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UPDATE OF TVA'S NATURAL RESOURCE PLAN DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia

Prepared by:
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COVER SHEET

Update of TVA's Natural Resource Plan

Proposed action: The Tennessee Valley Authority (TVA) has prepared this Draft Supplemental Environmental Impact Statement to assess the potential environmental, social, and economic impacts associated with implementing an updated Natural Resource Plan.

Type of document: Draft Supplemental Environmental Impact Statement

Lead agency: Tennessee Valley Authority

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Abstract:

TVA proposes to make changes to the structure of and programs identified in its Natural Resource Plan (NRP), completed in 2011. TVA developed the NRP to guide its natural resource stewardship efforts. The existing NRP addresses TVA's management of biological, cultural, and water resources; recreation; reservoir lands planning; and public engagement. The NRP also guides TVA in achieving the objectives of its Environmental Policy for a more systematic and integrated approach to natural resource stewardship.

In the 2011 NRP, TVA committed to reviewing the NRP every five years and updating the plan to ensure it remains relevant and current. In 2016, as part of the update process, TVA staff began a holistic review of the NRP and determined that the 2011 NRP does not encompass all of the resource stewardship programs managed by TVA. TVA concluded that the NRP was not comprehensive and not fully serving as the overall strategic guide as was first envisioned. Based on this assessment, TVA determined that updating the NRP was the best path forward to address identified concerns.

Under the No Action Alternative (Alternative A), TVA would not make changes to the 2011 NRP. Under Alternative B, TVA proposes to update the 2011 NRP which was based on the Blended Management alternative of the EIS and accepted by the TVA Board of Directors in August 2011. Existing and proposed programs will be categorized into the 10 proposed focus areas. The programs described in Alternative B would result in additional beneficial impacts to natural resources while providing TVA with an adaptable framework for implementing stewardship programs and activities over the next 20 years. TVA's preferred alternative is Alternative B.

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SUMMARY

Introduction

In 2011, the Tennessee Valley Authority (TVA) completed its first Natural Resource Plan (NRP; TVA 2011a) to guide its stewardship efforts for managing the waters and public lands throughout the Tennessee River watershed and power service area. The NRP represents TVA's high-level strategy for managing its natural resources in the near- and long-term. The 2011 NRP addresses TVA's management of biological, cultural, and water resources; recreation; reservoir lands planning; and public engagement. The purpose of the plan is to integrate the goals of these resource areas, provide for the optimum public benefit, and balance sometimes conflicting resource uses. The 2011 NRP also guides TVA in achieving the objectives of its Environmental Policy for a more systematic and integrated approach to natural resource stewardship.

In the 2011 NRP, TVA committed to reviewing the NRP every five years and updating the plan to ensure it remains relevant and current. In 2016, as part of the update process, TVA staff began a holistic review of the NRP and determined that, after extensive discussion and consideration, the 2011 NRP was not all encompassing of natural resources programs and, by not being inclusive, the NRP was not as comprehensive as desired. TVA concluded that the NRP was not fully serving as an overall strategic guide as was first envisioned, and the non-comprehensive program coverage has impacted the plan's usefulness to TVA as a management guide. Based on this assessment, TVA determined that updating the NRP was the best path forward to address identified concerns.

The proposed update to the NRP (TVA 2019a) would be consistent with the Blended Management alternative approved by the TVA Board of Directors in August 2011. Generally, the proposed objectives in the updated NRP align with the resource area goals identified in the 2011 NRP. Therefore, proposed changes are being considered by TVA in a supplement to the 2011 Environmental Impact Statement (EIS; TVA 2011b).

Purpose and Need for Action

The purpose of the action is to update the 2011 NRP to provide strategic guidance and alignment of TVA's Natural Resources work as well as create efficiencies in business planning and stewardship project implementation. The need for the action is to more clearly define strategies, including objectives and programs, for each focus area and a flexible approach for long-term planning, which would help TVA prioritize funding plans and support TVA's mission. To complement the strategic guidance that the 2020 NRP will provide, Natural Resources will develop 3- to 5-Year Action Plans that will provide a tactical approach to implement the specific activities associated with the 10 focus area programs. The two-pronged approach of a tactical, short-term implementation strategy (3- to 5-Year Action Plan) that complements the strategic, long-term guidance document (2020 NRP) will provide the direction and flexibility necessary for successful implementation. The NRP update would improve the document's efficacy by creating a more comprehensive 2020 NRP that better serves as an effective management guide.

Alternatives

Alternative A – The No Action Alternative

Under the No Action alternative, TVA would not make changes to the 2011 NRP, which is a blended management approach to natural resources management. TVA would continue to implement key programs identified in six resource areas that are integral to enhancing future implementation efforts.

TVA would also continue to maintain activities and projects that address safety and comply with TVA's mission and applicable laws, regulations, policies, and executive orders. The NRP accounts for the interconnectivity of each resource area and their supporting programs, which establishes a foundation by which TVA may implement greater levels of programs.

By not taking action to update and refresh the NRP, however, TVA would be inconsistent with the implementation component of the plan (Phase II of the "Road Map for Success"), wherein TVA commits to periodic updates of the plan to ensure consideration is given to changing resource conditions.

Alternative B – TVA's Proposed Action – Updates to TVA's Natural Resource Plan

Under Alternative B, TVA would make numerous changes to the blended management approach identified in its NRP. TVA proposes to update the NRP to become a strategic document which includes focus area programs, objectives and anticipated benefits, and introduces four additional focus areas into the NRP. This shift expands the focus of the NRP from the original six resource areas to ten focus areas to ensure that the NRP addresses the entire scope of natural resource stewardship efforts. Existing and proposed programs will be categorized into the 10 proposed focus areas. The updated NRP would include Section 26a and Land Use Agreements, Public Land Protection, and Ecotourism focus areas. Nuisance and Invasive Species Management was addressed on a limited basis in the 2011 NRP; in the 2020 NRP, TVA proposes to add the Nuisance and Invasive Species Management Focus Area, placing greater emphasis on the management of nuisance and invasive species.

The new groupings of certain programs are appropriate based on their nature and would improve the plan's clarity and usefulness. TVA proposes to delete some programs that are better managed by other entities. Additionally, TVA proposes to introduce additional programs and combine some existing programs to better describe current activities. TVA would revise the organization of the plan itself by revising the six resource areas, creating the following ten focus areas:

- Reservoir Lands Planning
- Section 26a and Land Use Agreements
- Public Land Protection
- Land and Habitat Stewardship
- Nuisance and Invasive Species Management
- Cultural Resources Management
- Water Resource Stewardship
- Recreation
- Ecotourism
- Public Outreach and Information

Affected Environment and Environmental Consequences

Terrestrial Ecology

Affected Environment. There are 4,000 vascular plant species and an array of habitat types occurring within the TVA region. Most of the plant communities found in the region are common and well represented across the landscape, but about 80 community associations have a global ranking of G1, meaning they are critically imperiled and at a high risk of extinction due to extreme rarity.

Throughout the TVA region, forest is the most common vegetation type when lands are not managed intensively for agricultural production. About 85 percent of TVA parcels managed for sensitive resources and conservation are upland deciduous forest, bottomland hardwood forest, evergreen forest, or mixed evergreen-deciduous forest. The most recent Forest Inventory Analysis data available from the US Forest Service for Tennessee indicates that forest cover has remained nearly constant between 2010 and 2014.

Invasive plants are common across the landscape. Since publication of the 2011 Final EIS, TVA has continued to implement efforts to remove invasive plant species from selected TVA parcels.

Since publication of the 2011 Final EIS, dramatic declines in bat populations have been observed in the TVA region and on TVA lands. TVA has implemented several targeted Natural Resource projects focused on bat conservation, recovery, and research. TVA has expanded collaborative efforts with state and federal agencies and other conservation organizations to address the threat to bat populations posed by white nose syndrome.

Environmental Consequences. Under Alternative A, programs within the Biological Resources Resource Area are expected to have beneficial impacts on discrete sites where projects are implemented; no negative impacts are anticipated. Continued implementation of programs and activities under the other five resource areas in the 2011 NRP have the potential for minor, indirect beneficial or adverse impacts on plant communities on TVA lands because manipulation of terrestrial habitats is not a primary goal of these programs. Site-specific environmental reviews of new proposed projects with the potential to affect terrestrial ecology would include consideration of minimization and avoidance measures to reduce adverse impacts.

Continued implementation of these programs and activities under Alternative B would result in the same direct and indirect beneficial impacts as under Alternative A. Most programs outside of the Land and Habitat Stewardship and Nuisance and Invasive Species Management focus areas have the potential for minor, indirect beneficial or adverse impacts on plant communities on TVA lands because manipulation of terrestrial habitats is not a primary goal of these focus areas. The 2020 NRP proposed planning methodology, utilizing 3- to 5-year action plans, would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in user, resource, and programmatic needs.

Aquatic Ecology

Affected Environment. The rivers located in the TVA region support a large variety of freshwater fishes and invertebrates, including freshwater mussels, snails, crayfish, and insects. Due to the number of major river systems found in this region, the Southeastern US is recognized as a globally important area for freshwater biodiversity. Since 2011, TVA has contributed to numerous water quality improvement and species enhancement efforts to benefit aquatic communities throughout the Tennessee River watershed. These efforts include stream buffer establishment and streambank stabilization efforts, stream barrier removals, contributions to fish

and mussel hatchery facilities to promote reproduction and reintroduction of aquatic species (particularly rare, threatened, and endangered species), and other efforts to promote stewardship and an increased knowledge of aquatic biodiversity in the Tennessee River watershed.

TVA also continues to monitor the ecological health of its reservoirs (by implementing guidance from the 2004 Reservoirs Operations Study) and streams (through the Stream Monitoring program in the 2011 NRP).

Environmental Consequences. Under Alternative A, programs within the Biological Resources and Water Resources resource areas have provided beneficial impacts at discrete sites where projects are implemented; some short-term adverse impacts are noted during implementation of some activities (e.g., during construction of in-stream stabilization structures), but because these programs are designed to provide a net benefit to aquatic communities, no long-term adverse impacts are anticipated. Continued implementation of programs in the Cultural Resources, Public Engagement, Recreation Management, and Reservoir Lands Planning resource areas has the potential for minor, indirect beneficial or adverse impacts for aquatic communities because improvement of aquatic habitat is not a primary goal of these resource areas.

Implementation of Alternative B would not result in significant changes to programs affecting aquatic ecology because some of the proposed programs have been implemented outside of the NRP framework for many years. The 2020 NRP proposed activity planning methodology, utilizing 3- to 5-year action plans, would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in user, resource, and programmatic needs.

Threatened and Endangered Species

Affected Environment. Since publication of the 2011 NRP, six fish and seven mussel species have been elevated from the federal Candidate list and given threatened or endangered species status under the Endangered Species Act (ESA). Since 2011, 14 terrestrial animal species were either not listed under the ESA after review, delisted, or are no longer thought to occur in the TVA region. Currently, there are 19 federally listed, protected, or Candidate terrestrial animal species occurring in the TVA region. There are 39 federally threatened or endangered plant species occurring within the TVA region, compared to 44 species as cited in the 2011 Final EIS. TVA lands located across the seven-state region are known to support 307 occurrences of 137 different state-listed plant species.

Environmental Consequences. Under Alternative A, TVA's Biological Resources programs would continue to incorporate a variety of stewardship programs benefiting rare species and meeting regulatory responsibilities for protecting listed species and their habitat on the lands and waters within the TVA region. Overall, while minor, short-term, direct and indirect adverse impacts could continue to result from implementation of specific projects under Alternative A, any direct, indirect, or cumulative impacts on listed species would continue to be assessed, avoided, and/or minimized via existing regulatory mechanisms (particularly ESA and the National Environmental Policy Act [NEPA]).

All listed species management activities occurring since the 2011 NRP would continue with adoption of Alternative B. Overall, under Alternative B, there would be a combination of direct and indirect beneficial and adverse impacts on listed species similar to those described under

Alternative A. Any adverse impacts would be short-term and would be minimized or mitigated to the extent practicable.

Wetlands

Affected Environment. Approximately 15 percent of TVA lands were identified via remote sensing data and aerial photography to have wetlands, and previous studies indicate approximately 197,000 acres of wetlands are found along the TVA reservoir system and within the groundwater influence area of the reservoirs. This number has remained relatively consistent since 2011. Approximately 90 percent of the wetlands on TVA lands are located on the mainstem Tennessee River. Palustrine wetlands are the predominant wetlands in the TVA region. Regional trends in wetland loss have been closely tied to population growth and urban/suburban development. Studies show a slower rate of wetland loss over the past seven years compared to previous decades. However, both forested and emergent wetland acreage continue to decline, while increases are seen in the presence of freshwater ponds.

Environmental Consequences. Overall, Alternative A would continue to provide a beneficial framework for managing, identifying, and restoring wetlands. Implementation of Alternative B would provide slightly greater benefits to wetlands than Alternative A because the 2020 NRP would include a more comprehensive suite of wetland programs and activities, and TVA's ability to respond to emerging issues and needs would improve. Combined with the issuance of 3- to 5-year action plans, implementation of Alternative B would likely result in more effective prioritization of future, site-specific projects that increase wetland habitat and improve existing wetlands within the Valley, which also improves ecosystem services associated with wetlands (e.g., flood control and abatement, water quality improvement, and increased biodiversity).

Floodplains

Affected Environment. The integrated operation of the TVA reservoir system provides substantial protection against flooding in the Tennessee, Ohio, and Mississippi River basins. The drainage basin of the Tennessee River is about 41,000 square miles and the TVA power service area encompasses about 80,000 square miles. Floodplain areas along reservoir shorelines normally encompass TVA lands and other lands where TVA owns flowage easements.

Environmental Consequences. Hundreds of individual projects in the six resource areas have been planned and implemented since adoption of the 2011 NRP. When any such projects were proposed, they were analyzed on a case-by-case basis in accordance with TVA's NEPA procedures, consistent with Executive Order (EO) 11988, with conditions imposed, as appropriate, to minimize adverse impacts to floodplains and their natural and beneficial values, as well as to operation of the TVA reservoir system. Under the No Action Alternative, these types of minor beneficial and adverse impacts would continue.

Overall, because many of the programs and activities under Alternative B would not differ from Alternative A and because other programs that may change are not anticipated to have any environmental impacts, Alternative B would not result in any impacts or changes from impacts described in the 2011 Final EIS.

Water Quality

Affected Environment. In addition to the nine reservoirs on the mainstem of the Tennessee River, TVA operates 39 tributary dams for various combinations of power generation, flood control, pumped storage, navigation, recreation, water supply, economic development, and fish and wildlife habitat. This system of dams and their operation is the most significant factor

affecting water quality and aquatic habitats in the Tennessee River and its tributaries. Portions of several rivers downstream of dams are included on the most recent state Clean Water Act (CWA) Section 303(d) lists of impaired waters due to dissolved oxygen levels, flow modifications, and thermal modifications resulting from impoundment.

Since 2011, several actions have improved water quality. Repairs to Wolf Creek Dam were completed in late 2013 and river flows were greatly improved in the summer of 2014 leading to the delisting of dissolved oxygen as an impairment for the stream. TVA, in conjunction with the Tennessee Department of Environmental Conservation (TDEC), has also implemented multiple activities with goals to reduce sediments and phosphates entering TVA reservoirs. Currently implemented within the Elk River watershed, these activities are expected to provide major improvements to water quality.

TVA continues to monitor water quality on its reservoirs as part of the Ecological Health Monitoring Program. In the most recent ratings (2014 through 2018), 17 of the 31 reservoirs improved their scores, 11 scores declined, and 3 were unchanged compared to the results shown in the 2011 Final EIS. TVA also continues to implement monitoring programs for tailwaters, dissolved oxygen, and water temperature.

Environmental Consequences. Over the long term, there would continue to be largely beneficial impacts under Alternative A from many activities such as water quality monitoring, shoreline stabilization, and partnerships. These beneficial impacts would be minor to major depending on their location and ability to address site-specific water quality issues. Adverse impacts would mostly occur over the short term and would be minimized or mitigated through the environmental review process.

Implementation of Alternative B would result in similar impacts on water quality as compared to Alternative A.

Air Quality

Affected Environment. Since the publication of the 2011 Final EIS, air quality continues to improve in the TVA region. The TVA region is in attainment for all National Ambient Air Quality Standards except for a 3-kilometer radius circular area in Kingsport, Sullivan County, Tennessee, which is in non-attainment for the 2010 1-hour sulfur dioxide standard. Emission reductions across the portfolio of TVA's power-generation facilities has declined significantly: between 2011 and 2017, nitrogen oxide emissions are down 52 percent, sulfur dioxide has declined 76 percent, and carbon dioxide emissions have declined 31 percent.

Environmental Consequences. Overall, impacts under Alternatives A and B would be the same. This conclusion is consistent with the 2011 Final EIS. Although there is a potential for future development on TVA land which may introduce new sources of air emissions, those sources would have to go through the agency permitting and approval process. Program implementation under the NRP is unlikely to result in new long-term emissions sources. Continued declines in emissions from TVA emission reduction projects are likely to offset any potential increases in emissions from new industrial development.

Climate

Affected Environment. Data trends for the time period 1981-2010 indicate increasing temperatures, decreasing precipitation, declining cloud cover, and increasing solar radiation in the region. Since the publication of the 2011 Final EIS, TVA has taken an active role in preparing for the potential impacts of climate change by developing and maintaining its Climate

Change Adaptation Plan. Also, since 2011, TVA, in coordination with other federal agencies as well as state and local partners, has initiated a Sentinel Monitoring program with 19 stations designed to assess potential biological, ecological, and hydrological responses of aquatic ecosystems related to climate change. TVA power plant carbon dioxide emissions have dropped by approximately 31 percent between 2011 and 2017 due to a multitude of emission reduction projects instituted by TVA in this period.

Environmental Consequences. The potential for climate change ultimately exists on a global scale as a consequence of industrialization and widespread use of fossil fuels for power generation and transportation needs around the globe. Continued implementation of the 2011 NRP would benefit climate through management of lands for Natural Resource Conservation or Sensitive Resource Management under the Comprehensive Valleywide Land Plan (CVLP). Similarly, programs and activities that enhance forest management could benefit climate when such actions increase carbon sequestration. Adverse impacts would continue where carbon sequestration is reduced due to harvesting or conversion of natural areas to developed areas. These actions, occurring as part of the NRP, would continue to have negligible to minor effects on climate. Under Alternative B, TVA would discontinue the Terrestrial Greenhouse Gas Sequestration Management Program because it is better managed and implemented by universities or other entities. Overall, impacts would be similar to those under Alternative A because TVA has not yet fully implemented this program in the 2011 NRP.

Cultural Resources

Affected Environment. Since 2011, TVA has implemented NRP initiatives to evaluate its data on archaeological resources (and structures) in the Tennessee Valley and develop an integrated cultural resource database. From 2015 to the present, TVA has been developing a system for tracking and managing all agency related cultural resource information. This work is ongoing due to the large amount of cultural resource data involved. The exact number of archaeological resources identified on TVA lands is being determined through this data review. In the meantime, TVA continues to estimate that there are 11,500 sites on TVA lands, the same estimate provided in the 2011 Final EIS.

The total number of sites within the TVA region considered eligible for listing in the National Register of Historic Places (NRHP) is not known. However, at least 19 archaeological sites and archaeological districts on TVA land are listed on the NRHP. A new project is underway to improve TVA's inventory of historic buildings and structures to meet TVA's obligations under Section 110 of the National Historic Preservation Act (NHPA). All of TVA's hydroelectric dams are now either listed in the NRHP or determined eligible for listing in the NRHP as a result of consultation with State Historic Preservation Officers (SHPOs).

Environmental Consequences. Under Alternative A, TVA has been reasonably successful in implementing these programs although at a modified level based on available funding. A blended management approach would continue. TVA will address potential effects to cultural resources that may occur as a result of other programs for Section 106 compliance as specific projects are implemented. Cultural resource effects would also be reviewed by TVA when site-specific actions are proposed on TVA lands to ensure compliance with NEPA and NHPA.

