, J.F. Pagels, and W.J. McShea. 1999. Additional records of the rock vole, Microtus chrotorrhinus (Miller) (Mammalia: Rodentia: Muridae), in Virginia. Banisteria 14:36−38. Available online at: https://orrocklab.zoology.wisc.edu/Html/Pubs/orrock_et_al._banisteria_1999.PDF. Accessed February 2017. Virginia Department of Game and Inland Fisheries. 2016. Wildlife Information. Available online at: http://www.dgif.virginia.gov/wildlife/information/?s =050020. Accessed April 2016.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2016. The PLANTS Database (http://plants.usda.gov, 25 August 2016). National Plant Data Team, Greensboro, NC 27401-4901 USA.VDGIF, Accessed July 2016.

U.S. Department of Agriculture Web Soil Survey.

U.S. Fish and Wildlife Virginia spiraea modeled potential habitat.

West Virginia Department of Natural Resources Natural Heritage Program Biodiversity shapefile.

West Virginia Department of Natural Resources Natural Heritage Program Natural Heritage Inventory data (2016).

West Virginia Division of Natural Resources. 2016. Rare, Threatened & Endangered Species – WV Natural Heritage Program. Available online at: http://www.wvdnr.gov/Wildlife/RareSpecList.shtm. Accessed March 2017.

West Virginia Division of Natural Resources. 2015. 2015 West Virginia State Wildlife Action Plan. Available online at http://www.wvdnr.gov/2015%20West%20Virginia%20State%20Wildlife%20Action%20Plan%20Submittal.pdf. Accessed May 2016.

Woolaver et al., 1998

[a] Global/State Conservation Status: Conservation status ranks are based on a one to five scale, ranging from critically imperiled (G1) to demonstrably secure (G5). Status is assessed and documented at three distinct geographic scales - global (G), national (N), and state/province (S). Global/State Conservation Rank: G1 = Critically imperiled - At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors; G2 = Imperiled - At high risk of extinction or elimination due to very restricted range, very few populations, steep declines, or other factors; G3 = Vulnerable - At moderate risk of extinction or elimination due to a restricted range, relatively few populations, recent and widespread declines, or other factors; G4 = Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors; G5 = Secure - Common; widespread and abundant; NNR=Unranked- species conservation status not accessed; Q = Questionable taxonomy; ? = Inexact numeric rank.

[b] Impact Determinations: NI = No impacts, BE = Beneficial effects, MIINLT = May impact individuals but is not likely to cause a trend toward federal listing or loss of viability, LT = Likely to result in a trend to federal listing or loss of viability.

[C] Analyzed as cave-obligate species.

N/A = Presence/Absence surveys were not carried out

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

BIOLOGICAL EVALUATION

APPENDIX E

George Washington National Forest Regional Forest Sensitive Species List and Occurrence Analysis Results (OAR) Table

Table 2

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
VERTEBRATE						
Fish						
1	*Ammocrypta clara*	Western sand darter	Lee and Scott Counties, VA	Sandy runs of clear to moderately turbid medium and large rivers.	G3	S1
1	*Cottus baileyi*	Black sculpin	Bland, Smyth, Tazewell, and Washington Counties, VA	Cool to cold (i.e., trout-water) streams and spring runs with usually clear water and moderate to high gradient.	G4Q	S2
1	*Etheostoma acuticeps*	Sharphead darter	Washington County, VA	Fast, deep, rocky riffles in small to medium rivers; strongly flowing water in riffles and chutes.	G3	S1
1	*Etheostoma osburni*	Candy darter	Bland, Giles, Pulaski, and Wythe Counties, VA	Fast rubble riffles of small to medium rivers and cool montane streams; rocky, typically clear.	G3	S1
1	*Etheostoma tippecanoe*	Tippecanoe darter	Not found in the GWNF: from four sites in the Jefferson National Forest, Clinch R, lower Copper Creek.	Shallow gravel riffles of small to medium-sized rivers.	G2	S1
1	*Ichthyomyzon greeleyi*	Mountain brook lamprey	Lee, Scott, Smyth, and Tazewell Counties, VA	Clean, clear, gentle- or high-gradient creeks.	G4	S2
1	*Notropis ariommus*	Popeye shiner	Lee, Russel, Scott, Smyth, Washington, and Wise Counties, VA	Warm, relatively clear flowing waters of large creeks and small to medium rivers.	G3	S2S3
8	*Notropis semperasper*	Roughhead shiner	Augusta, Bath, and Highland Counties in VA. Species is documented within 2 miles of Project area in the GWNF based on WVDNR NHP NHI data.	Limited to relatively pristine streams; typically it occurs in cool and warm, usually clear, large creeks and medium-sized rivers with moderate gradient.	G2G3	S2S3
8	*Noturus gilberti*	Orangefin madtom	Upper James Watershed	Riffles and runs of medium to large, cool to warm, usually clear streams	G2	S2
1	*Percina burtoni*	Blotchside logperch	Russel, Scott, Smyth, Tazewell, and Washington Counties, VA	Gravel runs and riffles of clear, small to medium rivers.	G2G3	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
8	*Phenacobius teretulus*	Kanawha minnow	Carroll, Floyd, Galax, Grayson, Montgomery, Pulaski, and Wythe Counties, VA	Riffles and runs of gravel, rubble, and boulder in cool to warm creeks and small to medium rivers.	G3G4	S2S3
1	*Phoxinus tennesseensis*	Tennessee dace	Bland, Scott, Smyth, Washington, and Wythe Counties, VA	Pools of spring-fed headwaters; primarily cool and cold, clear, small creeks.	G3	S1
Amphibian						
1	*Plethodon hubrichti*	Peaks of otter salamander	Bedford, Botetourt, and Rockbridge Counties, VA	Mixed oak, late successional with loose rocks and logs greater than 1,800 feet.	G2	S2
3	*Plethodon punctatus*	Cow knob salamander	Augusta, Bath, and Highland Counties, VA	Mixed hardwood stands, late successional with loose rocks and logs greater than 2,500, numerous rock outcrops.	G3	S2
1	*Plethodon welleri*	Weller's salamander	Grayson, Smyth, and Washington Counties, VA	Spruce-fir forests and adjacent northern hardwoods, tends to associated with rocky substrates.	G3	S2
Bird						
6	*Falco peregrinus*	Peregrine falcon	Accomack, Alleghany, Buchanan, Charles City, Dickenson, Giles, Gloucester, Isle of Wight, Lancaster, Lee, Madison, Middlesex, Newport News (City), Norfolk (City), Northampton, Page, Portsmouth (City), Prince George, Richmond (City), Rockbridge, Shenandoah, and York Counties, VA	Nests on ledges or cliffs, buildings, bridges, quarry walls. Non-breeding sites include farmland, open country, lake shores, and broad river valleys.	G4	S1B/S2 N

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
6	*Haliaeetus leucocephalus*	Bald eagle	Entire GWNF	Areas close to coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water for food sources. Nests are found in tall trees except where only cliff faces or ground sites are available. Preference is for tall, sturdy conifers, but can also nest in pine, spruce, fir, cottonwood, willow, oak, beech, and others.	G5	S3S4B/ S3S4N
3	*Lanius ludovicianus migrans*	Migrant loggerhead shrike	In Highland, Bath, Augusta, and Nelson Counties, VA	Typical habitat includes fencerows and open grasslands with trees and shrubs.	G4T3Q	S1B/S2N
2	*Thryomanes bewickii altus*	Appalachian Bewick's wren	Species is considered extirpated within the Analysis Area	Historically thickets, old fields, fencerows, and old home sites in Highland County, VA.	G5T2Q	SHB
Mammal						
2	*Microtus chrotorrhinus carolinensis*	Southern rock vole	Bath and Highland Counties, VA	Cool, moist, mossy talus under oaks/northern hardwoods above 2,500 feet	G4T3	S1
3	*Myotis leibii*	Eastern small-footed bat	Augusta, Bath, and Highland Counties, VA	Hibernates in caves during winter, roosts in crevices of large rock outcrops, cliffs, and under large rocks. Roosting habitat may include trees and snags with peeling bark. Forages in forested and open habitat types in ridges, valleys, and around water.	G1G3	S2
3	*Sorex palustris punctulatus*	Southern water shrew	Bath and Highland Counties, VA	Riparian areas within spruce-fir forests and northern hardwoods, typically above 2,500 to 3,000 feet in elevation.	G5T3	S1S2
INVERTEBRATE						
Snail (Mollusk, Class Gastropoda)						
1	*Glyphyalinia raderi*	Maryland glyph	Alleghany County, VA	Calciphile, edge of seeps within leaf litter.	G2	S1S2

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
1	*Helicodiscus diadema*	Shaggy coil	Alleghany and Rockbridge Counties, VA	Calciphile, limestone rubble and talus.	G1	S1
1	*Helicodiscus lirellus*	Rubble coil	Rockbridge County, VA	Calciphile, limestone rubble and talus.	G1	S1
1	*Helicodiscus triodus*	Talus coil	Alleghany County, VA	Calciphile, limestone rubble on wooded hillsides and near cave entrances.	G2	S1S2
1	*Io fluvialis*	Spiny riversnail	Lee, Russell, Scott, Smyth, Tazewell, Washington, Wise Counties, VA	Shallow waters of shoals that are rapid to moderate and well-oxygenated.	G2	S2
3	*Paravitrea reesei*	Round supercoil	In scattered western counties in VA: found in Jefferson National Forest and Carroll, Pulaski, Montgomery, Pittsylvania, Carroll, Grayson, and Smyth Counties.	Calcareous woodlands and glades, prefers moist environments such as under rocks, in moist leaf litter, and on river bluffs and slopes near water.	G3	SU
Mussel (Mollusk, Class Bivalvia)						
8	*Alasmidonta varicosa*	Brook floater	Augusta County, VA	Riffles and moderate rapids with sandy shoals or gravel bottoms.	G3	S1
8	*Elliptio lanceolata*	Yellow lance	Bath and Nelson Counties, VA	Sandy substrates, rocks and in mud, in slack water areas.	G2G3	S2S3
1	*Pleuronaia barnesiana*	Tennessee pigtoe	Bland, Bristol (City), Lee, Russell, Scott, Smyth, Tazewell, Washington, and Wise Counties, VA	Riffles and shoal areas with moderate to swift current velocities.	G2G3	S2
7	*Fusconaia masoni*	Atlantic pigtoe	Bath County, VA	Fast flowing, well oxygenated streams and is restricted to fairly pristine habitats.	G2	S2
1	*Lasmigona holstonia*	Tennessee heelsplitter	Bland, Lee, Norton (City), Russell, Scott, Smyth, Tazewell, Washington, and Wise Counties, VA	Fine-particle substrates in backwaters or pool-like habitats.	G3	S1
8	*Lasmigona subviridis*	Green floater	Bath and Nelson Counties in VA	Averse to strong currents, small creeks and large rivers and sometimes canals at depths of 1-4 feet.	G3	S2
1	*Pleurobema cordatum*	Ohio pigtoe	Scott County, VA	In or immediately above riffles in heterogenous assemblages of gravel, cobble, and boulders in medium to large rivers.	G4	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
1	*Pleurobema oviforme*	Tennessee clubshell	Lee, Russell, Scott, Smyth, Tazewell, Washington, and Wise Counties, VA	Creeks and small rivers, it may be found immediately above riffles or in flats.	G2G3	S2S3
1	*Pleurobema rubrum*	Pyramid pigtoe	Scott County, VA	Riffles or shoals in relatively shallow water and coarse-particle substrates, along sand bars, or in deep water (>4 m) with stable mud and muddy sand bottoms.	G2G3	SH
1	*Toxolasma lividum*	Purple Liliput	Russell, Scott, Smyth, and Washington Counties, VA	Headwaters of small to medium sized rivers.	G3Q	SH
Pseudoscorpion (Arachnid, Order Pseudoscoriones)						
1	*Kleptochthonius orpheus*	Orpheus cave pseudoscorpion	Greenbrier Watershed and Monroe County, WV	Subterranean obligate - caves.	G1	Not ranked
Amphipod (Crustacean, Order Amphipoda)						
1	*Stygobromus abditus*	James cave amphipod	Giles, Pulaski, Smyth, Washington, and Wythe Counties, VA	Subterranean obligate - caves.	G3	S3
1	*Stygobromus cumerlandus*	Cumberland cave amphipod	Lee, Scott, and Wise Counties, VA	Subterranean obligate - caves.	G3G4	S1S2
1	*Stygobromus estesi*	Craig County cave amphipod	Only identified in Rufe, Caldwell Cave, Craig County, VA	Subterranean obligate - caves, seeps.	G4	S3
1	*Stygobromus fergusoni*	Montgomery County cave amphipod	Botetourt and Montgomery Counties, VA	Subterranean obligate – caves.	G2G3	S1
1	*Stygobromus gracilipes*	Shenandoah Valley cave amphipod	Clarke, Frederick, Rockingham, Shenandoah, and Warren Counties, VA (All specimens collected from 11 caves in the Potomac River drainage in small streams and pools).	Subterranean obligate – caves.	G3G4	S3
1	*Stygobromus hoffmani*	Alleghany County cave amphipod	Alleghany and Craig, VA	Subterranean obligate – caves.	G2	S2
6	*Stygobromus mundus*	Bath County cave amphipod	Bath County, VA	Subterranean obligate - caves	G2G3	S1S2
Isopod (Crustacean, Order Isopoda)						
1	*Caecidotea incurva*	Incurved cave isopod	Smyth, Washington, and Wythe Counties, VA	Subterranean obligate – caves.	G2G4	S2
6	*Miktoniscus racovitzai*	Racovitza's terrestrial cave isopod)	Bath County, VA	Subterranean obligate – caves.	G3G4	S2
1	*Brachoria dentata*	A millipede	Lee County, VA	Leaf litter, deciduous forests.	G2G3	S2S3

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
1	*Brachoria eutypa ethotela*	Hungry mother millipede	Known to occur on Pine Mountain above Troutdale, VA.	Leaf litter, deciduous forests.	G2	S2
1	*Buotus carolinus*	A millipede	Bland, Bedford, Giles, Grayson, Montgomery, Patrick, Roanoke, Tazewell, and Washington Counties, VA; and Pocahontas and Pendleton Counties, WV.	Leaf litter, deciduous forests.	G3	S3
5	*Cleidogona hoffmani*	Hoffman's cleidogonid millipede	Bland, Grayson, and Smyth Counties, VA. Only known from 12 locations in Tennessee, North Carolina, and Virginia.	Mountaintop species, leaf litter, deciduous forests.	G3	S2S3
1	*Cleidogona lachesis*	A millipede	Grayson and Smyth Counties, VA	Beech leaf litter, deciduous forests.	G2	S1
1	*Dixioria fowleri*	Fowler's millipede	Tazewell County, VA	Leaf litter, deciduous forests.	G2	S2
1	*Dixioria pela coronata*	A millipede	Grayson and Smyth Counties, VA	Leaf litter, northern hardwood, spruce forests, >5000' in altitude.	G2T2	S2
5	*Nannaria shenandoa*	Shenandoah Mountain xystodesmid millipede	Rockingham and Augusta County, VA. Also identified within the South Fork Shenandoah Watershed.	Leaf litter, mixed oak forest from 831 to 1,094 feet.	G1	S1
6	*Pseudotremia alecto*	Mays mountain cave millipede	Alleghany and Bath Counties, VA	In caves and Leaf litter, deciduous forests.	G1	S1
3	*Semionellus placidus*	Pleasing xystodesmid millipede	Augusta and Nelson Counties, VA.	In deciduous forests and cove habitats under moist leaf litter and near water sources.	G3	S3
3	*Escaryus cryptorobius*	Montane centipede	Blue Ridge Mountains, VA	Upper soil horizon, spruce-birch forests.	G2	S2
1	*Escaryus orestes*	Whitetop Mountain centipede	Grayson, Smyth, and Washington Counties, VA	Dark moist soil and litter, spruce-birch forests.	G1G2	S1S2
6	*Nampabius turbator*	A cave centipede	Alleghany County in VA and the Upper James Watershed.	Subterranean obligate – caves.	G1G2	S1
6	*Pygmarrhopalites carolynae*	A cave springtail	Bath and Highland Counties, VA	Subterranean obligate – caves.	G4	S3
1	*Pygmarrhopalites commorus*	A cave springtail	Giles, Lee, and Wise Counties, VA	Subterranean obligate – caves.	G2G3	S2S3
6	*Pygmarrhopalites sacer*	A cave springtail	Bath County, VA	Subterranean obligate – caves.	G2	S2
1	*Leptophlebia johnson*i	Johnson's pronggill mayfly	Grayson County, VA	Aquatic – streams.	G4	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
1	*Gomphus viridifrons*	Green-faced clubtail	Botetourt, Carroll, Dickenson, Floyd, Grayson, Russell, Scott, and Wise Counties, VA	Small to large moderate-gradient rivers; free flowing with high water quality (larvae burrow in silt while adults forage in trees)	G3G4	S2
3	*Ophiogomphus incurvatus alleghaniensis*	Alleghany snaketail	Augusta County, VA	Breeds in riffle areas of spring-fed piedmont streams (prefer areas where gravel overlies soft mud in shallow water).	G3T2T3	S1
1	*Acroneuria kosztarabi*	Virginia stonefly	Franklin and Tazewell Counties, VA	Aquatic – streams.	G1G2	S1S2
1	*Isoperla major*	Big stripetail stonefly	Tazewell County, VA	Aquatic – streams.	G1	S1
1	*Megaleuctra williamsae*	Smokies needlefly	Grayson and Smyth Counties, VA	Aquatic – streams.	G2	S1S2
1	*Taeniopteryx nelsoni*	Cryptic willowfly	Grayson and Smyth Counties, VA	Aquatic – streams.	G1	S1
3	*Cicindela ancocisconensis*	Appalachian tiger beetle	Augusta, Bath, and Highland Counties, VA	Riparian - sandy/silty edges of rocky mountain streams and rivers. Occasionally reported along roads. Prefers to breed in sandy loam.	G3	S2
3	*Cicindela patruela*	Northern barrens tiger beetle	Augusta County, VA	Eroded slopes of exposed sandstone and conglomerate.	G3	S2
1	*Cyclotrachelus incisus*	A ground beetle	Dickens County, VA	Dry, well drained site, red maple, magnolia, mountain laurel.	G4	SU
5	*Hydraena maureenae*	Maureen's hydraenan minute moss beetle	Bath County, VA	Interstitial water in riparian-shale substrate along stream edge.	G2?	S2?
1	*Brachypanorpa jeffersoni*	Jefferson's short-nosed scorpionfly	Giles, Grayson, Smyth, and Washington Counties, VA	Moist soil around seeps, high elevation, larvae use short burrows in loose soil and moss.	G2	S1S2
2	*Callophrys irus*	Frosted elfin	Augusta, Fairfax, Isle of Wight, Montgomery, Prince William, Roanoke, Rockbridge, and Spotsylvania Counties, VA.	Pine barrens and oak savannas; dry, open woods, clearings, and road/powerline ROWs with abundant wild indigo and/or lupine.	G3	S2?
2	*Erynnis persius persius*	Persius duskywing	Augusta and Highland Counties, VA.	Bogs, wet meadows, open seeps in boreal forests, oak savannas, or open mixed pine oak forests.	G5T1T3	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
6	*Pyrgus centaureae wyandot*	Appalachian grizzled skipper	Alleghany, Frederick, Montgomery, Roanoke, Rockbridge, Salem (City) Counties, VA.	Shale barrens, open shale in oak woodlands. Dwarf cinquefoil is a host plant.	G5T1T2	S1
3	*Speyeria diana*	Diana fritillary	Upper James Watershed, VA.	Grasslands and shrublands. Thistles and milkweed are larval host plants; milkweed, violets, and other plants are food sources.	G3G4	S3
3	*Speyeria idalia*	Regal fritillary	Augusta, Highland, and Nelson Counties, VA.	Remnant tallgrass prairie, as well as riparian areas, herbaceous wetlands, grasslands, old fields, and savannas. Host plants include violets.	G3	S1
6	*Catocala herodias gerhardi*	Herodias underwing	Augusta and Bath Counties, VA.	Pitch pine/bear oak scrub woodlands, >3000 feet. Larval foodplants are oaks, (e.g., scrub oak).	G3T3	S2S3
6	*Euchlaena milnei*	Milne's euchlaena moth	Augusta and Bath Counties, VA.	Moist, forested slopes of mixed pine hardwood forests or oak woodlands with acidic soil. Larval foodplants include willows.	G2G4	S2
3	*Psectrotarsia hebardi*	Hebard's noctuid moth	Occurrences noted near Warm Springs Mountain about 9 miles away.	Rich, mesic hardwood forest: larval host plant includes Canada horse-balm.	GU	SH
NON-VASCULAR PLANTS						
Lichen						
2	*Hydrothyria venosa*	Hydrothyria lichen	Botetourt County, VA	Aquatic—streams, springs, and cascades.	G4	S1
1	*Hypotrachyna virginica*	Virginia hypotrachyna lichen	Southern Appalachian Mountains, including Mount Rogers and Whitetop Mountain (south of GWNF), and a documented occurrence in Rockbridge County, VA.	Abies, Picea, Rhododendron and various hardwood trees in spruce-fir forests and fire-cherry communities.	G1G2	SH

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
Liverwort						
1	*Bazzania nudicaulis*	A liverwort	Grayson, Smyth, and Washington Counties, VA.	Bark and rock outcrops in spruce-fir forests.	G2G3	S1
1	*Bazzania nudicaulis*	A liverwort	Mount Rogers and Whitetop Mountain (south of GWNF).	Bark and rock outcrops in spruce-fir forests.	G2G3	S?
1	*Frullania oakesiana*	A liverwort	Grayson, Rappahannock, and Smyth Counties, VA.	Bark in spruce-fir forests.	G3?	S?
1	*Metzgeria fruticulosa*	A liverwort	Mount Rogers and Whitetop Mountain (south of GWNF).	Bark in spruce-fir forests.	G2Q	S?
2	*Nardia lescurii*	A liverwort	Botetourt, Giles, Spotsylvania, and Suffolk Counties, VA.	Riparian—on peaty soil over rocks, usually in shade and associated with water, greater than 3,000 feet.	G3?	SU
1	*Plagiochila austinii*	A liverwort	Dickinson, Giles, Prince George, Rappahannock, and Russell Counties, VA.	Rich, moist, densely forested ravines, shaded outcrops.	G3	S?
1	*Plagiochila sullivantii var sullvantii*	A liverwort	Albemarle, Giles, and Smyth Counties, VA.	Moist shaded rock outcrops, under cliff ledges, in crevices.	G2T2	SNR
1	*Sphenolobopsis pearsonii*	A liverwort	Smyth County, VA.	Southern Appalachians of the United States, the plants grow on the bark of Fraser fir, mountain-ash, and occasionally red spruce on mountain peaks above 6,039 feet elevation.	G2	S?
Moss						
1	*Sphagnum flavicomans*	Northeastern peatmoss	Whitetop Mountin (south of GWNF)	Bogs, seeps.	G3	SU
VASCULAR PLANT						
3	*Aconitum reclinatum*	Trailing white monkshood	Bath, Highland, and Augusta Counties, VA.	Rich cove sites, rocky high elevation forests, high elevation streambanks, seepage swamps, mafic fens, seepages with high pH, usually on base rich substrates. Known from fewer than 50 sites.	G3	S3
3	*Allium oxyphilum*	Nodding onion	Augusta and Highland Counties, VA.	Shale barrens, sandstone glades: rocky sandstone and shale substrates.	G2Q	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
2	*Arabis patens*	Spreading rockcress	Buckingham, Clarke, Fairfax, Frederick, Page, and Shenandoah Counties, VA.	Shaded, calcareous cliffs, buffs, and talus slopes; crevices and thin soils on and around shaded outcrops of limestone, dolomite, marble, and calcareous shale; also in nutrient-rich, river floodplain forests.	G3	S1
1	*Berberis canadensis*	American barberry	Lee, Wise, Scott, Dickenson, Russell, Tazewell, Smyth, Bland, Wythe, Carroll, Pulaski, Giles, Montgomery, Craig, Roanoke, Franklin, Boteourt, Bedford, and Pittsylvania Counties, VA	Calcareous open woods, bluffs, cliffs, along fencerows.	G3	S3S4
1	*Buckleya distichophylla*	Piratebush	Bland, Botetourt, Carroll, Craig, Giles, Montgomery, Pulaski, Roanoke, Washington Counties, VA	Open oak and hemlock woods.	G3	S2
1	*Cardamine clematitis*	Mountain bittercress	Dickenson, Russell, Washington, Smyth, Grayson, Giles and Pulaski Counties, VA	Riparian, spring seeps, rocky streamsides at higher summits in the southern Appalachians.	G3	S1
1	*Cardamine flagellifera*	Blue Ridge Bittercress	Dickenson, Giles, and Grayson Counties, VA	Riparian, spring seeps, rocky streamsides.	G3	S1
3	*Carex polymorpha*	Variable sedge	Bath, Highland, and Augusta Counties, VA; approximately a dozen known populations, primarily in the Ridge and Valley province, as well as the Northern Blue Ridge province.	Open acid, usually sandy soil, oak-heath woodlands, pine-oak/heath woodlands, clearings, and wetland ecotones responds to fire.	G3	S2
2	*Carex schweinitzii*	Schweinitz's sedge	Augusta and Highland Counties, VA; known from six counties in the Ridge and Valley Province.	Calcareous (limestone) seeps, fens, bogs, marshes.	G3G4	S1
1	*Chelone cuthbertii*	Cuthbert's turtlehead	Brunswick, Carroll, Chesterfield, Dinwiddie, Grayson, Henrico, Isle of Wight, Newport News (City), Petersburg (City), Prince George, Suffolk (City), Surry, Sussex, and York Counties, VA	Bogs, wet meadows, boggy woods and thickets.	G3	S2
3	*Cleistesiopsis bifaria*	Small spreading pogonia	Craig, Dickenson, Scott, and Wise Counties.	Well drained, rather open, scrubby hillsides, oak-pine-heath woodlands, dry, acidic soils.	G4?	S2