In conclusion, implementation of Alternative B would have similar impacts to cultural resources as Alternative A. While there are new focus areas included in Alternative B that have the potential to affect cultural resources, such as Section 26a and Land Use Agreements, these activities have been occurring for many decades with procedures in place to ensure compliance with Section 106 of the NHPA. The addition of these focus areas to the NRP would not create

new impacts to cultural resources; rather they would continue to produce both beneficial and occasional negative impacts to archaeological sites and historic structures and buildings.

Recreation

Affected Environment. TVA continues to be a regionally important recreation provider, and regional population growth has increased demand for developed and dispersed recreation opportunities. TVA operates many day use public recreation areas and manages approximately 500 agreements with commercial and public operators to provide recreational opportunities (e.g., marinas and campgrounds). This number has remained relatively consistent since 2011 and includes implementation and compliance with TVA's Commercial Recreation Guidelines established in 2010. There are now 170 miles of trails on TVA land, up from approximately 100 miles in 2011.

Other TVA programs affect the quality and quantity of recreation opportunities. For example, there are more than 2,200 floating cabins on TVA reservoirs. TVA completed the first phase of a rulemaking process for floating cabins; more detailed health, safety, and environmental standards for floating cabins will be addressed in a later Phase II rulemaking once TVA has discussed proposed standards with stakeholders.

Environmental Consequences. Under Alternative A, TVA would continue to successfully implement most programs and activities identified in the 2011 NRP that affect recreation demand and opportunity. However, as the regional population continues to grow, TVA's programs may not fully address increasing user demand over the long term. Actions to increase recreation opportunities would be needed and could include construction of additional developed and dispersed recreation facilities. These impacts could be minor to moderate depending on the location and intensity of use.

Implementation of Alternative B would provide greater benefits to recreation than Alternative A. This is because Alternative B proposes to include a more comprehensive suite of recreation programs and activities with greater ability to respond to emerging issues. Combined with the issuance of 3- to 5-year action plans, implementation of Alternative B would likely result in more effective prioritization of future, site-specific projects that address issues of increased recreational demand and improved user experiences.

Natural Areas

Affected Environment. The TVA natural areas program includes small wild areas, habitat protection areas, wildlife observation areas, and ecological study areas. In total, TVA manages 114 habitat protection areas, 31 Small Wild Areas, five ecological study areas, and six wildlife observation areas. Since publication of the 2011 Final EIS, three new TVA natural areas have been created, all of which are Habitat Protection Areas on Kentucky Reservoir.

There are also a host of management issues that TVA contends with regarding its natural areas. These issues include frequency of monitoring, lack of management plans, invasive species, vegetation management, trail maintenance, boundary marking and signage, maintenance of facilities, gates and barriers, litter and dumping, improper use, and adjacent land use and encroachment.

Environmental Consequences. Under Alternative A, there would continue to be beneficial impacts for those natural areas where a management plan is developed and continued potential for degradation of other natural areas due to lack of active management.

When compared to Alternative A, implementation of Alternative B would result in minor additional benefits to natural areas. While many of the program additions themselves are longstanding and traditionally have been implemented outside of the NRP, the action plans could provide additional benefits over the long term.

Land Use

Affected Environment. TVA manages its lands and shorelines to protect the integrated operation of the TVA reservoir and power systems, to provide for public use and enjoyment of the reservoir system, and to provide for continuing economic growth. These resources include a 41,000 square-mile watershed, 293,000 acres of reservoir land, 11,000 miles of reservoir shoreline, and thousands of miles of tributary streams and rivers that span a seven-state region.

TVA has a duty to manage these resources wisely for present and future generations. TVA developed regulations to implement Section 26a and will continue to implement the Shoreline Management Policy, Land Policy, and Public Land Protection Policy to manage the use of reservoir lands and waters under its control.

Environmental Consequences. Under Alternative A, TVA would continue to conduct environmental reviews to address site-specific issues prior to the approval of any proposed activity on lands under its control. Future activities and land uses would continue to be guided by the TVA Land Policy and other relevant policies as well as compatibility with surrounding land uses. Due to TVA's land use policies and project approval process, the potential for adverse effects is minimized.

Impacts under Alternative B would be similar to those under Alternative A because TVA would continue to conduct environmental reviews to address site-specific issues. The inclusion of Section 26a, land use stakeholder education, and communication efforts into the 2020 NRP is expected to improve partnerships, increase public awareness concerning how land and shoreline use impacts the environment and TVA's management of the reservoir system, as well as improve understanding and compliance with TVA's permitting and land use requirements. This education and communication program is anticipated to benefit implementation of TVA's land use policies as well as the public affected by land use decisions.

Prime Farmland

Affected Environment. The 2011 Final EIS describes how the Farmland Protection Policy Act (FPPA) requires all federal agencies to evaluate the impacts to prime farmland, and farmland of statewide or local importance prior to conversion of the land to a use incompatible with agriculture. Approximately 22 percent of TVA's power service area is classified as prime farmland (not including approximately 20 counties for which soil survey information was not available). An additional 4 percent of TVA's power service area would be classified as prime farmland if drained or protected from flooding (USDA 2018).

The 2011 Final EIS reported a decline in the average size of farms and a growth in the number of farms. However, it appears that this trend has reversed. More recent USDA data reveals that between 1982 and 2012 the average size of farms has increased 6.3 percent while the number of farms has decreased 14.7 percent (TVA 2019b).

Environmental Consequences. Under the No Action Alternative, TVA would continue to manage its programs in accordance with the 2011 NRP and to follow the FPPA's coordination requirements when considering development in areas that include prime farmland. In the 2011 Final EIS, TVA concluded that there would be beneficial impacts from programs and activities

that enhance soil quality or provide support to local and regional agricultural services. There would continue to be minor adverse impacts associated with the permanent conversion of prime farmland to nonagricultural uses.

The 2020 NRP includes more programs and activities affecting development than the 2011 NRP. In general, this would improve TVA's ability to manage prime farmland However, in many cases, impact differences would be negligible or minor when compared to Alternative A because many of these program additions themselves are longstanding and traditionally have been outside of the NRP. Alternative B would provide minor additional beneficial impacts through the inclusion of additional focus areas and 3- to 5-year action plans in the NRP. Overall, both beneficial and adverse impacts are expected to be minor.

Visual Resources

Affected Environment. A number of natural features and human alterations contribute to the aesthetic quality and character of a landscape. TVA utilizes classification criteria adapted from the US Forest Service scenic management system to evaluate visual attributes and determine the overall scenic value of an area. Large parts of the Tennessee Valley have the characteristics of a scenic, rural countryside. The wide variety of land uses present throughout TVA's areas of jurisdiction result in differing levels of visual compatibility depending on the type of facility and its integration with the surrounding scenic resources. Since publication of the 2011 Final EIS, the land uses adjacent to existing TVA lands and the visual resources associated with them have not changed or been altered significantly.

Environmental Consequences. Under Alternative A, TVA would continue implementing programs and activities that affect visual resources as under the 2011 NRP. In the 2011 Final EIS, TVA concluded that implementation of the Blended Management alternative would result in localized improvement in the scenic quality of TVA lands. Conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative remain largely accurate, as these programs have improved scenic quality in some locations, but their full implementation is not likely to be complete within the 20-year timeframe of the 2011 NRP.

Because many programs in the 2020 NRP are a continuation of current management under Alternative A, implementation of Alternative B would provide minor additional beneficial impacts compared to Alternative A. This is primarily because the 3- to 5-year action plans provide a more appropriate structure under which programs benefitting visual resources would be implemented more successfully. Also, TVA's Section 26a and Land Use Implementation Program evaluates and seeks to minimize impacts, including on visual resources, during the permitting and land use agreement process.

Navigation

Affected Environment. As described in the 2011 Final EIS, TVA operates the Tennessee River and its tributaries as an integrated system for the purposes of navigation, flood control, and power production, which is consistent with the public benefits within the region. TVA has been involved with water resources planning and system integration since the creation of the agency in 1933 and the construction of the Tennessee River navigation channel in 1945. According to current estimates, the navigational channel supports travel by over 28,000 barges annually and carries 45 to 50 million tons of goods up and down the Tennessee River (TVA 2018).

Environmental Consequences. Under Alternative A, TVA would continue to conduct Section 26a project reviews to ensure the construction of water use facilities does not encroach upon the

commercial navigation channel or marked recreational channels. Consequently, the conclusion in the 2011 Final EIS that there would be no direct impact on commercial navigation remains accurate.

Impacts would be the same under Alternative B because TVA would continue to conduct Section 26a reviews to ensure the construction of water use facilities does not encroach upon the commercial navigation channel or marked recreational channels.

Socioeconomics and Environmental Justice

Affected Environment. The 2011 Final EIS describes the population of the TVA region as having increased by 10.9 percent from 2000 to 2010 and by 15.5 percent from 1990 to 2000 which exceeded the national average for both decades. The regional population has continued to grow between 2010 and 2017, though at a slower rate than the country or broader southern region. The population growth rate for the TVA power service area is expected to decline to about 0.5 percent by 2043. The TVA power service area, which consists of 180 counties in 7 states is also expected to continue to become more urban: the percentage of the population living in metropolitan areas is increasing and is projected to continue increasing in the future.

Environmental Consequences. In general, conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative remain largely accurate. The 2011 NRP has provided socioeconomic benefits, largely related to visitor experience and increased expenditures by those visiting and recreating on TVA lands. Beneficial impacts on minority and low-income populations would more likely occur in areas where those populations overlap with TVA reservoirs or other facilities. Beneficial impacts on population, employment, and income would most likely continue to occur in localized areas with commercial operators and high levels of developed and dispersed recreation.

Compared to Alternative A, the incorporation of additional programs and activities into the 2020 NRP may provide modest additional beneficial impacts. With the implementation of 3- to 5-year action plans, Alternative B would provide greater ability to respond to emerging issues and opportunities. Alternative B would likely result in more effective prioritization of future, site-specific projects that address employment, environmental justice, and income.

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Acronyms

ACS	American Community Survey
ARPA	Archaeological Resources Protection Act
BMP	Best Management Practice
CAA	Clean Air Act
CMP	Comprehensive Master Plan
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRM	Cultural Resources Management
CVLP	Comprehensive Valleywide Land Plan
CWA	Clean Water Act
DO	Dissolved Oxygen
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FPPA	Farmland Protection Policy Act
HAP	Hazardous Air Pollutants
IPaC	Information for Planning and Consultation
MATS	Mercury and Air Toxics Standards
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	Nitrogen Dioxide
NRHP	National Register of Historic Places
NRP	Natural Resource Plan
O_3	Ozone
PA	Programmatic Agreement
Pd	*Pseudogymnoascus destructans*
PM2.5	Particulate Matter with a Diameter of 2.5 Micrometers and Smaller
RLMP	Reservoir Land Management Plan
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Officer
SMI	Shoreline Management Initiative
SO_2	Sulfur Dioxide
TVA	Tennessee Valley Authority
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFWS	US Fish and Wildlife Service
WIIN Act	Water Infrastructure Improvements for the Nation Act of 2016

CHAPTER 1 – PURPOSE AND NEED FOR ACTION

1.1 Introduction and Background

The Tennessee Valley Authority (TVA) is unique among power generators in that it was created to not only empower the economic aspects of Southeast society but also to protect and improve the natural resources of the Tennessee Valley region. Today the results of TVA's efforts are apparent in the abundant natural resources in the region and the opportunities they afford.

In 2011, TVA completed its first Natural Resource Plan (NRP; TVA 2011a) and Environmental Impact Statement (EIS; TVA 2011b) to guide its stewardship efforts for managing the waters and public lands of the Tennessee River Valley (Figure 1-1). The NRP represents TVA's high-level strategy for managing its natural resources in the near and long term. The 2011 NRP addresses TVA's management of biological, cultural, and water resources; recreation; reservoir lands planning; and public engagement. The purpose of the plan is to integrate resource area objectives, provide for the optimum public benefit, and balance sometimes conflicting resource uses. The 2011 NRP also guides TVA in achieving the objectives of its Environmental Policy for a more systematic and integrated approach to natural resource stewardship.

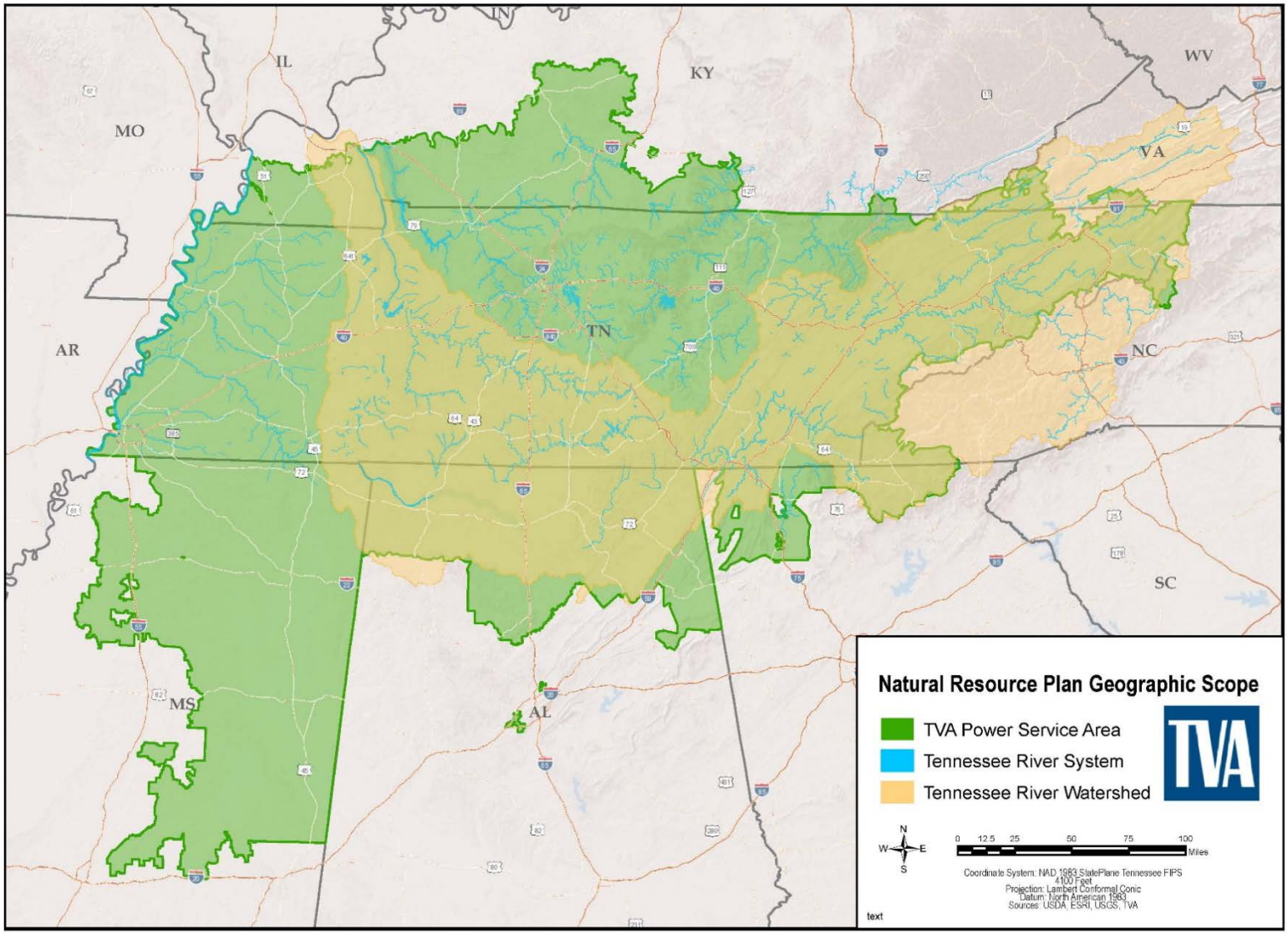

Figure 1-1. Natural Resource Plan Geographic Scope

As part of the process of developing the NRP, TVA developed an associated EIS. The 2011 Final EIS describes resource management programs and activities, alternative approaches to TVA's resource management efforts, and the environmental impacts of the alternatives, including the alternative comprising the NRP's preferred Blended Management alternative (TVA 2011b).

The 2011 Final EIS identified four management alternatives:

- The No Action Alternative: Meeting regulatory and technical requirements and managing lands through existing prioritization methods that consider recreational needs and public safety, while meeting applicable regulations and policies.
- Custodial Management: Focusing management to ensure compliance with TVA's mission, applicable laws, regulations and other mandates; such management could have resulted in transitioning some management responsibilities to contractors or closing facilities, discontinuing some programs or projects, and reducing the level of effort in some areas.
- Flagship Management: Proactive management of natural resources to increase stewardship to the "gold standard," enhancing recreation facilities and opportunities while emphasizing sustainable technologies, facility management, and reducing impacts at heavily visited sites.
- Blended Management: Identifying and emphasizing key programs that are integral to enhancing future implementation efforts while maintaining activities and projects that address safety and are necessary to comply with TVA's mission and applicable laws, regulations, policies, and other mandates.

On August 18, 2011, the TVA Board of Directors determined that the Blended Management alternative was in the best interest of TVA and accepted and authorized its implementation. This decision was based on that alternative's consistency with TVA's Environmental Policy, its focus on certain key programs that establish a baseline for future enhanced implementation efforts, and the flexibility it provides for the use of partnerships, volunteers, and other sources of funding to leverage programs while working within resource and staff constraints.

In the 2011 NRP, TVA committed to reviewing the NRP every five years and updating the plan to ensure it remains relevant and current. In 2016, as part of the update process, TVA staff began a holistic review of the NRP and determined that the 2011 NRP does not encompass all of the resource stewardship programs managed by TVA. TVA concluded that the NRP was not comprehensive and not fully serving as the overall strategic guide as was first envisioned. Based on this assessment, TVA determined that updating the NRP was the best path forward to address identified concerns.

The proposed update to the NRP (TVA 2019a) would be consistent with the Blended Management alternative approved by the TVA Board of Directors in August 2011. Generally, the proposed objectives in the updated NRP align with the resource area goals identified in the 2011 NRP. Therefore, proposed changes are being considered by TVA in a supplement to the 2011 EIS.

1.2 Purpose and Need for Action

The purpose of the action is to update the 2011 NRP to provide strategic guidance and alignment of TVA's Natural Resources work as well as create efficiencies in business planning and stewardship project implementation. The need for the action is to more clearly

define strategies, including objectives and programs, for each focus area and a flexible approach for long-term planning, which would help TVA prioritize funding plans and support TVA's mission. The NRP update would improve the document's efficacy by creating a more comprehensive 2020 NRP that better serves as an effective management guide for business and budget planning.

The 2011 NRP included six resource areas but did not address numerous programs that are managed by TVA. The updated NRP would include Section 26a and Land Use Agreements, Public Land Protection, and Ecotourism focus areas. Nuisance and Invasive Species Management were addressed on a limited basis in the 2011 NRP. In the 2020 NRP, TVA proposes to include the Nuisance and Invasive Species Management Focus Area, placing greater emphasis on the management of nuisance and invasive species.

Under the proposal, the updated 2020 NRP would be expanded to include ten proposed focus areas that tell a comprehensive story of TVA's work in natural resources. The 2020 NRP would serve as a strategic document that, over the next 20 years, guides the direction of TVA's resource stewardship. The NRP creates a framework for balancing land use, human activity, and conservation to achieve the greatest public benefit from our natural resources.

To complement the strategic guidance that the 2020 NRP would provide, TVA would develop a 3- to 5-Year Action Plan to provide a tactical approach to implement the specific activities associated with the ten focus area programs. The two-pronged approach of a short-term implementation strategy (3- to 5-Year Action Plan) that complements the long-term strategic guidance document (2020 NRP) would provide TVA the agility and flexibility necessary to achieve the goals of TVA's Natural Resources Stewardship Strategy. This approach supports the shift of the 2020 NRP to a strategic level guidance document that would retain long term relevance, since adjustments in the implementation of the NRP due to changes such as availability of stewardship funding, new trends in public use and input from the public would be addressed through the 3- to 5-Year Action Plan. The Action Plan would be continually updated during the life of the 2020 NRP.

1.3 Decision to be Made

The TVA Board of Directors will decide whether to accept the 2020 NRP in Alternative B or to continue recognizing the 2011 NRP as described in Alternative A.

1.4 Related Plans, Programs and Environmental Reviews

Section 1.8 of the 2011 Final EIS describes plans, programs, and environmental reviews relevant to the resources under consideration in the 2011 NRP and Final EIS. These include the 2004 Reservoir Operations Study and Final EIS, the 1998 Shoreline Management Initiative (SMI) and Final EIS and subsequent Policy, the 1997 Clean Water Initiative and Final Environmental Assessment (EA), the 1990 Lake Improvement Plan and Final EIS, 11 reservoir land management plans, and 10 resource unit management plans.

Since 2011, TVA has completed environmental reviews for the following plans and programs relevant to the resources and programs analyzed in this Supplemental EIS (SEIS):

Floating Cabins Policy Review Final EIS (TVA 2016a)

In February 2016, TVA completed an environmental review of the management of floating cabins and nonnavigable houseboats mooring on TVA reservoirs. This review was initiated

in April 2014 out of concern for the fair use of public lands and reservoirs, safety, sanitation and water quality.

On May 5, 2016, the TVA Board of Directors approved a policy for TVA's management of existing nonnavigable houseboats and floating houses (now called floating cabins). Subsequent to the May 5, 2016 Board policy, the Water Infrastructure Improvements for the Nation Act of 2016 (WIIN Act) was enacted on December 16, 2016 by the United States Congress including Title IV Section 5003, which amended the TVA Act to include Section 9b. This new section specifically addresses floating cabins and provides that TVA may allow the use of floating cabins where the structure was located on waters under TVA's jurisdiction as of December 16, 2016; and where the owner maintains the structure in accordance with reasonable health, safety, and environmental standards set by the TVA Board of Directors. Section 9b also states that TVA may establish regulations to prevent the construction of new floating cabins.

TVA is currently promulgating regulations in accordance with the WIIN Act to address health, safety, and environmental standards for floating cabins.

Updates to Eight Reservoir Land Management Plans and the Comprehensive Valleywide Land Plan (TVA 2017)

On August 23, 2017, the TVA Board of Directors approved the proposed Multiple Reservoir Land Management Plans (RLMPs) for TVA-managed public lands on eight reservoirs in Alabama, Kentucky, and Tennessee: Chickamauga, Fort Loudoun, Great Falls, Kentucky, Nickajack, Normandy, Wheeler, and Wilson. The TVA Board also approved the proposed changes to the Comprehensive Valleywide Land Plan (CVLP) land use allocation target ranges, which were set forth in the NRP in 2011 and intended to aid decision making across the entire TVA reservoir system. The Final EIS for this program was published in July 2017.

Amendments to the Watts Bar Reservoir Land Management Plan (TVA 2019c)

In 2012, TVA released a plan amendment to the Watts Bar RLMP that addressed the allocation of 143.6 acres of reservoir property that was not considered in the 2009 Watts Bar RLMP. The 143.6 acres include reservoir shorelands that front adjacent property that TVA acquired in the vicinity of Kingston Fossil Plant after the ash spill.

In March 2019, TVA released a Supplemental EA that analyzes proposed changes to the land use allocations for six parcels of public land on Watts Bar Reservoir, affecting a total of 226 acres of TVA land in Rhea and Roane counties in east Tennessee. These changes amended the 2009 Watts Bar RLMP.

Muscle Shoals Reservation Comprehensive Master Plan (TVA 2015)

In March 2015, TVA approved a final Comprehensive Master Plan (CMP) to encourage proper and responsible development of approximately 1,000 acres of the Muscle Shoals Reservation. The CMP serves as an overarching guiding principles tool to encourage well-managed development. It includes data and inputs collected throughout the planning process, the actions taken to develop the CMP, the preferred reuse plan, and the steps necessary to bring this surplus property to auction.

1.5 Regulatory Overview

Section 1.9 of the 2011 Final EIS describes the federal statutes and executive orders (EOs) relevant to the formulation and evaluation of the NRP alternatives. For example, some of

the programs and activities under consideration in the NRP are required by laws such as the Endangered Species (ESA) and the National Historic Preservation Act (NHPA). The implementation of other programs and activities can be influenced by requirements for compliance with these and other laws and regulations. The key laws and regulations that relate to this SEIS are the same as those described in the 2011 Final EIS and include the TVA Act, the National Environmental Policy Act (NEPA), the Clean Water Act (CWA), EO 11990 (Protection of Wetlands Management), the Clean Air Act (CAA), ESA, NHPA, Archaeological Resources Protection Act (ARPA), the Farmland Protection Policy Act (FPPA), and EO 12898 (Environmental Justice).

While there have been regulatory changes to some of these laws (e.g., National Ambient Air Quality Standards [NAAQS] for ozone [O_3] under the CAA) since 2011, they do not substantially alter the way TVA manages its natural resources.

1.6 Scoping and Public Involvement

Scoping, which is integral to the process for implementing NEPA, is a procedure that solicits public input to the NEPA process to ensure that: (1) issues are identified early and properly studied; (2) issues of little significance do not consume substantial time and effort; (3) the NEPA document is thorough and balanced; and (4) delays caused by an inadequate review are avoided. TVA's NEPA procedures require that the scoping process commence soon after a decision has been reached to prepare a NEPA review to provide an early and open process for determining the scope and for identifying the significant issues related to a proposed action.

On July 16, 2018, TVA published in the Federal Register a Notice of Intent (Notice) to conduct the environmental review of a proposed NRP update in accordance with NEPA and published information about the review and planning effort on the TVA webpage. TVA also notified the media and numerous individuals, organizations, and intergovernmental partners of the review. The Notice initiated a 30-day public scoping period, which concluded on August 20, 2018. As stated in the Notice, TVA determined that a supplement to the 2011 NRP EIS would be completed.

TVA also issued a press release announcing that public input was being sought on the proposed update to the NRP. Media outlets across the region published or broadcast stories based on the release.

TVA also developed an initial project mailing list and sent postcards to notify those on the list. The mailing list was derived from prior stewardship and natural resource efforts which included local, state, and federal partners; non-governmental entities; and other interested stakeholders. Approximately 250 postcards were mailed. At the time, TVA also placed newspaper advertisements in 37 newspapers around the region to provide notice of the planning effort, the public scoping meetings, and to invite public comments.

TVA hosted four public scoping meetings at locations throughout the Tennessee Valley: Knoxville, Tennessee; Chattanooga, Tennessee; Muscle Shoals, Alabama; and Buchanan, Tennessee. TVA published social media posts and event reminders for the public scoping meetings. The four public meetings were attended by a total of 66 people.

Additionally, TVA hosted a webinar for the public on August 6, 2018, to provide the public another opportunity to obtain information on the proposed update to the NRP. Twenty-eight people registered for the webinar.

In its Federal Register Notice and on its website, TVA stated its intention to update the NRP that was accepted in 2011 and solicited feedback from the public on the ten proposed focus areas and the programs associated with each focus area. TVA asked that new issues or information about other concerns related to TVA's natural resource stewardship activities also be brought to TVA's attention.

TVA received a variety of comments and opinions regarding the proposed changes to the NRP. TVA received a total of 29 submissions from members of the public and intergovernmental entities (18 email or online comment form submittals and 11 written comments).

TVA received comments related to the following topics:

- Aquatic Vegetation
- Silver Carp
- Nuisance and Invasive Plants
- Section 26a Applications
- Land Use
- Reservoir Lands Planning
- Shoreline Erosion
- River Operations
- Trails
- Recreation Partnerships
- Dispersed Recreation
- Ecotourism
- Habitat and Forest Management
- Prescribed Fire
- Economic Development
- Boundary Marking
- Violations and Encroachments
- Preserving Public Lands
- Public Outreach

Public involvement will continue throughout implementation of the NRP under either alternative.

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CHAPTER 2 - ALTERNATIVES

2.1 Description of Alternatives

This chapter provides a detailed description of both alternatives addressed in the SEIS. A summary table outlining and describing the differences between the 2011 and 2020 NRPs is provided in Appendix A.

As shown in Figure 2-1, the two alternatives propose different structures for the NRP. These differences are described in detail in the following sections.

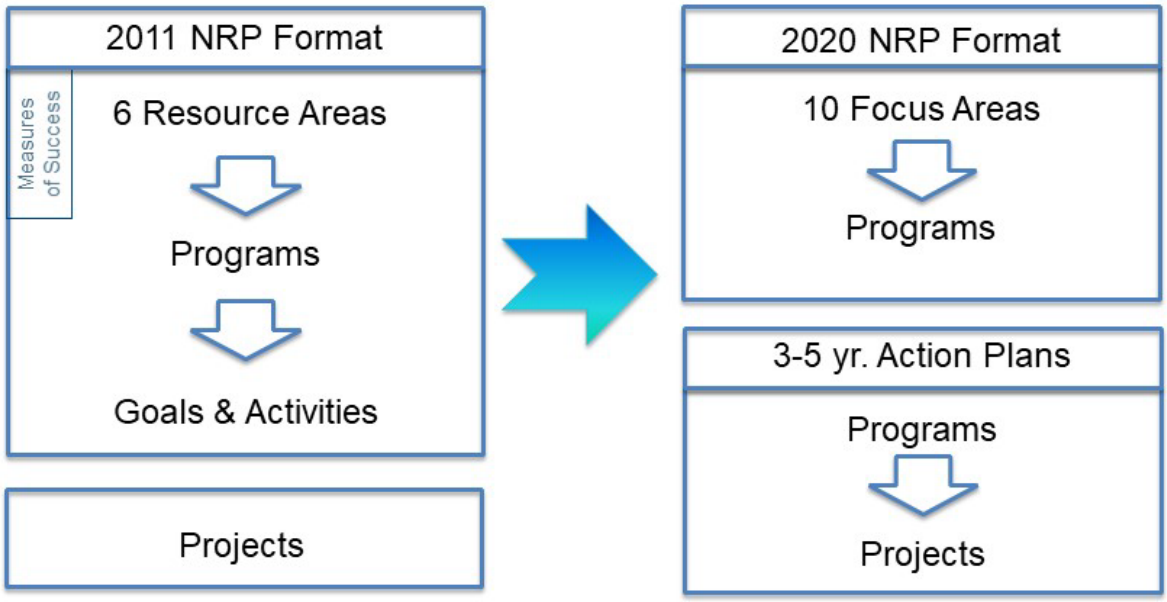

Figure 2-1. Natural Resource Plan Structure

2.1.1 Alternative A – The No Action Alternative

Under the No Action alternative, TVA would not make changes to the 2011 NRP, which is a blended management approach to natural resources management. Key programs identified in six resource areas that are integral to enhancing future implementation efforts would continue to be implemented. The six resource areas are:

- Biological Resources
- Cultural Resources
- Recreation Management
- Water Resources
- Reservoir Lands Planning
- Public Engagement

TVA would also continue to maintain activities and projects that address safety and comply with TVA's mission and applicable laws, regulations, policies, and EOs. The NRP establishes interconnectivity of each resource area and their supporting programs, which provides a foundation by which TVA may implement greater levels of programs.

By not taking action to update and refresh the NRP, however, TVA would be inconsistent with the implementation component of the plan (Phase II of the "Road Map for Success"), wherein TVA commits to periodic updates of the plan to ensure consideration is given to changing resource conditions.

2.1.2 Alternative B – TVA's Proposed Action – Updates to TVA's Natural Resource Plan

Under Alternative B, TVA proposes to update the NRP to become a strategic document which includes focus area programs, objectives and anticipated benefits, and introduces four additional focus areas into the NRP. Existing and proposed programs will be categorized into the 10 proposed focus areas. This shift expands the focus of the NRP from the original six resource areas to 10 focus areas to ensure that the NRP addresses the entire scope of TVA's natural resource stewardship efforts. The updated NRP would include Section 26a and Land Use Agreements, Public Land Protection, and Ecotourism focus areas. Nuisance and Invasive Species Management were addressed on a limited basis in the 2011 NRP. In the 2020 NRP, TVA proposes to include the Nuisance and Invasive Species Management Focus Area, placing greater emphasis on the management of nuisance and invasive species.

The revised groupings of certain programs are appropriate based on their nature and would improve the plan's clarity and usefulness. TVA proposes to delete some programs that are better managed by other entities. Some programs in the 2011 NRP are being restructured to serve as tools (e.g., types of implementing projects or efforts) to achieve the objectives of multiple programs in the proposed 2020 NRP. Most programs proposed in the 2020 NRP are consistent with existing TVA stewardship efforts. TVA proposes to introduce additional programs to expand stewardship efforts and combine some existing programs to better describe current activities. TVA would revise the organization of the plan itself by revising the six resource areas, creating the following ten focus areas:

- Reservoir Lands Planning
- Section 26a and Land Use Agreements
- Public Land Protection
- Land and Habitat Stewardship
- Nuisance and Invasive Species Management
- Cultural Resources Management
- Water Resource Stewardship
- Recreation
- Ecotourism
- Public Outreach and Information

Description of the Ten Proposed Focus Areas

2.1.2.1 Reservoir Lands Planning

TVA uses RLMPs as tools to manage the approximately 293,000 acres of public land around its reservoirs. Reservoir Lands Planning is the framework for how TVA intends to

manage its public land. Additionally, TVA aligns the use of public lands with its policies and guidelines as well as with its responsibilities under the TVA Act of 1933.

As a steward of critically important natural and cultural resources across the Tennessee Valley, TVA has a duty to manage its lands sustainably for present and future generations. Reservoir Lands Planning guides TVA's management decisions concerning natural and cultural resources and property administration.

Public lands adjacent to TVA reservoirs, together with adjoining private lands, have been used for public parks, industrial development, commercial recreation, residential development, tourism development, and forest and wildlife management areas, and to meet a variety of other needs associated with local communities and government agencies. Land Plans guide land use approvals, private water use facility permitting and resource management decisions on TVA-managed public land.

RLMPs detail the land management strategies used on a reservoir-by-reservoir basis and guide TVA's decisions related to Section 26a and land use requests. The planning process includes a systematic method of identifying and evaluating the most suitable uses of public lands under TVA stewardship. During the reservoir lands planning process, TVA considers land use and natural and cultural resource needs, TVA's Programmatic interests, and input provided by the public and state and federal agencies to guide the allocation of TVA land and land rights.

Objective:

- Manage the public lands and land rights entrusted to TVA to protect the operation of the reservoir and power systems, to provide for appropriate public use and enjoyment of the reservoir system, to provide for continuing economic growth in the power service area, and to manage the resources in the Tennessee Valley

Benefits:

- Provides a consistent approach to balancing shoreline development, recreational use, natural and cultural resource management, and other uses by applying a systematic methodology to identify the most suitable land uses
- Identifies land use zone allocations to optimize public benefit, balance competing demands for the use of public lands, and support TVA's broad regional resource development mission
- Guides TVA's land management and property administration decisions while enhancing the protection of resources, including threatened and endangered species, cultural resources, wetlands, unique habitats, natural areas, water quality, and the visual character of the reservoirs
- Provides a mechanism for public involvement that allows local, state, and federal entities as well as individual members of the public to participate during the lands planning process

Program:

The 2011 NRP included Reservoir Lands Planning as a resource area. The 2020 NRP includes Reservoir Lands Planning as a focus area with one program.

COMPREHENSIVE VALLEYWIDE LAND PLAN PROGRAM

As part of the NRP, TVA developed its CVLP which comprises the framework for TVA's reservoir lands planning program. Through this program TVA will continue to develop and

evaluate RLMPs to guide TVA's land management and property administration decisions, while protecting natural and cultural resources. This program aligns with TVA's Land Policy and provides a consistent and systematic methodology to determine the most sustainable land uses for each parcel of TVA land.

The percentage of land available for each zone is established by the CVLP, which was originally set forth in the 2011 NRP. TVA's Board of Directors approved updates to the CVLP allocation ranges in August 2017 (Table 2-1). The CVLP established a target range for each zone allocation based on information from existing RLMPs. The allocation ranges help guide decision making across the TVA reservoir system.

Table 2-1. Comprehensive Valleywide Land Plan Zone Allocations

Zone	Allocation Designation	2011 CVLP Range Allocations (Percentage)	2017 CVLP Range Allocations (Percentage)
Zone 2	Project Operations	5 to 7	7 to 10
Zone 3	Sensitive Resource Management	15 to 18	14 to 18
Zone 4	Natural Resource Conservation	58 to 65	56 to 63
Zone 5	Industrial	1 to 2	1 to 3
Zone 6	Developed Recreation	8 to 10	8 to 10
Zone 7	Shoreline Access	5	5 to 6

Source: TVA 2017

Examples of projects and efforts that support the implementation of the CVLP program may include making updates and revisions to existing RLMPs to reflect changing conditions or new information without changes to the land use allocations. However, land use allocation changes may be required to correct an administrative error or to respond to certain land use requests that are consistent with the TVA Land Policy.

Expected Benefits of the Program

- Provides a consistent approach by applying a systematic methodology to identify the most suitable land uses
- Identifies land use zone allocations to optimize public benefit, balance competing demands for the use of public lands and to support TVA's broad regional resource development mission
- Guides TVA land management and property administration decisions while enhancing the protection of significant resources, including threatened and endangered species, cultural resources, wetlands, unique habitats, natural areas, water quality and the visual character of the reservoir

Geographic Scope of the Program

Program efforts will be implemented on TVA managed reservoir lands

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Resource Area: Reservoir Lands Planning	**Focus Area: Reservoir Lands Planning**	No change to focus area name proposed.
No programs were included in the 2011 NRP	CVLP	The CVLP was introduced in the 2011 NRP, but it was not categorized as a program in the proposed 2020 NRP.

2.1.2.2 Section 26a and Land Use Agreements (New)

The lands and shoreline along TVA reservoirs are special places, and the Section 26a of the TVA Act and land use processes help to ensure that they stay that way. TVA's goal is to protect land and shoreline resources while supporting access to public land and waters.

TVA is entrusted to manage its land and shoreline resources in order to provide multiple benefits to the people of the Tennessee Valley and to serve as a responsible steward of the Tennessee River System.

TVA manages the use of these lands and shorelines in a manner that is consistent with the purposes of the TVA Act. In an effort to best manage the use of these reservoir lands and waters, TVA developed its Land Policy, Shoreline Management Policy, and Section 26a Regulations.

Section 26a Permitting

Section 26a of the TVA Act requires that TVA approval be obtained prior to construction, operation, or maintenance of any dam, appurtenant works, or other obstructions affecting navigation, flood control, or public lands or reservations along or in the Tennessee River or its tributaries. Applications for shoreline construction may include requests for items such as boat docks, piers, boathouses, boat launching ramps, shoreline stabilization, dredging, and existing floating cabins. This section of the TVA Act is extremely important because it is designed to ensure that construction along the shoreline and in the waters of the Tennessee River system does not adversely impact or compromise TVA's capability to manage the river system. TVA reviews and approves about 1,500 construction permits each year, and approximately 85 percent of these permits are associated with residential development.

Land Use

The objective of TVA's Land Policy, adopted in 2006, is to preserve the reservoir lands remaining under its control in public ownership. Under this Land Policy, TVA considers requests for a variety of land use actions. The Land Policy is provided in Appendix D.

In some rare instances, transferring lands from TVA control to another entity is justified because of the significant public benefit. Each year, TVA reviews approximately 25 major reservoir property actions; these actions involve the sale or disposal of TVA's land or land rights, or easements on TVA land. Examples of these actions include providing easements to municipalities and agencies for construction of public infrastructure, such as water lines and roads, and providing easements for commercial recreation campgrounds and marinas.

In addition to grants of interests in real property, staff also review requests for licenses of TVA land for various purposes, including agricultural use, commercial recreation activities, industrial uses, public infrastructure, and special events. Special events, such as national fishing tournaments and local sporting events, support economic development and tourism in many communities in the Tennessee Valley.

Appendix C provides an overview of TVA's land use agreements, including the history of the program and the process for reviewing land use requests.