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
1	*Clematis addisonii*	Addison's leatherflower	Botetourt, Montgomery, Roanoke, and Rockbridge Counties, VA	Open glades and rich woods over limestone and dolomite.	G1?	S2
3	*Clematis coactilis*	Virginia white-haired leatherflower	Wythe, Pulaski, Giles, Montgomery, Craig, Roanoke, and Botetourt Counties, VA	Shale barrens, rock calcareous woodlands.	G3	S3
3	*Corallorhiza bentleyi*	Bentley's coralroot	Bath County, VA	Dry, acid woods, along roadsides, well-shaded trails in Appalachian deciduous forests.	G2	S2
2	*Delphinium exaltatum*	Tall larkspur	Highland and Augusta Counties, VA	Dry calcareous soil in open grassy glades or thin woodlands.	G3	S3
2	*Echinodorus tenellus*	Dwarf burhead	Pines Chapel Pond, Augusta County, VA	Pond margins, wet depressions in sandy soil.	G5?	S1
3	*Euphorbia purpurea*	Glade spurge	Bedford, Floyd, Grayson, Greene, Montgomery, Page, Rockbridge, Russell, Tazewell, and Washington Counties, VA	Rich, swampy woods, seeps, and thickets.	G3	S2
1	*Gentiana austromontana*	Appalachian gentian	Nelson County, VA	High elevation forests and grassy balds, Southern Appalachian endemic.	G3	S3?
1	*Hasteola suaveolens*	Sweet-scented Indian plantain	Appomattox, Campbell, Carroll, Clarke, Fairfax, Loudoun, Montgomery, and Pulaski Counties, VA	Riverbanks, wet meadows and rich floodplain forests.	G4	S2
3	*Heuchera alba*	White alumroot	Augusta and Highland Counties, VA	High elevation rocky woods and bluffs.	G2Q	S1
2	*Hypericum mitchellianum*	Blue Ridge St. Johns wort	Washington, Smyth, Grayson, Patrick, and Bedford Counties, VA	Grassy balds, forest seepages, moderate to high elevations.	G3	S3
1	*Ilex collina*	Long-stalked holly	in Giles, Grayson, and Tazewell Counties in VA	Bogs, seeps, and shrubby streamheads greater than 3,100 feet elevation.	G3	S1
1	*Iliamna remota*	Kankakee globe-mallow	Alleghany, Botetourt, Rockbridge, and Bedford Counties	Open, disturbed riverbanks and roadsides.	G1Q	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
2	*Isoetes virginica*	Virginia quillwort	Augusta and Nelson Counties, VA	Sinkhole ponds of Shenandoah Valley and from woodland streams, woodland ponds, low, wet wooded areas, and upland depression wetlands of the Mountains and Piedmont.	G1	S1
3	*Juglans cinerea*	Butternut	Augusta, Bath, Highland, and Nelson Counties, VA	Well-drained bottomland and floodplain, rich mesophytic forests mostly along toeslopes.	G4	S3?
3	*Liatris helleri*	Turgid gay-feather	Bath and Augusta Counties, VA	Clay soils, gravel, shale barrens, and rocky (granitic, amphibolite) outcrops, at elevations ranging from 2,300-4,250 feet.	GNR	S3
1	*Lilium grayi*	Gray's lily	Bath and Highland Counties, VA	Bogs, open seeps, wet meadows, and grassy balds.	G3	S2
1	*Lycopodiella margueritae*	Marguerite's clubmoss	Bath County, VA	Seasonally moist soils, wet acidic ditches, borrow pits.	G2	Not Ranked
3	*Micranthes caroliniana*	Carolina saxifrage	Buchanan, Carroll, Dickenson, Grayson, Russell, Smyth, Tazewell, Washington, and Wythe Counties, VA	Moist, shaded rocks and cliffs.	G3	S3
3	*Monotropsis odorata*	Sweet pinesap	Bath and Augusta Counties, VA	Dry oak-pine-heath-woodlands with sandy soil.	G3	S3
1	*Packera millefolium*	Piedmont ragwort	Lee and Scott Counties, VA	Open limestone outcrops and cedar barrens.	G2	S2
2	*Paxistima canbyi*	Canby's Mountain lover	Craig, Frederick, Giles, Lexington (City), Montgomery, Page, Pulaski, Radford (City), Russell, Scott, Shenandoah, Tazewell, and Wythe Counties, VA	Calcareous cliffs and bluffs, usually undercut by streams.	G2	S2
3	*Phlox buckleyi*	Sword-leaf phlox	Augusta and Bath Counties, VA. VADNR NHI documented occurrence within approximately 215 and 3,138 feet of the Project centerline.	Open, often dry oak woodlands and rocky slopes, usually over shale in humus rich soils, along roadsides.	G2	S2
3	*Poa paludigena*	Bog bluegrass	Bath County, VA	Shrub swamps and seeps, usually under shale.	G3	S2
2	*Potamogeton hillii*	Hill's pondweed	Bath County, VA	Clear, cold calcareous ponds.	G3	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]
2	*Potamogeton tennesseensis*	Tennessee pondweed	Bath and Augusta Counties, VA	Ponds, back water of streams and rivers.	G2G3	S1
1	*Prenanthes roanensis*	Roan Mountain rattlesnake-root	Washington, Smyth, Grayson, and Floyd Counties, VA	Grassy balds, open high elevation forest and outcrops.	G3	S3
3	*Pycnanthemum torreyi*	Torrey's mountain-mint	Arlington, Bland, Campbell, Dinwiddie, Fairfax, Fauquier, Franklin, Giles, Greensville, Lunenburg, Nelson, Prince William, Southampton , and Sussex Counties, VA	Open, dry rocky woods, roadsides, and thickets near streams, and heavy clay soil over calcareous rock.	G2	S2
1	*Rudbeckia triloba var. pinnatiloba*	Pinnate-lobed coneflower	Giles and Wise Counties, VA	Dry calcareous soil of open woods and roadsides.	G5T3	S1
3	*Scutellaria saxatilis*	Rock skullcap	Bath, Highland, Augusta, and Nelson Counties, VA	Rich, dry to mesic ridgetop woods.	G3	S3
1	*Sceptridium jenmanii*	Alabama grapefern	Scott, Russell, and Wise Counties	Open woods, old fields, pastures.	G3G4	SH
2	*Sida hermaphrodita*	Virginia mallow	Albemarle, Alleghany, Arlington, and Fairfax Counties, VA	Riverbank glades with loose rock or sandy soil.	G3	S1
1	*Silene ovata*	Mountain catchfly	Lee and Wise Counties, VA	Rich woodlands and forests over limestone.	G3	S1
3	*Trillium pusillum var. moniticulum*	Mountain least trillium	Augusta County, VA	Open oak woodlands in well-drained soil and margin of thickets.	G3T2	S2
1	*Tsuga caroliniana*	Carolina hemlock	Washington, Tazewell, Smyth, Grayson, Wythe, Carroll, Pulaski, GFiles, Montgomery, Floyd, Patrick, Franklin, Roanoke, Botetourt, Bedford, Pittsylvania, Rockbridge, and Halifax Counties, VA	Rocky ridges and slopes, usually dry and well drained.	G3	S3
2	*Vitis rupestris*	Sand grape	in Alleghany, Arlington, Fairfax, Loudoun, Rockbridge, and Stafford Counties, VA	Scoured banks of rivers and streams over calcareous bedrock.	G3	S1

Table 2 (cont'd)

George Washington National Forest (GWNF) Regional Forester's Sensitive Species (RFSS) List – Region 8 [a]
Occurrence Analysis Results (OAR)Table

Project area of analysis: ACP MP 83.9 to MP 123.5

OAR Rank [b]	Species Name	Common Name	Range on or near GWNF	Habitat - Detail	Global/ Rank [b]	Virginia State Rank [b]

Sources:

Communications with WVDNR and MNF botanists.

ESRI aerial imagery.

U.S. Department of Agriculture Web Soil Survey.

Carnegie Museum of Natural History. Virginia Land Snails. Available at http://www.carnegiemnh.org/science/mollusks/va_paravitrea_reesei.html. Accessed November 2016. https://www.fieldmuseum.org/sites/default/files/shear_2009.pdf.

Carnegie Museum of Natural History. 2016. Available at http://www.carnegiemnh.org/science/. Accessed May 2016.

Consortium of North American Lichen Herbaria. *Hypotrachyna virginica*. Available at http://lichenportal.org/portal/taxa/index.php?taxon=54448. Accessed November 2016.

George Washington National Forest. 2016. Meeting between GWNF and Atlantic Coast Pipeline, LLC. March 29, 2016.

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available online at http://explorer.natureserve.org/. Accessed April 2016, May 2016, July 2016.

Shear, W.A. 2009. *Buotidae*, a new family for the minute North American millipede *Buotus carolinus* (Chamberlin) 1940 (*Diplopoda, Chordeumatida, Striarioidea*). Zootaxa 2290: 41−49.

U.S. Department of Agriculture, Natural Resources Conservation Service. 2016. The PLANTS Database (http://plants.usda.gov, 25 August 2016). National Plant Data Team, Greensboro, NC 27401-4901 USA.VDGIF, Accessed July 2016.

U.S. Forest Service. n.d. Eastern small-footed miotis. Available at: https://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5200543.pdf. Accessed November 2016.

Virginia Department of Conservation and Recreation Division of Natural Heritage 2016 database.

irginia Department of Conservation and Recreation. 2016b. Natural Heritage Program Natural Community and Rare Species Lists. Available online at: http://www.dcr.virginia.gov/natural-heritage/infoservices. Accessed March 2016.

Virginia Department of Game and Inland Fisheries. 2016. Wildlife Information. Available online at: http://www.dgif.virginia.gov/wildlife/information/?s =050020. Accessed April 2016.

Weakley, A.S., J. C Ludwig, J.F Townsend, L.C. Gastinger, M. Terry, R. Fuller. Flora of Virginia. Foundations of the Flora of Virginia Project Inc. 1572 pages.

[a] RFSS List updated by the Forest February 24, 2014 (based on Region 8 sensitive species list effective January 1, 2002.

[b] See the legend for rankings following the table.

Legend for Rankings in the OAR Table

1. OAR Rankings:

   1 = Project located out of known species range.

   2 = Lack of suitable habitat for species in project area.

   3 = Habitat present, species was searched for during field survey, but not found.

   4 = Species occurs in project area, but outside of activity area.

   5 = Field survey located species in activity area.

6 = Species not seen during field survey, but possibly occurs in activity area based on habitat observed; or field survey not conducted when species is recognizable (time of year or time of day). Therefore assume presence and no additional surveys needed.

7 = Aquatic species or habitat known or suspected downstream of project/activity area, but outside identified geographic bounds of water resource cumulative effects analysis area (defined as point below which sediment amounts are immeasurable and insignificant).

8 = Aquatic species or habitat known or suspected downstream of project/activity area, but inside identified geographic bounds of water resource cumulative effects analysis area.

9 = Project occurs in a 6th level watershed included in the USFWS/FS T&E Mussel and Fish Conservation Plan (August 8, 2007 U.S. Fish & Wildlife Service concurrence on updated watersheds). Conservation measures from USFWS/FS T&E Mussel and Fish Conservation Plan applied.

2. Global Rank

Global ranks are assigned by a consensus of the network of natural heritage programs, scientific experts, and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species or variety. This system was developed by The Nature Conservancy and is widely used by other agencies and organizations as the best available scientific and objective assessment of taxon rarity and level of threat to its existence. The ranks are assigned after considering a suite of factors including number of occurrences, numbers of individuals, and severity of threats.

G1 = Extremely rare and critical imperiled with 5 or fewer occurrences or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.

G2 = Very rare and imperiled with 6 to 20 occurrences or few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range; or vulnerable to extinction because of other factors. Usually fewer than 100 occurrences are documented.

G4 = Common and apparently secure globally, though it may be rare in parts of its range, especially at the periphery.

G5 = Very common and demonstrably secure globally, though it may be rare in parts of its range, especially at the periphery.

GU = Possibly rare, but status uncertain and more data needed.

G? = Unranked, or, if following a ranking, ranking uncertain (ex. G3?).

3. State Rank

The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources (NHRs) are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The criterion for ranking NHRs is the number of populations or occurrences, i.e. the number of known distinct localities; the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals; the quality of the occurrences, the number of protected occurrences; and threats.

S1 = Extremely rare; usually 5 or fewer populations or occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.

S2 = Very rare; usually between 5 and 20 populations or occurrences; or with many individuals in fewer occurrences; often susceptible to becoming extirpated.

S3 = Rare to uncommon; usually between 20 and 100 populations or occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.

S4 = Common; usually >100 populations or occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

SH = Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.

SU = Status uncertain, often because of low search effort or cryptic nature of the element.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE PROJECT

BIOLOGICAL EVALUATION

APPENDIX F

Monongahela National Forest
Recommended Surveys

Recommended Environmental Resource Surveys for the Proposed Atlantic Coast Pipeline GWNF6 Route on the Monongahela National Forest

April 11, 2016

INTRODUCTION

Atlantic Coast Pipeline, LLC (ACP) has proposed constructing a 42-inch diameter pipeline to transport natural gas from north-central West Virginia to several delivery points in North Carolina and eastern Virginia. As currently proposed, the pipeline would cross National Forest lands managed by the Monongahela National Forest (MNF) for approximately 5.4 miles. The proposed pipeline would also cross National Forest lands managed by the George Washington National Forest.

The Federal Energy Regulatory Commission (FERC) has jurisdiction over interstate pipelines. FERC will be the lead federal agency for the pipeline permitting and routing decision, and they will prepare an Environmental Impact Statement to support their decision. The Forest Service will make a separate decision on whether to permit use of National Forest land for the proposed pipeline. The Forest Service is participating in the FERC process as a cooperating agency, and the Forest Service intends to rely on the FERC EIS when making its decision on the use of National Forest land for the proposed pipeline.

ACP applied for a special use permit to conduct environmental and routing surveys along the proposed route through the MNF. The results of these surveys are intended to inform FERC's EIS. The MNF has issued a decision to allow the surveys (surveys on the George Washington National Forest were permitted separately and are not addressed in this document). The permit authorizes the specific surveys that ACP requested in their permit application, as well as any additional surveys deemed necessary by the Forest Service or other federal and state agencies, provided the effects of such surveys are within the scale and scope considered in the original permit decision. The Forest Service anticipated some of these additional survey needs and compiled the resource survey recommendations contained herein. These recommendations identify key pieces of information that are likely to be needed for the Forest Service decision. It is in the best interests of ACP, FERC, and the Forest Service to collect data that meet these needs; therefore, the surveys conducted by ACP should consider, at a minimum, the items addressed in this document. Surveys should be sufficiently thorough and comprehensive to adequately inform the decision-making process and to allow the MNF and the public to review, understand, and critique the survey (methods, assumptions, sources, conclusions, etc.). The Forest Service anticipates coordinating with ACP and FERC on an ongoing basis to further develop the situation-specific details of data needs and survey protocols. Before implementation of surveys, any procedures, protocols, assumptions, sources, references, etc. not considered herein should be reviewed and approved by the MNF. The MNF will review and approve the qualifications of all personnel involved in the survey work. The MNF may reject data not collected by MNF-approved personnel according to MNF-approved protocols.

Surveys should cover the entirety of the 300-foot-wide survey corridor, as identified in ACP's application for the survey special use permit. Surveys should also cover any areas outside the survey corridor that would be disturbed by the proposed pipeline, including, but not limited to, proposed access routes, staging areas, and temporary construction areas. Surveys may also need to extend beyond the survey corridor to fully inventory certain resource features that lie partially within the survey corridor, or that lie outside the survey corridor but could potentially be impacted directly or indirectly by activities within the corridor. Examples of such features may include, but are not limited to, species populations, cultural resource sites, receiving streams and wetlands, karst features, scenic resources, and habitats that may be fragmented by the proposed pipeline.

In addition to the proposed route, field surveys should be conducted to the same level of detail for all other alternatives that would affect the MNF.

Notes:

- Because FERC is the lead federal agency, they will consult directly with the US Fish and Wildlife Service (USFWS) for any threatened, endangered, and proposed species that would be affected by the proposed pipeline. Data needs identified herein for threatened, endangered, and proposed species are specific to the Forest Service permitting decision. The USFWS may identify additional information needs and/or survey protocols.
- Cultural Resource surveys are not addressed in this document. These surveys will follow required protocols established in a separate permit to be issued under the authority of the Organic Act and/or Archaeological Resources Protection Act of 1979 (ARPA), as amended.

Terrestrial Wildlife

Several federally Threatened, Endangered or Proposed (TEP) animal species and a variety of vertebrate and invertebrate Regional Forester Sensitive Species (RFSS) are known to occur within the proposed ACP study corridor and/or suitable habitat for these species exists within the area. TEP animal species include the endangered Indiana and Virginia big-eared bats and the threatened northern long-eared bat. The Cheat Mountain salamander is not known to occur within the proposed study corridor, however given the proximity to known populations, high elevation, and presence of spruce/northern hardwood habitat in the vicinity of Gibson Knob and Cloverlick Mountain, a habitat survey should be conducted on any part of the survey corridor that lies on National Forest land in this area and, if potential habitat is found, CMS surveys should be completed. The habitat survey should be conducted by a recognized expert on Cheat Mountain salamanders, subject to the approval of the MNF. Detection of any federally threatened or endangered species should be reported to the Forest Wildlife Biologist within 48 hours.

A list of Monongahela National Forest (MNF) RFSS animal species is included at the end of this section; recommendations included in this section address only the terrestrial animal species. We recommend that the applicant coordinate with MNF Forest Wildlife Biologist as well as the WV Division of Natural Resources and the WV FWS Field Office to determine which RFSS species may be present within the study area. Hereafter in this section, TEP and RFSS species will be combined for ease of discussion as TES species (Threatened, Endangered or Sensitive). For those TES species with known occurrences or known habitat within the corridor, specific survey recommendations are given below. Regardless of whether surveys for a particular species are determined to be desirable or feasible, the data and analysis provided must be sufficient to disclose effects on all TES species, reach effect determinations for all RFSS species, and determine consistency with all Forest Plan direction related to TES species.

General Habitat Surveys

While observations may already exist for some TES species in the vicinity of the proposed corridor (e.g., golden-winged warbler, northern long-eared bat, little brown bat, and others), the lack of known observations does not preclude the potential for the species to be present given suitable habitat. Thus, we recommend that habitat assessments be conducted within, but not limited to, the proposed 300' wide survey corridor within the 2,000' study corridor in order to determine whether further surveys may be necessary for TES species that currently lack presence-absence data within the area (see discussion in the Introduction regarding the areal extent of surveys). General habitat evaluations are helpful, however, many TES are associated with a few specific habitat types, which we recommend be considered in greater detail. These include:

- Rocky habitats (e.g., rock outcrops, talus slopes, ledges, generally rocky substrate), which provide habitat for timber rattlesnakes, green salamanders, Allegheny woodrats, small-footed bats, rock voles, water shrews, spotted skunks, and other species;
- Grasslands and early successional habitats (even if highly disturbed), which can provide suitable habitat for the vesper sparrow, golden-winged warbler, etc.;
- High elevation spruce-northern hardwood forest, which provides habitat for the northern goshawk, Cheat Mountain salamander, and northern flying squirrel as examples; and
- Wetlands (both permanent and ephemeral), seeps, streams, and other aquatic resources which also provide habitat for terrestrial species, such as the southern water shrew, olive-sided flycatcher, among other RFSS. It should be noted that some of these ephemeral

wetland habitats (including vernal pools) may not meet the jurisdictional boundaries of "waters of the United States". However, even if isolated, these isolated wetland resources do provide important habitat for wildlife and should be noted as part of the habitat survey efforts.

Field reconnaissance generally includes walking transects and visiting potential "special habitats" (see above) to assess wildlife habitat and probable use of the area by wildlife species, including TES. This does NOT include special surveys that require specific techniques and focused effort (e.g., goshawk surveys, breeding bird surveys, bat surveys, etc.); it also includes only a general assessment of special habitats. If such habitats and/or TES species are found in an area, it is recommended that more detailed survey efforts be undertaken.

Timing of these surveys does make a difference, thus be sure to note the date when filling out survey forms. For example, the breeding season for most of our birds runs from mid-May through the end of June. Surveys made during this time period (especially earlier in that time period for grassland birds) are more likely to detect a larger number of bird species, and it is likely that the area is considered to have nesting habitat for the species. Birds detected during surveys earlier or later in the year may well be migrants or wintering individuals. Likewise, surveys of rock outcrops made in the spring or fall are more likely to detect several RFSS (e.g., green salamanders, Allegheny woodrats, and rattlesnakes), than those in the summer or winter, as a result of life history characteristics of those species.

1) **Transects** should be walked at a slow to normal pace, looking for signs of wildlife, special habitats (e.g., rocky habitats or seeps/wetlands), and habitat features (e.g., large hollow denning trees or exceptional roost trees). In addition to looking for wildlife, biologists should note any RFSS or invasive plant species or evidence of potential archaeological resources.
   a) Where possible, scan surrounding hillsides or valleys for rock outcrops, seeps, etc. If special habitats (not already planned for visitation based on the office review) are noted while walking transects, they should be surveyed as well.
   b) Use a habitat survey form to describe the general habitat type and ecological setting, dominant tree species and understory vegetation, etc. Also note any wildlife species observed on this form.
   c) Take pictures – general habitat and any special habitats or features or wildlife/sign.

2) **Surveys of special habitats**
   a) **Rock outcrops, talus, boulder/rubble fields, and generally rocky substrate.** These areas provide potential habitats for several RFSS, including woodrats, rock voles, rattlesnakes, small-footed bats, and green salamanders. Ledges and large outcrops with cracks and recesses that provide possible cover should be noted and described. Likewise, large talus fields and other rocky habitats should be noted, including a general description (e.g., general rock size, is it wet and mossy? forest cover type, etc.). This information will help in making determinations as to whether the area provides potential habitat for TES.
      i) Take a single GPS point if small, or several around the periphery if large area.
      ii) Keep an eye out for possible woodrat latrines or middens (large pile of sticks, leaves, trash, etc. near the entrance to rock crevices).

iii) Use a flashlight to scan in crevices for green salamanders and small-footed bats.
iv) Conduct surveys for southern rock vole, spotted skunk, and southern water shrew. Consult with the Forest Wildlife Biologist for survey protocol details.
v) Follow up with the Forest Wildlife Biologist for additional details of the rocky habitat survey protocol; these surveys should be conducted by qualified biologists familiar with the species using these habitats.

b) **Riparian habitat transect.** Riparian areas provide critical habitat for a wide variety of species, from wood turtles to wood ducks, and are protected by Forest Plan direction. In addition to a general description of the area and vegetation, specific habitat features should be noted, such as cavity trees, stream type (e.g., intermittent, perennial), general stream width, bank type (e.g., gradual slope; undercut bank; ledge, boulders or cobble), flooding regime, etc. See also specifications for stream inventory in the hydrology section of this document.
   i) Make note of burrows, tracks in mud, cavities or stick nests, and other evidence of wildlife use of the area.

c) **Seeps.** Seeps are important habitat features for a variety of species and also are protected by Forest Plan direction, regardless of Clean Water Act jurisdictional status.

d) **Wetlands, open water bodies and vernal pools.** These habitats are critical to a wide variety of species, both those that are obligate wetland species (e.g., ducks, wading birds, muskrat, and many frog and salamander species) and those that use the areas for drinking water. While most wetlands and ponds are obvious during any time of year, vernal pools often only contain water for a limited period of time in the spring and/or fall – yet they are critical to many species. If no water is present, other characteristics (e.g., topography, vegetative species present, darkened leaves, etc.) must be used to identify these areas.
   i) GPS the site, but don't worry about taking points all the way around a very large pond or wetland as these should be visible from aerial photographs. Do take points all the way around smaller wetlands or pools.
   ii) Attempt to estimate current and maximum water depth and/or hydroperiod (e.g., permanent water body vs vernal pool) and NWI wetland type (e.g., coniferous or deciduous forested wetland, scrub-shrub wetland, marsh, meadow, bog …)

e) **Caves or other karst features.** Scan the area for cave openings, sinkholes, etc. If found, take a GPS point, but do not enter any cave or other karst openings without specific, additional permission from the Forest Supervisor. All caves are currently closed to entry. Within karst geology on MNF lands, the corridor surveyed for potential openings should extend 1,000 feet from the centerline on each side.

f) **Other habitats**. Other special habitats, such as spruce forests and grasslands, may be encountered. Those habitats and any species noted there should be addressed in a manner similar to those noted above.

3) **Documentation of wildlife using the entire survey area**. Any wildlife species observed (including indirect observations such as tracks or stick nests) should be documented.
   a) List the birds that you see and hear; also note any nests found. Consult the breeding bird point count database before heading out to the field to see if there are any routes located nearby and familiarize yourself with the species that were observed there if similar habitat.

b) Make note of mammal tracks and other wildlife sign both while walking through units and driving between areas.
c) Photo-document any species or feature that cannot be identified in the field.

4) **TES species** encountered. While the Indiana bat, Virginia big-eared bat, northern long-eared bat and Cheat Mountain salamander are the only federally threatened and endangered vertebrate animal species on the Monongahela, the Forest provides habitat for many RFSS (see list at the end of this section). If these species are observed during surveys, or other evidence of probable habitat is encountered (e.g., nests that fit the description for a goshawk, or other RFSS bird species, woodrat middens, probable rattlesnake skin, etc.), a species observation form should be filled out to document the observation and provide information to inform the EIS.
   a) Photos should be taken of all TES species or sign noted as well as of the general surrounding habitat.

Examples of Species-specific Surveys

The following paragraphs provide recommended survey techniques for some of the TES species that may be associated with habitats in/near the survey corridor; surveys may also be needed for other species if suitable habitat is identified. These recommendations are based on current FS survey methodology and/or other established protocols, but do not necessarily represent the only suitable methods available. Timing of surveys will be an important part of the survey protocol for many species, and not all surveys are best conducted at the same time of year (e.g., the rock outcrop surveys for specific species such as the green salamander and Allegheny woodrat are better conducted in early spring and fall, while bat mist-net surveys should be conducted during summer).

TES BATS

Mist-net surveys have been conducted across the MNF on an annual basis since 1997 to provide evidence of potential Indiana bat maternity colonies, identify other TES bat species, and assist the Forest in ensuring that proposed activities do not adversely impact these species. We recommend that ACP Survey efforts use the same methods (mist-netting) for consistency, complemented with acoustic surveys where practicable to both assist in appropriate location of mist-nets and to pick up species that are likely to be detected and identified using that survey method. The Forest also conducts annual acoustic transects and can provide the results of historical surveys in the proposed survey area to the applicant, if requested, to assist in site locations.

Recommendations for mist-net surveys follow those established by the USFWS for the Indiana bat. In addition, if Indiana bats or northern long-eared bats are captured, the use of radio-telemetry is recommended to identify roost trees and potential maternity colonies; reproductively active female little brown bats and small-footed bats also should be tracked to roost sites (for pregnant bats of all species, the lightest transmitter possible should be used and should not weigh more than 5% of the bat's expected non-pregnant weight). Mist-netting specifications and roost tree data forms used by the Monongahela National Forest are available upon request. While the MNF acoustic driving transect protocol would not be suitable for the proposed survey effort, we recommend that stationary acoustic efforts follow the most recent protocols established by the USFWS.

NORTHERN GOSHAWK

Within potentially suitable northern goshawk habitat (large blocks of high elevation northern hardwood and/or spruce forest), it is recommended that surveys for this species be conducted using a broadcast acoustical method and following protocols established in the *Northern Goshawk Inventory and Monitoring Technical Guide* (Woodbridge 2006), as modified herein. Please note that different survey protocols are used at different time periods and that broadcast acoustical surveys should not be conducted earlier than mid-May to avoid disturbance that could result in desertion of the nest.

<u>Dawn Acoustical Survey</u>

This method is based on detection of courtship vocalizations and flight displays of goshawks at their nest sites. It consists of establishing "listening stations" in close proximity to known nest stands or patches of suitable habitat and conducting 1½-hour listening periods at dawn during the early breeding season. The following has been taken from the Northern Goshawk Inventory and Monitoring Technical Guide and adapted to local conditions.

<u>Protocol</u>

1) <u>Establishment of survey stations.</u>

Listening stations should be positioned within 150 m of all habitats to be surveyed. Use aerial photographs to determine point locations providing optimal coverage of suitable habitat within a radius of 150 m (7.1 ha). To reduce attenuation of sound by surrounding vegetation or landforms, locate stations on slightly elevated positions, whenever possible, but not on ridges or in large openings. Efficiency may be increased by location of stations on roads; however, tradeoffs with position may occur within habitat patches. Stations must be clearly marked to allow for finding their location in darkness. Whenever possible, establish multiple stations approximately 300 m apart to achieve simultaneous coverage of entire survey area by multiple observers.

2) <u>Timing of surveys</u>

Seasonal timing. To coincide with the peak of courtship vocalizations by goshawks at their nest sites, surveys should be conducted during the month preceding egg laying. Reproductive chronology likely varies between geographic regions and elevations, and local information should be used to estimate egg-laying dates. For the Monongahela National Forest surveys should be conducted between February 01 and March 15 (see Figure 1).

Note that during years with particularly cold or wet spring weather, onset of incubation may be delayed for up to 1 month. If no detections of goshawks are heard during the first listening session, a repeat session should be conducted before May 15. Two sessions are required to assign "unoccupied" status to the area surveyed.

Session timing. The observer should arrive and be settled at the listening station *at least* 45 minutes before sunrise. The listening session should continue until 1½ hours after sunrise. Plan carefully so that the entire listening session can be conducted without interruptions.

3) <u>Listening session methods</u>. During each listening session, record start and stop time, actual sunrise onset, time and duration of goshawk vocalizations, type of goshawk vocalizations, and direction (bring compass) and estimated distance of goshawk vocalizations. To ensure consistency of data collection, a standard field data collection form (Appendix X) should be

used. Dewey and others (2003) reported a variety of calls detected during dawn acoustical surveys in Utah. Calls included variations of the alarm call (*kak-kak-kak*) (Squires and Reynolds 1997) and plaintive wail call (Squires and Reynolds 1997). Length of vocalizations varied from short, one-note call segments to series of alarm calls and wails lasting up to 10 seconds.

4) Locating nest sites. Auditory detection of goshawks during courtship indicates occupancy of the surveyed forest patch; subsequent location of the nest should not be attempted until after the estimated date of hatching. Intensive Search Surveys should be employed to locate nests.

Broadcast Acoustical Survey

This method is based on broadcast of taped goshawk calls at points along transect routes to elicit responses from defensive territorial adult goshawks and their young. Often termed the "Kennedy-Stahlecker Protocol," it is currently the standard method used by the USDA Forest Service and many others. The efficacy of this method has been evaluated in terms of response rates at known successful nests (Joy et al. 1994, Kennedy and Stahlecker 1993, Watson et al. 1999), and recently at territories occupied by non-breeding goshawks (Keane and Woodbridge 2002).

Protocol

The protocol is based on the methods described by Kennedy and Stahlecker (1993), with refinements from Joy et al. (1994) and Watson et al. (1999). Adjustments to the number of surveys required and spacing of calling stations were made to optimize probability of detection and survey effort and cost.

1) Establishment of survey transects and stations.

Before initiating surveys, use aerial photographs and topographic maps to determine optimal placement of survey transects. Draw detailed maps of survey routes and station location and provide them to crews conducting surveys. When possible, establish start and end points of transects along existing roads, trails, streams, or other landforms. The maximum distance between parallel transects should be 250 m. Minimize number of stations located on roads, unless roads are entirely within the habitat of interest.

2) Call stations should be located 200 m apart along each transect. To increase coverage, offset station locations on adjacent transects by 100 m. The most important factor in transect and station placement is completeness of coverage; to achieve acceptable confidence in survey results, all suitable habitat should be within 150 m of a calling station.

3) For project surveys, the survey area should include the proposed project area plus an additional buffer beyond the project boundary. For projects involving significant modification of forest structure (e.g., commercial thinning), the survey should extend 800 m beyond the project boundary. This distance corresponds to the mean radius of the post-fledging area (about 200 ha) and will allow for detection of territories that overlap the project area. For projects that involve minor modification of forest structure (under-burning, light under--thinning, and light salvage) surveys need extend only 400 m beyond the project boundary.

4) Timing of surveys: Surveys should be conducted during the nestling and fledgling stages, including early postfledging dependency. This period corresponds to late May to mid-June to early July on the Monongahela National Forest (see Figure 1). Survey results might be unreliable after these dates. Surveys may begin half an hour before sunrise and should cease half an hour before sunset.