Objectives:

- Manage permission to use the shoreline and public land in a fashion that is consistent with of the TVA Act, National Environmental Policy Act, Shoreline Management Policy, and the Land Policy
- Seek to develop clear rules and policies, engage in public education and communication, and issue permits and agreements consistent with standing policies
- Support unified development of the Tennessee River system and flood control objectives

Benefits:

- Balances competing demands to provide public access to the reservoir while protecting natural and cultural resources and TVA's management of the river system
- Provides consistent guidance to support use and development of eligible public lands and shoreline for residential, commercial recreation, public, and industrial purposes
- Supports community development and growth by making TVA public lands and shoreline available for infrastructure and public use
- Provides an interface between TVA and landowners around TVA reservoirs

Programs:

The 2011 NRP did not address TVA's work in Section 26a and Land Use Agreements. The 2020 NRP proposes Section 26a and Land Use Agreements as a focus area which supports TVA's goal to protect the shoreline of the Tennessee River watershed while supporting recreational access to the waters and utilizing the land for the best public use. The Section 26a and Land Use Agreements Focus Area includes two programs which align the NRP more consistently with how TVA manages the natural resources of the Tennessee Valley.

SECTION 26A AND LAND USE IMPLEMENTATION

TVA applies the Section 26a and Land Use Implementation Program in accordance with Section 26a of the TVA Act, TVA's Land Policy, and associated regulations and guidelines.

This program helps balance resource conservation, sustainable economic development, and recreation opportunities. TVA will ensure compliance with Section 26a permits and land use agreements through shoreline and land inspections. TVA will evaluate and develop procedural efficiencies related to permitting and land use agreement processes. Section 26a permits are issued to provide permission for development along the shoreline for private, public, industrial, and commercial recreation water-use facilities, shoreline stabilization, and harbor limits. Land use agreements such as a fee sale, easement, or license provide the agreement holder the necessary rights for use of TVA property for purposes such as industrial, commercial recreation, or public utilities. Other land use

agreements could include permission for special events on TVA property such as a fishing tournament on a TVA dam reservation.

Examples of projects and efforts that support the implementation of the Section 26a and Land Use Implementation program could include:

- Supporting stakeholder requests through the issuance of Section 26a permits and Land Use agreements in accordance with Section 26a of the TVA Act, Shoreline Management Policy and Land Policy
- Inspecting shoreline construction projects for compliance with Section 26a permits
- Evaluating, revising, and developing guidelines as needed to support the implementation of TVA's Section 26a permitting and Land Use agreement program

Expected Benefits of the Program

- Greater adherence to Section 26a of the TVA Act
- Enhanced management of the river system for multiple benefits
- Improved development and disposal of managed lands to support sustainable development in the Valley

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed

SECTION 26A AND LAND USE STAKEHOLDER EDUCATION AND COMMUNICATION

TVA will engage in stakeholder outreach and communication regarding Section 26a of the TVA Act, TVA's Land Policy, and associated regulations and guidelines. Stakeholders include government entities, lakefront property owners, realtors, dock builders, recreational users, and industrial and commercial entities. TVA will use outlets such as TVA's website to provide user friendly information for stakeholders regarding permitting and land use. To increase awareness of these policies, regulations, and guidelines as provided by Section 26a, TVA will conduct stakeholder outreach workshops and campaigns.

Examples of projects and efforts that support the implementation of the Section 26a and Land Use Stakeholder Outreach and Communication program could include:

- Providing information through TVA's website, social media and other communication platforms
- Conducting realtor and stakeholder workshops and outreach events

Expected Benefits of the Program

- Improved partnerships
- Increased public awareness concerning how land and shoreline use impacts the environment and TVA's management of the reservoir system
- Improved understanding and compliance with TVA's Section 26a permitting and land use requirements

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed.

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Not included	**Focus Area: Section 26a and Land Use**	This is a new focus area that was not included in the 2011 NRP.
	Section 26a and Land Use Implementation	This is an existing TVA program that is new to the 2020 NRP.
	Section 26a and Land Use Stakeholder Education and Communication	This is an existing TVA program that is new to the 2020 NRP.

2.1.2.3 Public Land Protection (New)

In addition to the approximately 293,000 acres of public land, TVA also manages nearly 470,000 acres of inundated property and administers on behalf of the United States various land rights over another 293,000 acres of privately owned land for the purposes of managing the TVA reservoir system. TVA constantly faces challenges associated with activities that abuse or attempt to privatize TVA public land or impact important resources. These activities degrade the quality of the land, land rights, and the user experience, and the cumulative effects threaten TVA's ability to fulfill its management responsibilities.

Through both proactive and reactive management efforts in this focus area, TVA will protect the public land and land rights in its custody and control to preserve them for future generations while simultaneously balancing competing demands.

Objectives:

- Protect the public land and land rights in TVA's custody and control to preserve them for future generations while balancing competing demands through proactive and reactive management efforts
- Apply consistent enforcement of TVA's regulations, policies, and applicable laws
- Inventory land management needs and instances of abuse and implement actions to improve the quality of TVA public land
- Inform and engage the public to provide clear expectations for sustainable use of TVA public land

Benefits:

- Protects wildlife habitat and biodiversity in the Tennessee Valley
- Supports unified development in the Tennessee River system and flood control objectives
- Provides cleaner water and lands that contribute to a better quality of life and attract economic development and investment to the region

Programs:

The 2011 NRP placed TVA's Public Land Protection efforts in multiple programs located within the Biological Resources Resource Area. The 2020 NRP proposes Public Land Protection as a standalone focus area, which includes four programs. These new programs align the NRP more consistently with TVA's Public Land Protection efforts and how TVA manages the natural resources of the Tennessee Valley.

PUBLIC LAND OUTREACH

Outreach and engagement are the first lines of defense for public land protection. TVA utilizes several methods for engaging the public and conveying expectations for appropriate use of TVA public land. To improve public lands and waters, TVA supports communities by encouraging participation in reservoir and community cleanups. Through proactive communication with stakeholders and adjacent property owners, TVA can prevent encroachments and unauthorized uses of its land. Additionally, TVA's website is an important platform used to share information about the guidelines and rules for the authorized use of TVA public land.

Examples of projects and efforts that support the implementation of the Public Land Outreach program could include:

- Supporting reservoir and community cleanups
- Sharing information with stakeholders and adjacent property owners to increase awareness and promote the value of TVA public lands

Expected Benefits of the Program

- Prevention of encroachments and other abuse by encouraging the appropriate use of TVA public land through improved communication efforts
- Reduction of trash and litter on TVA public land through engagement and the support of reservoir and community clean ups

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed

PUBLIC LAND PROTECTION ENFORCEMENT

In accordance with the Public Land Protection Policy, approved by the TVA Board in August 2018, TVA protects its land through establishment and maintenance of rules and regulations and enforcement using available means. Rules and regulations create consistency for the public and TVA by outlining expectations and buttressing the basis for enforcement. TVA's Public Land Protection Policy is provided in Appendix B.

Examples of projects and efforts that support the implementation of the Public Land Rules, Regulations and Enforcement program could include:

- Enhancing and implementing rules and regulations for authorized use of TVA public lands
- Protecting the quality and value of TVA public lands by addressing abuse and privatization of those lands
- Increasing awareness of the rules for use of TVA public lands by maintaining rules information on TVA's webpage and installing rules signs on TVA property

Expected Benefits of the Program

- Sustainable use of TVA public lands
- Consistency in the enforcement of unauthorized activities and abuse of TVA public land
- Reduced violations and encroachments due to enforcement of rules and resolution of infractions

- Increased willingness of responsible parties to comply due to TVA's consistent enforcement

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands

COMPREHENSIVE LAND CONDITION ASSESSMENT
Through this program, TVA assesses its land to determine the condition of each parcel and identify stewardship needs for maintaining or improving the parcels. The stewardship needs for each parcel are prioritized and addressed as necessary which can drive the need for projects in other focus areas programs. Examples of these identified needs may include invasive species management, reestablishing a wildlife opening, or reestablishing a TVA boundary.

Examples of projects and efforts that support the implementation of the Comprehensive Land Condition Assessment program could include:

- Assessing the condition of TVA lands to identify management needs such as implementing invasive species control, enhancing wildlife habitat and reestablishing TVA property boundary

Expected Benefits of the Program
- Increased protection of natural, cultural and sensitive resources
- Increased knowledge of existing resource conditions and stewardship needs on TVA public lands
- Enhanced positive public perception associated with proactive land management

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands.

NATURAL RESOURCES ASSET INVENTORY
The Natural Resources Asset Inventory Program is a database of assets and facilities on TVA's developed and undeveloped lands. Examples of assets and facilities include picnic areas, camp sites, playgrounds, swimming beaches, pavilions, visitor centers, launching ramps, canoe accesses, fishing piers, and parking areas. Having an accurate inventory allows for the development of routine maintenance and inspection schedules that are important in lifecycle management of assets. This information can be used to protect TVA investments and to support future project planning for repair, renovation, or replacement of those assets.

Examples of projects and efforts that support the implementation of the Natural Resources Asset Inventory program could include:

- Assessing TVA assets to identify maintenance needs
- Providing data to inform annual budgeting and project prioritization
- Implementing inspection and routine maintenance schedule

Expected Benefits of the Program
- Increased efficiency in project planning and lifecycle management of assets
- Increased protection of TVA investments on reservoir lands
- Improved availability of information to share with the public

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands.

PROPERTY MANAGEMENT
TVA's Property Management Program encompasses efforts designed to clearly identify TVA boundaries and take steps to reduce and mitigate unauthorized uses of TVA public lands that have a detrimental effect on the resources and user experience. Establishing and maintaining TVA's public land boundary and signage assists (1) the public in identifying TVA public land, (2) adjacent property owners by preventing unintended encroachments, and (3) TVA through clear identification and resolution of existing encroachments. In addition, and as resources allow, TVA systematically monitors, maintains and installs access control measures that prevent abuse from motorized vehicles and other damaging activities, manages contracts with local communities for the control of litter and trash dumping, and performs reservoir shoreline inspections to monitor construction activities.

Examples of projects and efforts that support the implementation of the Property Management program could include:

- Surveying to establish or reestablish TVA's property boundary
- Implementing access control to protect TVA public lands
- Installing signage to convey rules for authorized uses of TVA public lands

Expected Benefits of the Program
- Clearly identified property boundaries on TVA's public land
- Reduced instances and more effective resolution of encroachments and unauthorized uses
- Increased protection of natural and cultural resources
- Continued TVA presence on public lands and reservoirs to support appropriate use
- Enhanced positive public perception associated with proactive land management

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Not included as a specific resource area	**Focus Area: Public Land Protection**	TVA proposes Public Land Protection as a new Focus Area in the 2020 NRP. It includes two former Biological Resources programs, one of which is included in the 2020 NRP as a tool for implementation, and four new programs.
Land Conditions Assessment and Land Stewardship Maintenance	Comprehensive Land Condition Assessment	This former Biological Resources Program is now included in the Public Land Protection Focus Area, with a minor name change. The scope of the program is unchanged.
Boundary Maintenance	Property Management	The former Biological Resources Program Boundary Maintenance is now included as a tool in the proposed Property Management Program in the 2020 NRP.
	Natural Resources Asset Inventory	This is a new program proposed for the 2020 NRP.
	Public Land Outreach	This is a new program proposed for the 2020 NRP.
	Public Land Protection Enforcement	This is a new program proposed for the 2020 NRP.

2.1.2.4 Land and Habitat Stewardship (formerly Biological Resources)

The Land and Habitat Stewardship Focus Area contains many of the programs and activities classified under the Biological Resources area of the 2011 NRP.

Land and Habitat Stewardship refers to the management of natural resources such as land, plants, and animals with a particular focus on how that management brings value and benefit for both present and future generations. The Tennessee River's 41,000 square-mile watershed along with TVA's 293,000 acres of public land, 11,000 miles of reservoir shoreline, and an even larger power service area that spans portions of seven states, provide a canvas for TVA to manage its natural resources and enhance habitat. Changing conditions as a result of damage from natural events (storms, disease, and insects) and impacts from public use require proactive resource management. TVA's land and habitat stewardship on public lands provides a valued diversity of habitats, including native plant communities. This provides complementary opportunities including hunting, fishing, camping, hiking, biking, photography, wildlife viewing, and other outdoor activities.

TVA works closely with various local, state, and federal agencies, non-governmental organizations, industries, and stakeholders to develop and support conservation planning strategies. For example, TVA has partnered to craft federal refuge management plans and comprehensive state-wide conservation plans. TVA's management efforts often align with interagency goals and objectives.

Objectives:

- Improve protection and monitoring of sensitive resources on TVA land
- Enhance biological diversity and wildlife habitat
- Improve forest health and associated ecological benefits
- Improve interagency relationships and partnership efforts toward mutual stewardship goals

Benefits:

- Increases planning, protection, and management of sensitive resources (e.g., threatened and endangered species, wetlands, and natural areas)
- Improves implementation measures through adaptive management approaches and partnership opportunities
- Enhances wildlife habitat and biological diversity through restoration and maintenance of native plant communities using ecologically sound management practices
- Expands partnerships to further resource stewardship efforts in the region
- Increases opportunities for outdoor public use

Programs:

Much of the work described in the Land and Habitat Stewardship Focus Area was categorized in the Biological Resources area in the 2011 NRP, which contained nineteen programs. In the 2020 NRP, the proposed Land and Habitat Stewardship Focus Area includes eight programs, and these programs align the NRP more consistently with how TVA manages the natural resources of the Tennessee Valley. TVA proposes to reclassify or combine the remaining 2011 NRP programs into other programs or focus areas.

THREATENED AND ENDANGERED SPECIES

The Threatened and Endangered Species Program addresses compliance with Section 7(a)(1) of the ESA under which all federal agencies, including TVA, are required to consult with the US Fish and Wildlife Service (USFWS) concerning the effects of its actions on species listed by USFWS, as well as carry out conservation programs for listed species. TVA collaborates with other federal and state agencies, non-governmental organizations and academic institutions to plan, design and implement projects to help benefit T&E species where appropriate.

Examples of projects and efforts that support the implementation of the Threatened and Endangered Species program could include:

- Continuing to comply with the requirements of the Endangered Species Act and implementation of biological opinion requirements
- Supporting and facilitating monitoring of select species populations
- Creating monitoring plans, seeking partnerships and cataloging select species
- Continuing cave protection activities
- Continuing implementation of habitat enhancement and protection activities

Expected Benefits of the Program

- Encouraged support of compliance with the Endangered Species Act by protecting and improving T&E habitat on TVA lands and waters
- Increased resource knowledge to help make informed decisions on how lands are managed

- Improved coordination and communication with regulators

Geographic Scope of the Program
Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

WETLAND MANAGEMENT
The Wetland Management Program seeks to implement a proactive approach to identify, manage, and protect wetlands on TVA lands. TVA maintains a wetland database that contains information on wetlands to support informed decision making during the review of proposed actions throughout the Tennessee River watershed and power service area. Examples of projects and efforts that support the implementation of the Wetland Management program could include:

- Continuing implementation of current TVA wetland monitoring, management and protection practices on TVA-managed lands
- Assessing wetland function and quality
- Continuing to manage current database including data updates, information sharing and improved mapping

Expected Benefits of the Program
- Enhanced land management decisions through improved mapping and assessments identifying the location, type, condition and quality of wetlands on TVA lands
- Identified threats to wetlands on TVA managed land
- Increased preservation of the quantity, quality, functionality and biological diversity of TVA's wetlands

Geographic Scope of the Program
Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

SENSITIVE RESOURCES DATA
TVA's sensitive resource data is maintained through the TVA Natural Heritage database. The TVA Natural Heritage database is a biological database that contains an ecological inventory of rare plants, animals, natural communities, natural areas, and other sensitive natural resource features. Examples of projects and efforts that support the implementation of the Wetland Management program could include:

- Continuing current management of TVA Natural Heritage and wetlands databases.
- Supporting data sharing agreements among TVA and other state and federal resource agencies

Expected Benefits of the Program
- Improved management and protection of the Valley's sensitive resources through increased knowledge and data sharing of resource information
- Enhanced collaborative working environment through data sharing activities with state, federal and non-governmental organization partners
- Improved development of avoidance, minimization and mitigation measures as part of project planning

Geographic Scope of the Program
Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

NATURAL AREAS MANAGEMENT
Through this program, TVA manages natural areas which are ecologically significant sites, lands set aside for particular management objectives, and lands that contain sensitive biological, cultural, or scenic resources. The TVA Natural Areas Management Program includes small wild areas, habitat protection areas, wildlife observation areas, and ecological study areas. Examples of projects and efforts that support the implementation of the Natural Areas Management program could include:

- Monitoring and assessing TVA's natural areas to develop a prioritized list of maintenance or improvement needs
- Developing and implementing comprehensive natural area management plans
- Establishing criteria to designate new and/or remove existing natural areas on TVA-managed lands
- Protecting and enhancing ecological communities (e.g. restoration of native communities, invasive species control, use of prescribed fire and maintaining and protecting rare native communities)
- Maintaining, enhancing and developing trails in Natural Areas

Expected Benefits of the Program
- Expanded and improved knowledge and information about sensitive resources, resulting in enhanced habitat protection of some of the Valley's unique areas
- Increased opportunities for ecotourism resulting in greater local and regional economic benefits
- Enhanced public awareness and appreciation of unique natural areas
- Enhanced collaborative working environment through information sharing with state, federal and non-governmental organization partners

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands.

GRASSLANDS AND AGRICULTURAL LANDS MANAGEMENT
Through the Grasslands and Agricultural Lands Management Program, TVA's non-forested lands (e.g., plant communities and the wildlife they support) are maintained and enhanced through stewardship efforts. Management of these lands provides habitat diversity of plant and animal communities as well as other environmental benefits. Examples of projects and efforts that support the implementation of the Grasslands and Agricultural Lands Management program could include:

- Continuing to manage agricultural licenses and cooperative State and Federal Agency agreements on TVA-managed lands
- Developing partnerships and utilize cooperative and land use agreements with State and Federal Agencies, Non-Governmental Organizations and local agricultural producers to manage and enhance TVA grasslands and agricultural lands
- Establishing transitional buffer zones for habitat, establish native plant communities and maintain early successional habitat through use of prescribed burning, bush hogging and invasive control measures

- Implementing habitat conversion and enhancement (e.g. converting exotic turf grass to native grass and forbs and creating and maintaining quality pollinator habitat)

Expected Benefits of the Program

- Enhanced plant community diversity and wildlife habitat (NWSGs, legumes, forbs), support for existing resource management unit plans and protection of sensitive resources (e.g., visual, wetlands, cultural) by maintaining vegetative cover on specific sites
- Maintenance cost savings to TVA (e.g., dam reservations, substations, interior forest roads) and enhanced local agribusiness
- Elevated potential to meet interagency resource management goals
- Demonstrated innovative resource management practices

Geographic Scope of the Program

Program efforts will be implemented on TVA managed lands

DEWATERING PROJECTS

Through the Dewatering Projects Program, TVA operates nine dewatering areas on Kentucky and Wheeler reservoirs. A dewatering area is an area that is seasonally flooded as part of a waterfowl management program created and operated by TVA and its partners. The projects are operated as part of the Tennessee and Wheeler National Wildlife Refuges and State Wildlife Management Areas. Examples of projects and efforts that support the implementation of the Dewatering Projects Management program could include:

- Refurbishing and upgrading dewatering facilities to standard operation and function to support Dam Safety Governance and monitoring areas
- Operating, managing and maintaining dewatering areas and protecting structural integrity of earthen levees
- Collaborating with local and regional partners to provide enhanced public use and recreational opportunities such as hunting, camping, biking, hiking, wildlife viewing and fishing

Expected Benefits of the Program

- Increased awareness of s overwintering waterfowl, other wildlife and sensitive species habitat
- Enhanced protection of wetlands, bottomland forests, cultural resources, agricultural lands and highway or railroad embankments
- Improved waterfowl hunting and other dispersed use opportunities (e.g., wildlife viewing, bank and boat fishing, hiking and biking)
- Increased economic benefits to local communities through ecotourism and agriculture

Geographic Scope of the Program

Program efforts will be implemented on TVA managed lands

FOREST RESOURCE MANAGEMENT

In the Forest Resource Management Program, TVA oversees forest resources by developing management plans to balance multiple uses such as enhancing habitat, managing vegetation, and controlling exotic, invasive plant species. Examples of projects

and efforts that support the implementation of the Forest Resource Management program could include:

- Assessing tree cutting and vegetation damage encroachments
- Managing hazard trees and small-scale vegetation (tree removal) operations associated with storm or insect damages
- Monitoring broad forest trends on TVA-managed lands and provide support to state forestry assessment plans
- Developing and maintain a qualified fire management crew to enhance and protect TVA assets
- Implementing forest health and enhancement projects (e.g. reforestation, prescribed fire, invasive vegetation control, native species conversion, implementation of unit management plans, wildlife habitat enhancements and scaled timber harvest and salvage activities)

Expected Benefits of the Program

- Public safety and regulatory compliance by hazard tree mitigation and vegetation control at dams, dikes, levees, emergency spillways, dewatering units
- Forest protection through insect and disease control and monitoring and wildfire prevention and suppression
- Maintained forest health and associated ecological benefits by supporting diverse, sensitive, historic and unique plant communities as well as wildlife habitats

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed

CONSERVATION PLANNING

Conservation planning efforts are carried out by local, state, and federal agencies as well as by non-governmental organizations and others. Through this program, TVA will support and participate in these interagency efforts to develop stewardship strategies on public lands. Examples of projects and efforts that support the implementation of the Conservation Planning program include:

- Partnering with regulatory and resource management agencies and Non-Governmental Organizations in local, state and regional conservation planning efforts
- Providing technical expertise, facilitating research opportunities and participate in working groups (e.g. Migratory Bird working groups)

Expected Benefits of the Program

- Increases interagency partnership opportunities
- Maintains and improves interagency relationships and cooperative efforts toward mutual goals
- Enhances the understanding and management of plant communities, wildlife and their habitats

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Resource Area: Biological Resources	**Focus Area: Land and Habitat Stewardship**	The proposed Land and Habitat Stewardship Focus Area includes eight of the 19 programs included in the Biological Resources Resource Area of the 2011 NRP. TVA proposes to reclassify or combine the remaining 11 2011 NRP programs into other programs or focus areas.
Threatened and Endangered Species	Threatened and Endangered Species	There is no change proposed to this program.
Wetlands Management	Wetland Management	There is no change proposed to this program.
TVA Sensitive Resources Data Management	Sensitive Resources Data	There is no change proposed to this program.
Natural Areas Management	Natural Areas Management	There is no change proposed to this program.
Grasslands and Agricultural Lands Management	Grasslands and Agricultural Lands Management	There is no change proposed to this program.
Dewatering Projects Management	Dewatering Projects	There is no change proposed to this program.
Forest Resource Management	Forest Resource Management	There is no change proposed to this program.
Conservation Planning	Conservation Planning	There is no change proposed to this program.
Non-Native Invasive Plant Management	Non-Native Plant Management on TVA Lands	This former Biological Resources program has been renamed and is now included in the Nuisance and Invasive Species Management Focus Area.
Nuisance Animal Control	Nuisance Animal Control	This former Biological Resources program is now included in the Nuisance and Invasive Species Management Focus Area.
Land Condition Assessment and Land Stewardship Maintenance	Comprehensive Land Condition Assessment	This former Biological Resources program has been renamed and is now included in the Public Land Protection Focus Area.
Boundary Maintenance	Property Management	This former Biological Resources program has been renamed and is now included in the Public Land Protection Focus Area.
Non-Native Invasive Plant Management	Non-Native Plant Management on TVA Lands	This former Biological Resources program has been renamed and is now included in the Nuisance and Invasive Species Management Focus Area.
Nuisance Animal Control	Nuisance Animal Control	This former Biological Resources program is now included in the Nuisance and Invasive Species Management Focus Area.

2011 NRP	2020 NRP	Comment
Terrestrial Greenhouse Gas Sequestration Management		This program is better managed and implemented by universities or other entities.
Wildlife Habitat Council – Third-Party Certifications		TVA's membership in the Wildlife Habitat Council will continue. In the 2020 NRP, this former program will serve as a tool to implement the objectives of multiple Land and Habitat Stewardship programs.
Wildlife Habitat Enhancement Partnerships		TVA will continue to develop these partnerships to implement wildlife habitat enhancement projects. In the 2020 NRP, this former program will serve as a tool to implement the objectives of multiple Land and Habitat Stewardship programs.
Migratory Birds Management		Implementation of this program will be incorporated into other 2020 NRP programs in the Land and Habitat Stewardship Focus Area.
Leave No Trace		This former program is a tool that will be utilized to implement the programs in multiple focus areas.

2.1.2.5 Nuisance and Invasive Species Management (New)

Invasive species represent one of the most significant threats to the Tennessee Valley's natural resources. Climate change, increased recreational use and travel, and global transport may amplify the potential impacts caused by invasive species. Some species can become a nuisance when present in concentrated amounts or in undesired locations, becoming destructive or even threatening to humans, property, and other species. Nuisance and invasive species may have harmful effects on infrastructure, economy, human health, and recreation.

TVA works to address the negative effects of terrestrial and aquatic plants by using a prioritized, planned, and adaptive approach to management. On land, TVA manages nonnative, invasive plants for improvement of habitat using a variety of control methods which include mechanical and chemical controls and prescribed burning. In an aquatic environment, TVA uses targeted surveying techniques and integrated management strategies where established growth impacts or impedes the access to developed public use areas. This can include the use of mechanical harvesting to clear navigation channels, aquatic labeled herbicides to open up nearshore recreation sites, and selective biological controls where water bodies become inundated with plant growth. In some cases, TVA may manage newly introduced species to reduce future impacts from the species. TVA works directly with state and local stakeholders to partner on such efforts.

TVA controls nuisance animals where negative impacts may occur to TVA lands, reservoirs, public infrastructure, and recreational users and facilities to protect public health and safety, TVA assets, and adjacent property from damage. For example, TVA is addressing public health and safety issues associated with feral hogs on public lands, bird impacts to power structures, and local flooding caused by beavers. TVA is also working to address recreational safety concerns and protection of native aquatic species as a result of the migration of Asian Carp into the Tennessee River watershed.

Past experience has demonstrated that prevention and control of nuisance and invasive species is best achieved through collaboration among all levels of government and the private sector. TVA will continue to develop critical partnerships and implement proactive strategies to prevent or reduce the likelihood that new nuisance and invasive species become established within the Valley.

Objectives:

- Sustain and expand efforts to address the threats of invasive and nuisance species in order to best protect the Valley's natural resources
- Ensure use of practical and environmentally sound management practices which will take into account stakeholder expectations and the multiple uses of TVA lands and water
- Implement internal and external outreach efforts creating enhanced public awareness and action regarding the impacts of invasive and nuisance plants and animals
- Establish partnerships with university, local, state, and federal entities to identify and address threats posed by invasive and nuisance species within the Tennessee Valley

Benefits:

- Improves protection and enhancement of resources, habitats, biodiversity, and use of public lands and reservoirs
- Enhances public awareness and action regarding the impacts of invasive and nuisance plants and animals
- Develops partnerships with resource management agencies and non-governmental organizations to further resource management efforts in the region and beyond

Programs:

The 2011 NRP placed TVA's efforts in Nuisance and Invasive Species Management into two programs located within the Biological Resources Resource Area. The 2020 NRP proposes Nuisance and Invasive Species Management as a standalone focus area, which includes three programs. These new programs align the NRP more consistently with how TVA manages the natural resources of the Tennessee Valley.

AQUATIC PLANT MANAGEMENT

TVA's Aquatic Plant Management Program focuses on the reduction of impacts of nuisance and invasive aquatic plants while balancing the multiple uses of TVA reservoirs. The program will manage and reduce impacts of nuisance and invasive species utilizing outreach opportunities to improve understanding of these impacts while developing collaborative partnerships with university, state, and local partners and serving as technical experts on aquatic plant management in the Valley. In 1993, TVA completed an SEIS for these program activities; aquatic plant management activities under the NRP would be consistent with those addressed in the 1993 SEIS:

1. Mechanical treatments, including aquatic plant harvester, aquatic weed cutters, manual V-blade cutters
2. Chemical methods, including applying emergent (foliar), floating, granular and submersed herbicide applications with non-restrictive EPA-approved aquatic herbicides (in accordance to label recommendations) on targeted populations of aquatic plant species

3. Biological methods, including the introduction of triploid (sterile) Chinese grass carp (*Ctenopharyngodon idella*) and *Galerucella* spp. leaf beetle
4. Public outreach efforts, including events to inform and educate the public on aquatic plant species in the Valley and preventative measures related to the introduction of aquatic species and management alternatives
5. Collaboration and partnerships with reservoir stakeholder groups and state and local governments to provide technical expertise on the history and management of aquatic plants in the Valley, and partnerships with universities to develop new mechanical, biological, and chemical methods for aquatic plant management (TVA 1993)

Expected Benefits of the Program

- Improved reservoir access and use for multiple user groups
- Increased protection of water resources and migratory bird habitat
- Reduced impacts to TVA power operations caused by nuisance and invasive aquatic plant growth
- Reduced impacts from pioneer invasive aquatic plant species
- Enhanced outreach program efforts and partnership development to increase public knowledge and improve future decision making

Geographic Scope of the Program

Program efforts will be carried out within the Tennessee River Watershed

NONNATIVE INVASIVE PLANT MANAGEMENT ON TVA LANDS

TVA's Nonnative Invasive Plant Management Program will manage the effects of nonnative invasive plants on TVA lands. TVA manages these species, utilizing mechanical, chemical, prescribed fire, and other means in areas where habitat improvements have been made, in natural areas, on trails, and on dam reservation properties. The following are examples of species that are nonnative and displace native species and their communities: privet (*Ligustrum* spp.), kudzu (*Pueraria montana*), tree-of-heaven (*Ailanthus altissima*), fescue (*Festuca* spp.), johnson grass (*Sorghum halepense*), olives (*Elaeagnus* spp.), and nepalgrass (*Microstegium vimineum*), etc. TVA's management activities include the following:

1. Managing nonnative invasive plants on TVA-managed lands
2. Developing a prioritized plan to control nonnative invasive plants on areas with sensitive resources, habitat enhancements and high public use, emphasizing areas with high partnership potential
3. Mechanical methods including wrenches, hand, FeCon mulching machine, bush hogging, strip discing
4. Chemical methods, including foliage, broadcast, hack, stump and basal application with non-restricted herbicides (according to label recommendations)
5. Biological methods, including the use of animals of the ruminant species where practical to manage chinese privet (*Ligustrum sinense*), kudzu (*Pueraria montana*), and other species as identified
6. Prescribed fire treatments, which provide control and seasonal suppression of undesirable nonnatives and stimulate desirable native species

Expected Benefits of the Program

- Improved forest resources, wildlife habitats and biodiversity

- Improved protection of cultural and sensitive resources
- Increased protection of recreational assets and public land

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands

NUISANCE ANIMAL CONTROL
The TVA Nuisance Animal Control Program manages the effects of nuisance animals on TVA lands, facilities, and recreational users in order to protect against such impacts.

The objective of TVA's Nuisance Animal Control Program is to reduce natural resource and facility damage caused by nuisance species. This work is done primarily through contractual agreements TVA has with the Wildlife Services section of the US Department of Agriculture Animals and Plant Health Inspection Service. The following species have a high-risk potential for power operations failure, public health and safety, resource damage, or damage to TVA or other property or assets: raccoons, beavers, vultures, Canada geese, groundhogs, feral swine, double-crested cormorants, ospreys, great blue herons, starlings, etc.

Standard protocols include (1) assessment, (2) harassment and dispersal, (3) harassment with lethal reinforcement, and (4) lethal take. TVA will continue to collaborate with educational institutions and other partners to study the tendencies of nuisance animals and potential mitigation measures.

Examples of projects and efforts that support the implementation of the Nuisance Animal Control program include:

- Resolving animal damage conflicts via existing contractual agreement with USDA-WS through standard protocols which include assessment, harassment and dispersal, harassment with lethal reinforcement and lethal take
- Developing and implementing proactive strategies to manage nuisance animals on TVA-managed lands
- Continuing to collaborate with educational institutions and other partners to study the tendencies of nuisance animals and potential mitigation measures

Expected Benefits of the Program
- Furthered protection of TVA's river management and power generation assets
- Enhanced protection of natural and cultural resources on TVA lands
- Increased protection of recreational assets and public land

Geographic Scope of the Program
Program efforts will be carried out within the Tennessee River Watershed

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Not included as a specific resource area	**Focus Area: Nuisance and Invasive Species Management**	TVA proposes to expand Nuisance and Invasive Species Management as a standalone focus area in the 2020 NRP. It includes two programs from the former Biological Resources Resource Area and one new program.
Nonnative Invasive Plant Management	Nonnative Invasive Plant Management	This former Biological Resources Program is now included in the Nuisance and Invasive Species Focus Area.
Nuisance Animal Control	Nuisance Animal Control	This former Biological Resources Program is now included in the Nuisance and Invasive Species Focus Area.
	Aquatic Plant Management	This is a new program proposed in the 2020 NRP.

2.1.2.6 Cultural Resources Management (formerly Cultural Resources)

TVA has a rich history in cultural resource management that goes back to its establishment in 1933. As a federal agency, TVA is responsible for identifying, managing, and protecting cultural resources that are found on its property or affected by its actions. These cultural resources may include historic buildings, structures, sites or objects, archaeological resources, Native American burials, funerary objects, sacred items, and other historic resources. Laws, EOs, and associated regulations are in place that obligate TVA to protect these important sites and resources. These include NHPA, the Native American Graves Protection and Repatriation Act (NAGPRA), and ARPA.

Objectives:

- Comply with all federal laws related to cultural resource management on federal lands or on lands affected by TVA actions
- Increase our knowledge base regarding significant cultural resources on TVA lands through identification, evaluation, and documentation
- Protect and preserve significant archaeological and historic resources through improved and enhanced management practices such as monitoring, shoreline stabilization, archaeological curation, and enforcement of federal laws
- Provide educational and outreach opportunities within TVA communities concerning the necessity of protecting cultural resources and sharing the unique history of the Tennessee Valley
- Partner with stakeholders, such as federally recognized Indian tribes, whose ancestral lands fall within the Tennessee Valley

Benefits:

- Ensures effective and sustainable protection of sensitive, non-renewable cultural resources
- Improves relationships with stakeholders that attach cultural value to TVA-managed lands

- Ensures compliance with all applicable laws protecting cultural resources on federal land
- Increases education and awareness of the importance of protecting cultural resources through public outreach and community engagement
- Increases understanding of TVA's history and our role in the continuing development of the Tennessee Valley

Programs:
The 2011 NRP contained nine programs that made up the Cultural Resources Resource Area. The 2020 NRP proposes that this resource area be restructured to include the same functions in eight programs in the Cultural Resource Management Focus Area. These programs help ensure compliance with applicable laws and support the sound stewardship of archaeological and historic resources that fall within the agency's management responsibility. This focus area more consistently aligns the NRP with how TVA manages the cultural resources of the Tennessee Valley.

PRESERVATION PROGRAM
NHPA requires federal agencies to establish a Preservation Program to identify, evaluate, and nominate historic properties to the National Register of Historic Places (NRHP) and manage these resources in a way that preserves their historic integrity. Examples of projects and efforts that support the implementation of the Preservation Program include:

- Conducting archaeological surveys TVA-managed lands
- Hosting archaeological test excavations and field schools
- Maintaining TVA's historic photo collection, cemetery database and historic agency information
- Maintaining the existing database or developing a comprehensive database to unify TVA's cultural resource data sources in one location for improved resource management
- Enhancing curation and management of TVA's Historic Collection
- Conducting identification surveys of historic structures on TVA-managed lands.
- Evaluating and nominating sites to the National Register of Historic Places
- Conducting adaptive reuse studies of TVA's historic buildings
- Submitting National Historic Preservation Act Section 3 report on Section 110 progress every three years
- Developing and implementing plans for TVA-owned historic properties suitable for heritage tourism

Expected Benefits of the Program
- Increased information gathered from historic sites to provide a better understanding of the history of the Tennessee Valley and the Nation and to fulfill TVA's obligations under Section 110 of the NHPA
- Increased protection of historic and archeological sites
- Improved decision-making capabilities and prioritization of management actions from increased knowledge of sensitive resource locations on TVA managed lands
- Improved relationships with stakeholders through increased partnership opportunities

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands

ARPA ENFORCEMENT

ARPA protects archaeological sites on Indian and federal lands. The Act prohibits the removal or damage of archaeological resources and provides both criminal and civil penalties for violations. Examples of projects and efforts that support the implementation of the Archaeological Resources Protection Act Enforcement Program include:

- Conducting ARPA inspections through security checks
- Enforcement of the ARPA by TVA Police

Expected Benefits of the Program

- Decreased incidences of looting through public awareness of the enforcement process
- Improved relationships with stakeholders who have a spiritual or religious tie to the resources being impacted through illegal excavation and removal of archaeological resources
- Increased protection of sites

Geographic Scope of the Program

Program efforts will be implemented on TVA managed lands.

SECTION 106 COMPLIANCE

Section 106 of the NHPA requires federal agencies to consider the effects its undertakings will have on historic properties (e.g., historic structures or archaeological sites eligible for the National Register). Agencies must provide consulting parties an opportunity to comment on such undertakings prior to approval. Examples of projects and efforts that support the implementation of the Archaeological Resources Protection Act Enforcement Program include:

- Managing existing mitigation obligations
- Conducting reviews required by National Historic Preservation Act Section 106.
- Establishing database for managing mitigation obligations

Expected Benefits of the Program

- Meet compliance obligations in the review of federal undertakings by following regulations and statutes
- Increased protection of cultural resources and knowledge
- Increased public appreciation and enjoyment of these resources
- Decreased compliance costs and staff time requirements by gained efficiencies

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

NAGPRA COMPLIANCE

NAGPRA provides for the protection of Native American human remains, funerary objects, sacred objects, and objects vital to Native American cultural identity (cultural items). It provides a process whereby TVA can return cultural items in its control to Native American lineal descendants or federally recognized Native American tribes. Examples of projects and efforts that support the implementation of the Native American Graves Protection and Repatriation Act Compliance Program include:

- Complying with NAGPRA
- Conducting repatriation and disposition of human remains and funerary objects to federally recognized tribes who once lived in the Tennessee Valley

Expected Benefits of the Program
- Improved relationships with federally recognized Indian tribes
- Meet compliance obligations under NAGPRA
- Increased protection of cultural resources and knowledge

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands.