5) Calling procedure: At each calling station, broadcast at 60 degrees from the transect line for 10 seconds, then listen and watch for 30 seconds. Repeat this sequence two more times, rotating 120 degrees from the last broadcast. Repeat the three-call sequence again. After the last sequence, move to the next station. Move (walk) between stations at an easy pace, listening and watching carefully for goshawk calls and signs. The majority of time will be spent walking between stations, so it is important to be alert for goshawks approaching, often silently, to investigate the surveyor. Do not survey from vehicles or use vehicles to move between stations. Use of two observers will likely enhance the probability of visual detections of goshawks; however, experienced surveyors may conduct surveys singly. To avoid misidentifying broadcasts of coworkers, simultaneous surveys should be conducted no closer than two transect widths apart.

During the nestling stage, broadcast the adult alarm call.

During the late nestling and fledgling stages, broadcast the juvenile begging or wail call. This call is more likely to elicit responses from juvenile goshawks.

Do not survey under conditions such as high winds (greater than 15 mph) or rain that may reduce ability to detect goshawk responses. Record the detection type, compass bearing, station number, and distance from transect of any responses detected. Attempt to locate the goshawk visually and determine the sex and age (adult versus juvenile/fledgling) of the responding individual. To ensure consistency of data collection, a standard field data collection form (see end of this section) should be used.

WEST VIRGINIA NORTHERN FLYING SQUIRREL

The 300-foot-wide corridor surrounding the center line of the proposed route does not intersect any mapped suitable habitat for the West Virginia northern flying squirrel (NFS) on National Forest land. The 2,000 foot-wide study area does contain mapped suitable habitat on National Forest land in the vicinity of Buzzard Ridge. If all activities associated with construction and operation of the proposed pipeline are expected to stay within the 300-foot corridor, surveys for NFS should not be needed. However, if any such activities are contemplated within the portion of the study area that contains mapped suitable habitat, field verification of suitable habitat would be needed. Because existing habitat mapping is based largely on remotely sensed data, the presence or absence of suitable habitat needs to be confirmed in the field by a wildlife biologist whose qualifications have been approved by the MNF.

GOLDEN-WINGED WARBLER

Where potential habitat exists in or adjacent to the corridor, playback surveys for golden-winged warblers should be conducted.

BALD AND GOLDEN EAGLES
Aerial nest surveys should be conducted for bald eagles, and roost site surveys should be conducted for both bald and golden eagles. Consult the Forest Wildlife Biologist for details of survey protocols.

OTHER
Should field habitat surveys show evidence of suitable habitat for other TES species, additional species-specific protocols may be available from the MNF (e.g., Allegheny woodrats) for follow-up survey efforts.

Monongahela National Forest RFSS Animal Species

MONONGAHELA NF 2012 RFSS List	
MAMMALS	
Microtus chrotorrhinus carolinensis	Southern Rock Vole
Myotis leibii	Eastern Small-footed Myotis
Myotis lucifugus	Little Brown Myotis
Myotis septentrionalis	Northern Myotis
Neotoma magister	Allegheny Woodrat
Perimyotis subflavus	Tri-colored Bat
Sorex dispar	Long-tailed Shrew
Sorex palustris punctulatus	Southern Water Shrew
Spilogale putorius	Eastern Spotted Skunk
Synaptomys cooperi	Southern Bog Lemming
BIRDS	
Accipiter gentilis	Northern Goshawk
Ammodramus henslowii	Henslow's Sparrow
Asio otus	Long-eared Owl
Contopus cooperi	Olive-sided Flycatcher
Falco peregrinus anatum	American Peregrine Falcon
Haliaeetus leucocephalus	Bald Eagle
Lanius ludovicianus migrans	Migrant Loggerhead Shrike
Melanerpes erythrocephalus	Red-headed Woodpecker
Pooecetes gramineus	Vesper Sparrow
Vermivora chrysoptera	Golden-winged Warbler
REPTILES	
Crotalus horridus	Timber Rattlesnake
Glyptemys insculpta	Wood Turtle
AMPHIBIANS	
Aneides aeneus	Green Salamander
Cryptobranchus alleganiensis	Eastern Hellbender
Pseudotriton montanus	Mud Salamander
INVERTEBRATES - ARACHNIDS	
Apochthonius paucispinosus	Dry Fork Valley Cave Pseudoscorpion
INVERTEBRATES - BIVALVES	
Alasmidonta marginata	Elktoe
Lasmigona subviridis	Green Floater
INVERTEBRATES - CRUSTACEANS	
Caecidotea cannula	Cannulate Cave Isopod
Caecidotea holsingeri	Holsinger's Cave Isopod

Caecidotea simonini	A Cave Obligate Isopod
Caecidotea sinuncus	A Cave Isopod
Cambarus elkensis	Elk River Crayfish
Cambarus nerterius	Greenbrier Cave Crayfish
Stygobromus culveri	Culver's Cave Amphipod
Stygobromus emarginatus	Greenbrier Cave Amphipod
Stygobromus nanus	Pocahontas Cave Amphipod
Stygobromus parvus	Minute Cave Amphipod
INVERTEBRATES - GASTROPODS	
Fontigens tartarea	Organ Cavesnail
INVERTEBRATES - INSECTS	
Brachionycha borealis	Boreal Fan Moth
Calephelis borealis	Northern Metalmark
Cicindela ancocisconensis	Appalachian Tiger Beetle
Cicindela patruela	Northern Barrens Tiger Beetle
Cicindela purpurea	Cow Path Tiger Beetle
Erora laeta	Early Hairstreak
Erynnis lucilius	Columbine Duskywing
Euchlaena milnei	A Geometrid Moth
Gomphus quadricolor	Rapids Clubtail
Gomphus viridifrons	Green-faced Clubtail
Hadena ectypa	A Noctuid Moth
Hesperia metea	Cobweb Skipper
Lycaena hyllus	Bronze Copper
Pieris virginiensis	West Virginia White
Pseudanophthalmus fuscus	A Cave Beetle
Pseudanophthalmus hadenoecus	Timber Ridge Cave Beetle
Pseudanophthalmus hypertrichosis	A Cave Beetle
Pseudanophthalmus montanus	Dry Fork Valley Cave Beetle
Pseudosinella certa	Gandy Creek Cave Springtail
Pseudosinella gisini	A Springtail
Pyrgus wyandot	Southern Grizzled Skipper
Sinella agna	A Springtail
Speyeria diana	Diana Fritillary
INVERTEBRATES - OTHER	
Macrocotyla hoffmasteri	Hoffmaster's Cave Planarian
Phagocata angusta	A Cave Obligate Planarian
Pseudotremia fulgida	Greenbrier Valley Cave Millipede
Pseudotremia lusciosa	Germany Valley Cave Millipede

Pseudotremia princeps	South Branch Valley Cave Millipede
Sphalloplana culveri	Culver's Planarian
Zygonopus weyeriensis	Grand Caverns Blind Cave Millipede
Zygonopus whitei	Luray Caverns Blind Cave Millipede

NORTHERN GOSHAWK DAWN ACOUSTICAL FIELD FORM
MONONGAHELA NATIONAL FOREST

LOCATION NAME_______________________________________ SITE No. _________________ VISIT # __________
OBSERVERS ____

DATE _________________ SUNRISE_____________ START TIME______________ END TIME _______________

WIND SPEED: 0 1 2 3 4 5 TEMP________° F SKY CONDITIONS: 0 1 2 3 4 5 6 7 8

Beufort#	Speed (MPH)	Indicator
0	less than 1	smoke rises vertically
1	1-3	smoke will drift
2	4-7	wind felt on face

Sky:	
0	clear or few clouds
1	partly cloudy
2	cloudy

GPS ID _________________ UTM: N_______________________________ E_____________________________

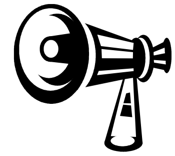
BIRD Sp. HEARD	# of BIRDS	AZM & DISTANCE	TYPE OF VOC.	TIME & LENGTH	VISUAL
				/	Y N
				/	Y N
				/	Y N
				/	Y N
				/	Y N

BIRD SPECIES CODES: **VOCALIZATIONS:**
NOGO - NORTHERN GOSHAWK **COHA -** COOPER'S HAWK **SSHA** – SHARP-SHINNED HAWK **Kakking**
RTHA – RED-TAILED HAWK **RSHA** – RED-SHOULDERED HAWK **BWHA** – BROAD-WINGED HAWK **Wail**
OSPR - OSPREY **CORA -** COMMON RAVEN **PIWO -** PILEATED WOODPECKER **Repeated wail**
BADO – BARRED OWL **NSWO** – NORTHERN SAW-WHET OWL **UNKN** – UNKNOWN **Copulation Kakking**

NOTES (If birds are seen but not heard vocalizing note the species here)

Field Form Checked and Complete Yes ☐ No ☐ **if "No" date finished ________**

NORTHERN GOSHAWK BROADCAST ACOUSTICAL FIELD FORM
MONONGAHELA NATIONAL FOREST



LOCATION NAME____ **#of POINTS** ______________ **VISIT #** ___________ **OBSERVERS** ____

DATE ________________ **START TIME**_____________ **END TIME** ______________
WIND SPEED: 0 1 2 3 4 5 **TEMP**______° **F** **SKY CONDITIONS: 0 1 2 3 4 5 6 7 8**

Beufort#	Speed (MPH)	Indicator
0	less than 1	smoke rises vertically
1	1-3	smoke will drift
2	4-7	wind felt on face

Sky:	
0	clear or few clouds
1	partly cloudy
2	cloudy

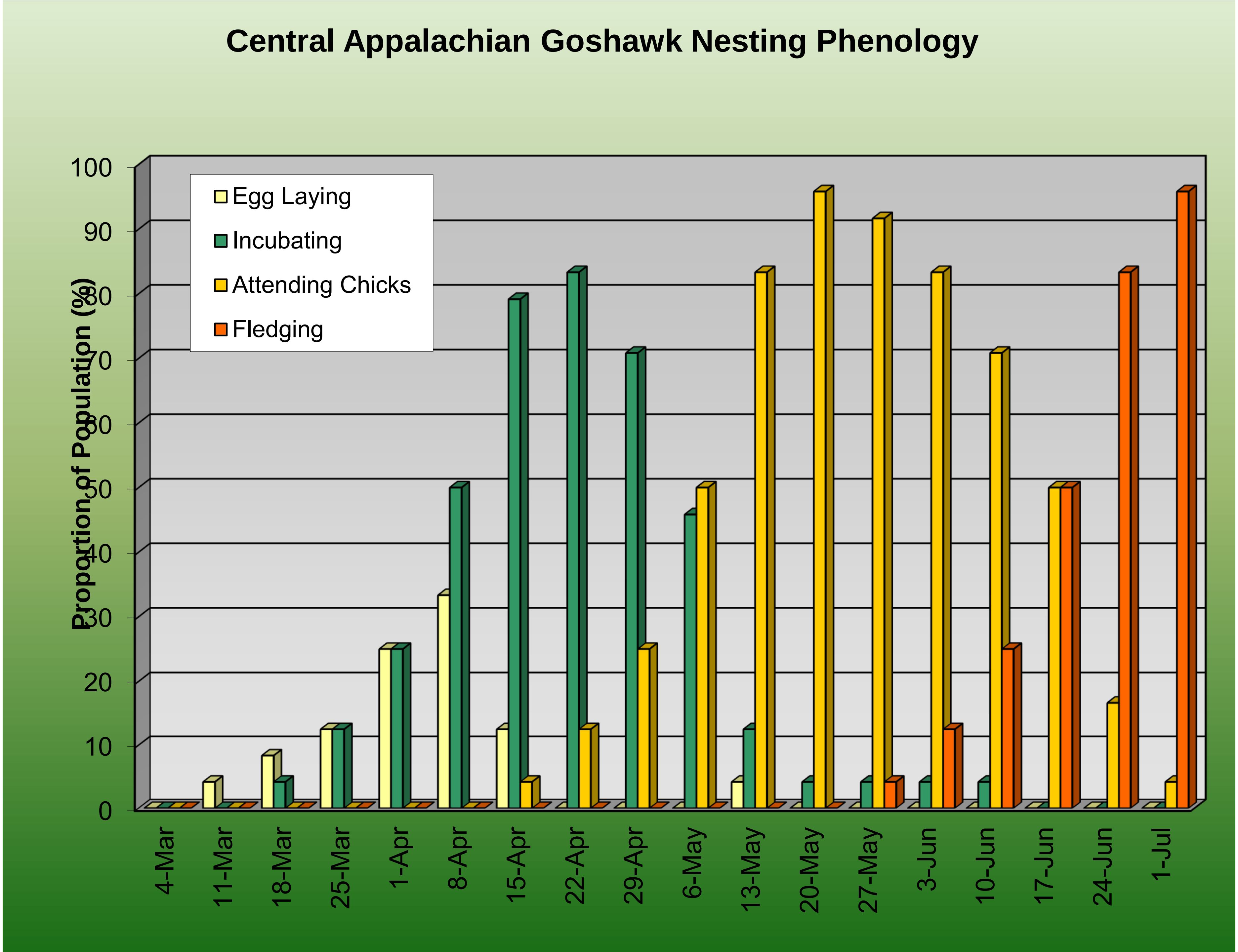
SPECIES (seen or heard)	AZM & DISTANCE	# OF INDS	VISUAL ID	POINT	TIME
			Y N		
			Y N		
			Y N		
			Y N		
			Y N		

BIRD SPECIES CODES:
NOGO - NORTHERN GOSHAWK **COHA -** COOPER'S HAWK **SSHA –** SHARP-SHINNED HAWK
RTHA – RED-TAILED HAWK **RSHA –** RED-SHOULDERED HAWK **BWHA –** BROAD-WINGED HAWK
OSPR - OSPREY **CORA -** COMMON RAVEN **PIWO -** PILEATED WOODPECKER
BADO – BARRED OWL **NSWO –** NORTHERN SAW-WHET OWL **UNKN –** UNKNOWN

GOSHAWK EVIDENCE FOUND AND IMPORTANT LOCATION INFORMATION (prey, NOGO feathers, nest)

ITEM DESCRIPTION	GPS ID	UTM LOCATION	
		N	E
		N	E
		N	E
		N	E

Form Checked and Complete Yes ☐ **No** ☐ if "No" date finished _________________________



Central Appalachian Goshawk Nesting Phenology
Proportion of Population (%)
0
10
20
30
40
50
60
70
80
90
100
Egg Laying
Incubating
Attending Chicks
Fledging
4-Mar
11-Mar
18-Mar
25-Mar
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
3-Jun
10-Jun
17-Jun
24-Jun
1-Jul

Botanical Resources

Four federally listed and sixty one Regional Forester's Sensitive Species (RFSS) plants have been documented on the Monongahela National Forest (MNF), and are collectively referred to as TES (Threatened, Endangered, and Sensitive) species. A full list is provided at the end of this section. A number of stands 120 years or older are present along the route, and may have old growth characteristics. A variety of non-native invasive plants (NNIS) are also present on the Forest, and are also listed at the end of this section.

Office and field botany surveys will need to be conducted in the areas to be surveyed for the ACP proposed route(s) to locate and document occurrences of any of these species, as well as sensitive habitats likely to host TES species. These sensitive habitats include seeps, cliffs and rock outcroppings, shale barrens, wetlands, etc. In stands 120 years old or older, botanists should describe the presence (or absence) and extent of old growth characteristics.

These surveys must be done by a competent botanist who demonstrates a high level of familiarity with Central Appalachian terrestrial ecology, and skill in identifying all plants that are likely to be encountered in West Virginia mountain forests. The Forest Service must evaluate and approve the qualifications of prospective botanists.

The survey should be conducted according to the specifications below. The survey should cover all areas on National Forest land that might be affected directly or indirectly by the proposed project (see discussion of areal survey coverage in the Introduction).

The Forest Service may accompany botanists into the field from time to time and will review the survey results upon completion.

Survey methodology

It is recommended that survey coverage be distributed along the entire length of the survey corridor on National Forest land in survey segments up to but no longer than one mile each. Coverage of any areas outside the survey corridor that could be affected by the proposed project should be coordinated with the Forest Service on a case-by-case basis. For the purposes of species list documentation, old growth characteristics evaluation, and survey data forms, each contiguous major forest community patch should be considered a survey unit. Major forest communities on the MNF include mixed mesophytic/cove hardwoods, oak, northern hardwoods, oak-pine, hemlock, spruce, and riparian. They are described in Chapter 3 of the Forest Plan EIS, and are approximately delineated in a GIS layer which will be provided to botanists conducting the survey. In cases where isolated parcels of National Forest land less than one mile long are to be surveyed, each isolated parcel, or the forest community patches therein, will be considered a survey unit.

All identified survey units should be thoroughly surveyed on foot by the meander method. Survey routes should cross drainages and side ridges to provide good coverage of all of the different habitats present in each survey unit. Survey coverage as depicted by the GPS route documentation should average at least 100 linear feet per acre for each unit surveyed and should be distributed across the unit.

Efforts should be focused on those habitats that, in the judgment of the botanist, are most likely to harbor TES plants listed at the end of this section. However, all habitats should be traversed and described, and **it is highly recommended that the botanists compile a list of all herbaceous, vine, tree, and shrub species found in each survey unit.**

The FS can provide a Likelihood of Occurrence table to help the botanist focus survey efforts toward likely habitats for TES plant species. The botanist should supplement this table with personal knowledge of habitat requirements and an evaluation of soil type, land type association, aspect, slope, etc. The botanist may suggest changes to the Likelihood of Occurrence table, but is not required to provide additional information for the table. A determination of "not likely to occur" should not be construed as a guarantee that a species will not occur in one of the survey units.

While conducting the survey, the botanist should also report conditions found within each survey unit, regardless of the presence or absence of TES and NNIS plant species. Remarks of this type should include: general ecological characterization of the site, notation of erosional features, evidence of herbivory, rock outcrops and ledges, large areas of blowdown, seeps, wetlands, and other sensitive and rare habitats, and presence of old roads within the survey unit. The botanist should also report incidental encounters of TES plants or high priority NNIS while traveling between survey units within the project boundary.

For stands identified in the GIS layers as 120 years old or older, the botanist should describe the status (presence, absence, condition) of the seven old growth characteristics as described in the MNF's Land and Resource Management Plan, Appendix B. These include age, species composition, structural diversity, woody debris, gap formation, patch size, and adjacency and scale.

Field surveys in high probability habitat for running buffalo clover should take place between June 1 and August 15, inclusive (per Forest Plan direction). Field surveys outside high priority habitat for running buffalo clover should take place between June 1 and September 30, inclusive. (USDA, 2006). Survey units should be visited at least once during this time, but may be visited more than once. If high potential habitat for a particular TES plant species is present, a re-check may be needed during the time best suited for identification. The FS can provide maps that depict approximate locations of high probability habitat for running buffalo clover.

For all surveys, the botanist should use a mapping grade global positioning system (GPS) unit with computer downloading capabilities to:

- Document survey routes through each area that is surveyed. Minor gaps in route documentation due to inadequate satellite coverage or unfavorable Dilution of Precision are expected; however, GPS route documentation should be thorough enough to demonstrate good coverage of each unit. Route documentation should have a horizontal accuracy of 10 meters or less.
- Record site locations for each population of TES plants found. All GPS locations should have a horizontal accuracy of 5 meters or less, and documentation of accuracy, such as that typically contained in differentially corrected GPS data

files, should be provided. Recreational grade GPS units generally are not capable of this level of accuracy.

For each survey unit, the botanist should:

- Report all herbaceous, shrub, tree, and vine species encountered on a separate electronic species list data form for that survey unit.
- Provide GPS documentation of the survey route walked according to the specifications listed above. A single line feature should represent the path of travel in each survey unit, unless multiple visits are made to a unit, in which case the route file may contain a separate line feature for each visit. Route files should be "cleaned" to remove any errant outlier vertices that obviously do not lie on the actual path of travel, as well as spurious lines connecting distant points that do not represent a path actually walked on the ground.
- Should old growth characteristics be present in any stand or survey unit 120 years old or older, please provide a brief written description of the status of each of the seven characteristics within that survey unit.

For all TES plant sites found in the survey units, the botanist should:

- Provide GPS location data with a horizontal accuracy of 5 meters or less. For populations that are less than 50 feet long in their longest dimension, a single GPS point near the approximate center of the population will suffice. For populations that are greater than 50 feet long in their longest dimension, GPS points that form a rough polygon around the population should be collected. Precise delineation of convoluted population boundaries is not required.
- Multiple small patches of the same species within a contiguous habitat patch (e.g., a TES species scattered across a talus slope) may be treated as one population and depicted by a polygon surrounding the multiple locations. Alternatively, each of the multiple patches may be represented by an individual GPS point if this results in less effort for the botanist.

For all high priority NNIS plant sites found in the survey units, the botanist should:

- Provide GPS location data using the same standards outlined above for delineating TES plant populations. However, multiple locations along a road, trail, etc. that do not extend into the adjacent off-road habitat may be depicted by a line, accompanied by a description of the density and distribution along that line.

For all low priority NNIS plants found in the survey units:

- All low priority NNIS found should be included in the overall species list for that survey unit. GPS locations are not necessary for low priority NNIS, unless, in the judgment of the botanist, these species appear to threaten the ecological integrity of the survey unit or adjacent habitats. The nature and extent of the threat should be explained in the final report.

For any incidental observations of TES and high priority NNIS plants while traveling between survey units within the project boundary, the botanist should:

- Provide a single GPS point located at the center of populations that are less than 50 feet long in the longest dimension.

- Provide a sketch or GIS feature (line or polygon) depicting the approximate extent of any population greater than 50 feet in length in the longest dimension. The sketch or GIS feature does not have to be based on GPS data.
- Multiple small patches of the same species within a contiguous habitat patch (e.g., a TES species scattered across a talus slope or a NNIS scattered along a roadside) may be treated as one population and depicted by a sketch or GIS feature of the approximate extent. The sketch or GIS feature does not have to be based on GPS data.
- Low priority NNIS observed while traveling between survey units need not be reported unless they appear to threaten the integrity of the ecosystem in which they occur.

Threatened, Endangered, Sensitive, and non-Native Invasive Plant Species

Threatened and Endangered Plant Species

These plants have been found on the Monongahela and are federally listed as either Threatened (T) or Endangered (E).

Scientific Name	Common Name
Arabis serotina	Shale-barren rock cress (E)
Isotria medeoloides	Small whorled pogonia (T)
Spiraea virginiana	Virginia spirea (T)
Trifolium stoloniferum	Running buffalo clover (E)

Regional Forester's Sensitive Plant Species

These plants have been identified by the Regional Forester as species for which population viability is a concern, as evidenced by significant current or predicted downward trend in numbers and density, or by habitat capability or trend that would reduce the species' existing distribution. RFSS include, but are not limited to, USFWS candidate species, species de-listed by the USFWS in the last five years, and species with NatureServe Global, Trinomial or National Ranks of G1-G3, T1-T3 or N1-N3. Certain species with a state rank of S1 or S2 may also be included.

Scientific Name	Common Name
Agrostis mertensii	Arctic Bentgrass
Allium allegheniense	Allegheny Onion
Allium oxyphilum	Lillydale Onion
Amelanchier bartramiana	Bartram Shadbush
Arabis patens	Spreading Rockcress
Astragalus neglectus	Cooper's Milkvetch
Baptisia australis var. australis	Blue Wild Indigo
Botrychium lanceolatum var. angustisegmentum	Lanceleaf Grapefern
Botrychium oneidense	Bluntlobe Grapefern
Carex roanensis	Roan Mountain Sedge
Clematis occidentalis var. occidentalis	Purple Clematis
Corallorhiza bentleyi	Bentley's Coralroot
Cornus rugosa	Roundleaf Dogwood
Cypripedium reginae	Showy Lady's-slipper
Delphinium exaltatum	Tall Larkspur
Eriogonum alleni	Shalebarren Wild-buckwheat
Euphorbia purpurea	Darlington's Spurge
Gaylussacia brachycera	Box Huckleberry
Gymnocarpium appalachianum	Appalachian Oak Fern
Hasteola suaveolens	Sweet-scented Indian-plantain
Heuchera alba	White Alumroot
Hexalectris spicata	Crested Coralroot

Hypericum mitchellianum	Blue Ridge St. John's-wort
Ilex collina	Long-stalk Holly
Juglans cinerea	Butternut
Juncus filiformis	Thread Rush
Juncus trifidus	Highland Rush
Liatris turgida	Turgid Blazing Star
Linum sulcatum	Grooved Yellow Flax
Listera cordata	Heartleaf Twayblade
Marshallia grandiflora	Large-flowered Barbara's-buttons
Menyanthes trifoliata	Bog Buckbean
Monarda fistulosa ssp. brevis	Smoke Hole Bergamot
Ophioglossum engelmannii	Limestone Adder's-tongue
Paronychia argyrocoma	Silvery Nailwort
Paronychia virginica	Yellow Nailwort
Paxistima canbyi	Canby's Mountain-lover
Pedicularis lanceolata	Swamp Lousewort
Phlox buckleyi	Swordleaf Phlox
Piptatherum (=Oryzopsis) canadense	Canada Mountain Ricegrass
Platanthera shriveri	Shriver's Frilly Orchid
Poa paludigena	Bog Bluegrass
Polemonium vanbruntiae	Bog Jacob's-ladder
Potamogeton tennesseensis	Tennessee Pondweed
Pycnanthemum beadlei	Beadle's Mountainmint
Ranunculus pensylvanicus	Pennsylvania Buttercup
Rhamnus lanceolata ssp. lanceolata	Lanceleaf Buckthorn
Ribes lacustre	Bristly Black Currant
Scutellaria saxatilis	Rock Skullcap
Silene virginica var. robusta	Fire Pink
Stellaria borealis ssp. borealis	Boreal Starwort
Taenidia montana	Mountain Pimpernel
Taxus canadensis	Canada Yew
Tortula ammonsiana	Ammons' Tortula Moss
Trichomanes boschianum	Bristle-fern
Trichostema setaceum	Narrow-leaved Blue-curls
Trifolium virginicum	Kate's Mountain Clover
Triphora trianthophora	Nodding Pogonia
Viola appalachiensis	Appalachian Blue Violet
Vitis rupestris	Sand Grape
Woodwardia areolata	Netted Chainfern

High Priority non-native invasive plant species
These species have the capability to invade forested ecosystems or other high quality habitats in the project area, or they may interfere with tree regeneration. These species should be GPS-located wherever they occur.

Scientific Name	Common Name
Acer platanoides	Norway maple
Ailanthus altissima	tree of Heaven
Alliaria petiolata	garlic mustard
Ampelopsis brevipendunculata	porcelain berry
Arthraxon hispidus	jointed grass or small carpgrass
Berberis thunbergii	Japanese barberry
Bromus commutatus	hairy chess or meadow brome
Butomus umbellatus	flowering rush
Celastrus orbiculata	Oriental bittersweet
Coronilla varia	crown vetch
Dioscorea oppositifolia	Chinese yam
Hydrilla verticillata	hydrilla
Iris pseudacorus	yellow iris or yellow flag
Ligustrum vulgare, L. sinense, L. japonica, L. obtusifolium	exotic privets
Lonicera japonica, L. maackii, L. morrowii, L. tatarica, L. tatarica.x L. morrowii	Japanese honeysuckles
Lysimachia nummularia	moneywort or creeping jenny
Lythrum salicaria	purple loosestrife
Microstegium vimineum	Japanese stiltgrass
Paulownia tomentosa	princess-tree
Polygonum cuspidatum	Japanese knotweed
Polygonum perfoliatum	mile-a-minute vine
Polygonum sachalinense	sachaline or giant knotweed
Pueraria lobata	kudzu
Ranunculus ficaria	lesser celandine or fig buttercup
Rhamnus cathartica	common buckthorn
Rhodotypos scandens	jetbead
Rubus phoenicolasius	wineberry
Sorghum halepense	Johnsongrass
Vinca major	bigleaf periwinkle
Vinca minor	common periwinkle

Non-native invasive plant species that may be considered problematic in certain special habitats (e.g., wetlands, glades, barrens, wildlife openings, range allotments, etc.). These species should be GPS-located if they occur in a habitat where they can cause resource damage.

Scientific Name	Common Name
Amaranthus hybridus	common pigweed or green amaranth
Anthoxanthum odoratum	sweet vernal grass
Arctium minus	lesser burrdock
Barbarea vulgaris	winter cress or yellow rocket
Bromus inermis var. inermis	smooth brome
Bromus sterilis	barren bromegrass or poverty brome
Bromus tectorum var. tectorum	downy chess or cheatgrass
Carduus acanthoides	plumeless thistle
Carduus crispus	curled thistle
Carduus nutans	musk thistle
Centaurea nigrescens (C. pratensis)	Tyrol knapweed (meadow knapweed)
Centaurea stoebe ssp. micranthos (C. maculosa)	spotted knapweed
Chrysanthemum leucanthemum	Ox-eye daisy
Cichorium intybus	chicory
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Clerodendrum trichotomum	harlequin glorybower
Daucus carota	Queen Anne’s lace
Dipsacus laciniatus	cut-leved teasel
Dipsacus sylvestris	common teasel
Echium vulgare	viper’s bugloss
Elaeagnus angustifolia	Russian olive
Elaeagnus umbellata	autumn olive
Elytrigia repens	Quackgrass
Epipactis helleborine	broadleaf helleborine
Euphorbia esula	leafy spurge
Festuca arundinacea	Kentucky 31 fescue
Festuca elatior	tall fescue
Festuca pratensis	meadow fescue
Glechoma hederacea	ground ivy or gill-over-the-ground
Heracleum mantegazzianum	giant hogweed
Hesperis matronalis	Dame’s rocket
Hieracium pratense	king devil or field hawkweed
Holcus lanatus	velvet grass
Hypericum perforatum	common St. John’s wort
Lespedeza bicolor	Japanese bushclover
Lespedeza cuneata	sericea lespedeza
Melilotus alba	white sweet clover

Melilotus officinalis	yellow sweet clover
Muscari botryoides	grape hyacinth
Myriophyllum spicatum	Eurasian water-milfoil
Ornithogalum nutans	drooping star of Bethlehem
Ornithogalum umbellatum	star of Bethlehem
Perilla frutescens	beefstakeplant
Phalaris arundinacea	reed canary grass
Phleum pratense	Timothy
Plantago lanceolata	English plantain or narrow-leaf plantain
Plantago major	great plantain
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Poa trivialis	rough bluegrass
Polygonum aviculare	knotweed
Polygonum caespitosum	Asiatic water pepper
Poncirus trifoliata	hardy orange
Potamogeton crispus	curly pondweed
Rorippa sylvestris	creeping yellow cress
Rosa multiflora	multiflora rose
Rumex acetosella	sheep sorrel
Rumex crispus	yellow dock or curly dock
Spiraea japonica	Japanese spiraea
Stellaria media	common chickweed
Tussilago farfara	Colt's-foot
Verbascum thapsus	great mullein

Literature Cited

Strausbaugh, P. D. and E. L. Core. 1978. Second edition. Seneca Books, Inc., Morgantown, WV.

USDA Forest Service. 2006a. *Monongahela National Forest Final Environmental Impact Statement for Forest Plan Revision*. USDA Forest Service, Eastern Region, Milwaukee, WI.

USDA Forest Service. 2006b. *Monongahela National Forest Land and Resource Management Plan*. USDA Forest Service, Eastern Region, Milwaukee, WI.

Minerals and Geology

The following are recommendations for the survey, investigation and collection of geologic and mineral related information needed for analysis of the proposed project.

A. Geology

Identify, investigate and map the extent of any known or unknown hazard geology along the proposed pipeline route. Describe and identify any geologic conditions, and characteristics that may cause concerns for the construction, operations and maintenance of the pipeline, and any conditions that may relate to effects on other resources.

Likewise, identify, investigate and map the extent and depth of any sinks, sinkholes, caves that may exist within or near the proposed pipeline route, staging area and associated new roads. Additional geophysical investigations at such identified areas may be needed to facilitate a decision on the proposed pipeline. Please note that all caves and other karst features on the MNF are closed to entry. If data collection requires entry, separate written authorization from the Forest Supervisor will be required.

The proposed GWNF6 route crosses several areas of limestone, which should be the focus of cave and karst inventory.

The project may also cross sensitive lithologic units known for unstable slope, i.e. the Mauch Chunk Group . The steep terrain through many areas of the proposed route(s) and steeply dipping formations may affect soil stability, erosion potential , reclamation and revegetative success. See slope stability survey recommendations in the Soil and Hydrology sections of this document.

B. Minerals

Identify, investigate and map any old natural gas wells within or near the proposed pipeline route

Pipeline construction and excavation activities may intersect reclaimed natural gas wells affecting the plugged borehole and exposing encapsulated pit material. Such pit material could have elevated concentrations of chemicals.

Identify, investigate and map any surface coal mines, workings, spoil piles, abandoned facilities within or near the proposed pipeline route. Coal spoil/waste that is intersected by the proposed pipeline route needs to be identified, extent mapped and tested for acid generating potential, heavy metals, and any other potential components of concern.

<u>Old Coal Mine/Strip Workings</u>

Construction activities from the pipeline project (digging 5-12 feet in depth) may expose already reclaimed and stabilized acid generating coal spoil piles from the former strip mining of the area.

Construction activities may intersect old underground coal mine workings that exist close to the surface allowing for water interaction, transmission of fluids and cross connectivity issues affecting water quality and water quantity. These construction activities may also release vast volumes of unknown trapped water existing within the mine workings affecting the water table in the area. Proper mapping using mine maps (see State of WV) and avoidance is recommended.

Identify, investigate and map any known or discovered landfills, and underground mine workings
Pipeline construction may unknowingly intersecting improperly disposed or discarded mine related fluids or hazardous materials in underground workings.

Identify, investigate and map the geology of any major stream crossings
Boring under streams and rivers may intersect un-mined coal units or other soft units or limestone units that could allow for unstable pipeline bedding, water interaction, transmission of fluids through cracks and fractures and cross connectivity issues affecting water quality and water quantity. See also survey recommendations in the Hydrology section of this document.

References

Medville, Douglas M. and Hazel E. Medville. 1995. Caves and Karst of Randolph County. West Virginia Speleological Survey Bulletin 13. 250 pp.

Reger, David B. 1931. West Virginia Geological Survey Randolph County Report, 989 pp.

Reger, David B. 1931. Randolph County General and Economic Geology Map, West Virginia Geological Survey.

USDA-FS Engineering Staff. 1994. Slope Stability Reference Guide for National Forests in the United States, Volumes I-III. EM-7170.

Links-
West Virginia Geologic and Economic Survey. Geology Interactive Mapping Portal for oil, gas, coal
http://ims.wvgs.wvnet.edu/index.html

Mine Information Data System (MIDS)
http://www.wvgs.wvnet.edu/www/coal/MIDS_Index.htm

Soils

The surveys needed for the soil resource include a site specific order 1 level soil survey within the corridor. See also the discussion in the Introduction regarding the aerial extent of surveys for resources that may be impacted directly or indirectly. An Order 1 Soil Survey is defined by the USDA NRCS in the referenced document.
http://www.nrcs.usda.gov/wps/portal/nrcs/detail//?cid=nrcs142p2_054252

This task would need to be performed by a professional journey level soil scientist with experience in soil mapping and description in the Eastern US. Expertise in the Appalachian region (Georgia-Maine) is preferred.

- The following data would need to be collected as part of this order 1 soil survey:
    - Information and data that can be used in analysis to determine soil stability and predictions for erosion and sediment control.
        - Slope
        - Soil type
        - Soil mineralogy
        - Depth to bedrock and bed rock structure/ dip slope
        - Presence of pans
        - Indications of past slope failures both natural and those attributed to anthropogenic disturbance such as road building, logging, mining and other activities.
        - Presence of subsurface water tables
    - Description of the organic horizons and an assessment of below ground carbon stocks related to the soil types within the corridor to account for loss of stored carbon stocks as well as sensitive organic horizons that act to store carbon and water and are part of niche biological habitats (e.g., folistic epipedons and spodic horizons in current and former spruce and hemlock forests).
    - Soil chemistry assessments for the presence of base poor soils as required by the Forest plan. This is mainly soil types that form over the Pottsville geology but are not limited to this formation.

In addition, the following document should be used as a tool in guiding additional data collection for determining slope stability on USFS lands.

Prellwitz, Rodney W.; Koler, Thomas E.; and Steward, John E., coords. 1994. **Slope Stability Reference Guide for National Forests in the United States**. Publication EM-7170-13. Washington, DC: U.S. Department of Agriculture, U.S. Forest Service, Engineering Staff. 3 volumes, 1091 p

ACP has prepared a detailed protocol for conducting the order 1 soil survey. This protocol has been reviewed and approved by the Forest Service, and it must be followed to ensure the utility of the resulting data and analysis.

Hydrology

The installation of a pipeline through the forest and across mountains, streams, and other features would result in certain hydrologic impacts.

1. There is a potential for the proposed pipeline to produce impacts/damage to wetlands (swamps, bogs, springs/seeps, etc.), streams, floodplains, wells, and public water supplies. Data sufficient to elucidate these impacts should be collected. This includes not only those features located directly within the corridor but also those features adjacent to corridor that have the potential to be impacted or affected (see discussion of areal extent of surveys in the Introduction). Surveys related to these issues should include the following:
    a. Wetland present in and adjacent to the corridor should be delineated according to the *Corps of Engineers Wetland Delineation Manual, 1987.* The total acreage of the wetland should be provided, in addition to acreage located directly in the corridor. The delineation should encompass not only those "jurisdictional" wetlands, but also wetlands not under the jurisdiction of the Clean Water Act, such as isolated wetlands.
    b. Identification, inventory and assessment of all streams (perennial, intermittent, and ephemeral), springs/seeps, bogs, fens, swamps, etc. be included and be done by accepted methods and in a manner such that the potential for impacts can be analyzed and reviewed by the MNF and the public.
    c. A functional assessment conducted to analyze the size and functional value of the wetlands that would be affected by the proposed pipeline.
    d. During the survey, as resources are evaluated, ACP should consider if mitigation would be possible for the highest quality resources at risk (e.g. those resources that are assigned the most stringent level of protection by WVDEP – such as Tier 3 vs. Tier 2 streams and the WVDEP's designated use category, etc.).
    e. Inventory wells and public water supplies (if any) in and adjacent to the corridor. Depending on surface and groundwater flow characteristics, such supplies could be located some distance away from the corridor.
2. Analyze steep slopes and areas close (within approximately 300') to streams for slope stability and for their erosion potential.
    a. Slope stability
    b. Soil erosion potential
    c. In a recent consent order, WVDEP required a geotechnical analysis to define the root cause(s) of historical pipeline right-of-way failures, and to provide a written report of its findings and a plan of corrective actions to address the root cause(s) of pipeline right-of-way failures. The results of this analysis would likely be useful to guide the need for additional analyses for this survey.
3. Intercepting shallow groundwater and expressing it to the surface and altering its natural flow path are a potential concern, especially where the ground contour is altered, such as deep water bars or access routes that generate cut slopes.
4. Because of the interconnected network of sinkholes, caves, voids, fractures, etc. in karst environments, actions in one area can produce impacts considerable distance for the actual point of activity, thus surveys where the corridor crosses karst terrain or limestone should include the following
    a. Survey for the presence of sinkholes within the corridor and ¼ mile beyond the corridor on either side.

b. Surveys for the presence of sub-surface features and potential flow paths – caves, voids, faults/fractures/joints, etc. (dye tracing, geophysical methods, etc. may be necessary in order to understand the subsurface flow paths)

Note that caves and all other karst features on the MNF are closed to entry. If any surveys require entry, separate written authorization from the Forest Supervisor will be required.

Fisheries/Aquatic Ecology

Table 1 contains aquatic resource issues that should be considered as part of the analyses of potential direct, indirect, and cumulative effects associated with the ACP proposal for sub-watersheds on the MNF. These suggestions may not be all encompassing and neither are they intended to be prescriptive regarding specifications for the type or extent of information that might be needed to analyze the ACP proposal. However, the suggestions may be useful for developing an aquatic resource evaluation plan and identifying appropriate protocols for acquiring any information that is deemed necessary. It is expected that protocols used to conduct field assessments for aquatic resources would be coordinated with the designated Forest aquatic resource specialist(s) to discuss and attain protocol efficacy and data utility.

Information that may be needed to address aquatic resource issues for a possible ACP proposal should span all areas that could be affected including the pipeline corridor, support facilities, staging areas, short-term ingress/egress routes, and access routes needed for long-term operation/maintenance of the proposed pipeline (see discussion in the Introduction regarding the areal extent of surveys).

Table 1. Potential aquatic resource issues, attributes of particular interest, potential for adverse effects, and recommended information gathering.

Aquatic Resource Issue	Attribute of Interest	Potential for Adverse Effects Associated with Pipeline Alternative	Recommended Information Gathering
Watershed Health	alterations	high	characterize
Aquatic Environments	wetlands	high	locate, characterize
	perennial streams	high	locate, characterize
	intermittent streams	high	locate, characterize
	ephemeral streams	high	locate, characterize
	springs/seeps	high	locate, characterize
	karst (sinkholes)	high	locate, characterize
Clean Water Act	anti-degradation	high	characterize
	designated uses	high	characterize
Water Quality	water chemistry	moderate	establish baseline
	stream turbidity	high	characterize
	stream temperature	low	characterize
Water Quantity	hillslope hydrology	high	characterize
	in-stream flows	high	characterize
Stream Channel Characteristics	fluvial geomorphology	high	establish baseline
	bed/bank stability	high	establish baseline
	substrate composition	high	establish baseline
	substrate embeddedness	high	establish baseline
	habitat composition	high	establish baseline
Aquatic Management Indicator Species	wild brook trout	high	presence/absence

Aquatic Resource Issue	Attribute of Interest	Potential for Adverse Effects Associated with Pipeline Alternative	Recommended Information Gathering
(and Suitable Habitat)			
Aquatic Regional Forester's Sensitive Species (or Suitable Habitat)	candy darter	high	presence/absence
	Appalachian darter	high	presence/absence
	New River shiner	high	presence/absence
	Kanawha minnow	high	presence/absence
	eastern hellbender	high	presence/absence
	green floater (mussel)	moderate	+ presence/absence
	elktoe (mussel)	moderate	+ presence/absence
	[R]cave/karst-dwelling species	moderate	presence/absence
	[R]Order Odonata	moderate	presence/absence
Recently Described Species	Greenbrier River crayfish (*Cambarus smilax*)	high	# presence/absence
Critical Stages of Life History	aquatic species listed above	moderate	potential for design considerations
Aquatic Passage	Aquatic community	low	potential for design considerations

+ coordinate with West Virginia Division of Natural Resources for appropriate consideration mussel species
# coordinate with Dr. Zach Loughman at West Liberty University for appropriate consideration of the Greenbrier River crayfish
R see Regional Forester's Sensitive Species list for Forest Service Region 9

Recreation and Scenery

ACP should analyze and document the potential effects of the proposed project to:

- Existing developed and dispersed recreation sites
- Existing trails
- Planned trails
- Wilderness and Wilderness Study Areas (in particular Roadless Area Conservation Rule areas)
- Scenery and Visual Quality
- Eligible Wild and Scenic Rivers
- Visitor safety – during construction and operation

Roads and Facilities

ACP should identify all existing Forest Service systems roads needed to access the proposed pipeline corridor, including FS roads not within the proposed corridor. Any non-system roads or new roads needed on National Forest land should also be identified. The impacts of use, maintenance, construction, and reconstruction of access roads should be disclosed in the EIS.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE PROJECT

BIOLOGICAL EVALUATION

APPENDIX G

George Washington National Forest
Recommended Surveys

Impacts and effects should be discussed for all associated activities/disturbance (temporary or permanent), including the pipeline corridor, access roads, staging areas, disposal areas, etc.).

Geology

Major areas of concern regarding the geological resources include potential impacts to groundwater and potential impacts to, and from, geologic hazards. Specific geologic hazards include landslides, debris flows, slope failure, slope stability, sedimentation, sinkholes, flooding, acid producing rock formations and seismic activity. More detailed concerns are described in accompanying material.

Soils

Display total acres of pipeline construction and road including cut and fill slopes and bladed areas for other facilities so that impacts on soil productivity can be identified. Identify mitigation measures concerning erosion control, trench construction, and road construction. Follow state or federal construction standards; any variances, such as length of trench open at one time, must be justified in terms of benefits to soil and water protection. Road construction with grades over 25% will be water barred, mulched, seeded with annuals after construction. Proven erosion control vegetation mixes must be seeded at appropriate times of the year. Erosion control measures must be installed prior to or immediately after construction of an area. More detailed concerns are described in accompanying material.

Water Resources

Identify streams, waterbodies, wetlands, floodplains and other riparian areas crossed by, or potentially affected by, the proposed pipeline. Calculate estimates of soil erosion and resultant sedimentation in the streams and address impacts of the sedimentation on aquatic biota. Also address potential impacts to the physical character of the streams from stream crossings. Identify uses of the streams in the affected area including any downstream water supplies.

Fisheries and Aquatic Resources

Identify streams, associated riparian corridors, and aquatic/riparian dependent biota within the corridor and those potentially affected downstream. Measures will need to be prescribed to protect stream water quality, the physical character of the streams, levels of streamflow, stream connectivity, streamside vegetation communities, stream biota, slope stability, and to minimize erosion and sedimentation. Potential impacts on karst systems and the flora and fauna associated with sinkhole ponds also needs to be addressed. In addition to impacts on the aquatic biota, potential impacts on recreation fishing activities should also be assessed. More detailed concerns are described in accompanying material.

Timber and Vegetation

The analysis should describe the impacts to timber in the corridor and describe the expected vegetation community that would occupy the permanent right-of-way. Areas proposed for the removal of trees will be evaluated for old growth characteristics according to Forest Service guidelines. If any areas are determined to meet the definition of old growth, the effects of harvesting the old growth will be evaluated in the environmental analysis.

Non-Native Invasive Species

The proposed pipeline should be inventoried before construction to identify locations of populations of non-native invasive species in, and adjacent to, the corridor. The Forest Service can provide a list of the high priority species of concern. The area should be treated before construction to reduce potential seed sources and vegetative propagation. Measures should be established to prevent infestations during and after construction through equipment cleaning, monitoring and treatment. A maintenance plan should be established for long-term periodic monitoring and treatment. Properly established vegetation cover and prevention of soil erosion will help prevent infestations.

Wildlife and Threatened, Endangered and Sensitive Species

The analysis of impacts on federally listed threatened and endangered species and their habitat will need to be addressed in a Biological Assessment and the impacts on sensitive species (species listed on the Regional Foresters list of sensitive species) will need to be addressed in a Biological Evaluation. The Forest Service will provide lists of the species to be included in the analysis. In addition, impacts to locally rare species will also need to be addressed in the environmental analysis. The Forest Service will provide of list of locally rare species that could be affected by the project. Effects of proposed pipeline project on habitat for golden and bald eagles will need to analyzed and appropriate mitigation measures taken to comply with the Bald and Golden Eagle Act. The impacts of the project on the Management Indicator Species identified in the Forest Plan will also need to be addressed in the environmental analysis. More detailed concerns are described in accompanying material.

Cow Knob Salamander

This is a globally rare species protected under a Conservation Agreement with U.S. Fish and Wildlife Service. This agreement is incorporated into Forest Plan standards. Concerns include direct habitat damage and indirect habitat damage from things like microclimate changes or increased predation. Potential mitigation measures could include: avoid areas with CK salamanders - control elevation and aspect; restore currently disturbed habitat - road closure and rehab; acquisition of CK salamander habitat in private ownership; minimize pipeline length across suitable CK salamander habitat; minimize width across suitable CK salamander habitat; or investigate optimum vegetation cover of pipeline corridor for salamanders

Shenandoah Mountain Salamander

This is another globally rare species and surveys will be needed to determine presence or absence. If present, the concerns and potential mitigation measures would be the same as for the Cow Knob salamander.

Bats

Identify and map any cave locations and karst areas within or adjacent (within 2 miles) to the corridor. Any surveys for bats should follow the current survey guidelines as issued by the US Fish and Wildlife Service.

Illegal ATV Use

Corridors such as gas pipelines can become areas that support illegal ATV use. This type of use can result in resource damage, erosion, loss of vegetative cover, improved access to protected areas, illegal hunting and other user conflicts.   Measures to prevent this type of use should be incorporated into the design of the project.

<u>Planning</u>

The analysis will need to identify any aspects of the project that would not be in compliance with the Forest Plan for the GWNF. If the pipeline construction or operation is not in compliance, ways to make it compliant would need to be evaluated or the analysis would need to address the impacts of amending the Forest Plan. The analysis needs to identify any impacts to resources with specific plan implications such as Potential Wilderness Areas and Special Biological Areas.

Forest Plan standards regarding special use authorizations and linear rights-of-way require the following:

> *Limit to needs that cannot be reasonably met on non-NFS lands or that enhance programs and activities. Locate uses where they minimize the need for additional designated sites and best serve their intended purpose. Require joint use on land when feasible.*
>
> *Develop and use existing corridors and sites to their greatest potential in order to reduce the need for additional commitment of lands for these uses. When feasible, expansion of existing corridors and sites is preferable to designating new sites.*

The environmental analysis will need to examine alternatives to locate the pipeline on lands other than National Forest System lands. Alternatives will also need to address the ability of utilizing existing corridors rather than creating new ones.

Tom Collins, Forest Geologist, George Washington & Jefferson National Forests

Impacts and effects should be discussed for all associated activities/disturbance (temporary or permanent), including the pipeline corridor, access roads, staging areas, disposal areas, etc.). One of the bases for assessing potential impacts is to consider the impacts associated with existing pipeline corridors in comparable geologic settings (similar geologic materials, geologic structures, and geologic processes) within a physiographic province (such as the Ridge and Valley physiographic province or the Ridge and Valley physiographic province). Similarities and differences between the proposed pipeline project and existing pipeline can be noted and evaluated. Pipeline corridors which have been in place for more the one or two decades can provide some information on potential effects during operation of the pipeline.

Groundwater

1. - Assess the potential for impacts to groundwater during construction and operation of the pipeline, access roads, and associated facilities.

2. - Identify and map karst geologic areas and features (sinkholes, caves, disappearing streams, etc.) onsite or downslope from the pipeline, access roads, disposal areas. and associated facilities.

3. - Identify springs, wetlands, groundwater-dependent ecosystems, or other indications of shallow groundwater. Assess potential for project excavations (trenches, roads) to intercept shallow groundwater.

4. – Identify groundwater recharge and discharge areas relevant to the proposed project.

5. – Identify any hazardous or toxic chemicals or materials that would be transported to and used in the pipeline corridor. Describe the spill prevention and control procedures for transporting and using such materials.

6. – Describe methods to be used to cross perennial or intermittent streams and valley bottoms where the pipeline would encounter permanent or seasonal groundwater flows.

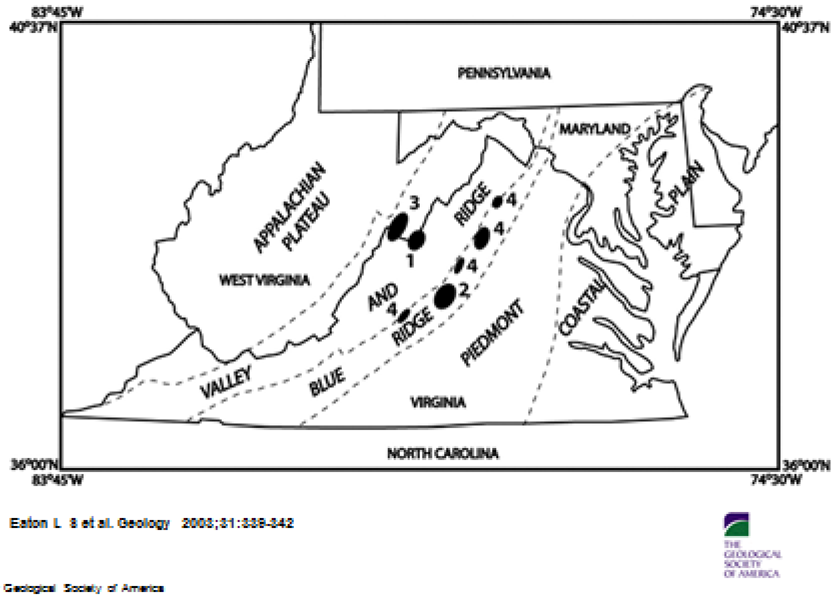
Geologic Hazards

Geologic hazards are geologic processes or conditions (naturally occurring or altered by humans) that may affect infrastructure, public health and safety, and resources. Geologic hazards may affect, and in some cases be affected by, the construction and operation of the pipeline, roads, and associated facilities.

1. –**Natural landslides**: Identify existing slope stability conditions in the footprint of, or relevant to, the proposed facilities (such as existing landslides; streamside slopes subject to undermining by streams; geologic structures that may be adverse to slope stability such as dip slopes; debris flow paths). Assess potential for various types of landslides (mass movements, mass wasting) to affect pipelines, access roads,

2. – **Natural debris flows**: Assess the potential for debris flow type of landslides to impact the pipeline and associated facilities. Consider the frequency of debris flow events, including the major debris flow events in Virginia and West Virginia from 1949 to 1996 (Figure 1 from Eaton, L.S. et. al., 2003).

Figure 1. Areas affected by debris-flow events in Virginia and West Virginia from 1949 to 1996. 1—June 17–18, 1949, storm in western Virginia and eastern West Virginia; 2—August 19–20, 1969, storm in western Nelson County, Virginia; 3—November 3–5, 1985, st...



Credit: Figure 1 from Eaton, L.S., Morgan, B. A.,Kochel, R.C. and Howard A. D., 2003, Role of debris flows in long-term landscape denudation in the central Appalachians of Virginia, *Geology* 2003;31;339-342.

http://geology.gsapubs.org/content/31/4/339.short

3. - Assess the potential impacts on pipeline and access roads of swarms of debris flows, such as occurred in June 1949 in Augusta County (Figure 2) and in August 1969 in Nelson County (Figure 3).

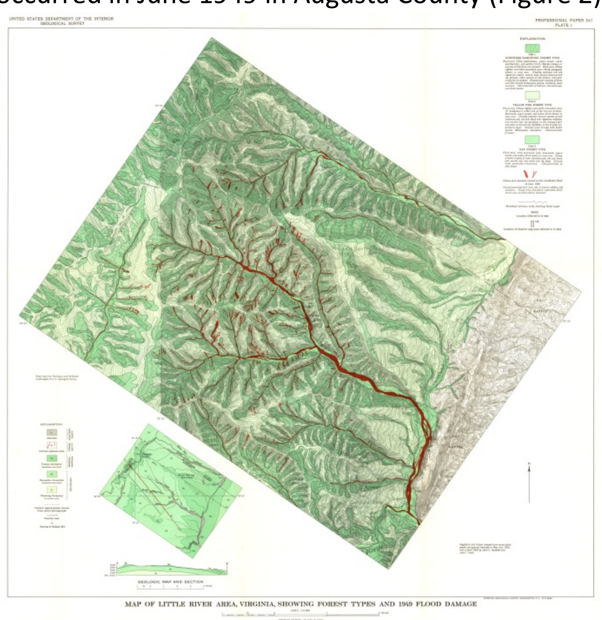


Figure 2 - A June 17-18, 1949 storm triggered more than 100 debris flows in the Little River area on the North River Ranger District in Augusta County, Virginia. Credit: Plate 1 from Hack, J. T., and Goodlett, J. C., 1960, USGS Professional Paper 347.http://pubs.er.usgs.gov/publication/pp347

Figure 3 - Debris flows in Davis Creek area triggered by remnants of Hurricane Camille August 19/20, 1969 in Nelson County, Virginia. Credit: Map excerpt from Morgan, B.A. et al., 1999, INVENTORY OF DEBRIS-FLOW AND FLOODS IN LOVINGSTON AND HORSESHOE MOUNTAIN, VA: 7.5 MINUTE QUADRANGLES FROM THE AUGUST 19/20, 1969 STORM IN NELSON COUNTY, VA, USGS OFR-99-518.
http://geology.er.usgs.gov/eespteam/terrainmodeling/ofr99_518.htm

3a. – **Project-related slope failures (landslides)**: Assess the slope stability of proposed cut slopes and fill slopes during construction and operation of the pipeline, access roads, and associated facilities. Identify any risks to people, facilities, and resources associated with potential failure of slopes modified for the project.

3b. –**Road fill slope stability**: In considering the stability of road fill slopes, determine the slope % at which road construction would switch from cut-and-fill to full bench construction. Prepare a slope map of the project area including areas of potential access road construction. Use slope % for cut-and-fill to full bench construction as one of the slope breaks in classifying slopes on the slope map. Identify methods and locations for disposal of excess excavation (such as from full bench road construction).

3c. – **Trench backfill stability**: In considering the stability of fill in pipeline trenches, determine the slope % at which fill in trenches would be unstable and subject to fill slope failure. Prepare a slope map of the project area. Use slope % at which fill in trenches would be unstable as one of the slope breaks in classifying slopes on the slope map. Identify methods and locations for disposal of excess excavation from the trenches.

3d. –**Corridor road slope stability**: The access roads to reach the pipeline corridor are a familiar type of road. In contrast, the road built in the pipeline corridor is a different type of road, cutting a wide swath across the landscape in order to accommodate heavy construction equipment traffic to dig the trench and install the pipeline. While different in scale and layout than an access road, the construction within the corridor is basically a wide road with an adjacent pipeline trench (Figure 4).

Figure 4 – Example of construction road with adjacent pipeline trench. Material excavated for the road is piled on uphill side of road; material excavated for the trench is piled in a berm on downhill side of trench.

Assess the slope stability of the corridor road and adjacent pipeline trench during construction and operation of the pipeline. Of special concern is the loose, unconsolidated material (soil, colluvium, weathered or fractured bedrock) resulting from the excavation and stored in temporary piles or berms. What will be the volume (cubic yards) of loose, excavated materials and how long will these piles or berms remain before some or all of the material is used for backfill or is graded as part of reclamation?