THOUSAND EYES ARCHAEOLOGICAL OUTREACH
ARPA requires agencies to develop programs to increase public awareness of the need to protect archaeological sites located on its public lands. TVA's Thousand Eyes Program provides educational opportunities across the Valley and a volunteer site stewardship program. Examples of projects and efforts that support the implementation of the Native American Graves Protection and Repatriation Act Compliance Program include:

- Conducting outreach events with community partners
- Developing interpretive or regulatory signage
- Managing TVA's volunteer site stewardship program

Expected Benefits of the Program
- Reduction in looting that results in permanent destruction of non-renewable cultural resources
- Increased protection of cultural resources
- Increase in public knowledge of the significant archaeological resources in the Tennessee Valley
- Increased public appreciation and enjoyment of these resources

Geographic Scope of the Program
Program efforts will be carried out within the Tennessee River Watershed and Power Service Area

ARCHAEOLOGICAL MONITORING AND PROTECTION
This program seeks to identify archaeological sites on TVA land that are being threatened by looting, erosion, or other impacts to identify the appropriate action plans for protection. Examples of projects and efforts that support the implementation of the Archaeological Monitoring and Protection Program include:

- Protecting archaeological sites on TVA lands and reservoir shoreline
- Monitoring archaeological sites on TVA lands and reservoir shoreline
- Monitoring sites, developing signage, stabilizing eroding shoreline, installing access control measures and working with TVA Police to increase patrols under the ARPA Enforcement program

Expected Benefits of the Program
- Preservation of significant archaeological resources

- Increased knowledge and prioritization of resources in need of protection to guide future management decisions
- Improved collection of data on the annual loss of resources
- Preservation of non-renewable cultural resources
- Increased information gathered from these sites providing a better understanding of the history of the Tennessee Valley and the Nation

Geographic Scope of the Program
Program efforts will be carried out within the Tennessee River Watershed

NATIVE AMERICAN CONSULTATION
This program includes consultation and partnerships with tribes to protect, manage, and learn from the significant Native American archaeological sites located in the Tennessee Valley. Examples of projects and efforts that support the implementation of the Native American Consultation Program include:

- Coordinating and conducting consultation with federally recognized Indian tribes
- Conducting formal consultation workshops with federally recognized tribes
- Identifying, managing and protecting Native American sites on TVA land

Expected Benefits of the Program
- Increased knowledge of cultural resources
- Improved stakeholder relationships
- Enhanced partnerships with tribes to protect, manage and learn from the significant Native American archaeological sites located in the Tennessee Valley

Geographic Scope of the Program
Program efforts will be implemented on TVA managed lands

CORPORATE HISTORY
The corporate history program maintains a record of TVA's rich history and provides educational and outreach opportunities to promote TVA's historical significance to the region, the nation, and the world. Examples of projects and efforts that support the implementation of the Corporate History Program include:

- Developing a formal TVA corporate history program and providing regular updates to the TVA Timeline
- Developing an oral history program
- Developing an annual history public outreach component and associated web site

Expected Benefits of the Program
- Increased public awareness of TVA's historical significance to the region, nation and world
- Improved stakeholder relationships
- Increased public knowledge of cultural resources

Geographic Scope of the Program
Program efforts will be carried out within the Tennessee River Watershed and Power Service Area

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Resource Area: Cultural Resources	**Focus Area: Cultural Resource Management**	Focus area name change only.
Preservation Program	Preservation Program	The Preserve America Program will be incorporated into the Preservation Program.
Preserve America		
Archaeological Resources Protection Act	ARPA Enforcement	There is no change proposed to this program.
National Historic Preservation Act Section 106	Section 106 Compliance	There is no change proposed to this program.
Native American Graves Protection and Repatriation Act	NAGPRA Compliance	There is no change proposed to this program.
Archaeological Outreach (Thousand Eyes)	Thousand Eyes Archaeological Outreach	There is no change proposed to this program.
Archaeological Monitoring and Protection	Archaeological Monitoring and Protection	There is no change proposed to this program.
Native American Consultation	Native American Consultation	There is no change proposed to this program.
Corporate History Program	Corporate History	There is no change proposed to this program.

2.1.2.7 Water Resources Stewardship (formerly Water Resources)

TVA has been actively involved in water resources management and river system integration since 1933, when Congress charged the agency with managing and serving as the steward of the Tennessee River and its tributaries. Water Resource Stewardship focuses on protecting and improving the aquatic habitat and quality of the streams, rivers, and reservoirs in the Tennessee River watershed.

The Tennessee River watershed encompasses parts of seven states in the Southeast and is approximately 41,000 square miles. The watershed is one of the most biologically diverse watersheds in North America and is home to more than 240 fish species and about 75 mussel species. TVA's efforts to protect and improve water quality and aquatic biodiversity include collecting and reporting aquatic resource and water quality data and working with partners to implement watershed protection efforts. TVA also builds and catalyzes partnerships, promotes public outreach efforts, and provides technical support to implement key water resource initiatives throughout the Tennessee River watershed.

TVA works with partners to improve and enhance priority watersheds. Improvement and enhancement efforts include streambank stabilization, buffer establishment, in-stream habitat improvements, mussel propagation and re-introduction, and outreach. Partnership outreach efforts are also a vital part of Water Resources Stewardship. One example of partnership outreach efforts is the development of the Tennessee River Basin Network, a group of peer agencies and non-profit organizations that are working together to identify collaboration opportunities and shared resources and initiate long-term planning and outreach efforts to protect and improve biodiversity in the Tennessee River watershed.

Objectives:

- Monitor and assess biological conditions in streams and tailwaters to maintain an in-depth knowledge of the changing conditions of water quality throughout the Valley and help TVA and stakeholders identify and track water quality protection and improvement opportunities
- Partner to promote and implement water quality and aquatic habitat improvement across the Tennessee River watershed
- Develop and execute outreach activities to raise public awareness of the importance and value of protecting water resources within the Tennessee River watershed

Benefits:

- Provides data that support an integrated management approach for TVA and natural resource stewardship activities
- Provides data to partners to enhance the understanding of stream, tailwater, and reservoir conditions, support research and water related conservation activities to improve water quality, reduce drinking water associated costs, create more recreation opportunities, and improve habitat for aquatic life
- Fosters collaborative efforts and enhances the ability to leverage funding, technical support and networking opportunities to implement partnership activities that protect exceptional aquatic biodiversity within the Tennessee River watershed
- Increases public awareness of the value of the Tennessee River system's biodiversity and water quality

Programs:

The 2011 NRP contained nine programs that made up the Water Resources Resource Area. The 2020 NRP proposes restructuring of this area into the Water Resources Stewardship Focus Area. This new focus area includes six programs which combine many of the previous programs that describe TVA's work in water resource stewardship. These programs align the NRP more consistently with how TVA enhances water resources in the Tennessee River watershed.

AQUATIC ECOLOGY MANAGEMENT

The Aquatic Ecology Management Program focuses on the enhancement of aquatic biological communities in streams, reservoirs and tailwaters of the Tennessee River watershed. This includes activities such as habitat improvement, biological monitoring, aquatic invasive species control, and pollution reduction. TVA partners with local, state, and federal partners to identify and actively protect diverse aquatic biological communities. Examples of projects and efforts that support the implementation of the Aquatic Ecology Management program may include:

- Supporting collaborative partnerships to identify water quality improvement and aquatic habitat protection needs
- Partnering with local organizations and state and federal agencies to propagate fish and mussel species for reintroduction, install in-stream habitat improvement structures and remove aquatic barriers
- Partnering with local organizations and state and federal agencies to conduct outreach efforts to promote the value of the Tennessee River and its aquatic biodiversity

Expected Benefits of Program

- Increases protection of aquatic habitats and biological communities
- Enhances coordination among stakeholders resulting in better management decisions
- Increases awareness of biodiversity hotspots within the Tennessee River watershed

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed.

STREAM MONITORING

The goal of TVA's Stream Monitoring Program is to use biological monitoring to assess ecological conditions of streams throughout the Tennessee River watershed. The Stream Monitoring Program helps TVA maintain an in-depth knowledge of the changing conditions in water quality throughout the Valley and is used to identify water quality protection and improvement opportunities. This data is also shared with other stakeholders to benefit resource improvement efforts. Other monitoring such as reservoir inflow and tailwater monitoring are performed by TVA and are outside the scope of the NRP because these monitoring efforts support TVA's hydroelectric operations.

Examples of projects and efforts that support the implementation of the Stream Monitoring program include:

- Conducting annual stream assessments
- Sharing stream monitoring data
- Field sampling for fish and aquatic macroinvertebrate communities at approximately 525 sites throughout the Tennessee River watershed. Approximately 100 sites are sampled annually. This data is collected, stored, managed, and used by TVA to make management decisions, and shared with stakeholders to target and track water quality improvement efforts.

Expected Benefits of Program

- Provides data on stream conditions to help TVA and stakeholders make informed watershed management decisions
- Helps target and track watershed improvement efforts
- Provides comprehensive aquatic biological data sets to evaluate long term trends in water quality

Geographic Scope

Program efforts will be carried out within the Tennessee River Watershed

SENTINEL MONITORING

TVA's Sentinel Monitoring Program is a partnership effort to foster a better understanding of climatic impacts on water resources in the Tennessee River Watershed. TVA partners with state and federal resource and environmental agencies to conduct long-term monitoring efforts to collect data on temperature, flow, aquatic life, and other parameters. Examples of projects and efforts that support the implementation of the Sentinel Monitoring program include:

- Collaborating with the Southeast Monitoring Network to collect physical, chemical and biological data at stream sites located throughout the Tennessee Valley

- Managing and sharing data, conducting trend analysis and reporting results

Expected Benefits of Program

- Enhances understanding of potential climate change effects on streams and their biodiversity
- Improves planning efforts due to early identification of potential mitigation needs and strategies for aquatic species protection
- Improves knowledge and information sharing with agencies and other stakeholders for assessment and planning
- Ensures consistency with EO 13514 (Federal Leadership in Environmental, Energy and Economic Performance, 2009) and the CEQ's implementation instructions to evaluate climate change risks and vulnerabilities

Geographic Scope

Program efforts will be carried out within the Tennessee River Watershed

WATER RESOURCE OUTREACH

TVA will work with local, state, and federal partners to inform stakeholders about the importance of water resources to the quality of life in the Tennessee Valley. These outreach efforts will focus on (1) promoting sustainable land use stream and reservoir water quality; (2) sharing information with stakeholders about water resources at events such as bass tournaments, boat shows, and other events; and (3) communicating emerging resource concerns (e.g., loss of aquatic diversity, nutrient and sediment reductions). Examples of projects and efforts that support the implementation of the Water Resource Outreach program include:

- Promoting sustainable land use practices that protect stream and reservoir water quality
- Sharing information with stakeholders about water resources through media (e.g., videos, social media and web page) and at events such as bass tournaments, boat shows and other events
- Communicating emerging resource concerns (e.g., loss of aquatic diversity and nutrient and sediment reductions).

Expected Benefits of Program

- Increases public awareness of the importance and value of protecting water resources within the Tennessee River watershed
- Enhances public involvement and ownership in water resource protection and improvement

Geographic Scope

Program efforts will be carried out within the Tennessee River Watershed.

NUTRIENT SOURCE MANAGEMENT

This program will focus on reducing nutrients (e.g., phosphorus) in TVA reservoirs. Using existing data to assess the nutrient status, TVA will target reservoirs with the greatest potential for nutrient load reductions. This program will provide information to improve understanding and communicate resource conditions within the Tennessee Valley, while working to reduce nonpoint nutrient loading from these watersheds. Examples of projects and efforts that support the implementation of the Nutrient Source Management program include:

- Conducting research on potential nutrient trading opportunities
- Partnering with State and Federal Agencies, Non-Governmental Organizations to create nutrient reduction strategies
- Working with partners to implement nutrient reduction projects to address non-point source pollution

Expected Benefits of Program

- Increases ability to identify the nutrient non-point sources from watersheds into TVA reservoirs in order to support focused nutrient load reduction initiatives
- Reduces excess nutrient loads to improve water quality and aquatic habitat
- Develops methods and techniques for achieving measurable nutrient load reductions and improvements in water quality

Geographic Scope

Program efforts will be carried out within the Tennessee River Watershed

TENNESSEE VALLEY CLEAN MARINA

The Tennessee Valley Clean Marina Program is a voluntary program that promotes environmentally responsible marina and boating practices and links commercial recreation infrastructure to TVA's Section 26a and Land Use Implementation Program. Marina operators choosing to participate in the program implement best management practices (BMPs) to reduce water pollution in the Tennessee River watershed. Examples of projects and efforts that support the implementation of the Tennessee Valley Clean Marina program include:

- Collaborating with marina owners to maintain their clean marina certifications and certify new marinas
- Developing and providing marina owners and operators with outreach materials and training on existing obligations and best management practices to protect water quality
- Working with the marina operators to install best management practices associated with oil and gas control, sewage management and erosion prevention

Expected Benefits of Program

- Increases awareness of marina owners and operators about environmentally responsible best management practices
- Improves water resource conditions in TVA managed reservoirs
- Supports compliance with state and federal regulations (e.g., waste water management, fuel management, solid waste management requirements)

Geographic Scope

Program efforts will be carried out within the Tennessee River Watershed

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Resource Area: Water Resources	**Focus Area: Water Resources Stewardship**	Minor focus area name change only.
Aquatic Ecology Management	Aquatic Ecology Management	There is no change proposed to this program.
Stream and Tailwater Monitoring	Stream Monitoring	The stream monitoring components of this program will remain the same. Tailwater monitoring will continue to support the operation of TVA's hydroelectric facilities, but will not be included in the NRP.
Climate Change Sentinel Monitoring	Sentinel Monitoring	There is no change proposed to this program, with the exception of a minor name change.
Tennessee Valley Clean Marina	Tennessee Valley Clean Marina	There is no change proposed to this program.
Water Resource Outreach Campaign	Water Resource Outreach	There is no change proposed to this program, with the exception of a minor name change.
Nutrient Source – Watershed Identification and Improvement Program	Nutrient Source Management	These programs will be combined to form the Nutrient Source Management Program in the 2020 NRP.
Northern Gulf of Mexico/Mississippi River Basin Nutrient Load Reductions Program		
Strategic Partnership Planning		This former program is a tool that is utilized to achieve the objectives of the Water Resources Stewardship Focus Area and Programs in the 2020 NRP.
Reservoir Shoreline Stabilization/Riparian Management Program		This former program is a tool that is utilized to achieve the objectives of multiple focus areas and programs in the 2020 NRP.

2.1.2.8 Recreation (formerly Recreation Management)

TVA's Recreation focus area supports recreation opportunities so that the Tennessee Valley remains one of the best places to live, work, and play. Since its establishment by Congress in 1933, TVA's earliest leaders understood that as the lands around the reservoirs were developed in the Tennessee Valley, recreation would be a direct link to the social and economic advancement of the surrounding areas. This was explicitly recognized in a 1936 TVA Board of Directors report to Congress, which stated: *"The Tennessee River possesses a great variety of scenery. If this beauty is preserved, the river system will become one of the favorite recreation areas in the United States."* TVA envisioned development along its reservoirs in an effort to bring more people closer to these valuable resources in the hopes that they might enjoy the many benefits that they provide.

TVA reservoirs and the land surrounding them offer an abundance of recreation opportunities, including boating, water skiing, canoeing, sailing, windsurfing, swimming, fishing, hunting, hiking, nature photography, picnicking, bird-watching, and camping. Much of the 293,000 acres of TVA public land is available for dispersed recreation, which offers a more primitive experience that is not supported by developed recreational facilities.

Many of TVA's developed recreation areas, such as campgrounds and marinas, are managed by commercial and public operators who specialize in the recreation business. TVA encourages sustainable management practices from these operators, like water conservation and native plant management. In addition to the recreation assets and activities on TVA land, TVA partners with local, state and federal agencies to support nearly 400 public recreation areas through management agreements. TVA administers these agency agreements to provide complimentary recreational assets, including wildlife refuges and municipal and state parks. These recreational opportunities support the economic impact of the travel and tourism industry in the Valley.

A 2016 study conducted by the University of Tennessee estimated an $11.9 billion economic impact from recreational expenditures in the Tennessee Valley. Since TVA manages roughly 11,000 miles of shoreline, that amounts to a one million dollars per mile benefit to the people of the Valley. From a primitive hiking trail to a fully developed commercial marina, TVA strives to balance resources under its care while providing a diverse array of recreational opportunities for the public.

Objectives:

- Provide commercial and public recreational opportunities on TVA managed lands
- Partner with local, state, and federal agencies to provide recreation assets and opportunities throughout the Valley
- Protect natural and cultural resources by developing and implementing sustainable recreation practices

Benefits:

- Increased recreation opportunities on TVA public lands
- Improved recreation information and data to support TVA and regional planning efforts
- Greater diversity of recreational opportunities through collaboration and partnerships
- Increased promotion of sustainable recreation best practices
- Enhanced integration of TVA and partner efforts to improve recreation management efficiency

Programs:

The 2011 NRP contained 16 programs that made up the Recreation Management Resource Area. The 2020 NRP proposes the restructuring of this area into the Recreation Focus Area. This new focus area includes eight programs, which combine many of the previous programs and add new programs that describe TVA's work in commercial recreation management (campgrounds and marinas), recreation partnerships, and dispersed recreation (hunting and hiking). These new programs align the NRP more consistently with how TVA manages the recreational assets of the Tennessee Valley.

Developed Recreation Management

TVA provides a variety of recreation assets available for public use on most of its dam reservations and public lands, including restrooms, fishing piers, picnic facilities and trails. These assets are either operated by TVA or through an agreement with a partner such as a concessionaire, city, county or state entity, are located at 46 dam reservations throughout the valley and one pumped storage hydroelectric facility. Management of these facilities includes inventory and assessment, as well as maintenance and upgrades, of existing facilities, and installation of new facilities at these sites. TVA's dam reservation areas encompass approximately 3,000 acres of land and support around 1 million visitors annually.

Examples of projects and efforts that support the implementation of the Developed Recreation Management program include:

- Continuing to operate and manage TVA campgrounds and day use areas
- Enhancing TVA campgrounds and day use areas consistent with ADA accessibility guidelines
- Utilizing emerging technologies with innovative design and efficiency measures at TVA campgrounds and day use areas

Expected Benefits of Program

- Enhanced recreational opportunity through the enhancement of dam reservations as ecotourism and economic hubs
- Increased public recreation opportunities
- Improved natural and cultural resource protection through the use of sustainable practices and low impact activities

Geographic Scope of the Program

Program efforts will be implemented on TVA managed lands.

Water Access

Under this program, TVA provides public access to streams, rivers and reservoirs through the management of launching ramps and access sites. Of the many launching ramps and access sites TVA has developed, most are operated by partners such as city, county, and state agencies through third party agreements. TVA operates and manages launching ramps and stream access sites throughout the Valley that are on TVA public lands.

Examples of projects and efforts that support the implementation of the Water Access program include:

- Managing launching ramps and stream access sites
- Continuing to manage and develop partnerships to establish and promote water trails

Expected Benefits of Program

- Increased enjoyment of the reservoirs and streams by fisherman, paddle sports enthusiasts and others
- Increased partnerships with organizations and local, state and federal agencies

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed.

Tennessee Valley Camp-Right Campground

The Tennessee Valley Camp-Right Campground program is a voluntary membership program that promotes environmentally friendly practices related to energy efficiency, water conservation and natural resource management efforts in public and private campgrounds on TVA land. The program increases visibility of participating members by promoting camping opportunities at these campgrounds.

Examples of projects and efforts that support the implementation of the Tennessee Valley Camp-Right Campground program include:

- Collaborating with campground operators to maintain their Camp-Right certifications and certify new campgrounds
- Providing campground operators promotional opportunities, networking and training
- Offering technical expertise and incentives to implement environmentally responsible retrofits and installations

Expected Benefits of Program

- Increased networking opportunities provided such as webinars, workshops and conferences for member campgrounds, industry experts and TVA staff
- Increased visibility through promotional opportunities
- Heightened awareness of low-impact camping and campground management principles related to energy efficiency, water conservation, natural and cultural resource protection and native plant and tree management
- Increased potential operator and cost savings through efficiency and sustainability efforts
- Increased quality of the camping experience to support a more sustainable campground economy

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed.

Dispersed Recreation Management

Through the Dispersed Recreation Management program, TVA will enhance dispersed recreation areas and access to public lands. This includes managing impacts and creating recreational opportunities on TVA public lands such as camping, bank fishing, hunting and bird-watching. Dispersed recreation areas are not supported by formal recreation facilities such as electricity, shower buildings and developed campsites.

Examples of projects and efforts that support the implementation of the Dispersed Recreation Management program include:

- Evaluating and maintaining dispersed recreation sites
- Promoting the Leave No Trace program through signage and web-based material

Expected Benefits of Program

- Increased access and recreational opportunities on public land
- Improved quality of dispersed recreational experiences

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed

Trails Management

TVA's public lands are home to more than 170 miles of recreational trails. Many of these trails are managed in conjunction with partners and volunteer groups. Trail management may include vegetation management, signage, walking surface improvements and monitoring trail conditions and usage. Trails provide recreational opportunities to the public including hiking, running, mountain biking, wildlife viewing, scenic viewing and other outdoor pursuits.

Examples of projects and efforts that support the implementation of the Trails Management program include assessing and maintaining TVA's 170 miles of trails and enhancing partnership opportunities for expansion of TVA's trail system.

Examples of projects and efforts that support the implementation of the Dispersed Recreation Management program include:

- Assessing, maintaining and enhancing TVA's trail system
- Developing partnerships to maintain and expand TVA's trail system

Expected Benefits of Program

- Increased trail-based recreation to support ecotourism and local economies
- Increased access to expand dispersed recreational opportunities

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed

Recreation Contract Management

TVA manages commercial and public recreational agreements and provides annual assessments and compliance associated with those contracts. TVA's recreational lands are typically used for campgrounds, marinas and public parks. This program includes implementing the Commercial Recreation Guidelines established in 2010, managing existing and proposed recreation agreements and associated Section 26a permits, responding to requests for short-term use of TVA lands for recreational events and resolving recreation related violations and encroachments. TVA also ensures contractual agreements and transferred lands are being utilized for public recreational purposes.