If a significant rainstorm occurs during the time these temporary piles or berms are present (such as in Figure 4), it could result is a mass failure of the temporary piles or berms, and then, a debris flow that could produce off-site damage downslope and in stream channel s. To estimate the volume and stability of these temporary piles or berms, a cross-section of this stage of the construction process is needed. The project design would have at least two types of cross-sections: 1) original ground surface, 2) final cut-and-fill. But project design needs a third cross-section to show temporary piles or berms as well as excavations (cut-slope); this design cross-section would show the construction at the point of maximum loose excavated material , that is, before the trench is backfilled (such as in Figure 4). Longitudinal profiles showing the slope % or grade along the corridor road at this stage of construction would also be needed to assess slope stability.

3e. – **Project-related debris flows:** Assess the potential for debris flows caused by failure of fill slopes created by the project (such as access roads, corridor road and pipeline construction, and associated facilities). Assess the potential for debris flows caused by failure of waste disposal areas (such as disposal areas for excess excavation along access roads, corridor road and pipeline). Assess risks to public safety, downslope infrastructure, streams and other resources associated with potential failure of fill slopes or disposal areas for the project.

Collins, T. K., 2008, Debris flows caused by failure of fill slopes: early detection, warning, and loss prevention. Landslides. 5:107–120
http://link.springer.com/article/10.1007/s10346-007-0107-y#page-1

3f. – **Project-related sedimentation**: Assess the potential for sedimentation due to surface erosion and mass wasting during construction and operation of the pipeline, access roads, and associated facilities. Consider the significant role of debris flows in sedimentation as indicated by Eaton, L.S. et. al. (2003):

> "In the Appalachians, and probably other mountainous terrains located in humid-temperate climates, the role of high-magnitude events on geomorphic effectiveness and landscape evolution arguably has been underestimated. The presence of coarse bedload stored in upland channels, porous regolith that mantles the slopes, and densely vegetated terrain marginalizes the effectiveness of frequent, lowmagnitude storms in mobilizing sediment. In contrast, high-magnitude events trigger debris flows, which incise streams, export sediment from the uplands, and deposit regolith onto debris fans or into lowland stream channels and floodplains."

Thus it is important to assess the potential for sedimentation due to surface erosion but also due debris flows resulting from failure of fill slopes or disposal areas.

4. - **Sinkholes (ground collapse)**: Identify and map karst geologic areas and features (sinkholes, caves, disappearing streams, etc.) onsite or downslope from the pipeline, access roads, and associated facilities. Assess the potential for sinkholes (ground collapse) to affect pipelines, roads, and associated facilities.

5. – **Flooding**: Assess potential for flooding to affect pipelines, roads, and associated facilities. Assess the how the slope modifications in the pipeline corridor and access roads would affect surface water flows and runoff.

6. – **Acid-producing rock (sulfide) hazards**: Identify sulfide-bearing geologic materials in project area (Figure 9). Assess potential impacts of project to result in effects such as barren acidic cut slopes, acidic runoff, fill seepage and deterioration (Orndorff and Daniels, 2002).

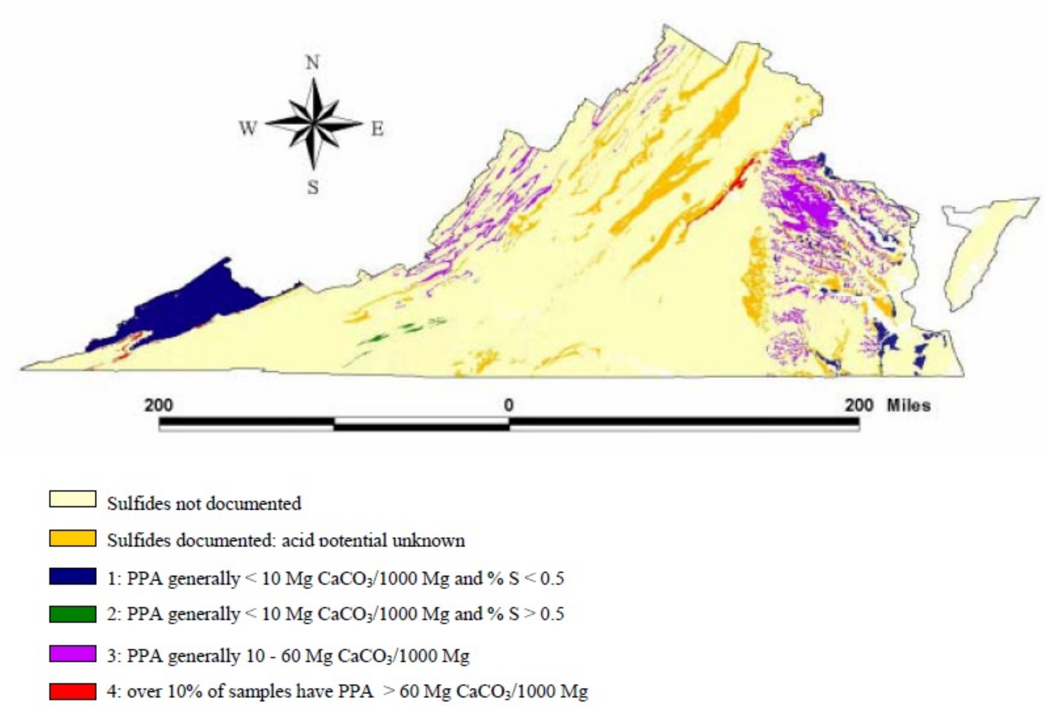


Figure 9. Geographic extent and hazard ratings for sulfide-bearing geologic materials in Virginia.

Credit: Figure 9 from: Orndorff, Zenah, and Daniels,W. Lee, 2002, Delineation and Management of Sulfidic Materials in Virginia Highway Corridors, Virginia Transportation Research Council, 530 Edgemont Road Charlottesville, VA 22903, Report No.VTRC 03-CR3, Sept. 2002.

http://hdl.handle.net/10919/46714

7. – **Seismic hazards**: Assess potential effects relating to seismic hazards from earthquakes.

Dawn Kirk, GWJ Forest Fisheries Biologist

1. Impacts and effects should be discussed for all associated activities/disturbance (temporary or permanent), and not just the pipeline corridor itself (include things such as access roads and staging areas).

2. My bulleted comments below are organized by the "Currently Identified Environmental Issues" provided on pages 7-8 of the NOI. I will likely have additional comments after review of the draft document.

<u>Impacts on surface water resources including springs, seeps, and wetlands</u>

- Identify perennial, intermittent, and ephemeral water bodies and associated riparian corridor
- Identify aquatic/riparian dependent biota within corridor and those potentially affected downstream
- Physical habitat assessment at stream crossing location for characterization and monitoring purposes, including water chemistry
- No dewatering of streams for construction purposes
- Follow time of year restrictions for sensitive biota
- Ensure stream connectivity
- What, if any chemicals are used to coat the pipe or for construction?
- Concern over open cut in the stream channel. Above ground crossing or directional boring under the hyporheic zone seems less of an impact to the stream.
- No staging areas in riparian corridor
- Minimize parallel trenching in riparian corridors, pipe should cross close to 90°
- Need slope stability and sedimentation analysis
- Contamination from construction equipment from things such as hydraulic, fuel, and lubricating fluids
- Steep access roads and cut and fill staging areas
- What is the runoff control/soil stability site plan for ROW, road, staging area and trenching impacts?
- What is the response plan in the event of failure?
- What are trigger points for action (such as if 2" of rain predicted, what additional measures are taken, or what measures are done at the end of the week before a long weekend)?
- Long term stability plan (vegetation) and plan for restricting public vehicular access within corridor (concern over mud-bogging)

<u>Impacts on groundwater resources and wells</u>

- Identify karst areas
- Downstream water supplies
- Sinkhole ponds and associated flora/fauna

<u>Impacts on protected species and habitat</u>

- Current and proposed FS sensitive species list (ex. Sherando spiny amphipod looks like it is within the proposed alternate corridor near Hickory spring)
- SBAs
- Locally rare species
- T&E species (for ex. James spinymussel, swamppink, VA sneezeweed, cowknob salamander are in/near/downstream from corridor, should probably address Madison Cave isopod also)

- MIS (ex. brook trout, beaver for aquatic/riparian spp)
- Trout streams
- Survey for and long-term control of NNIS

Impacts on property values, tourism, and recreational resources

- Recreational fishing resource and impact on angling

Atlantic Coast Pipeline Comments – Dr. Carol Croy, Forest Wildlife Biologist

Sensitive Species – The following sensitive species should be surveyed for, if habitat suitable for these is found on the proposed routes. Effects of proposed actions on sensitive species either found or suitable habitat found and assuming presence (in the case for hard to survey species) should be analyzed in the Biological Assessment of the EIS.

Virginia northern flying squirrel: spruce and northern hardwoods. Northern hardwood habitat can be found in the higher elevations along ridgetops in Highland county on the George Washington NF. Spruce can be found along riparian areas in high elevations in Highland county on the GWNF.

Southern water shrew: streams and riparian areas associated with northern hardwoods and/or spruce

Southern rock vole: cool, moist mossy talus areas in northern hardwoods

Bald eagle: See Bald and Golden eagle act section

Peregrine falcon: Peregrine falcons have recently been documented expanding their breeding range into western Virginia. Any exposed clifflines encountered along the proposed route should be surveyed for potential breeding activity

Management Indicator Species – The following Management Indicator Species (MIS) will need to be surveyed for in the proposed project area and effects of the proposed pipeline project evaluated for the species found present, or habitat suitable for the species found present, in the EIS, biological environment section.

Cow Knob Salamander, Pileated woodpecker, Ovenbird, Chestnut-sided warbler, Acadian flycatcher, Hooded warbler, Scarlet tanager, Pine warbler, Eastern towhee, Wild brook trout, Eastern wild turkey, black bear, White-tailed deer, Beaver.

Regulatory reasons why Management Indicator Species need to be considered in this project and descriptions of why these species were selected as MIS can be found on pages 2-18 and 2-19 of the George Washington National Forest Revised Land and Resource Management Plan

Bald and Golden Eagle Act - Both bald and golden eagles are known to be on or near the George Washington National Forest. Bald eagles actively nest along and on ridges adjacent to the Back Creek, Jackson, North, and James Rivers. Golden eagles are known to winter on ridges in the George Washington National Forest, both along the Allegheny and Blue Ridge Mountains. Both have large breeding and wintering ranges. Recent camera trapping surveys for wintering golden eagles have documented a large population on the George Washington National Forest. Surveys for active nests for bald eagles will need to conducted. Effects of proposed gasline project on habitat for these species will need to analyzed and appropriate mitigation measures taken to comply with the Bald and Golden Eagle Act. Bald Eagles are also a Southern Regional Forester's Sensitive Species due to recent federal endangered species act postlisting requirements. Current bald eagle management recommendations are attached.

Locally Rare Species – Effects to locally rare species will need to analyzed in the EIS. An excel spreadsheet is provided that lists the locally rare species that are either known to be in the proposed route area, or habitat suitable for these species is present.

Soil Resource input for surveying needs regarding data collection for the Atlantic Coast Pipeline Project

- Use USDA NRCS Web Soil Survey for basic soil survey maps for the area.
- Survey area includes possible road locations and other associated facilities.
- Field verify soil survey maps with field soil profile descriptions. At least one description for each map unit. Identify soils not included in map unit descriptions found in Web Soil Survey (WSS). GPS field profile descriptions and areas of apparent slope failure, wetness and rock outcrop.
- Soil profile descriptions will use the protocols in the “Field Book for Describing and Sampling Soils”, National Soil Survey Center, Natural Resources Conservation Service, USDA.
- Field soil profile descriptions will include pH and slope.
- Field notes will include a decision on whether the soil profile description fits the map unit description or not and why.
- Survey Soil contact will consult with FS soil contact biweekly with schedule adjusted as needed.
- Field soil profile descriptions will be to 40 inches or bedrock using a bucket auger or shovel. Justification for bedrock is needed.
- Deliverables of a final map and spreadsheet showing locations and summary of each field description and a notebook containing original field notes will be received by FS.
- Field notes can include observations on surface features, such as wetness, slope failure, outcrops, shallow rooting, root wad descriptions, road cut notes, etc.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE PROJECT

APPENDIX H

Soil Erosion and Sedimentation Modeling Report

Monongahela and George Washington National Forests Biological Evaluation

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE
Docket Nos. CP15-554-000
CP15-554-001

Soil Erosion and Sedimentation Modeling Report

Monongahela National Forest

and

George Washington National Forest

March 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

ACP	Atlantic Coast Pipeline
Atlantic	Atlantic Coast Pipeline, LLC
ECD	erosion control device
ECP	Erosion Control Plan
GWNF	George Washington National Forest
HUC12	Hydrologic Unit Code 12
MNF	Monongahela National Forest
NRCS	Natural Resources Conservation Service
PPC	proposed pipeline corridor
Project	Atlantic Coast Pipeline
RA	Representative Areas
RUSLE	Revised Universal Soil Loss Equation
RUSLE2	Revised Universal Soil Loss Equation, Version 2
SSURGO	Soil Survey Geographic
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation

EXECUTIVE SUMMARY

Soil disturbance associated with construction creates the potential for increased soil erosion and transport of eroded sediments into nearby streams during construction activities. This report evaluates the potential for soil erosion and transport from the proposed Atlantic Coast Pipeline (ACP or Project) on lands administered by the U.S. Forest Service (USFS) in the Monongahela National Forest (MNF) and the George Washington National Forest (GWNF). This analysis not only considers proposed activities on USFS-owned lands, but all construction activities in adjacent lands that have the potential to result in sedimentation on USFS-owned lands.

Erosion models were used to provide estimates of the soil loss and transport as well as the effectiveness of the Project-specific erosion control devices (ECDs). Soil loss, as used in this report, refers to soil leaving the construction workspace due to sheet and rill overland erosion. Detailed, fine-scale modeling of the proposed construction workspace in and adjacent to USFS-owned lands was performed using the Revised Universal Soil Loss Equation, Version 2 (RUSLE2). This model provides estimates of sheet and rill overland erosion during all phases of construction from initial clearing through restoration. RUSLE2 was chosen as the best and appropriate tool to estimate soil runoff from construction areas based on consultations with former Natural Resources Conservation Service (NRCS) scientists (Lightle, 2016). RUSLE2 is the product of decades of scientific research from its beginnings as a soil loss prediction tool for agriculture to more general use for various activities and soils. The NRCS and private consultants continue to develop and improve the model's capability, including construction sites.

Selected portions of the study area which represent stream crossings were inspected to provide greater detail of these environmentally sensitive areas. The key takeaway of this analysis is to evaluate how effective proposed ECDs are in preventing potential soil loss. The results of the analysis will also aid in the determination of potential effects of the Project on sensitive resources. It should be noted that the erosion model predicts the sheet and rill overland erosion leaving the construction workspace, but not necessarily transport further downstream in a channel or stream. Once eroded soil enters a stream, the soil particles become suspended in the water. These soil particles will ultimately settle out as they flow away from the site, resulting in reduced downstream sediment delivery. The RUSLE2 erosion model does not simulate this reduction in sediment loading in streams, and therefore model predictions should not be used as an estimate of stream sediment delivery.

In addition to this analysis, broad scale watershed modeling with a simplified version of the model (the Revised Universal Soil Loss Equation [RUSLE]) was performed (see Appendix F). Although this modeling does not include the detail of the construction-site modeling, it provides an estimate of existing soil loss from the watersheds crossed by the Project. The key takeaway of this analysis is to compare the relative magnitude of potential soil loss estimated by the site-specific RUSLE2 analysis to the naturally occurring soil loss for the watersheds.

Construction activities associated with the ACP would impact approximately 413 acres of USFS-owned lands within the GWNF and MNF (see Table 2.1-1). An additional 566 acres of adjacent lands that have the potential to result in sedimentation on USFS-owned lands was also included in the analysis. The majority of the lands in the study area have moderate slopes (10 to 30 percent); about 25 percent have slopes steeper than 30 percent (see Table 6.6-1). The ECDs currently planned to mitigate soil erosion from the construction activities include silt fences, water diversion bars, mulching, and seeding. In addition, Atlantic Coast Pipeline, LLC (Atlantic) will employ Best-in-Class design and operational measures for construction in steep slopes (greater than 30 percent) to minimize or eliminate landslides during construction and operations. Because these Best-in-Class measures are related to slope failures rather than erosion they were not incorporated into this analysis. However, implementation of these measures will aid in the reduction of erosion and sedimentation beyond what is reported herein.

For this analysis, a typical construction scenario for each one-mile stretch of pipeline was assumed to last three months. The timing of construction was estimated based on common construction site practices:

- Week 1: Clearing, installation of ECDs
- Week 2 to Week 4: Initial grading, trenching, and installation of pipe
- Week 5: Backfilling and initial regrading
- Week 6: Temporary seeding with annual ryegrass and mulching with straw
- Week 12: Final grading and hydroseeding (mulch + seed + tackifier)

The most sensitive periods for erosion are when bare soil is exposed. In the estimated three month construction schedule there are four weeks (Week 2 through Week 5) of bare soil exposure. This schedule was applied to all construction activities except those occurring on very steep slopes. As steeper slopes are more susceptible to erosion, the construction activities on slopes greater than 30 percent will be accelerated in order to minimize the time of disturbance and exposure. For these slopes, the schedule (clearing to final grading and hydroseeding) was assumed to be compressed to two weeks for each 0.05 mile segment.

The model results showed that predicted erosion from disturbed soils in the study area, summarized by watershed, ranged from 2.2 to 8.0 tons/acre during the initial year of disturbance (see Table 8-1). This equates to about 19 to 71 yd^3/acre or 0.4 to 1.3 mm of soil loss.[1] Model results also showed that the predicted erosion drops dramatically in years subsequent to construction as the sites become revegetated. Predicted erosion rates generally dropped below 1 ton/acre by the second or third year after construction, approaching pre-construction conditions.

Model simulations demonstrated that the ECDs proposed have a high degree of effectiveness, reducing soil erosion by approximately 95 to 98 percent (see Appendix C, Section 1.4). These predicted sediment removal efficiencies are consistent with laboratory testing of devices such as the Silt-Saver Belted Strand Retention Fabric, which achieves 94 to 99 percent removal (Risse, 2006). As the proposed ECDs are highly effective in controlling erosion, using additional soil control devices such as more water diversion bars or double silt fences are only predicted to yield a marginal additional benefit (see Appendix C, Section 1.2 and Section 1.4).

A closer look at portions of the study area that represent stream crossings showed similar predicted erosion rates in the initial year (1.3 to 8.6 tons/acre; see Table 8-2). This represents an estimated 11 to 76 yd^3/acre or 0.2 to 1.4 mm of topsoil loss.[1] While some stream crossings show up to 28 tons leaving the construction site (and entering the stream) during the first year of disturbance, all of the sediment runoff from the construction area is not anticipated to reach the stream due to filtration by vegetation and infiltration into the soil. However, even if all of the sediment were to reach the waterbody,

---

1 These values were calculated using a soil bulk density of 1.34 g/cm^3, which is the weighted average of the bulk densities identified for the upper mineral horizons of the SSURGO map units crossed by the Project within the MNF and GWNF.

it would not likely result in an appreciable increase in turbidity. To put this in context, 1 ton/year of soil entering a stream with a flow of 1 cfs only represents an average concentration increase of 1 mg/l of suspended solids. For example, average annual stream flow for Back Creek near Sunrise (approximately 3.2 miles from the ACP) is 92 cfs (U.S. Geological Survey, 2017). If 28 tons of soil entered this stream at its crossing with the pipeline during the first year of disturbance it would result in an average increase of 0.3 mg/l in suspended solids. While the U.S. Environmental Protection Agency (USEPA) has not set numeric water quality criteria for suspended solids, it has published a water quality criteria recommendation for solids and turbidity that is based on light reduction (USEPA, 2003). This criterion is summarized in the 1986 USEPA Quality Criteria for Water as:

> *Solids (Suspended, Settleable) and Turbidity* - *Freshwater fish and other aquatic life: Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life.*

Although it is not known what the existing suspended solids and turbidity concentrations (and compensation depth) are at this location, it is unlikely that an increase of 0.3 mg/l would appreciably reduce light attenuation (i.e., Secchi) depth.

Model results using RUSLE for existing erosion in the watersheds crossed by the Project in the MNF and GWNF also help to put the predicted increased erosion into perspective. Using this model, on a watershed-wide scale the total natural sediment erosion ranged from 9,000 to 101,000 tons/year (see Appendix F). When compared to the total soil erosion for the areas identified in the site-specific RUSLE2 analysis, the predicted erosion due to activities in the first year of construction represent 0.2 to 2.3 percent of the existing annual erosion of the watershed.

Model sensitivities were conducted to determine what factors produce the greatest uncertainty in model predictions as well as which ECDs are most effective (see Appendix C). Installation of ECDs had the biggest effect on soil erosion. Installation of ECDs was predicted to reduce erosion by about 96 percent. Additional silt fences only increased the sediment trapping efficiency by less than an additional 1 percent. The accelerated schedule of steep slope construction produced an additional benefit reducing erosion by 1 to 2 percent. The seasonal construction schedule was predicted to have a significant impact on erosion as rainfall varies throughout the year. Construction beginning in July (the wettest month) was predicted to result in three times as much erosion as construction beginning in drier months such as April or August. For portions of the route where construction will begin during the months that typically receive a higher amount of rain, Atlantic will implement additional ECDs, as needed, based on current and forecasted conditions.

1.0 INTRODUCTION

The proposed Atlantic Coast Pipeline (ACP or Project) spans 28 Hydrologic Unit Code 12 (HUC12) subwatersheds in the Monongahela National Forest (MNF) and the George Washington National Forest (GWNF). Soil disturbance associated with construction creates the potential for increased soil erosion and transport of eroded sediments into nearby streams during construction activities. This report evaluates the potential for soil erosion and transport from the proposed ACP on lands administered by the U.S. Forest Service (USFS) in the MNF and GWNF.

Soil disturbances at the sites of construction have the potential to impact the local surrounding areas. Erosion controls included in the Project-specific Erosion Control Plans (ECPs) are designed to minimize these impacts. In order to address potential erosion and sediment transport impacts detailed soil erosion modeling was performed for the construction sites using information from the construction plans as well as the ECPs to provide site-scale erosion estimates and evaluate the effectiveness of the erosion control devices (ECDs).

The modeling described in this report is intended to be used as a planning tool to generally identify areas where higher erosion rates are anticipated and to refine the erosion and sediment control plans for work conducted on USFS-owned lands. Additionally, sensitivity analyses are used to demonstrate the potential benefits of various erosion and sediment controls on exposed lands and help identify important controllable factors during construction to ensure the protection of soil resources and sensitive areas that would be subject to erosion and/or sedimentation.

2.0 PROPOSED ACTION

2.1 PROPOSED FACILITIES

For the ACP, Atlantic Coast Pipeline, LLC (Atlantic) proposes to construct and operate approximately 603.8 miles of natural gas transmission pipelines and associated aboveground facilities in West Virginia, Virginia, and North Carolina (see Figure 2.1-1). Once constructed, the ACP will be capable of delivering up to 1.5 million dekatherms per day of natural gas that will be used to generate electricity, heat homes, and run local businesses. The Project will facilitate cleaner air, increase the reliability and security of natural gas supplies, and provide a significant economic boost in West Virginia, Virginia, and North Carolina. More information is provided at the company's website at www.dom.com/acpipeline. Atlantic has contracted with Dominion Transmission, Inc., a subsidiary of Dominion Resources, Inc., to permit, build, and operate the ACP on behalf of Atlantic. Atlantic is seeking authorization from the Federal Energy Regulatory Commission under Section 7(c) of the Natural Gas Act to construct, own, operate, and maintain the Project.

The Project crosses approximately 5.15 miles of the MNF in the Marlinton Ranger District in Pocahontas County, West Virginia, and approximately 15.98 miles of the GWNF in the Warm Springs, North River, and Glenwood-Pedlar Ranger Districts in Highland, Bath, and Augusta Counties, Virginia. On USFS-owned lands, the ACP will consist of a 42-inch-diameter buried steel pipeline. No above-ground facilities are proposed on USFS-owned lands. Minor appurtenant facilities that would be placed on USFS-owned lands consist of pipeline markers and cathodic protection test stations.

The ACP proposes to utilize a 125-foot-wide construction right-of-way for installation of the 42-inch pipeline, with a 40-foot-wide spoil side and an 85-foot-wide working side. For most pipeline construction activities, a right-of-way width of 125 feet would accommodate large equipment, pipe stringing and set up, welding, trenching, and the temporary storage of topsoil and trench spoil. In wetlands and certain other ecologically sensitive areas, the construction right-of-way width will be reduced to 75 feet.

Additional temporary workspace, which would extend outside of the construction right-of-way, is proposed for road, wetland, and waterbody crossings and places where additional spoil storage, log landings, or equipment staging is needed. Atlantic notes that discussions with the USFS concerning potential areas for topsoil segregation are ongoing and could impact the width of the construction right-of-way for any areas requiring additional temporary workspace to accommodate topsoil storage. Table 2.1-1 shows the acreage affected on the MNF and GWNF for construction (temporary workspace), the permanent right-of-way, and access roads.

Construction of the ACP will require roads for access to the right-of-way. In the MNF, six access roads have been identified, including four existing USFS roads that would require improvements and two new access roads that would be constructed for the Project, one of which would be temporary. In the GWNF, 12 access roads have been identified, including 6 existing USFS roads that would require improvements, and 6 new access roads that would be built for the Project. Typical improvements to existing roads will range from regrading and graveling of existing road prisms (and of three existing trails). Improvements for existing roads identified for larger trucks and trailers will be evaluated on a case-by-case basis. New roads will include short spurs ranging from less than approximately 0.4 mile long to 5.3 miles long that are needed to connect existing roads with the proposed right-of-way. Once the pipeline is installed, 17 of the roads will be used to access the right-of-way for operations and maintenance purposes. The remaining road will be restored to pre-existing conditions following construction.

The ACP proposes to utilize a 53.5-foot-wide permanent right-of-way for operating purposes. The permanent right-of-way will be maintained in an herbaceous state in non-cultivated uplands to allow for maintenance access along the right-of-way, although no permanent access road will be established on or along the right-of-way. In wetlands, a reduced 10-foot-wide corridor centered over the pipeline will be maintained in an herbaceous state, while trees greater than 15 feet tall within 15 feet of the pipeline will be cut and removed from the right-of-way. No access roads will be established on or along the right-of-way. Atlantic notes that discussions with the USFS concerning pipeline maintenance are ongoing and could impact the width of the maintained easement.

3.0 MODEL SELECTION

The Revised Universal Soil Loss Equation, Version 2 (RUSLE2) soil erosion model was used to estimate soil runoff from Project workspaces within the GWNF and MNF. RUSLE2 was chosen after investigation of various runoff models and consultation with experts in RUSLE2 modeling, including former Natural Resources Conservation Service (NRCS) scientists. Based on these investigations and consultations, it was determined that RUSLE2 is the appropriate and best tool available to estimate soil runoff from construction areas (Lightle, 2016).

3.1 UTILITY

The RUSLE2 is the end-product of more than 70 years of scientific research and field experience and is one of the best available models for soil-loss and sediment delivery estimation (U.S. Department of Agriculture [USDA], 2013). RUSLE2 models both sheet and rill erosion and sediment deposition on a hill slope profile, ending at a concentrated flow channel. The model is capable of both simple single segment hill slope profiles as well as complex multi-segmented hill slopes where changes in land use and treatment, soils and changes in topography can be specified.

While other models exist they are typically obsolete in terms of climate data or the databases are not available for construction site activities (Lightle, 2016). Support for RUSLE2 is ongoing since the USDA-Agricultural Research Service continues to support and update the model. Additionally, the NRCS and private consultants continue to develop and improve the data files used in RUSLE2, especially for construction sites, and will continue to make them publically available upon request.

RUSLE2 can be used with full confidence that it meets high scientific standards and produces reliable results for conservation and erosion control planning for all lands where rill and interrill erosion occur by rainfall and Hortonian overland flow. The model is also land-use independent, allowing for soil erosion estimates anywhere where mineral soil is exposed (USDA, 2013). This capability is a major advantage when applying RUSLE2 to disturbed lands such as construction sites (Lightle, 2016).

3.2 LIMITATIONS

Current limitations of RUSLE2 include the inability of the model to simulate concentrated flow or gully erosion, landslide or mass wasting, snow melt erosion and wind erosion; exclusion of these factors will influence the soil erosion estimates. Additionally, slope lengths are limited to 1000 feet based on the erosion plot studies on which the science is based. Slope steepness is also limited to a 100 percent slope, or 45 percent rise. Details of these limitations can be found in USDA (2013).

3.3 UNCERTAINTY

The uncertainty of the RUSLE2 model input variables will impact the accuracy of the model output (sediment delivery) values. The models input variables are based on the Best Professional Judgment of the Subject Matter Experts that have direct experience with the data used in the model (USDA, 2013). According to the NRCS Official RUSLE2 Program Website as of 2015, confidence in model results are best (±25 percent) when the resultant sediment delivery is between 4 and 30 tons/acre/year and the least (>±100 percent) when resultant sediment delivery is less than 1 ton/acre/year. Results that range between 1 and 4 and 30 and 50 tons/acre/year have a moderate confidence level (±50 percent). When resultant sediment delivery is greater than 50 tons/acre/year, confidence levels are lower (>±50 percent) (Lightle, 2016).