Examples of projects and efforts that support the implementation of the Recreation Contract Management program include:

- Establishing and Maintaining third-party management agreements such as licenses, leases and easements to ensure those lands are being utilized for either public or commercial recreational purposes

Expected Benefits of Program

- Increased public service by providing recreational opportunities across the Valley
- Enhanced operations, facilities and recreational experiences on TVA owned, leased, and licensed properties while protecting natural and cultural resources

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed

Recreation Partnerships

TVA collaborates to enhance recreational opportunities and accessibility on public lands by partnering with local municipalities, state and federal agencies and non-governmental organizations to improve public recreation facilities. Recreation partnership projects include a broad range of activities: from minor improvements and upgrades of existing facilities, to installation of new public access facilities.

Examples of projects and efforts that support the implementation of the Recreation Partnerships program include:

- Partnering with local municipalities, state and federal agencies and non-governmental organizations to enhance recreational assets on public lands
- Providing technical assistance and fostering partnerships to assist and address unmet needs on public lands in the Tennessee Valley

Expected Benefits of Program

- Enhanced relationships with local, state and federal entities
- Expanded public service by providing recreational opportunities on TVA and non-TVA public lands across the Valley
- Enhanced operations, facilities and recreational experience on TVA and other public lands through partnership engagement

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed

Floating Cabins

The Floating Cabin program is focused on management of over 2,200 existing floating cabins on TVA reservoirs. Regulations will be developed in accordance with the WIIN Act, which was enacted on December 16, 2016 by Congress. The WIIN Act authorizes TVA to prevent the construction of new floating cabins. In addition, the regulations will address health, safety, and environmental standards to guide future management.

Examples of projects and efforts that support the implementation of the Floating Cabins program include:

- Collaborating with commercial marinas and stakeholders to develop implement new regulations to manage existing floating cabins in a manner that best protects the natural resources of the Tennessee Valley

Expected Benefits of Program

- Increased focus on floating cabin rules and standards that will address safety and environmental issues such as waste water, flotation, electrical safety and mooring
- Reduced floating cabin impacts to water quality, public recreation and navigation
- Removed derelict and abandoned structures

Geographic Scope of Program

Program efforts will be carried out within the Tennessee River Watershed

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Resource Area: Recreation Management	**Focus Area: Recreation**	Focus area name change only.
Management of Campgrounds on Dam or Power Plant Reservations	Developed Recreation Management	These programs will be managed under the broader Developed Recreation Management program.
Day-Use Areas on Dam Reservations		
Management of Campgrounds off Dam or Power Plant Reservations		
Day-Use Areas off Dam Reservations		
Tennessee Valley Camp-Right Campground Program	Tennessee Valley Camp-Right Campground	There is no change proposed to this program.
Trails Management	Trails Management	There is no change proposed to this program.
Stream Access Sites	Water Access	This program has been expanded to include streams, rivers, and reservoirs.
Dispersed Recreation Management	Dispersed Recreation Management	The 2011 NRP included Dispersed Recreation Management Programs in both the Biological Resources and Recreation Management Resource Areas. TVA proposes to combine these programs in the Recreation Focus Area in the 2020 NRP.
	Recreation Partnerships	This is a new program proposed for the 2020 NRP.
	Recreation Contract Management	This is a new program proposed for the 2020 NRP.
	Floating Cabins	This is a new program proposed for the 2020 NRP.
Annual Tours		This program is implemented by other organizations in TVA.
Leave No Trace		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Recreation Information Management		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Boating Density Assessments		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Recreation Design Principles		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.

2011 NRP	2020 NRP	Comment
Reservoir Lands Recreation Inventory Management		This program is included in the NR Asset Inventory program in the Public Lands Protection Focus Area.
Recreation Planning, Assistance, and Technical Support		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.

2.1.2.9 Ecotourism (New)

Ecotourism is nature-based, outdoor adventure, and sustainable tourism. This concept mixes outdoor recreation activities with conservation-based work which results in sustainable recreation areas that are based in nature and/or on natural features. TVA's Ecotourism programs will complement existing community, state, and regional travel and tourism efforts, which aligns with TVA's mission to make the Valley a great place to live, work, and play.

TVA's public lands and shoreline have long provided a platform for partnerships in support of the tourism industry. Community and private sector expansion of facilities, attractions, festivals and events helps attain critical mass to attract and hold leisure travelers. The result has been the development of travel destination experiences with extended stays leading to positive impacts to local economies, job creation, private investment, and an expanded tax base.

Objectives:

- Help communities to realize their full travel and tourism potential in a manner that does not detract from the natural environment
- Collaborate with partners to identify and plan recreational and tourism assets
- Enhance recreation facilities to expand tourism and local visitation
- Promote recreation and tourism opportunities to encourage use

Benefits:

- Provides positive impacts to local economies
- Increases understanding of recreational trends to maximize a local community's ecotourism potential
- Increases recreational opportunities for local communities and destination travelers
- Increases information provided to the public about available recreational opportunities in the Tennessee Valley

Programs:

The 2011 NRP included many references to ecotourism, but it was not included as one of the six resource areas and there were no programs specifically dedicated to ecotourism. The 2020 NRP proposes Ecotourism as a standalone focus area, which includes three programs. These new programs align the NRP more consistently with how TVA manages the natural resources with a focus on providing recreation and nature-based economic development opportunities to communities in the Tennessee Valley.

ECOTOURISM PARTNERSHIPS

TVA will work with partners to expand ecotourism infrastructure in their service area and create outreach materials to educate the public on sustainable recreation opportunities. This assists in expansion of current recreation/tourism opportunities to achieve a critical

mass sufficient to attract and hold leisure travelers for multiple days. Examples of projects and efforts that support the implementation of the Ecotourism Partnerships program could include:

- Collaborating with local municipalities, State and Federal Agencies and Non-Governmental Organizations to develop and enhance recreation amenities
- Collaborating with local municipalities, State and Federal Agencies and Non-Governmental Organizations to promote tourism and recreation opportunities

Expected Benefits of the Program

- Expanded recreation facilities and tourism opportunities that create local jobs and tax benefits
- Increased awareness of targeted areas in order to maximize the potential economic impact

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed

ECOTOURISM AND RECREATIONAL ASSESSMENTS AND STUDIES

Ecotourism and recreational assessments and studies are tools used to examine the current recreational trends, predict future growth, gain user preferences in facility development and create project specific strategies to guide future planning and resource allocation efforts. Regional and site-specific studies may be used to support planning efforts in ecotourism and recreation.

Examples of projects and efforts that support the implementation of the Ecotourism and Recreation Assessments and Studies program could include:

- Conducting assessments and studies to support future planning efforts in ecotourism and recreation

Expected Benefits of the Program

- Better informed decision making to facilitate project design and master planning efforts
- Improved understanding of recreational trends, uses, and preferences

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed

DAM EXPLORER

TVA will update its dam reservation master plans to reflect the full range of current and potential recreation opportunities in order to maximize recreation potential and attract visitors. TVA will continue to work with local communities to plan and create visitor destinations on TVA dam reservations and surrounding areas by creating new or enhancing existing recreation facilities and developing interactive interpretative and hands-on learning areas. Examples of projects and efforts that support the implementation of the Dam Explorer program could include:

- Expanding recreation opportunities by enhancing facilities on TVA's dam reservations

- Collaborating with local communities to create complimentary recreation and tourism opportunities near TVA dam reservations
- Developing master plans to guide future enhancements on TVA's dam reservations

Expected Benefits of the Program

- Increased tourism and recreation opportunities that support local communities
- Updated dam reservation master plans that include a variety of recreational opportunities

Geographic Scope of the Program

Program efforts will be implemented on TVA managed lands

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Not included	**Focus Area: Ecotourism**	This is a new focus area that was not included in the 2011 NRP.
	Ecotourism Partnerships	This is an existing TVA program that is new to the 2020 NRP.
	Ecotourism and Recreational Assessments and Studies	This is an existing TVA program that is new to the 2020 NRP.
	Dam Explorer	This is an existing TVA program that is new to the 2020 NRP.

2.1.2.10 Public Outreach and Information (formerly Public Engagement)

TVA has been charged with managing its resources in an integrated manner to ensure the protection, enhancement, and conservation of these resources for future generations to enjoy. Overarching public outreach programs increase public awareness and appreciation of the natural and cultural resources in the Valley as well as provide opportunities for volunteer involvement, environmental education, and collaborative partnerships. The public outreach and information programs focus on communicating, involving, and engaging communities of and visitors to the Tennessee River watershed and the TVA power service area.

Public Outreach and Information efforts include environmental education, volunteer opportunities, community support, and stakeholder engagement. Environmental education programming is a valuable component of TVA's public outreach, providing a platform for TVA to share information and our passion for natural and cultural resources and public lands with children and adults. TVA's Volunteer Program offers opportunities to learn about nature and be part of a collective effort to help protect natural and cultural resources and enhance recreational areas throughout the region.

Through e-newsletters such as River Neighbors, social media, web-based interactive tools, publications, and TVA's Public Land Information Center, TVA connects with stakeholders by providing information on local wildlife and aquatic habitats, river management, public lands, recreational areas, and TVA events. TVA also works collaboratively to support communities in their stewardship efforts across the region. Examples include the Kids in the Creek Programs which introduce kids to aquatic species in local streams, events that

promote recycling and reuse of materials, and 4-H clubs that teach environmental stewardship.

Objectives:

- Engage communities to increase awareness and understanding of the value of cultural and natural resources and recreational opportunities associated with public lands and waters throughout the Tennessee River Watershed and TVA's power service area
- Create opportunities for public involvement in resource stewardship and recreation
- Develop and maintain strategic relationships to enhance stewardship of recreational assets and cultural and natural resources in the Tennessee River Watershed and TVA's power service area through collaborative efforts and education

Benefits:

- Increases public awareness, involvement, and appreciation of the natural and cultural resources and recreational opportunities in the Tennessee River Watershed and TVA's power service area through an integrated education and communication effort
- Improves public understanding of the value and benefits of resource protection
- Enhances recognition of the high quality of life in the Valley

Programs:

Much of the work described in the Public Outreach and Information Focus Area was categorized in the Public Engagement Resource Area in the 2011 NRP, which consisted of three programs. The 2020 NRP proposes five programs in the Public Outreach and Information Focus Area. These programs align the NRP more consistently with how TVA communicates and implements outreach efforts with its stakeholders and partners.

COMMUNITY SUPPORT

This program supports communities throughout the Tennessee River watershed and TVA power service area to provide outreach and educational programs that align with TVA's natural and cultural resource protection efforts and TVA operations. This allows TVA to partner with others to expand positive impacts across the region. Examples of projects and efforts that support the implementation of the Community Support program include:

- Providing support for school recycling efforts
- Providing support, materials and technical expertise for environmental education

Expected Benefits of the Program

- Increased outreach and educational opportunities through partnerships
- Expanded resource protection and improvement efforts through partnerships

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

ENVIRONMENTAL EDUCATION

Through our Environmental Education efforts, TVA fosters appreciation and awareness of natural resources, including the Tennessee River system and its associated lands and resources. TVA will expand and implement environmental education programming to

schools and communities in support of STEAM (science, technology, engineering, art, and mathematics). Examples of projects and efforts that support the implementation of the Environmental Education program include:

- Developing and implementing a comprehensive and coordinated Environmental Education Program
- Leading hands-on learning experiences for children and adults on TVA public lands focused on environmental stewardship topics such as the Tennessee river system, and aquatic and terrestrial ecology
- Providing the Kids in the Creek programs to introduce children to aquatic species in local streams and help them understand the value of water resources
- Providing technical expertise for environmental education efforts and events

Expected Benefits of the Program

- Increased knowledge and awareness of the natural and cultural resources in the Valley
- Expanded understanding of the value and importance of natural and cultural resource protection
- Increased awareness and appreciation of recreational opportunities in the region

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

STAKEHOLDER ENGAGEMENT

Providing visitors and community members with information about the Tennessee River system including the Valley's natural beauty, unique wildlife habitats, and recreational opportunities can enhance experiences and grow an appreciation for the region. TVA uses outreach and communication materials such as interpretive displays on public lands and web-based products such as TVA River Neighbors to accomplish this. TVA also engages stakeholders to identify and implement opportunities for collaboration and partnerships to support stewardship efforts. Examples of projects and efforts that support the implementation of the Stakeholder Engagement program include:

- Creating and installing interpretive signs on TVA public lands
- Communicating and sharing information related to recreation, cultural and natural resources, public lands and the Tennessee River system through e-newsletters, web pages, social media and outreach events

Expected Benefits of the Program

- Increased knowledge and awareness of the natural and cultural resources in the Valley
- Expanded understanding of the value and importance of natural and cultural resource protection
- Increased awareness and appreciation of recreational opportunities in the region

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

TVA SCIENCE KIDS WORLD WATER MONITORING

Through this program, TVA engages children in science by providing water monitoring kits to selected schools and delivering in-class water educational programs. In the summer months, TVA implements this program through partnerships with State Parks, Scouting groups, and other community organizations. We also encourage teachers and participants to enhance their experience by using the program's online resources where they can log their classroom data and see how other children are using the program from around the world. Examples of projects and efforts that support the implementation of the TVA Science Kids World Water Monitoring program include:

- Delivering the World Water Monitoring program to children through elementary schools, state parks and other community organizations

Expected Benefits of the Program

- Increased knowledge and understanding of the value of water resources
- Encouraged participation in water resources conservation and protection efforts
- Promoted science careers and supported STEM education

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

VOLUNTEER PROGRAM

With our Volunteer Program, TVA encourages and guides participation in activities that help improve, enhance and promote natural and cultural resource protection and recreation on TVA public lands and reservoirs. Examples of projects and efforts that support the implementation of the Volunteer program include:

- Engaging and encouraging volunteers to participate in TVA led volunteer activities on TVA public lands
- Offering skills training to support volunteer activities carried out on TVA public lands

Expected Benefits of the Program

- Improved understanding of the role the public can play in caring for natural and cultural resources
- Expanded awareness of natural and cultural resources and recreational opportunities in the region
- Increased opportunities for public engagement

Geographic Scope of the Program

Program efforts will be implemented within the Tennessee River Watershed and Power Service Area

Summary of Proposed Changes

2011 NRP	2020 NRP	Comment
Resource Area: Public Engagement	**Focus Area: Public Outreach and Information**	Minor focus area name change only.
Environmental Education Program	Environmental Education	There is no change proposed to this program.
Volunteer Program	Volunteer	There is no change proposed to this program.
	Stakeholder Engagement	This is an existing TVA program that is new to the 2020 NRP.
	TVA Science Kids - World Water Monitoring	This is an existing TVA program that is new to the 2020 NRP.
	Community Support	This is an existing TVA program that is new to the 2020 NRP.
Foundation and Trust Fund Management		This program was determined to not be a viable source of funding for TVA's stewardship activities and will not be included in the 2020 NRP.

2.1.2.11 Other Proposed Changes

Numerous other changes to the NRP proposed by TVA are administrative in nature and reflect TVA's desire to identify program activities necessary to successfully implement the plan. Adding these administrative changes to the NRP would have no impacts to the environment and are included in the scope of the SEIS to ensure public disclosure of how the NRP would be amended. For example, TVA would eliminate the provision of the NRP that calls for periodic (5 year) updates to the plan. Alternatively, TVA proposes to inform the public by publishing an Annual Report on natural resource stewardship activities and improving the information available to the public on TVA's stewardship projects on TVA's webpage. TVA would provide multiple avenues for continuous public engagement and input into TVA's stewardship activities, incorporating a commenting mechanism into the NRP webpage, and pursuing opportunities for increased public interaction that would provide input regarding local needs and trends in the recreation and natural resource fields.

Action Plans

To complement the strategic guidance that the 2020 NRP will provide, Natural Resources will develop a 3- to 5-Year Action Plan that will provide a tactical approach to implement the specific activities associated with the 10 focus area programs. The two-pronged approach of a tactical, short-term implementation strategy (3- to 5-Year Action Plan) that complements the strategic, long-term guidance document (2020 NRP) is shown in Figure 2-2. This will provide the agility and flexibility necessary to achieve the goals of TVA's Natural Resources Stewardship Strategy. This approach supports the shift of the 2020 NRP to a strategic level guidance document that will retain long term relevance, since adjustments in the implementation of the NRP due to changes such as availability of stewardship funding, new trends in public use and input from the public would be addressed through the 3- to 5-Year Action Plan.

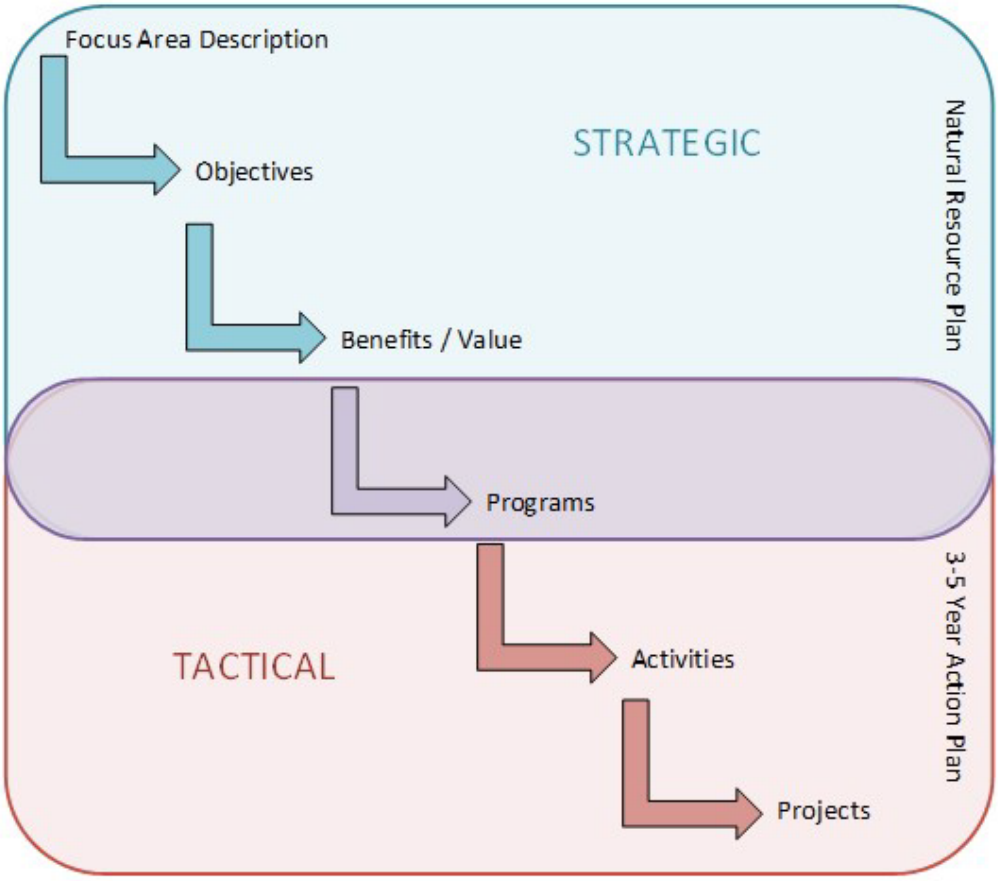

Figure 2-2. 3- to 5-Year Action Plans Tactical Approach

Measures of Success

TVA would remove the "measures of success" for each program from the current NRP, which experience has shown were too specific and removed from actual project implementation to be a useful metric. Instead, the updated NRP would identify objectives for each focus area to provide high-level, overarching strategic direction for each area. Objectives for the focus areas would be substantially consistent with TVA's blended management approach. The "measures of success" or similar metrics would be incorporated into the 3- to 5-year action plans developed by TVA staff.

2.2 Comparison of Alternatives

The environmental impacts of potentially affected resources associated with Alternatives A and B are summarized in Table 2-2. These summaries are derived from the information and analyses provided in Chapter 3 (Affected Environment and Environmental Consequences).