For purposes of pre-construction, during construction, and post-construction comparisons; if model output resulted in sediment delivery less than 1 ton/acre/year, conditions were considered equal since the level of accuracy suggests that sediment delivery from the site would remain constant. To most appropriately reflect model output accuracy, results in ton/acre/year should be considered as whole numbers (Lightle, 2016).

4.0 UNIVERSAL SOIL LOSS EQUATION AND RUSLE2

RUSLE2 estimates rates of rill and interrill soil erosion caused by rainfall and its associated overland flow. The major factors of climate, soil, topography, and land use determine rates of rill and interrill erosion. RULSE2 is based on the Universal Soil Loss Equation (USLE):

$$A = R * K * LS * C * P$$

Where: A = Net detachment (mass/unit area)

R = Rainfall/runoff erosivity factor

K = Soil erodibility factor

L = Slope length factor

S = Slope steepness factor

C = Cover management factor

P = Supporting practices factor

The original USLE used only one R, one K, one LS, one P factor, and a limited number of C factors for the entire yearly soil loss calculation. RUSLE2 is far superior because it provides daily soil loss calculations based on daily changes in rainfall, temperature, plant growth, residue decay, soil surface roughness, and the placement of supporting practices in precise locations and at specific points in time during the construction timeline. In addition, RUSLE2 models the establishment period from seeding through germination and can be set to continue modeling the establishment period of new seeding into future years. It also accounts for various soil disturbance activities involved in the construction and revegetation timeline.

The RUSLE2 application for this study was customized in consultation with former NRCS scientist David Lightle in order to accurately represent the site- and Project-specific details, which includes baseline conditions, construction details, and management plans. The model is intended to provide erosion estimates to support construction management planning, not as a definitive quantitative prediction of erosion. As stated in the model documentation, RUSLE2 was developed primarily to guide conservation planning, inventory erosion rates, and estimate sediment delivery (Purdue, 2016). The results presented in this report reflect preliminary erosion estimates that can be used in an iterative process to refine construction activities and ECPs.

5.0 MODELING APPROACH

The modeling approach developed for the Project involved analyzing segments of the proposed pipeline and access roads that either intersect USFS-owned lands or have predicted overland flow (i.e., runoff) paths that lead to USFS-owned lands. This resulted in approximately 47 miles and 979 acres of new construction with the potential to impact USFS-owned lands. These identified sections were further separated into approximately 0.05 mile sections for modeling, resulting in a total of 943 segments (Segments).

Segments of similar hillside conditions (i.e., rainfall, soil type, slope length, slope grade, and control devices) were grouped together into Representative Areas (RAs) and model simulations were performed for each RA, which were assumed to represent the soil erosion rate from all Segments in that grouping. Selected Segments of unique conditions, such as ones with extremely steep slopes, access roads, or stream crossings, were simulated by unique model simulations.

Concentrated flow channels (i.e., streams or water diversion bars) defined the bounds of the Segments, as these represent where sheet and rill erosion of a slope stops. In a few cases, some Segments included run-on areas beyond the construction workspace. These run-on areas were not simulated in the modeling due to the assumption of an ECP that includes diversion berms designed to prevent run-on from undisturbed upslope areas.

RUSLE2 was used to generate yearly soil erosion rates for each RA under the following different scenarios:

- Baseline – present conditions before construction begins; and

- Construction and Recovery – includes five years after construction commencement and encompasses the entire construction cycle and subsequent recovery and regrowth.

It should be noted that the estimated soil runoff represents the amount of sediment delivered to the end (bottom of) of the workspace Segment slope. Subsequent soil delivery from the workspace to areas of interest further downslope from the workspace would be less due to the additional perimeter controls installed outside the flow path. Examples of these controls include silt fence, filter socks, and other features that are installed along the perimeter of the workspace to capture sediment detached from disturbed areas. Therefore, the estimated sediment erosion in the disturbed areas is greater than what would be expected to actually flow off the workspace areas. Similarly, once eroded soil is delivered to streams, the sediment delivery further downstream will be less due to in-stream sedimentation.

6.0 MODEL APPLICATION

6.1 IDENTIFICATION AND DELINEATION OF SEGMENTS

Sections of the proposed pipeline corridor (PPC) were identified as having a potential erosion impact to USFS-owned lands if the Segment intersected or had predicted overland flow paths that lead to USFS-owned lands. Therefore, the PPC selected for the erosion modeling analysis includes sections that physically cross through USFS-owned lands and sections that may have sediment delivery further downstream to USFS-owned lands.

Overland flow paths were generated every 0.1 miles along the PPC centerline using the "Trace Downstream" tool available in ArcGIS (http://www.arcgis.com/home/item.html?id=5314c23c24484c68ac961f8772be813b). Intermittent and perennial streams were identified using field survey data and the National Hydrography Dataset, where field survey data was not available. Based on this approach, approximately 46.8 miles of the PPC were identified as potentially impacting streams on USFS-owned lands. These areas were then broken into approximately 0.05 mile (~264 feet) Segments for erosion modeling analysis. Figures showing flow paths associated with the sections of the PPC that pass near USFS-owned lands are included in Appendix D. Flow paths that do not lead to USFS-owned lands are shown as light-blue lines. Flow paths that were found to intersect any of the USFS-owned land are shown as light-red lines; intersecting areas are boxed in purple.

6.2 RAINFALL/RUNOFF EROSIVITY

The PPC has the potential to impact USFS-owned lands in five counties: Randolph and Pocahontas Counties in West Virginia, and Highland, Bath, and Augusta Counties in Virginia. Rainfall from the RUSLE2 databases was used based on location of the Segment along the PPC. The table below shows the milepost ranges where a specific county's rainfall erosivity database was used in the analysis.

Mileposts	County	R-factor
60.0 - 66.6	Randolph, WV	170
66.7 - 83.9	Pocahontas, WV	170
84.0 - 91.6	Highland, VA	140
91.7 - 106.8	Bath, VA	150
106.9 - 160.0	Augusta, VA	150

Each of these RUSLE2 climate records contains monthly average precipitation data from the official National Oceanic and Atmospheric Administration weather database for the period from 1970 to 2000, which was used to generate the daily rainfall erosivity or daily R-factors. Figure 6.2-1 shows the monthly rainfall erosivity for Pocahontas and Bath Counties. All five counties have similar annual and seasonal distributions of monthly rainfall and erosivity due to their close proximity to one another; they all have the highest precipitation occurring in July. The counties in West Virginia have slightly greater average rainfall, resulting in larger R-factor values.

Snowfall is not accounted for in RUSLE2, as it does not directly result in soil erosion when allowed to melt naturally; only erosive precipitation is included in the RUSLE2 climate records. An R-factor value is the average annual sum of the product of a storm's total energy and the storm's maximum 30-minute intensity. Thus, greater erosivity occurs where large amounts of rainfall occur at a high intensity. Erosion is generally directly proportional to R (i.e., all factors being equal, a 2x increase in R will yield a 2x increase in erosion); however, other factors also influence the effective erosivity. For example, water depth over a soil surface has a cushioning effect that reduces the erosivity of rainfall. The R-factor value is reduced on flat slopes and for intense rainfall.

6.3 SOIL ERODIBILITY

Soil Erodibility data was obtained from a combination of the Order 1 Soil Survey conducted by Atlantic in the MNF and GWNF and Soil Survey Geographic (SSURGO) data (Soil Survey Staff, 2016). The Order 1 Soil Survey data provides soil classifications and estimated K-values. However, this survey consists of field measurements with a spatial coverage that is limited to the PPC that crosses USFS-owned lands. The SSURGO database, which was used in areas outside the Order 1 Soil Survey corridor, also provides soil classifications and rock-free K-values. From the combined Order 1 Soil Survey and SSURGO datasets, it was determined that the PPC generally consists of medium-textured, skeletal soils (loams and silt loams with high rock contents in the soil profile). These soils have a relatively thin topsoil layer, medium-to-high organic matter percent at the surface, and have less coarse fragments at the surface than the underlying subsoil. The combined soil dataset was used to determine the average K-factor within each Segment.

Segment averaged K-factors were rounded up to the nearest 0.1 when grouping to RAs; rounding up provides more conservative estimates (i.e., greater resulting erosion estimates). The Segment averaged soil property and K-factor was matched to a RUSLE2 database with the most similar characteristics. The best matches for the identified soils characteristics within the PPC were:

- Undisturbed sandy loam, moderate to high organic matter, K = 0.2
- Undisturbed silt loam, moderate to high organic matter, K = 0.3
- Undisturbed silt loam, low to medium organic matter, K = 0.4

Permeability was not field-measured but was assumed to be medium-to-high based on the medium- to coarse-textured soils found along the majority of the PPC.

6.4 SLOPE LENGTH AND STEEPNESS

Slope steepness was calculated for each of the Segments using United States Geological Survey (USGS) 10 Meter Digital Elevation Model at its native resolution (USGS, 2016). RUSLE2 can take slope steepness values either in degree rise or percent rise. For this analysis, average percent rise was calculated for each Segment (rounded up to the nearest 5 percent). The average percent rise of each Segment was used to determine slope lengths by referencing the temporary waterbar spacing from the *West Virginia Erosion and Sediment Control Best Management Practice Manual*, *Virginia Erosion and Sediment Control Handbook*, and FERC *Upland Erosion Control*, *Revegetation, and Maintenance Plan*. The slope length values used in the analysis are shown in the table below.

State	Slope Rise (%)	Slope Length (feet)
West Virginia	0 – 5	300
West Virginia	5 – 10	175
West Virginia	10 – 15	125
West Virginia	15 – 20	100
West Virginia	20+	75
Virginia	0 – 7	100
Virginia	7 – 25	75
Virginia	25 – 40	50
Virginia	40+	25

6.5 GROUNDCOVER

6.5.1 Existing Conditions

The baseline pre-construction conditions of groundcover and canopy assumed in the RUSLE2 model runs were estimated from aerial imagery. The PPC crosses through predominately forested areas with some grassland. The grasslands were estimated to have maximum canopy cover value of 73 to 75 percent, and forested areas were estimated to have maximum canopy cover of 95 percent. Figure 6.5-1 presents the modeled seasonal distributions of canopy cover where the green shaded graph is forest and the red shaded graph is grass and forbs.

For this modeling effort, new perennial vegetation records were developed specifically for the growing season conditions for the Central Northeast Forage Production Zone for areas in Randolph and Pocahontas Counties, Lower Northeast Forage Production Zone for areas in Highland County, and the Upper Mid South Forage Production Zone for areas in Bath and Augusta Counties (Figure 6.5-2). The grass and forbs were modeled to have primary growth occurring from April through June and secondary growth occurring in September and October.

The difference between fully established grassland and forest cover was very minor in the model, with grasslands providing a slightly more conservative (i.e., higher versus lower) estimate of erosion (see Appendix C, Section 1.3). As such, grassland was assumed as the primary groundcover for baseline pre-construction conditions within the PPC.

6.5.2 Construction and Recovery Conditions: Overview

Management scenarios and construction timelines were defined for two construction scenarios: typical construction (with slopes less than 30 percent) and steep slope construction (with slopes greater than or equal to 30 percent). Typical construction timing was assumed to take three months for a one-mile-long section; this is a reasonable assumption as the total PPC is estimated to take 6 to 8 months to complete with multiple construction teams. Steep slope construction will have an expedited timeline of two weeks for each 0.05 mile segment to minimize the duration of bare soil exposure.

Identified Segments of the Project workspace were classified as either “corridor” or “access road”. For the Corridor Segments it was assumed that 75 percent of the area will be cleared and graded. The remaining 25 percent will have trees removed and understory shrubs trimmed but will not be graded (i.e., bare soil will not be exposed). Both the graded and ungraded portions of the corridor will be reseeded during restoration activities. Access road Segments were assumed to follow the same expedited two week timeline as steep slope construction but will have gravel applied in place of trenching and reseeding.

The construction activities that occur during the construction timing for either of the two scenarios are as follows:

- Clearing, initial grading, and creation of waterbars (initial tree removal will completed by hand and will have minimal ground disturbance);
- Installation of applicable erosion control devices at perimeter locations;
- Trenching and addition of pipeline;
- Backfill and rough grading (final grading is included here for the steep slope construction scenarios);
- Application of annual ryegrass for temporary cover (typical construction scenario only);
- Application of blown small grain straw (typical construction scenario only);
- Final grading (typical construction scenario only);
- Tracking with dozer with cleat marks perpendicular to slope direction;
- Application of nutrient additions (fertilizer and lime); and
- Hydroseeding of wood fiber bonded fiber matrix product and grass and forbs seed mix.

The Construction and Recovery conditions implemented in RUSLE2 were developed from the site-specific ECPs developed for the Project. Vegetation growth and maintenance of the sediment barriers are the primary methods to prevent erosion after the pipeline has been installed; therefore, the model evaluated a total of five years to demonstrate how the grass would reestablish and provide soil protection during the restoration and recovery conditions.

6.5.3 Construction and Recovery Conditions: Typical Scenario

The construction timings for the typical scenario, where Segment slopes are less than 30 percent, was approximated to take three months. The construction timeline was assumed to begin April 1 and continue for approximately 90 days throughout the higher rainfall erosivity periods of May and June. Varying the months which construction occurs will have an influence on soil erosion rates, as primary soil erosion factors that vary by month include rainfall erosivity, vegetation growth, and vegetation growth duration before frost. Thus, additional model sensitivity analysis was conducted on various construction terms and can be found in Appendix C, Section 1.5.

Waterbars and silt fences were assumed to be installed at each of the Segments immediately after clearing. Waterbars will be constructed across the slope, shaped to capture the flow from upslope and divert it to the edge of the construction corridor, and have an effective channel grade of no more than 4.0 percent. Waterbars will have a filter sock formed around the discharge end of the channel in the shape of a ‘J’ to trap sediment leaving the channel. Slope segments that terminate at waterbars were modeled in RUSLE2 as having a 4.0 percent grade diversion at the end of the slope.

Trenching and pipe installation operations were assumed to occur after placement of sediment silt fences. Waterbars were assumed to be immediately replaced after backfilling, persisting throughout the five years of modeling. Following pipe installation and backfilling, a temporary seeding of 60 pounds per acre of annual ryegrass and 3 tons of small grain straw was assumed. Approximately three months after the start of construction, the ground was assumed to be trackwalked, followed by the additional nutrients, which includes pH adjustment and other amendments based on soil test results, and finally covered with a Project-specific seed mix, mulch, and a bonded fiber matrix applied via hydroseeding equipment. The plant growth effects of applied soil amendments were accounted for in the yield or production level being modeled to achieve 75 percent canopy. The seed mix was assumed to be a grass and forbs mix based on the seed mixes specified in the Project-specific *Rehabilitation and Restoration Plan*, and hydroseeded with a total of 3,500 pounds per acre of bonded wood fiber matrix product.

Since the seed mixes include several species of native grasses, forbs, and other plants, a vegetation record with an annual growth or production distribution was created to represent the conditions of seasonal canopy development and leaf senescence throughout the seedling establishment period until an established stand is achieved. A typical maximum herbaceous cover of 75 percent was assumed for an established stand in three years with gradual increase in herbaceous cover and production occurring in years one and two. Figure 6.5.3 presents a plot of modeled vegetative cover development for seeded grass and forbs vegetation over five seasons from the date of seeding. Note the seasonal growth, development and decline in canopy over each season and increase in seasonal maximum canopy from year one through year three as the stand matures.

Recovery was modeled for five years following the start of construction. It was assumed erosion control devices would remain where they were initially placed and would be maintained until a uniform stand of perennial vegetation is established in the RAs. The assumption of maintenance would include removing accumulated sediment behind sediment barriers and in waterbars, repairing or replacing sediment barriers that have decayed or been undercut or overtopped during the vegetation establishment period, and reshaping of waterbars as necessary.

6.5.4 Construction and Recovery Conditions: Steep Slope Scenario

The construction timing for the steep slope scenario, where Segment slopes are greater than or equal to 30 percent, was approximated to take approximately two weeks for each 0.05 mile segment. Additional differences between the steep slope construction scenario and the typical construction scenario are:

- clearing, initial grading, and sediment control devices occur within the first week;
- within the second week, trenching and pipe installation operations occurs immediately after (for Segments classified as "access roads", gravel is applied in this step with no hydroseeding to follow); and
- hydroseeding mulch rate increased to 4,000 pounds per acre of bonded fiber matrix product.

Reducing the duration of bare soil exposure on steep slopes will drastically lessen the potential for sediment erosion. Recovery in the steep slope scenario was modeled for five years with the same assumptions as listed in the typical construction scenario. The effects of slope percentage on erosion rates are examined in Appendix C, Sections 1.1.

6.6 GROUPING SEGMENTS INTO REPRESENTATIVE AREAS

As discussed previously, approximately 47 miles of the PPC were identified to intersect or have flow paths that intersect USFS-owned land. These areas were identified as Segments which would be included in the RUSLE2 erosion modeling. Table 6.6-1 provides a summary of the Segments at the subwatershed level. Table 6.6-2 provides a summary of the Segments that are classified as stream crossings. Figures showing the stream crossing Segments are included in Appendix E. Note, as mentioned in the modeling approach, these summaries do not include the portions of the construction footprint that are not predicted to have runoff pathways within or leading to USFS-owned lands.

As a whole, both subwatershed Segments and stream crossing Segments have soil erodability (K-factor) values ranging from 0.2 to 0.4; the average soil erodibility for subwatershed Segments is 0.33 and stream crossing Segments have an average of 0.30. Roughly 75 percent of the Segments had slope percentages under 30 percent, falling into the typical construction scenario. Nine percent of the Segments had slope percentages above 40 percent.

Stream crossing Segments were found to have similar totals for slope ranges and percentages as subwatershed Segments. Sixty-five percent of Segments had slopes below 30 percent, with 20 percent of Segments having slope above 40 percent. This indicates that, on average, Segments near crossed waterbodies have steeper slopes compared to the average slopes of all identified Segments.

The 943 Segments were grouped based on similar conditions (slope length, slope steepness, soil type, rainfall, erosion control) into 101 RAs. Table 6.6-3 summarizes the RAs modeled in this analysis. RUSLE2 model runs were performed for each RA providing estimates of sediment delivery in ton/acre/year. Total sediment eroded was calculated as the product of the delivery rate, area, and duration to estimate entire workspace erosion potentially impacting USFS-owned lands.

7.0 MODEL SENSITIVITY

Various modeling scenarios were developed to study the model sensitivity to different management options and controls. Details of the sensitivity analyses are provided in Appendix C, including discussion about accuracy of the results produced by RUSLE2. The sensitivity analyses focused on the first year when construction is anticipated to be initiated and completed. The key points of the sensitivity analyses include:

- Steep Slope Analysis: disturbed areas with no erosion controls have much higher rates of predicted erosion as compared to areas where erosion controls devices are in place. Additionally, the reduced timeframe of construction on steep slopes has a large impact at reducing erosion rates when compared to both longer timeframe and no controls.

- Slope Length Analysis: addition of waterbars at closer spacing along steep slopes (thereby decreasing the slope length) provides only minor improvements in erosion prevention.

- Vegetative Cover Analysis: the type of vegetation assumed in the baseline condition – either grassland or forest – has little effect on the pre-construction erosion predictions. Therefore, it is not necessary to parse out the small portions of the existing right-of-way that are forested from those that are maintained as grassland.

- Construction Erosion Control Devices Analysis: the application of site-specific ECDs has a large reduction in soil erosion when compared to construction with no erosion controls. However, adding additional silt fence or filter sock yields marginal benefits.

- Construction Term Analysis: varying the construction term changes many model parameters associated with the months-of-construction, such as rainfall erosivity and vegetation growth period, which affects the erosion rate. Starting the construction term in April will yield the lowest erosion rates, while starting construction in July yields the highest erosion rates.

8.0 RESULTS

After grouping the 943 Segments by similar conditions, a total of 101 unique RAs were simulated that represent the workspaces on or adjacent to USFS-owned lands. As described in Section 6.5.3, the typical construction scenario timeframe of three months was assumed for Segments that have slope percentages less than 30 percent. This accounts for 75 percent of the subwatershed Segments and 65 percent of the stream crossing Segments.

The model results showed that predicted erosion from subwatershed segments ranged from 2.2 to 8.0 tons/acre during the initial year of disturbance (see Table 8-1). This equates to about 19 to 71 yd^3/acre or 0.4 to 1.3 mm of soil loss.[2] The stream crossing Segments showed similar predicted erosion rates in the initial year (1.3 to 8.6 tons/acre; see Table 8-2). This represents an estimated 11 to 76 yd^3/acre or 0.2 to 1.4 mm of topsoil loss.[2]

Total soil loss during the first year of construction was generally less in stream crossing Segments compared to subwatershed Segments if both areas were of comparable size. Specifically, the stream crossing Segments encompass a total of 71.1 acres, roughly 7.3 percent of the 979.4 acres that the subwatershed Segments encompass; however, the total soil loss due to the first year of construction for stream crossing Segments was only 5.8 percent of the total soil loss for the subwatershed Segments. This decrease in soil loss within the stream crossing Segments is mainly due to increased ECDs in these areas, including additional sediments barriers on either side of a stream crossing.

Model results showed that the predicted erosion dropped dramatically in years subsequent to construction as the sites become revegetated. Predicted erosion rates generally dropped below 1 ton/acre by the second or third year after construction. In the second year after construction, the growth of vegetation substantially reduced the erosion rates regardless of the slope or whether the Segment crosses a waterbody. By the third year, after two full growing seasons, erosion rates were comparable to pre-construction levels in 885 Segments, or 94 percent of all Segments. After the third full growing season, all areas were predicted to yield less than or equal to than 1 ton/acre/year, which approximates pre-construction erosion rates.

As expected, model results showed that erosion rates increased with steeper slopes and higher erodibility values. However, the effectiveness of the steep slope construction scenario can be seen in the results. For example, the *Jim Dave Run – Back Creek* and *Bolar Run – Jackson River* subwatersheds have the largest fraction of slope percentages greater than 40; however, their erosion rates were less than the *Dry Fork – Elk River* and *Headwater Knapp Creek* subwatersheds, which have a much smaller fraction of steep slopes. The expedited construction timeline limits the bare soil exposure duration which results in lower erosion rates, even though the slopes are steeper. Overall, the modeling indicated that predicted erosion rates on slopes greater than or equal to 30 percent would generally be lower than shallower slopes in the first year due to the expedited construction sequencing along these slopes. However, revegetation on these steep slopes is anticipated to evolve more slowly and would result in

---

2 These values were calculated using a soil bulk density of 1.34 g/cm^3, which is the weighted average of the bulk densities identified for the upper mineral horizons of the SSURGO map units crossed by the Project within the MNF and GWNF.

slightly higher predicted erosion rates than on shallower slopes in the second and third years after construction.

Model sensitivities were conducted to determine what factors produce the greatest uncertainty in model predictions as well as which ECDs are most effective (see Appendix C). Installation of ECDs had the biggest effect on soil erosion. Installation of ECDs was predicted to reduce erosion by about 96 percent. These predicted sediment removal efficiencies are consistent with laboratory testing of devices such as the Silt-Saver Belted Strand Retention Fabric, which achieves 94 to 99 percent removal (Risse, 2006). Additional silt fences only increased the sediment trapping efficiency by less than an additional 1 percent. The seasonal construction schedule was predicted to have a significant impact on erosion as rainfall varies throughout the year. Construction beginning in July (the wettest month) was predicted to result in three times as much erosion as construction beginning in drier months such as April or August. For portions of the route where construction will begin during the months that typically receive a higher amount of rain, Atlantic will implement additional ECDs, as needed, based on current and forecasted conditions.

Model results using the Revised Universal Soil Loss Equation (RUSLE) for existing erosion in the watersheds crossed by the Project in the MNF and GWNF also help to put the predicted increased erosion into perspective. Using this model, on a watershed-wide scale the total natural sediment erosion ranged from 9,000 to 101,000 tons/year (see Appendix F). When compared to the total soil erosion for the areas identified in the site-specific RUSLE2 analysis, the predicted erosion due to activities in the first year of construction represent 0.2 to 2.3 percent of the existing annual erosion of the watershed.

9.0 DISCUSSION

Existing erosion within the PPC is low due to the stabilized condition of the forest and grass cover. Construction will be expected to increase erosion for a short period of time, as demonstrated by the model results. The modeling indicates that implementation of suitable erosion and sediment management controls will reduce the predicted sediment load substantially. The most frequent controls assumed for the PPC in USFS-owned land is the installation of water diversion bars and standard silt fence that would be maintained throughout construction and until revegetation is successful. The model indicates that an approximate amount of sediment will detach from the areas disturbed during construction and be delivered to the sediment control devices directly in the flow paths of stormwater. However, additional perimeter controls not directly within the flow path will provide additional trapping of sediments to reduce the amount of sediment that leaves the workspaces. Therefore, the amount of sediment that will need to be managed during construction will likely be less than the erosion rates reported in Section 8.0.

While some stream crossings show up to 28 tons leaving the construction site (and entering the stream) during the first year of disturbance, all of the sediment runoff from the construction area is not anticipated to reach the stream due to filtration by vegetation and infiltration into the soil. However, even if all of the sediment were to reach the waterbody, it would not likely result in an appreciable increase in turbidity. To put this in context, 1 ton/year of soil entering a stream with a flow of 1 cfs only represents an average concentration increase of 1 mg/l of suspended solids. For example, average annual stream flow for Back Creek near Sunrise (approximately 3.2 miles from the ACP) is 92 cfs (USGS, 2017). If 28 tons of soil entered this stream at its crossing with the pipeline during the first year of disturbance it would result in an average increase of 0.3 mg/l in suspended solids. While the U.S. Environmental Protection Agency (USEPA) has not set numeric water quality criteria for suspended solids, it has published a water quality criteria recommendation for solids and turbidity that is based on light reduction (USEPA, 2003). This criterion is summarized in the 1986 USEPA Quality Criteria for Water as:

Solids (Suspended, Settleable) and Turbidity - Freshwater fish and other aquatic life: Settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life.

Although the existing suspended solids and turbidity concentrations (and compensation depth) are not available at this location, it is unlikely that an increase of 0.3 mg/l would appreciably reduce light attenuation (i.e., Secchi) depth.

Due to the short duration of the mechanical construction, the increase in erosion would be limited primarily to the first year, with some areas approximating pre-construction conditions within two full growing seasons following the installation of permanent restoration measures. Roughly 94 percent of the areas had predicted erosion rates comparable to natural erosion rates in the third year after construction. By the third growing season, the fourth year, all of the areas are expected to return to natural erosion rates.

It can be concluded that construction has the potential to increase erosion within subwatersheds resulting in higher sediment delivery at the outlets of the subwatershed. However, the overall increase of erosion and sediment delivery on the watershed scale is relatively modest.

10.0 REFERENCES

Lightle, D. 2016. Personal communication and consultations (see below for bio).

Purdue University. 2016. Publicly available RUSLE2 model documentation. Available online at: http://fargo.nserl.purdue.edu/rusle2_dataweb/About_RUSLE2_Technology.htm. Accessed October 2016.

Risse, T.M., S. Thompson, K. Harris, and J. Governo. 2006. Evaluation of Silt-Saver Belted Strand Retention Fabric for use as a Replacement for Type C Silt Fence. The University of Georgia Department of Biological and Agricultural Engineering. Submitted to Roger Singleton, Silt-Saver, Inc.

Soil Survey Staff. 2016. Web Soil Survey. Natural Resources Conservation Service, U.S. Department of Agriculture. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed 12-08-2016.

U.S. Department of Agriculture. 2013. *RUSLE2 Science Documentation*. Agricultural Research Service, Washington, DC. Available online at: https://www.ars.usda.gov/ARSUserFiles/60600505/RUSLE/RUSLE2_Science_Doc.pdf

U.S. Environmental Protection Agency. 2003. Developing Water Quality Criteria for Suspended and Bedded Secdiments (SABS) – Potential Approaches. Draft. Office of Science and Technology.

U.S. Geological Survey. 2016. USGS 10 Meter Digital Elevation Model (DEM).

U.S. Geological Survey. 2017. Data inventory for USGS station 02011460 Back Creek near Sunrise, VA Available online at: https://waterdata.usgs.gov/nwis/inventory/?site_no=02011460. Accessed 2/17/2017.

David T. Lightle (CPESC #651)

David T. Lightle is retired from the NRCS where he held various county, state and regional positions as a Soil Conservationist and Agronomist over his 44 year career. Prior to retirement, he worked as the Agronomist on the USDA, NRCS, Soil Interpretations Staff at the National Soil Survey Center in Lincoln, Nebraska. In that position, he served as national database manager for erosion prediction models (RUSLE2 and WEPS). In addition, he was the lead contact for the RUSLE2 model for NRCS and also developed the Soil Conditioning Index, the Soil Tillage Intensity Rating, and other tools used by staff in the 3000 NRCS field offices. David continues to work as an erosion and sediment control consultant. In his consulting work, he has utilized a new modified version of RUSLE2 containing new perennial vegetation modeling science to develop a specific database and custom user screens and access controls for each customer. Lightle has developed numerous new sediment barrier practice files, new mulch and commercial erosion control blanket files, new perennial vegetation files and new management files to represent common Best Management Practices required by Caltrans, Idaho Transportation Department, Southern California Edison and New Mexico Department of Transportation and Pacific Gas and Electric. Dave has also presented RUSLE2 training at EC -9, EC-10, and EC 14, 15 and 16 for the International Erosion Control Association.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Soil Erosion and Sedimentation Modeling Report

Monongahela National Forest and
George Washington National Forest

APPENDIX A - TABLES

TABLE 2.1-1

Summary of U.S. Forest Service Lands Affected by the Atlantic Coast Pipeline (acres)

National Forest	Temporary Workspace	Permanent Right-of-Way	Existing Access Roads	New Permanent Access Roads
Monongahela National Forest	47.0	33.1	29.1	1.5
George Washington National Forest	144.4	105.2	43.5	9.1
Total	**191.4**	**138.3**	**72.5**	**10.6**

TABLE 6.6-1

Subwatershed Segments Summary

Subwatershed (HUC12)	Segment Area [acres]	Segment Pipeline Length [miles]	County, State	Segment Erosivity (% each county)	Segment Erodability			Segment Slope (% of area)				
					Min	Mean	Max	[0 – 10]	[10 – 20]	[20 – 30]	[30 – 40]	[>40]
Bolar Run - Jackson River (HUC020802010102)	98.7	4.3	Bath, VA Highland, VA	150 (48.24%) 140 (51.76%)	0.22	0.36	0.40	19.64%	13.02%	26.84%	20.33%	20.17%
Cabin Creek - Mill Creek (HUC020802020106)	21.4	1.0	Bath, VA	150 (100%)	0.20	0.24	0.29	29.70%	35.15%	35.14%	0.00%	0.00%
Chair Draft - Calfpasture River (HUC020802020101)	32.7	1.9	Augusta, VA	150 (100%)	0.25	0.31	0.40	10.51%	27.53%	34.06%	25.62%	2.28%
Clover Creek - Greenbrier River (HUC050500030402)	162.6	7.4	Pocahontas, WV	170 (100%)	0.31	0.37	0.40	26.18%	29.48%	24.88%	12.76%	6.70%
Dry Fork - Elk River (HUC050500070102)	73.9	3.8	Pocahontas, WV Randolph, WV	170 (36.84%) 170 (63.16%)	0.20	0.32	0.40	33.44%	27.63%	27.03%	11.90%	0.00%
Dry Run (HUC020802010702)	50.9	2.4	Bath, VA	150 (100%)	0.20	0.28	0.40	20.94%	23.16%	39.42%	16.48%	0.00%
Hamilton Branch (HUC020802020104)	12.6	0.6	Augusta, VA	150 (100%)	0.22	0.25	0.40	0.00%	48.20%	18.05%	17.52%	16.23%
Headwaters Knapp Creek (HUC050500030202)	62.8	2.9	Pocahontas, WV	170 (100%)	0.20	0.30	0.40	8.59%	46.05%	36.62%	7.14%	1.59%
Inch Branch - Back Creek (HUC020700050703)	18.8	1.1	Augusta, VA	150 (100%)	0.21	0.26	0.30	9.64%	45.40%	32.15%	12.81%	0.00%
Jennings Branch (HUC020700050103)	56.0	3.5	Augusta, VA	150 (100%)	0.23	0.31	0.40	4.16%	35.22%	39.19%	16.34%	5.10%
Jim Dave Run - Back Creek (HUC020802010202)	113.7	5.6	Highland, VA Pocahontas, WV	140 (99.1%) 170 (0.9%)	0.22	0.33	0.40	3.26%	12.97%	27.43%	22.59%	33.75%
Lick Run - Stuart Run (HUC020802010704)	87.6	4.0	Bath, VA	150 (100%)	0.23	0.35	0.40	29.95%	27.75%	25.29%	13.93%	3.08%
Moffett Creek (HUC020700050105)	21.1	1.4	Augusta, VA	150 (100%)	0.23	0.31	0.40	48.17%	37.85%	10.10%	3.88%	0.00%
Old Field Fork (HUC050500070101)	86.5	3.7	Pocahontas, WV	170 (100%)	0.35	0.35	0.40	15.83%	41.52%	23.89%	17.48%	1.28%
Scotchtown Draft - Cowpasture River (HUC020802010701)	33.0	1.6	Bath, VA	150 (100%)	0.20	0.29	0.40	9.06%	17.02%	44.22%	22.61%	7.08%
Sitlington Creek (HUC050500030401)	47.2	2.2	Pocahontas, WV	170 (100%)	0.20	0.36	0.40	10.94%	13.68%	40.59%	25.68%	9.12%
Total	**979.4**	**47.2**			**0.20**	**0.33**	**0.40**	**18.23%**	**27.34%**	**29.48%**	**16.13%**	**8.81%**

TABLE 6.6-2

Stream Crossing Segments Summary

Waterbody ID	Approx. Milepost	Segment Area [acres]	County, State	Segment Erosivity	Segment Erodability			Segment Slope (% of area)				
					Min	Mean	Max	[0 – 10]	[10 – 20]	[20 – 30]	[30 – 40]	[>40]
spoe001	71.8	3.2	Pocahontas, WV	170 (100%)	0.35	0.35	0.35	67%	33%	0%	0%	0%
spoe019	80.8	2.1	Pocahontas, WV	170 (100%)	0.29	0.32	0.34	0%	50%	0%	50%	0%
spoe015	81.1	3.2	Pocahontas, WV	170 (100%)	0.40	0.40	0.40	0%	66%	0%	34%	0%
spoa402	81.5	3.2	Pocahontas, WV	170 (100%)	0.31	0.32	0.32	0%	0%	67%	33%	0%
spoa400	82.0	3.1	Pocahontas, WV	170 (100%)	0.26	0.27	0.29	0%	0%	0%	32%	68%
shia407	85.0	3.0	Highland, VA	140 (100%)	0.29	0.29	0.29	0%	0%	0%	31%	69%
shia410	85.1	2.9	Highland, VA	140 (100%)	0.30	0.31	0.33	0%	0%	0%	0%	100%
shia408 & shia409	85.4	3.0	Highland, VA	140 (100%)	0.26	0.27	0.29	38%	0%	33%	0%	29%
sbaa004	94.1	3.2	Bath, VA	150 (100%)	0.20	0.23	0.26	0%	0%	100%	0%	0%
obaa003 & sbaa014	96.3	2.2	Bath, VA	150 (100%)	0.20	0.20	0.20	47%	53%	0%	0%	0%
sbaa005	98.3	2.3	Bath, VA	150 (100%)	0.32	0.35	0.39	0%	0%	0%	0%	100%
sbaa006	98.9	3.0	Bath, VA	150 (100%)	0.27	0.31	0.40	0%	0%	71%	0%	29%
sbaa007 & sbaa021 & sbaa022	99.0	2.1	Bath, VA	150 (100%)	0.27	0.27	0.27	46%	0%	0%	0%	54%
sbaa003 & sbaa019	99.3	2.8	Bath, VA	150 (100%)	0.32	0.36	0.38	0%	37%	0%	37%	25%
saua436	115.8	1.7	Augusta, VA	150 (100%)	0.35	0.37	0.40	0%	100%	0%	0%	0%
saua435	116.5	1.7	Augusta, VA	150 (100%)	0.30	0.30	0.30	48%	0%	0%	52%	0%
saua416	117.0	1.5	Augusta, VA	150 (100%)	0.27	0.30	0.32	0%	0%	49%	0%	51%
saua418	117.2	1.7	Augusta, VA	150 (100%)	0.27	0.29	0.30	0%	0%	100%	0%	0%
saua419	117.7	1.9	Augusta, VA	150 (100%)	0.30	0.30	0.30	0%	0%	0%	100%	0%
saua427e & saua427p	120.2	2.3	Augusta, VA	150 (100%)	0.24	0.27	0.29	0%	32%	33%	0%	35%
saua428	120.4	1.5	Augusta, VA	150 (100%)	0.24	0.26	0.28	0%	54%	46%	0%	0%
saua429	120.5	1.5	Augusta, VA	150 (100%)	0.23	0.26	0.29	50%	50%	0%	0%	0%
saua438	121.0	1.5	Augusta, VA	150 (100%)	0.27	0.27	0.28	0%	51%	49%	0%	0%
saua421	122.5	1.5	Augusta, VA	150 (100%)	0.31	0.33	0.36	0%	100%	0%	0%	0%
saua422	122.8	2.2	Augusta, VA	150 (100%)	0.34	0.35	0.36	0%	30%	39%	32%	0%
saua423	123.0	1.6	Augusta, VA	150 (100%)	0.26	0.30	0.33	0%	0%	55%	45%	0%
saua072	154.2	2.1	Augusta, VA	150 (100%)	0.25	0.25	0.26	53%	0%	47%	0%	0%
saua434	154.4	0.7	Augusta, VA	150 (100%)	0.26	0.26	0.26	0%	0%	100%	0%	0%
saua071	154.5	1.5	Augusta, VA	150 (100%)	0.25	0.26	0.28	0%	54%	46%	0%	0%

TABLE 6.6-2

Stream Crossing Segments Summary

Waterbody ID	Approx. Milepost	Segment Area [acres]	County, State	Segment Erosivity	Segment Erodability			Segment Slope (% of area)				
					Min	Mean	Max	[0 – 10]	[10 – 20]	[20 – 30]	[30 – 40]	[>40]
saua433	154.8	1.6	Augusta, VA	150 (100%)	0.23	0.26	0.30	0%	52%	0%	48%	0%
saua432	154.9	1.8	Augusta, VA	150 (100%)	0.21	0.24	0.26	0%	53%	47%	0%	0%
saua431	155.0	1.0	Augusta, VA	150 (100%)	0.27	0.27	0.27	0%	0%	100%	0%	0%
saua430	155.1	1.8	Augusta, VA	150 (100%)	0.22	0.24	0.26	0%	100%	0%	0%	0%
saua064	155.2	0.7	Augusta, VA	150 (100%)	0.25	0.25	0.25	100%	0%	0%	0%	0%
Total		**71.1**			**0.20**	**0.30**	**0.40**	**12%**	**25%**	**27%**	**16%**	**20%**

TABLE 6.6-3

Representative Areas Summary

RA Description	Stream Crossing	County, State (R-factor)	Soil Type (K-factor)	Slope Length [feet]	Slope Percent	Controls	# Segments	RA Area [acres]
Corridor		Highland, VA (140)	Silt Loam (0.2)	100	5	Waterbar + FilterSock	2	2.0
Corridor		Highland, VA (140)	Silt Loam (0.3)	100	5	Waterbar + FilterSock	8	8.4
Corridor		Highland, VA (140)	Silt Loam (0.4)	100	5	Waterbar + FilterSock	11	12.5
Corridor		Highland, VA (140)	Silt Loam (0.3)	100	10	Waterbar + FilterSock	22	20.5
Corridor	Yes	Highland, VA (140)	Silt Loam (0.3)	100	10	Waterbar + FilterSock	3	2.9
Corridor		Highland, VA (140)	Silt Loam (0.4)	100	10	Waterbar + FilterSock	30	31.1
Corridor		Highland, VA (140)	Silt Loam (0.3)	75	15	Waterbar + FilterSock	25	25.0
Corridor		Highland, VA (140)	Silt Loam (0.4)	75	15	Waterbar + FilterSock	14	15.4
Corridor		Highland, VA (140)	Silt Loam (0.3)	75	20	Waterbar + FilterSock	41	39.4
Corridor		Highland, VA (140)	Silt Loam (0.4)	75	20	Waterbar + FilterSock	21	21.2
Corridor		Highland, VA (140)	Silt Loam (0.3)	75	25	Waterbar + FilterSock	46	46.5
Corridor		Highland, VA (140)	Silt Loam (0.4)	75	25	Waterbar + FilterSock	23	24.4
Corridor		Highland, VA (140)	Silt Loam (0.3)	50	30	Waterbar + FilterSock	41	40.3
Corridor	Yes	Highland, VA (140)	Silt Loam (0.3)	50	30	Waterbar + FilterSock	8	7.4
Corridor		Highland, VA (140)	Silt Loam (0.4)	50	30	Waterbar + FilterSock	19	20.8
Corridor		Highland, VA (140)	Silt Loam (0.3)	50	35	Waterbar + FilterSock	27	26.1
Corridor		Highland, VA (140)	Silt Loam (0.4)	50	35	Waterbar + FilterSock	24	25.5
Corridor		Highland, VA (140)	Silt Loam (0.3)	50	40	Waterbar + FilterSock	19	18.5
Corridor	Yes	Highland, VA (140)	Silt Loam (0.3)	50	40	Waterbar + FilterSock	2	1.8
Corridor		Highland, VA (140)	Silt Loam (0.4)	50	40	Waterbar + FilterSock	10	10.4
Corridor		Highland, VA (140)	Silt Loam (0.3)	25	45	Waterbar + FilterSock	11	11.0
Corridor		Highland, VA (140)	Silt Loam (0.4)	25	45	Waterbar + FilterSock	13	13.8
Corridor		Highland, VA (140)	Silt Loam (0.2)	25	55	Waterbar + FilterSock	1	1.0
Corridor		Highland, VA (140)	Silt Loam (0.3)	25	55	Waterbar + FilterSock	4	3.7
Corridor	Yes	Highland, VA (140)	Silt Loam (0.3)	25	55	Waterbar + FilterSock	1	1.0
Corridor		Highland, VA (140)	Silt Loam (0.4)	25	55	Waterbar + FilterSock	5	5.7
Corridor		Highland, VA (140)	Silt Loam (0.3)	25	50	Waterbar + FilterSock	2	2.0
Corridor	Yes	Highland, VA (140)	Silt Loam (0.3)	25	50	Waterbar + FilterSock	4	3.8
Corridor		Highland, VA (140)	Silt Loam (0.4)	25	50	Waterbar + FilterSock	7	8.0
Corridor		Highland, VA (140)	Silt Loam (0.3)	25	60	Waterbar + FilterSock	2	2.2
Corridor	Yes	Highland, VA (140)	Silt Loam (0.3)	25	60	Waterbar + FilterSock	1	1.0
Corridor		Highland, VA (140)	Silt Loam (0.4)	25	60	Waterbar + FilterSock	6	6.2
Corridor		Highland, VA (140)	Silt Loam (0.3)	25	65	Waterbar + FilterSock	1	1.0
Corridor		Highland, VA (140)	Silt Loam (0.3)	25	90	Waterbar + FilterSock	1	1.0

TABLE 6.6-3

Representative Areas Summary

RA Description	Stream Crossing	County, State (R-factor)	Soil Type (K-factor)	Slope Length [feet]	Slope Percent	Controls	# Segments	RA Area [acres]
Corridor		Bath, VA (150)	Silt Loam (0.2)	100	10	Waterbar + FilterSock	6	6.0
Corridor	Yes	Bath, VA (150)	Silt Loam (0.2)	100	10	Waterbar + FilterSock	2	1.8
Corridor		Bath, VA (150)	Silt Loam (0.2)	75	15	Waterbar + FilterSock	4	3.8
Corridor		Bath, VA (150)	Silt Loam (0.2)	75	20	Waterbar + FilterSock	9	9.7
Corridor	Yes	Bath, VA (150)	Silt Loam (0.2)	75	20	Waterbar + FilterSock	3	2.8
Corridor		Bath, VA (150)	Silt Loam (0.2)	75	25	Waterbar + FilterSock	5	5.2
Corridor	Yes	Bath, VA (150)	Silt Loam (0.3)	75	25	Waterbar + FilterSock	8	6.4
Corridor		Bath, VA (150)	Silt Loam (0.2)	50	30	Waterbar + FilterSock	6	6.5
Corridor	Yes	Bath, VA (150)	Silt Loam (0.2)	50	30	Waterbar + FilterSock	2	2.1
Corridor		Bath, VA (150)	Silt Loam (0.2)	50	35	Waterbar + FilterSock	5	5.4
Corridor		Bath, VA (150)	Silt Loam (0.2)	50	40	Waterbar + FilterSock	4	4.0
Corridor	Yes	Bath, VA (150)	Silt Loam (0.4)	50	40	Waterbar + FilterSock	2	1.4
Corridor	Yes	Bath, VA (150)	Silt Loam (0.3)	25	45	Waterbar + FilterSock	3	3.0
Corridor	Yes	Bath, VA (150)	Silt Loam (0.4)	25	45	Waterbar + FilterSock	1	0.9
Corridor	Yes	Bath, VA (150)	Silt Loam (0.4)	25	50	Waterbar + FilterSock	1	1.2
Access Road		Bath, VA (150)	Silt Loam (0.4)	75	20	Waterbar + Gravel + FilterSock	1	1.1
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.3)	100	5	Waterbar + FilterSock	2	1.8
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.2)	75	15	Waterbar + FilterSock	3	2.6
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.3)	75	15	Waterbar + FilterSock	2	1.6
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.4)	75	15	Waterbar + FilterSock	1	0.6
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.3)	75	20	Waterbar + FilterSock	4	3.1
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.4)	75	20	Waterbar + FilterSock	3	2.6
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.2)	75	25	Waterbar + FilterSock	1	1.0
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.4)	75	25	Waterbar + FilterSock	2	1.5
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.3)	50	35	Waterbar + FilterSock	5	4.4
Corridor		Augusta, VA (150)	Silt Loam (0.2)	25	45	Waterbar + FilterSock	1	0.9
Corridor	Yes	Augusta, VA (150)	Silt Loam (0.2)	25	70	Waterbar + FilterSock	1	0.8
Access Road		Augusta, VA (150)	Silt Loam (0.3)	75	25	Waterbar + Gravel + FilterSock	1	1.4
Corridor		Randolph, WV (170)	Silt Loam (0.2)	300	5	Waterbar + FilterSock	2	1.8
Corridor		Randolph, WV (170)	Silt Loam (0.3)	300	5	Waterbar + FilterSock	7	7.6
Corridor		Randolph, WV (170)	Silt Loam (0.4)	300	5	Waterbar + FilterSock	17	18.6
Corridor		Randolph, WV (170)	Silt Loam (0.2)	175	10	Waterbar + FilterSock	10	9.4
Corridor		Randolph, WV (170)	Silt Loam (0.3)	175	10	Waterbar + FilterSock	9	9.2
Corridor		Randolph, WV (170)	Silt Loam (0.4)	175	10	Waterbar + FilterSock	39	42.7

TABLE 6.6-3

Representative Areas Summary

RA Description	Stream Crossing	County, State (R-factor)	Soil Type (K-factor)	Slope Length [feet]	Slope Percent	Controls	# Segments	RA Area [acres]
Corridor		Randolph, WV (170)	Silt Loam (0.2)	125	15	Waterbar + FilterSock	4	3.8
Corridor		Randolph, WV (170)	Silt Loam (0.3)	125	15	Waterbar + FilterSock	10	10.7
Corridor		Randolph, WV (170)	Silt Loam (0.4)	125	15	Waterbar + FilterSock	37	40.3
Corridor		Randolph, WV (170)	Silt Loam (0.3)	100	20	Waterbar + FilterSock	16	17.1
Corridor		Randolph, WV (170)	Silt Loam (0.4)	100	20	Waterbar + FilterSock	48	52.4
Corridor		Randolph, WV (170)	Silt Loam (0.3)	75	25	Waterbar + FilterSock	13	14.0
Corridor		Randolph, WV (170)	Silt Loam (0.4)	75	25	Waterbar + FilterSock	49	50.8
Corridor		Randolph, WV (170)	Silt Loam (0.4)	75	30	Waterbar + FilterSock	40	42.3
Corridor		Randolph, WV (170)	Silt Loam (0.4)	75	35	Waterbar + FilterSock	28	30.1
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.4)	300	5	Waterbar + FilterSock	1	1.0
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.4)	175	10	Waterbar + FilterSock	1	1.2
Corridor		Pocahontas, WV (170)	Silt Loam (0.2)	100	20	Waterbar + FilterSock	3	3.2
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.3)	100	20	Waterbar + FilterSock	1	1.1
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.4)	100	20	Waterbar + FilterSock	3	3.2
Corridor		Pocahontas, WV (170)	Silt Loam (0.2)	75	25	Waterbar + FilterSock	2	2.3
Corridor		Pocahontas, WV (170)	Silt Loam (0.2)	75	30	Waterbar + FilterSock	3	3.2
Corridor		Pocahontas, WV (170)	Silt Loam (0.3)	75	30	Waterbar + FilterSock	9	9.5
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.3)	75	30	Waterbar + FilterSock	2	2.1
Corridor		Pocahontas, WV (170)	Silt Loam (0.3)	75	35	Waterbar + FilterSock	6	6.7
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.3)	75	35	Waterbar + FilterSock	2	2.1
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.4)	75	35	Waterbar + FilterSock	1	1.1
Corridor		Pocahontas, WV (170)	Silt Loam (0.3)	75	40	Waterbar + FilterSock	1	1.1
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.3)	75	40	Waterbar + FilterSock	1	1.0
Corridor		Pocahontas, WV (170)	Silt Loam (0.4)	75	40	Waterbar + FilterSock	18	19.1
Corridor		Pocahontas, WV (170)	Silt Loam (0.2)	75	45	Waterbar + FilterSock	1	1.0
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.3)	75	45	Waterbar + FilterSock	1	1.1
Corridor		Pocahontas, WV (170)	Silt Loam (0.4)	75	45	Waterbar + FilterSock	4	4.5
Corridor	Yes	Pocahontas, WV (170)	Silt Loam (0.3)	75	55	Waterbar + FilterSock	1	1.0
Corridor		Pocahontas, WV (170)	Silt Loam (0.4)	75	55	Waterbar + FilterSock	1	1.2
Corridor		Pocahontas, WV (170)	Silt Loam (0.3)	75	50	Waterbar + FilterSock	1	1.1
Corridor		Pocahontas, WV (170)	Silt Loam (0.4)	75	50	Waterbar + FilterSock	6	6.3
Corridor		Pocahontas, WV (170)	Silt Loam (0.4)	75	60	Waterbar + FilterSock	1	1.0
Access Road		Pocahontas, WV (170)	Silt Loam (0.4)	125	15	Waterbar + Gravel + FilterSock	1	7.9

TABLE 8-1

RUSLE2 Results Summary by Subwatershed Segments

Subwatershed	Segment Area [acres]	Baseline Erosion [ton/ac-yr]	Construction Erosion [ton/ac-yr]						Year 1 Construction Only [a]			
			Year 1	Year 2	Year 3	Year 4	Year 5	Total	[yd^3/ac]	[tons]	[yd^3]	[mm]
Bolar Run - Jackson River	98.7	<1 [b]	4.26	2.05	<1	<1	<1	7.70	37.7	420	3,720	0.713
Cabin Creek - Mill Creek	21.4	<1	2.56	<1	<1	<1	<1	4.29	22.7	55	486	0.428
Chair Draft - Calfpasture River	32.7	<1	3.95	1.62	<1	<1	<1	6.74	35.0	129	1,140	0.661
Clover Creek - Greenbrier River	162.6	<1	8.00	2.38	<1	<1	<1	11.80	70.9	1,300	11,500	1.34
Dry Fork - Elk River	73.9	<1	6.45	1.81	<1	<1	<1	9.42	57.1	477	4,220	1.08
Dry Run	50.9	<1	2.98	1.14	<1	<1	<1	5.03	26.4	152	1,340	0.499
Hamilton Branch	12.6	<1	2.19	1.13	<1	<1	<1	4.23	19.4	28	244	0.366
Headwaters Knapp Creek	62.8	<1	5.85	1.57	<1	<1	<1	8.54	51.8	367	3,250	0.978
Inch Branch - Back Creek	18.8	<1	3.13	1.22	<1	<1	<1	5.30	27.8	59	521	0.524
Jennings Branch	56.0	<1	3.96	1.60	<1	<1	<1	6.75	35.1	222	1,970	0.663
Jim Dave Run - Back Creek	113.7	<1	4.30	2.32	<1	<1	<1	8.14	38.1	489	4,330	0.719
Lick Run - Stuart Run	87.6	<1	4.12	1.43	<1	<1	<1	6.66	36.5	361	3,200	0.689
Moffett Creek	21.1	<1	3.12	<1	<1	<1	<1	4.82	27.6	66	583	0.522
Old Field Fork	86.5	<1	7.80	2.32	<1	<1	<1	11.50	69.0	674	5,970	1.3
Scotchtown Draft - Cowpasture River	33.0	<1	3.74	1.73	<1	<1	<1	6.68	33.2	124	1,090	0.626
Sitlington Creek	47.2	<1	7.45	3.15	1.07	<1	<1	12.30	65.9	351	3,110	1.25
Total	**979.4**	**<1**	**5.39**	**1.93**	**<1**	**<1**	**<1**	**8.60**	**47.7**	**5,280**	**46,700**	**0.901**

[a] These values were calculated using a soil bulk density of 1.34 g/cm3, which is the weighted average of the bulk densities identified for the upper mineral horizons of the SSURGO map units crossed by the Project within the MNF and GWNF.

[b] The RUSLE2 model in not sensitive to values less than 1 ton/acre; therefore, <1 more accurately represents these results.

TABLE 8-2

RUSLE2 Results Summary by Stream Crossing Segments

Crossed Waterbody ID	Approx. Milepost	CIF Area [acres]	Baseline Erosion [ton/ac-yr]	Construction Erosion [ton/ac-yr]						Year 1 Construction Only [a]			
				Year 1	Year 2	Year 3	Year 4	Year 5	Total	[yd^3/ac]	[tons]	[yd^3]	[mm]
spoe001	71.8	3.2	<1 [b]	7.33	<1	<1	<1	<1	8.92	64.9	24	210	1.23
spoe019	80.8	2.1	<1	6.41	2.53	<1	<1	<1	10.40	56.7	14	122	1.07
spoe015	81.1	3.2	<1	8.63	2.63	1.01	<1	<1	12.90	76.4	28	245	1.44
spoa402	81.5	3.2	<1	5.65	3.65	1.13	<1	<1	11.00	50.1	18	160	0.946
spoa400	82.0	3.1	<1	8.16	5.06	1.54	<1	<1	15.50	72.2	26	227	1.36
shia407	85.0	3.0	<1	4.31	2.81	1.16	<1	<1	8.87	38.2	13	113	0.722
shia410	85.1	2.9	<1	4.16	2.82	1.21	<1	<1	8.80	36.8	12	108	0.696
shia408 & shia409	85.4	3.0	<1	3.42	1.72	<1	<1	<1	6.26	30.2	10	89	0.571
sbaa004	94.1	3.2	<1	2.59	1.12	<1	<1	<1	4.65	22.9	8	73	0.433
obaa003 & sbaa014	96.3	2.2	<1	1.29	<1	<1	<1	<1	2.16	11.4	3	26	0.215
sbaa005	98.3	2.3	<1	4.08	2.82	1.22	<1	<1	8.79	36.1	10	84	0.682
sbaa006	98.9	3.0	<1	3.86	2.43	<1	<1	<1	7.77	34.2	12	102	0.646
sbaa007 & sbaa021 & sbaa022	99.0	2.1	<1	2.68	1.49	<1	<1	<1	5.19	23.7	6	50	0.449
sbaa003 & sbaa019	99.3	2.8	<1	4.93	2.34	<1	<1	<1	8.80	43.7	14	121	0.825
saua436	115.8	1.7	<1	4.23	1.13	<1	<1	<1	6.48	37.5	7	62	0.708
saua435	116.5	1.7	<1	3.18	1.62	<1	<1	<1	5.78	28.2	5	47	0.532
saua416	117.0	1.5	<1	4.02	1.90	<1	<1	<1	7.35	35.6	6	53	0.673
saua418	117.2	1.7	<1	4.36	1.29	<1	<1	<1	6.87	38.6	7	66	0.729
saua419	117.7	1.9	<1	4.26	2.56	<1	<1	<1	8.28	37.7	8	71	0.713
saua427e & saua427p	120.2	2.3	<1	3.44	1.38	<1	<1	<1	5.99	30.5	8	70	0.576
saua428	120.4	1.5	<1	2.88	<1	<1	<1	<1	4.65	25.5	4	38	0.482
saua429	120.5	1.5	<1	2.31	<1	<1	<1	<1	3.62	20.5	3	31	0.387
saua438	121.0	1.5	<1	3.73	1.64	<1	<1	<1	6.51	33.0	6	50	0.624
saua421	122.5	1.5	<1	4.25	1.13	<1	<1	<1	6.50	37.7	7	58	0.711
saua422	122.8	2.2	<1	4.55	2.30	<1	<1	<1	8.28	40.3	10	88	0.761
saua423	123.0	1.6	<1	3.99	2.39	<1	<1	<1	7.74	35.3	6	56	0.667
saua072	154.2	2.1	<1	2.31	<1	<1	<1	<1	3.52	20.4	5	43	0.386
saua434	154.4	0.7	<1	4.36	1.29	<1	<1	<1	6.87	38.6	3	28	0.729
saua071	154.5	1.5	<1	2.67	<1	<1	<1	<1	4.30	23.7	4	35	0.447
saua433	154.8	1.6	<1	2.89	1.50	<1	<1	<1	5.41	25.6	5	42	0.483

TABLE 8-2

RUSLE2 Results Summary by Stream Crossing Segments

Crossed Waterbody ID	Approx. Milepost	CIF Area [acres]	Baseline Erosion [ton/ac-yr]	Construction Erosion [ton/ac-yr]						Year 1 Construction Only [a]			
				Year 1	Year 2	Year 3	Year 4	Year 5	Total	[yd^3/ac]	[tons]	[yd^3]	[mm]
saua432	154.9	1.8	<1	2.42	1.26	<1	<1	<1	4.54	21.4	4	38	0.405
saua431	155.0	1.0	<1	3.76	2.24	<1	<1	<1	7.29	33.3	4	34	0.629
saua430	155.1	1.8	<1	2.10	<1	<1	<1	<1	3.30	18.6	4	33	0.351
saua064	155.2	0.7	<1	2.70	<1	<1	<1	<1	3.75	23.9	2	17	0.452
Total		**71.1**	**<1**	**4.27**	**1.94**	**<1**	**<1**	**<1**	**7.48**	**37.8**	**304**	**2,690**	**0.715**

[a] These values were calculated using a soil bulk density of 1.34 g/cm3, which is the weighted average of the bulk densities identified for the upper mineral horizons of the SSURGO map units crossed by the Project within the MNF and GWNF.

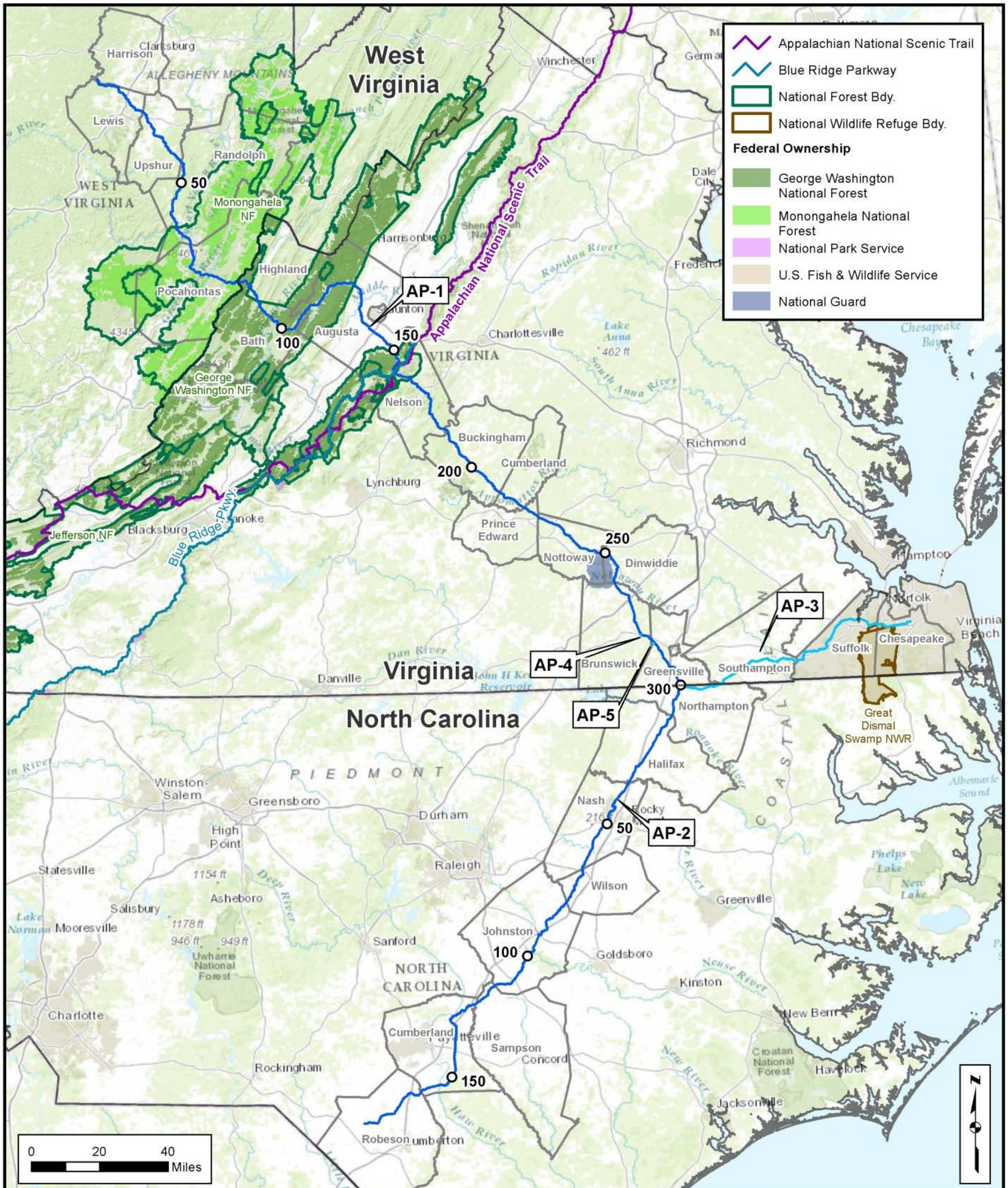
[b] The RUSLE2 model in not sensitive to values less than 1 ton/acre; therefore, <1 more accurately represents these results.

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Soil Erosion and Sedimentation Modeling Report

Monongahela National Forest and George Washington National Forest

APPENDIX B - FIGURES



ACP Mainline
ACP Lateral

Atlantic Coast Pipeline

Figure 2.1-1
Atlantic Coast Pipeline
Project Overview

ERM

FILE: M:\Clients\D-F\DOM\SRPP_ArcGIS\National_Forests\COM\COM_Figures_acp_com_general_location.mxd, REVISED: 01/23/2017, SCALE: 1:2,500,000 DRAWN BY: NRG GIS

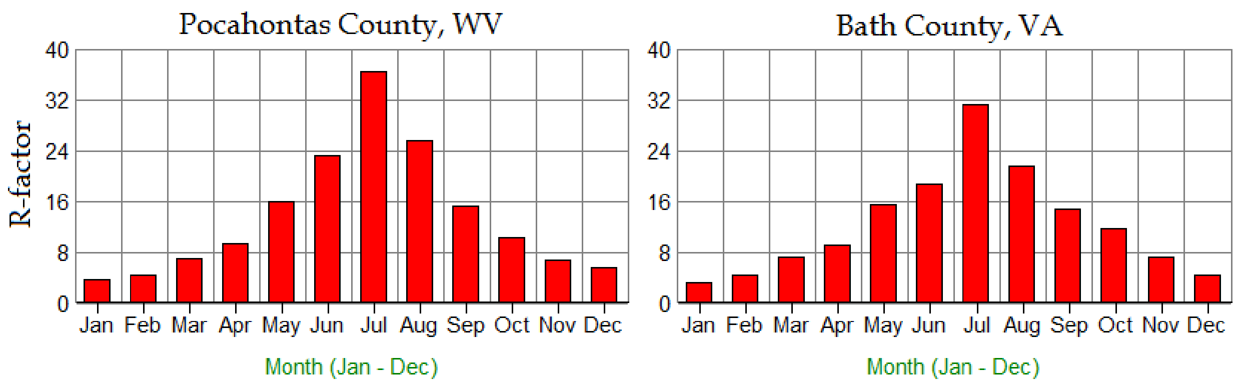


Figure 6.2-1
RUSLE2 Monthly Rainfall Erosivity

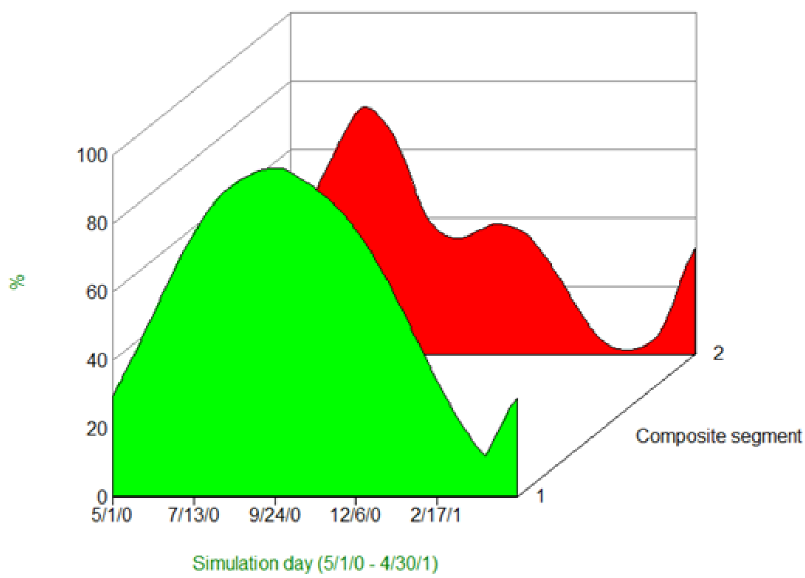


Figure 6.5-1
RUSLE2 Monthly Rainfall Erosivity

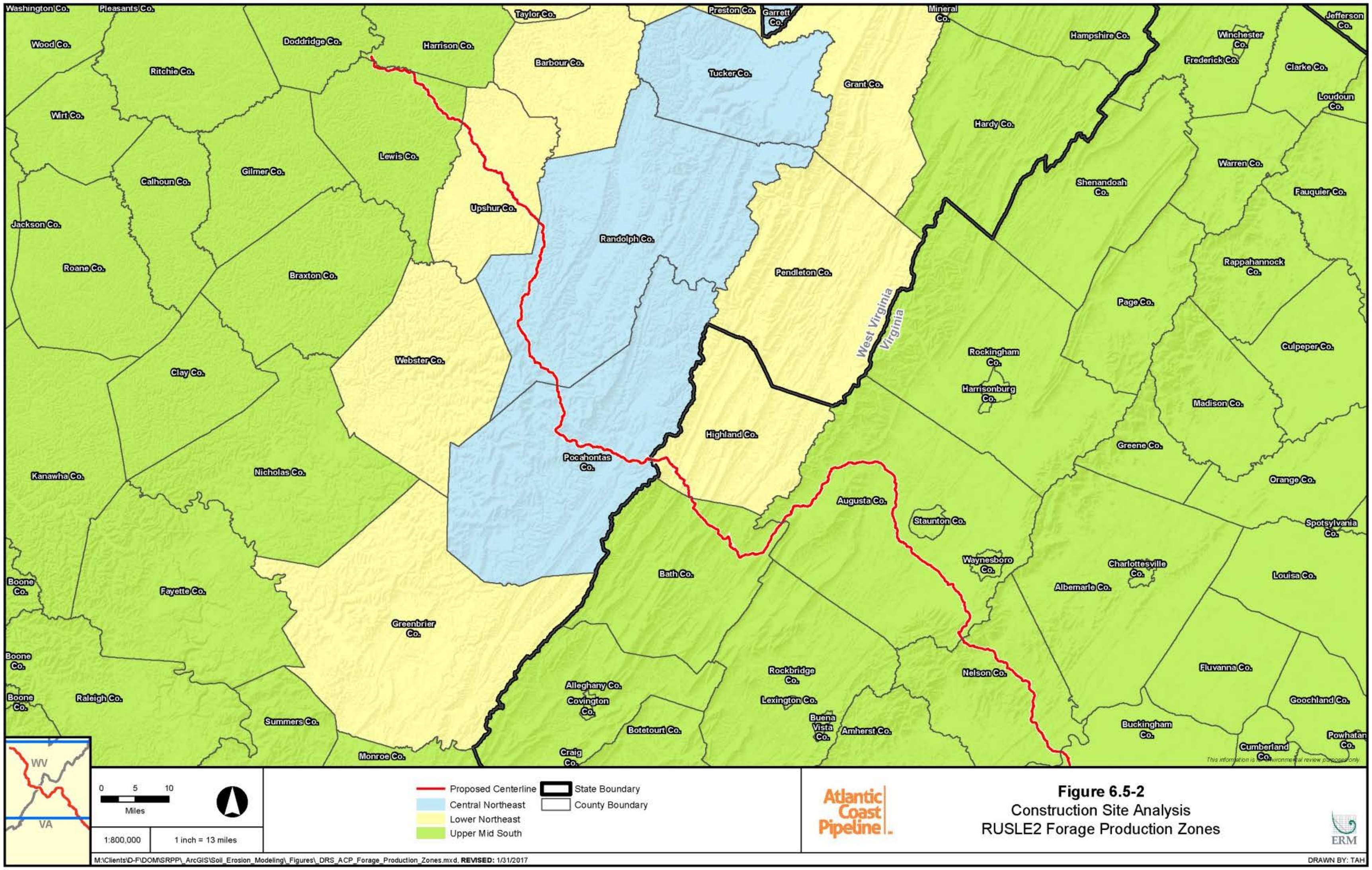


Figure 6.5-2
Construction Site Analysis
RUSLE2 Forage Production Zones

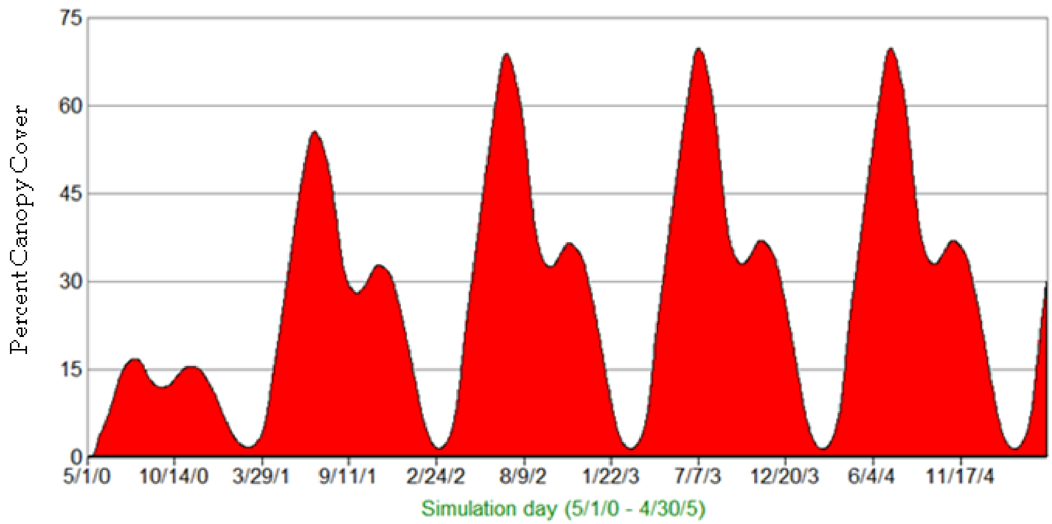


Figure 6.5-3
RUSLE2 Grass and Forb Canopy Growth

ATLANTIC COAST PIPELINE, LLC
ATLANTIC COAST PIPELINE

Soil Erosion and Sedimentation Modeling Report

Monongahela National Forest and
George Washington National Forest

APPENDIX C – SENSITIVITY ANALYSES

1.0 RUSLE2 MODEL SENSITIVITY

Various modeling scenarios were developed to study the model sensitivity to different management options and controls. Details of the sensitivity analyses are provided in this document, including discussion about accuracy of the results produced by Revised Universal Soil Loss Equation, Version 2 (RUSLE2). The sensitivity analyses focused on the first year when construction is anticipated to be initiated and completed. The key points of the sensitivity analyses include:

- Steep Slope Analysis: disturbed areas with no erosion controls have much higher rates of predicted erosion as compared to areas where erosion controls devices are in place. Additionally, the reduced timeframe of construction on steep slopes has a large impact at reducing erosion rates when compared to both longer timeframe and no controls.

- Slope Length Analysis: addition of waterbars at closer spacing along steep slopes (thereby decreasing the slope length) provides only minor improvements in erosion prevention.

- Vegetative Cover Analysis: the type of vegetation assumed in the baseline condition – either grassland or forest – has little effect on the pre-construction erosion predictions. Therefore, it is not necessary to parse out the small portions of the existing right-of-way that are forested from those that are maintained as grassland.

- Construction Erosion Control Devices Analysis: the application of site-specific erosion control devices (ECDs) has a large reduction in soil erosion when compared to construction with no erosion controls. However, adding additional silt fence or filter sock yields marginal benefits.

- Construction Term Analysis: varying the construction term changes many model parameters associated with the months-of-construction, such as rainfall erosivity and vegetation growth period, which affects the erosion rate. Starting the construction term in April will yield the lowest erosion rates, while starting construction in July yields the highest erosion rates.

1.1 STEEP SLOPE ANALYSIS

Soil delivery is most sensitive to slope steepness and duration that bare soil is exposed. Consequently, a specific construction scenario is applied to slopes that are greater than or equal to 30 percent rise. This Steep Slope Construction Scenario reduces the bare ground exposure timeframe to only two weeks for each 0.05 mile segment, compared to the Typical Construction Scenario exposure of three months.

This specific analysis examines the effectiveness of either construction scenario when compared to no control measures (i.e., exposed bare ground after mechanical construction). The study area has the following attributes for all iterations: Randolph County erosivity, silt loam with K-factor = 0.30 erodibility, and 200-foot slope length. The table below shows the RUSLE2 results for erosion during pre-construction (baseline), construction with no erosion controls, typical construction, and steep slope construction conditions for varying percent slopes. The Pre-Construction Scenario represents that of baseline conditions, with grasslands and forest cover. The Construction with no erosion controls Scenario represents mechanical construction with no sediment control devices, persisting for the same duration as the Typical Construction Scenario. The Typical Construction Scenario is described in Section 6.5.3 in the main report and persists for three months from April to June. Lastly, the Steep Slope Construction

Scenario is described in Section 6.5.4 and persists for two weeks starting in April. All values of erosion are from the first year following each of the scenarios.

Scenario	Erosion [ton/ac-yr]		
	30% Rise	35% Rise	40% Rise
Pre-Construction	0.0129	0.0146	0.0161
Construction with no erosion controls	575	679	779
Typical Construction	21.2	24.7	28.1
Steep Slope Construction	14.2	17.0	19.8

Regardless of which scenario is used during construction, erosion rates are expected to increase orders of magnitude above pre-construction conditions. Additionally, the greater the percent slope, the larger the erosion rate; the soils on steeper slopes are more likely to detach during precipitation events. Installation of sediment control devices, such as silt fences and waterbars, immediately after start of construction decreases the erosion rate by 96 percent in the first year. This is a significant decrease but requires careful monitoring and maintenance of those devices to ensure continued effectiveness; these devices are expected to function perfectly throughout their duration during model simulations. Finally, sediment erosion rates can further be decreased by 31 percent by decreasing the construction duration, thereby minimizing the time bare ground is exposed. This Steep Slope Construction Scenario is expected to be utilized on 26 percent of the identified Segments. This includes Segments that have slopes greater than or equal to 30 percent.

1.2 SLOPE LENGTH ANALYSIS

Soil delivery will depend on the length that sediment can travel before sheet and rill erosion stops. This is referred to as slope length, and is usually defined by waterbar placement when modeling construction sites.

This specific analysis examines the effectiveness of adjusting the slope length and its influence on erosion rates. The study area has the following attributes for all iterations: Randolph County erosivity, silt loam with K-factor = 0.30 erodibility, and pre-construction groundcover conditions (grasses and forests). The table below shows the RUSLE2 results for erosion with varying slope lengths and percent slopes. Each of the 100, 200, and 400-foot iterations are made with the same percent slope. The *Percent Change* column represents the difference in erosion rate of a percent slope specific scenario compared to the 200-foot slope length of the same percent slope scenario; the 200-foot slope length scenario is the slope length approximation used for all modeled areas during model runs. The different percent slope iterations capture a range of values found in the modeled Segments and show the sensitivity of slope length with various percent slopes.

Scenario	Percent Slope	Erosion [ton/ac-yr]	Percent Change
100-foot Slope Length	10%	0.00446	-3.5%
200-foot Slope Length	10%	0.00462	0.0%
400-foot Slope Length	10%	0.00481	4.1%
100-foot Slope Length	20%	0.00877	-4.5%
200-foot Slope Length	20%	0.00918	0.0%
400-foot Slope Length	20%	0.00961	4.7%
100-foot Slope Length	30%	0.0123	-4.7%
200-foot Slope Length	30%	0.0129	0.0%
400-foot Slope Length	30%	0.0135	4.7%
100-foot Slope Length	40%	0.0153	-5.0%
200-foot Slope Length	40%	0.0161	0.0%
400-foot Slope Length	40%	0.0168	4.3%

As shown from the Percent Change column, the model results indicate that slope length has a relatively minor effect on the erosion delivery estimates. Halving or doubling the slope length only results in approximately ±4 percent change from the 200-foot slope length model assumption for a given percent slope. This holds true for various percent slopes as well, with the maximum 40 percent slope only resulting in a slightly larger difference between the 100 and 200-foot slope lengths. However, increasing the percent slope from 10 percent to 20, 30 and 40 percent results in erosion increases of 99, 180, and 250 percent, respectively. Thus, finer groupings of slope length will yield very minor changes in overall erosion rates. Conversely, percent slope groupings need to be made a finer resolution (5 percent increments currently used) to capture that variables greater influence on erosion estimates.

1.3 VEGETATIVE COVER ANALYSIS

The proposed pipeline corridor crosses through two types of ground cover, grasslands and forests. Additionally, the predominate grass in the grasslands will differ depending on county, and can range from Central Northeast Forage Production Zone for areas in Randolph and Pocahontas Counties, Lower Northeast Forage Production Zone for areas in Highland County, and the Upper Mid South Forage Production Zone for areas in Bath and Augusta Counties. These different ground covers retard erosion due to their canopy cover which lowers fall height and rain drop impact, and root layer which binds the soils together.

This specific analysis examines the variance of erosion rates when the baseline ground cover is adjusted. The study area has the following attributes for all iterations: Randolph County erosivity, silt loam with K-factor = 0.30 erodibility, 200-foot slope length, and 10 percent slope. The table below shows the RUSLE2 results for erosion with various groundcover types found throughout the pipeline corridor.

Scenario	Erosion [ton/ac-yr]	Percent Change
Central Northeast Forage Production Zone Grasses	0.0133	0.00%
Lower Northeast Forage Production Zone Grasses	0.0129	-3.10%
Upper Mid South Forage Production Zone Grasses	0.0139	4.32%
Central Northeast Hardwoods	0.00916	-45.20%
Upper Mid South Hardwoods	0.00928	-43.32%

Different grass types as groundcover have minimal effect on soil erosion; the largest difference occurs between Lower Northeast Forage Production Zone Grasses and Upper Mid South Production Zone Grasses with a 7 percent difference. The different forest covers provide more conservative estimates of baseline erosion rates, roughly 45 percent less than that of grasslands. To simplify the number of groupings that will be used, and to provide conservative estimates of erosion rates, Upper Mid South Forage Production Zone Grasses will be used as baseline pre-construction conditions. As the erosion rate in all of these different groundcovers are less than 0.1 ton per year in a 10-acre plot of land (all 858 segments are around 1-acre in size), the assumption of one groundcover type to represent all pipeline areas is reasonable.

1.4 CONSTRUCTION EROSION CONTROL DEVICES ANALYSIS

Soil erosion rates are expected to significantly higher during the first year of construction when mechanical construction occurs and bare ground is exposed. ECDs such as silt fences, waterbars, and mulch application are expected to result in considerable reduction of soil erosion. While an additional layer of silt fences will further reduce soil erosion, the marginal improvement is examined in this sensitivity analysis.

The study area has the following attributes for all iterations: Randolph County erosivity, silt loam with K-factor = 0.30 erodibility, and 200-foot slope length. The table below shows the RUSLE2 results for erosion during pre-construction (baseline), construction with no erosion controls, typical construction with single and double silt fence at the bottom of the slope, and steep slope construction with single and double silt fence at the bottom of the slope; these scenarios are shown with varying percent slopes. The Pre-Construction Scenario represents that of baseline conditions, with grasslands and forest cover, for reference. The Construction with no erosion controls Scenario represents mechanical construction with no sediment control devices, persisting for the same duration as the Typical Construction Scenario. The Typical Construction Scenario is described in Section 6.5.3 in the main report and persists for three months, from April to June. Lastly, the Steep Slope Construction Scenario is described in Section 6.5.4 and persists for two weeks starting in April. All values of erosion are from the first year following each of the scenarios.

Scenario	Erosion [ton/ac-yr]			
	10% Rise	20% Rise	30% Rise	40% Rise
Pre-Construction	0.00462	0.00918	0.0129	0.0161
Typical Construction with no erosion controls	137	358	575	779
Typical Construction, single silt fence	7.06	14.1	21.2	28.1
Typical Construction, double silt fence	6.69	13.3	19.8	26.2
Steep Slope Construction, single silt fence	3.26	8.54	14.2	19.8
Steep Slope Construction, double silt fence	3.02	7.92	13.1	18.4

Typical construction with no erosion controls results in five-orders-of-magnitude increase in erosion over pre-construction conditions. Due to this drastic difference, construction influenced erosion should not be compared with baseline conditions; instead, construction with ECDs in place should be compared to construction with no erosion controls to show the percent effectiveness of a particular set of ECDs. Thus, another table can be created in which each scenario is shown as a percent difference from the construction with no erosion controls scenario.

Scenario	Percent Difference in Erosion			
	10% Rise	20% Rise	30% Rise	40% Rise
Typical Construction with no erosion controls	0.0%	0.0%	0.0%	0.0%
Typical Construction, single silt fence	-94.8%	-96.1%	-96.3%	-96.4%
Typical Construction, double silt fence	-95.1%	-96.3%	-96.6%	-96.6%
Steep Slope Construction, single silt fence	-97.6%	-97.6%	-97.5%	-97.5%
Steep Slope Construction, double silt fence	-97.8%	-97.8%	-97.7%	-97.6%

The ECDs present in the typical construction scenario result in an average erosion reduction of 95.9 percent compared to construction with no controls. Shallower slopes receive slightly less of a benefit as soil particles are less lightly to detach during precipitation events. The addition of a second silt fence results in minimal improvements compared to a single silt fence, the further erosion reduction is only 0.25 percent. Steep slope construction reduced bare ground exposure and ECDs prevent even more soil from leaving the work area, having an average erosion reduction of 97.6 percent. As with the typical construction scenario, an additional silt fence has marginal improvements of 0.18 percent. For modeling purposes, adding a secondary silt fence is often unnecessary as it has minor improvements from a single silt fence; recall that the model assumes perfect maintenance of any ECDs until removal. However, in practice a secondary silt fence could be useful in extending the duration of the silt fences.

1.5 CONSTRUCTION TERM ANALYSIS

The typical construction scenario persists for three months, as described in Section 6.5.3 in the main report. Varying the months which construction occurs will have an influence on soil erosion rates, as many model parameters will change in accordance with the construction months. Primary soil erosion factors that vary by month include rainfall erosivity, vegetation growth, and vegetation growth duration before frost.

The study area has the following attributes for all iterations: Randolph County erosivity and 200-foot slope length. The table below shows the RUSLE2 results for erosion during typical construction conditions at various three month periods, along with different percent slopes (10, 20, 30, and 40 percent rise) and soil erodibility values (0.3 and 0.4).

Scenario		Erosion [ton/ac-yr]			
Construction Term	K-Factor	10% Rise	20% Rise	30% Rise	40% Rise
April - June	0.3	6.23	11.5	12.5	17.2
May - July	0.3	7.06	14.1	14.2	19.8
June - August	0.3	17.6	32.6	28.6	37.4
July - September	0.3	24.7	43	41.7	53.2
August - October	0.3	6.67	12.4	13	17.9
April - June	0.4	8.4	15.4	16.8	23.2
May - July	0.4	9.54	18.9	19	26.6
June - August	0.4	23.8	43.7	38.4	50.3
July - September	0.4	33.7	57.8	56	71.5
August - October	0.4	9.01	16.5	17.5	24.2

April through June construction results in the lowest erosion rates for both K-factors, and all slope percentages. An additional table can be created which shows the percent difference in erosion from this minimum April through June construction period.

Scenario		Percent Difference in Erosion			
Construction Term	K-Factor	10% Rise	20% Rise	30% Rise	40% Rise
April - June	0.3	0%	0%	0%	0%
May - July	0.3	13%	23%	14%	15%
June - August	0.3	183%	183%	129%	117%
July - September	0.3	296%	274%	234%	209%
August - October	0.3	7%	8%	4%	4%
April - June	0.4	0%	0%	0%	0%
May - July	0.4	14%	23%	13%	15%
June - August	0.4	183%	184%	129%	117%
July - September	0.4	301%	275%	233%	208%
August - October	0.4	7%	7%	4%	4%

By generating this percent difference table, the change from April through June construction is seen to be very similar regardless of K-factor. Even though the study area with higher K-factors results in higher erosion rates, the relative changes when varying the construction months remains the same. Thus, K-factor can be concluded to not have a significant impact on the construction start month. The percent differences also allow the construction terms to be easily separated into months with lower erosion (April, May, and August starts) and months with higher erosion (June and July starts).

As mentioned previously, April through June has the least erosion; this is due to lower rainfall during the month of bare soil exposure during the construction phase (April in this case) coupled with both the primary and secondary seeded vegetation growth periods of May and September. August through October has the second lowest erosion rates, due to decreasing rainfall rates as winter approaches; while the seeding occurs in late October, which misses both of the primary and secondary growth periods of the current year, the lack of precipitation results in the mulch and tackifier to contain the soils. May through July start has higher rainfall compared to the April through June start, along with missing the primary growing season (as the grass will be seeded in June), resulting in higher erosion rates.

Both June and July construction term starts results in significantly larger erosion rates when compared to any of the April, May or August starts. The months of June and July have the most precipitation in Randolph County (and for all Counties that the pipeline crosses). Additionally, the seeded vegetation misses the primary growing season of May. The higher rainfall will also cause the freshly mulch and tackifier to break down, exposing more soil underneath during later months.