Section 101 of NEPA declares that it is the policy of the federal government to use all practicable means and measures, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations. TVA believes that the alternatives are consistent with this policy.

Because of the conservation focus in both alternatives, a wide range of beneficial uses of the environment could be obtained without degradation or unintended consequences under either alternative.

Table 2-2. Summary and Comparison of Alternatives by Resource Area

Resource Area	Alternative A – No Action Alternative	Alternative B – Proposed Action Alternative – Updates to TVA's Natural Resource Plan
Terrestrial Ecology	Beneficial impacts on species that are the focus of NRP programs; minor adverse impacts from programs not focused on species or habitat improvement.	Similar to Alternative A, except minor additional beneficial impacts from implementation of 3- to 5-year action plans.
Aquatic Ecology	Beneficial long-term changes to aquatic resources. Minor, short-term adverse impacts from restoration actions occurring in or near aquatic habitats.	Similar to Alternative A, except minor additional beneficial impacts from implementation of 3- to 5-year action plans.
Threatened and Endangered Species	Beneficial impacts on species that are the focus of NRP programs; minor adverse impacts from programs not focused on species or habitat improvement.	Similar to Alternative A, except minor additional beneficial impacts from implementation of 3- to 5-year action plans.
Wetlands	Continued beneficial impacts for wetlands on TVA lands.	Greater benefits to wetlands than Alternative A because there would be a more comprehensive suite of wetland programs and activities and an improved ability to respond to emerging issues and needs.
Floodplains	Minor beneficial impact as floodplain management minimizes impacts of development. Negligible loss of flood control and power storage, minimal effect on floodplain values.	Similar to those under Alternative A and there may be additional minor beneficial impacts from new programs such as Science Kids and additional stakeholder engagement and community support.
Water Quality	Beneficial impacts would be minor to major depending on their location and ability to address site-specific water quality issues. Adverse impacts would mostly occur over the short term and would be minimized or mitigated through the environmental review process.	Similar to Alternative A, except minor additional beneficial impacts from implementation of 3- to 5-year action plans.
Air Quality	Negligible impacts.	Same as Alternative A.
Climate	Negligible to minor benefits locally and regionally.	Same as Alternative A.

Resource Area	Alternative A – No Action Alternative	Alternative B – Proposed Action Alternative – Updates to TVA's Natural Resource Plan
Cultural Resources	Beneficial impacts from implementing framework for prioritizing and managing cultural resources.	Same as Alternative A.
Recreation	Mostly beneficial impacts on recreational demand and opportunity. Possible adverse impacts if facilities and opportunities do not keep up with demand.	Greater benefits to developed recreation than Alternative A due to more comprehensive suite of recreation programs and activities with greater ability to respond to emerging issues and needs.
Natural Areas	Beneficial impacts for natural areas where a management plan is developed. Adverse impacts where active management does not occur.	Similar to Alternative A, except minor additional beneficial impacts from implementation of 3- to 5-year action plans.
Land Use	TVA Land Policy and project approval process would minimize potential for adverse effects.	Adverse impacts minimized through Section 26a and land use agreement project review process and land use agreements. Overall beneficial impacts through increased stakeholder education and communication.
Prime Farmland	Beneficial impacts through continued implementation of programs and partnerships that conserve prime farmland. Minor adverse impacts from conversion to non-agricultural uses.	Similar to Alternative A, except minor additional beneficial impacts from implementation of 3- to 5-year action plans.
Visual Resources	Beneficial impacts where programs restore natural landscapes and aesthetic qualities. Localized adverse impacts if programs are not fully implemented.	Similar to Alternative A, except minor additional beneficial impacts from implementation of 3- to 5-year action plans.
Navigation	No direct impacts on navigation.	Same as Alternative A.
Socioeconomics and Environmental Justice	Local positive impacts to the economy and quality of life with negligible to moderate benefits.	Greater benefits than Alternative A due to additional programs that will increase focus on socioeconomics and from implementation of 3- to 5-year action plans.

2.3 Identification of Mitigation Measures

TVA's analysis of the preferred alternative includes mitigation under the 2020 NRP. Mitigation measures are actions that could be taken to avoid, minimize, or reduce or compensate for adverse impacts to the environment. TVA would continue implementing the following current commitments and mitigation measures:

- Prior to approving any projects under the NRP, TVA would continue to conduct an appropriate site-specific environmental review to determine the potential environmental effects of the proposed activity.
- As necessary, based on the findings of any site-specific environmental review, TVA may require the implementation of appropriate mitigation measures, including BMPs (e.g., Section 26a General and Standard Conditions/BMPs (TVA 2005a)), as a condition of approval for activities on TVA-managed lands.
- Any future development of lands potentially supporting use by sensitive species will be coordinated with both state and federal agencies, as appropriate.
- Consistent with EO 13112 (Invasive Species), disturbed areas would be revegetated with native or non-native, non-invasive plant species to avoid the introduction or spread of invasive species.
- TVA will comply with the NRP Programmatic Agreement (PA) executed in 2011 in consultation with the State Historic Preservation Officers (SHPOs), Advisory Council on Historic Preservation, and federally recognized Indian tribes which subsumes and governs all past and future land plans.

2.4 The Preferred Alternative

TVA's preferred alternative is Alternative B. The programs described in Alternative B would result in additional beneficial impacts to the environment while providing TVA with an improved and adaptable framework for implementing stewardship programs and activities over the next 20 years.

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 Terrestrial Ecology

3.1.1 Vegetation

3.1.1.1 Affected Environment

As described in the 2011 Final EIS, plant communities in the TVA region are rich in biodiversity, containing approximately 4,000 vascular plant species and an array of habitat types. The habitats range widely and include mesophytic forests and balds found in the higher elevations of the Blue Ridge ecoregion, limestone cedar glades and barrens of the Interior Plateau, and bottomland hardwood forest and cypress swamps found in the Mississippi Alluvial Plain. In all, nine ecoregions intersect the TVA region (TVA 2011b).

Most of the plant communities found throughout the TVA region are common and well represented across the landscape, but NatureServe (2009) recognizes about 83 community associations (distinct assemblages of plants classified by their dominant and diagnostic species) within the TVA region as having a global ranking of G1 (TVA 2011b). The G1 ranking defines communities that are critically imperiled and at a high risk of extinction due to extreme rarity (often five or fewer occurrences worldwide). Currently, TVA is actively managing several parcels containing rare plant habitats by removing woody vegetation using fire and mechanical means. The goal of these management activities is to promote open, prairie-like habitats and state-listed plant populations occurring at each site. Although status information on rare plant communities is not updated with regularity, it is unlikely any G1 plant communities have become more common since publication of the 2011 Final EIS.

Throughout the TVA region, forest is the most common vegetation type when lands are not managed intensively for agricultural production. This is also true for TVA lands; land cover on about 85 percent of TVA parcels managed for sensitive resources (Zone 3) and natural resource conservation (Zone 4) are upland deciduous forest, bottomland hardwood forest, evergreen forest, or mixed evergreen-deciduous forest (TVA 2011b). The remaining 15 percent of TVA parcels are in an open condition characterized by agriculture, emergent wetlands, scrub-shrub, and grassland/herbaceous communities. In the 2011 Final EIS, TVA used trends in Tennessee forest data to infer that total forest cover and mean forest age had increased on TVA lands. The most recent Forest Inventory Analysis data available from the US Forest Service for Tennessee indicates that forest cover has remained nearly constant between 2010 and 2014 (US Forest Service 2018a).

Also addressed in TVA's 2011 Final EIS are invasive plants (e.g., cocongrass, giant salvinia, hydrilla, and tropical soda apple), which are common across the landscape, including on TVA lands (TVA 2011b). EO 13112 directed TVA and other federal agencies to prevent the introduction of invasive species (both plants and animals), control their populations, restore invaded ecosystems, and take other related actions. EO 13751 (Safeguarding the Nation from the Impacts of Invasive Species), issued on December 8, 2016, amends EO 13112 and directs actions by federal agencies to continue coordinated federal prevention and control efforts related to invasive species. This order incorporates human and environmental health, climate change, technological innovation, and other emerging priorities into federal efforts to address invasive species. Some invasive plants have been introduced accidentally, but most were brought as ornamentals or for livestock

forage. Because these plants arrived without their natural predators (e.g., insects and diseases), their populations increased across the landscape with little opposition (Miller 2003). Since publication of the 2011 Final EIS, TVA has continued to implement efforts to remove invasive plant species from selected TVA parcels. Often, parcels selected for invasive species removal support sensitive biological resources or are used by the public for outdoor recreation.

3.1.1.2 Environmental Consequences

3.1.1.3 Alternative A

The 2011 NRP includes programs and activities with the potential to affect plant communities and the extent of invasive plants on TVA lands. These programs and activities primarily occur under the Biological Resources Resource Area, including:

- Sensitive Resources Data Management
- Conservation Planning
- Natural Areas Management
- Grasslands and Agricultural Lands Management
- Forest Resources Management
- Nonnative Invasive Plant Management

Since 2011, TVA has had marginal success in implementing programs affecting terrestrial ecology, with some programs not expected to be implemented fully within the 20-year life span of the 2011 NRP.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. In the 2011 Final EIS, TVA concluded that there would be beneficial impacts on vegetation from implementing the NRP; this analysis generally remains valid. Implementation of the No Action Alternative would not result in significant adverse impacts on the terrestrial ecology (vegetation) of the TVA region. Under the No Action Alternative, the Biological Resources programs and activities would continue unchanged. Programs within the Biological Resources Resource Area are expected to have beneficial impacts on discrete sites where projects are implemented; no negative impacts are anticipated. These beneficial impacts are expected to continue as long as the programs continue to be implemented. While management of invasive species and rare plant habitats would continue on the current trajectory, these programs and activities would not result in changes to land cover on a measurable scale. Projects proposed on TVA lands that have the potential to affect rare plant habitats or the extent of invasive species would be subject to an appropriate site-specific environmental review.

Continued implementation of programs and activities under the other five resource areas in the 2011 NRP have the potential for minor, indirect beneficial or adverse impacts on plant communities on TVA lands because manipulation of terrestrial habitats is not a primary goal of these programs. However, site-specific environmental reviews of new proposed projects with the potential to affect terrestrial ecology would include consideration of minimization and avoidance measures to reduce adverse impacts.

3.1.1.4 Alternative B

In the 2020 NRP, all programs that have the potential to directly affect terrestrial plant communities are included in the Land and Habitat Stewardship Focus Area and Nuisance and Invasive Species Management Focus Area. These are the same as listed under

Alternative A; TVA does not propose to change these programs for the 2020 NRP. While the administrative organization of the 2011 NRP differs from the 2020 NRP, on-the-ground implementation of programs affecting terrestrial ecology would remain virtually unchanged, and all land management activities occurring since the 2011 NRP would continue. Thus, continued implementation of these programs and activities under Alternative B would result in the same direct and indirect impacts as under Alternative A.

Most programs included in the other eight focus areas proposed in the 2020 NRP have the potential for minor, indirect beneficial or adverse impacts on plant communities on TVA lands because manipulation of terrestrial habitats is not a primary goal of these focus areas. Although these focus areas are new to the NRP itself, their implementation has been ongoing for many years. As a result, their impacts would be a continuation of current impacts. For example, programs included in the Section 26a and Land Use Agreements Focus Area do have the potential to influence on-the-ground projects that could affect plant communities on TVA land, but the programs themselves are not new and have been ongoing for many years. The only proposed change is the inclusion of the programs in this focus area in the 2020 NRP.

As under Alternative A, site-specific environmental reviews for new proposed projects with the potential to affect terrestrial ecology on TVA lands would include consideration of avoidance and minimization measures to reduce adverse impacts.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on vegetation.

In conclusion, overall impacts under Alternative B would be similar to those under Alternative A. There may be additional beneficial impacts from implementation of the 3- to 5-year action plans because the plans will likely result in more effective prioritization of future, site-specific projects that address vegetation on TVA lands.

3.1.1.5 Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to benefit vegetation include land management and conservation planning efforts on other federal (e.g., National Park Service and US Forest Service), state and local (e.g., state and county parks), and private lands. Changes in land use have the potential to adversely affect vegetation through direct removal, habitat fragmentation, or indirect effects such as runoff. These impacts are expected to continue through the life span of the 2011 or 2020 NRP.

Programs included in the 2011 and 2020 NRP that have a measurable potential to affect plant communities are intended to positively impact sensitive resources on TVA lands. Often, these programs are implemented in cooperation with other local, state, federal or non-profit conservation entities that have similar land management goals. This additive effect is expected to continue to result in beneficial impacts on vegetation.

When considered in a broader context, the incremental effect of implementing Alternative A or Alternative B would be minor beneficial cumulative impacts for the terrestrial ecology of the TVA region over the life span of either alternative.

3.1.2 Wildlife

3.1.2.1 Affected Environment

The 2011 Final EIS includes a description of the ecoregions and the distribution and types of wildlife species found within the TVA region and is incorporated into this SEIS by reference. In summary, the 2011 Final EIS describes the number of species present in the TVA region, includes an overview of pertinent laws and policies (e.g., Migratory Bird Treaty Act and EO 13186 [Responsibilities of Federal Agencies to Protect Migratory Birds]) that govern wildlife and describes the importance of TVA lands for wildlife habitat (e.g., riparian, open habitat, and caves). TVA partnerships with state and federal agencies that affect wildlife, hunting, fishing, and wildlife associated recreation on TVA lands, and nuisance wildlife management on TVA lands are also detailed in the 2011 Final EIS.

Generally, the trends and the descriptions of Tennessee Valley wildlife resources in the 2011 Final EIS remain accurate.

Since publication of the 2011 Final EIS, dramatic declines in bat populations have been observed in the TVA region and on TVA lands. The fungus that causes white nose syndrome (WNS), *Pseudogymnoascus destructans* (Pd), reached Tennessee in the winter of 2009/2010. Since 2013, populations of many winter cave-dwelling bat species have dropped sharply in the TVA region. TVA has implemented several targeted projects focused on bat conservation, recovery, and research. TVA has expanded collaborative efforts with state and federal agencies and other conservation organizations to address the threat to bat populations posed by WNS. Gates have been installed at the entrances of caves to protect roosting bats from human activities, artificial roosting trees have been installed across the TVA Region to provide permanent summer roosting habitat for bark-roosting species, and individuals have been captured and tracked using transmitters and airplanes to document foraging and roosting on TVA lands to better inform our forestry management practices. Caves on TVA-managed public lands remain closed to entry by the public in an effort to help any individual bats survive the WNS epidemic by reducing the potential for disturbance while they are in torpor and are most sensitive to WNS infection. No impacts to other cave-dwelling species have yet been observed due to bat population declines.

3.1.2.2 Environmental Consequences

3.1.2.3 Alternative A

In the 2011 NRP, programs and activities addressing wildlife communities are primarily located in the Biological Resources Resource Area and include the following:

- TVA Sensitive Resources Data Management
- Natural Areas Management
- Conservation Planning
- Migratory Birds Management
- Grasslands and Agricultural Lands Management
- Dewatering Projects Management
- Forest Resource Management
- Nuisance Animal Control
- Wildlife Habitat Council – Third-Party Certifications
- Wildlife Habitat Enhancement Partnerships
- Land Condition Assessment and Land Stewardship Maintenance

- Public Engagement
- Dispersed Recreation Management
- Leave No Trace
- Trails Management

TVA has experienced mixed success in implementing these programs and activities. While some have been fully implemented, most programs are unlikely to be fully implemented within the 20-year life span of the 2011 NRP.

For example, the activities included in the 2011 NRP Migratory Birds Management Program have not been fully implemented. The Tennessee River Valley Shorebird Working Group was created out of TVA's Tennessee River Valley Shorebird Initiative, but the Working Group was not extended beyond the duration of the Initiative which was completed in 2012. Although TVA is a signatory to a Partners in Flight memorandum of understanding (MOU) and routinely considers information from national and regional migratory bird management programs, including Partners in Flight, TVA has not formally participated in this effort since the Final 2011 NRP was published. TVA is, however, developing an Avian Protection Plan to outline procedures for addressing avian issues across the TVA power service area. TVA is working with the Council for the Conservation of Migratory Birds to develop an MOU under EO 13186 to outline TVA's avian conservation efforts. Though not reflected in the Final 2011 NRP, TVA continues to be a member of the Avian Power Line Interaction Committee to pool resources to conserve birds and to develop ways of preventing avian mortalities and associated power outages.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. As described in the 2011 Final EIS, implementation of these programs would continue to have minor direct and indirect beneficial impacts on wildlife on TVA lands. TVA programs continue to support foraging waterfowl and shorebirds populations in reservoirs, mudflats created by reservoir drawdowns, dewatering areas, and Wildlife Management Areas (WMA) managed by state partners. Wildlife viewing and hunting opportunities continue to exist throughout the TVA Region on TVA lands. Natural Resource programs support these activities through interpretive trails, habitat improvement projects, and recreation program efforts.

General wildlife habitat improvement projects, forest resources management projects, WMA improvement projects, and recreation projects that support wildlife viewing or hunting opportunities may benefit some species, while others may be negatively affected. Nuisance animals would continue to be controlled on a case-by-case basis, with coordination from US Department of Agriculture (USDA) Wildlife Services. Consistent with conclusions in the 2011 Final EIS, habitat improvement and forest management activities would continue to generally benefit wildlife resources. Minor adverse impacts may continue to result from implementation of other 2011 NRP program activities, including recreation and shoreline stabilization actions. These types of actions would be subject to appropriate site-specific environmental reviews to address potential negative impacts on sensitive resources.

In conclusion, under Alternative A, TVA would continue a blended management approach to implement programs and activities identified in the 2011 NRP. Most wildlife species would continue to benefit from the programs and activities as intended, provided that these programs are partially or fully implemented over the life span of the NRP. Adverse effects on wildlife would continue to be minor and short-term.

3.1.2.4 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to wildlife: Land and Habitat Stewardship, Reservoir Lands Planning, Recreation, Public Lands Protection, Nuisance and Invasive Species Management, Ecotourism, and Section 26a and Land Use Agreements. Specific programs and activities addressing wildlife communities within these focus areas include:

- Sensitive Resources Data
- Natural Areas Management
- Grasslands and Agricultural Lands Management
- Dewatering Projects Management
- Comprehensive Valleywide Lands Plan
- Developed Recreation Management
- Dispersed Recreation Management
- Trails Management
- Recreation Partnerships
- Floating Cabins
- Education and Engagement
- Public Land Rules, Regulations, and Enforcement
- Comprehensive Land Condition Assessment
- Natural Resources Asset Inventory
- Property Management
- Nuisance Animal Control
- Ecotourism Partnerships
- Ecotourism and Recreation Assessments and Studies
- Section 26a and Land Use Implementation

Under Alternative B, TVA would implement the 2020 NRP which includes more programs and activities that have potential to affect terrestrial animals than the 2011 NRP. Overall, program objectives and implementing actions proposed in the 2020 NRP would have the same type of effects on terrestrial animals as those described in the 2011 NRP under Alternative A because these actions would be a continuation of current actions occurring under the 2011 NRP and other TVA programs.

As under Alternative A, general wildlife habitat improvement projects, forest resource management, state partnerships improvement projects (e.g., WMA improvements), recreation projects that support wildlife viewing or hunting opportunities, lands planning and protection, and ecotourism may benefit some species, while others may be negatively affected. For example, as habitat improvements are made, invasive species and those that are accustomed to disturbance may disperse from the area while rare, sensitive, and potentially more native wildlife species may move in. Ecotourism, recreation, and hunting often increase human presence in areas. Although the educational opportunities for sensitive and rare wildlife brought on by these opportunities are intended to benefit species, disturbance and habitat alternation can negatively impact local wildlife.

New focus areas in the 2020 NRP, such as the Public Lands Protection, Ecotourism, and Section 26a and Land Use Agreements, include programs and activities with the potential to affect wildlife on TVA lands. Despite their addition to the 2020 NRP, the programs themselves are not new and the actions performed by these programs have been ongoing

for many years; the only proposed change is the inclusion of the programs in this focus area in the 2020 NRP. Thus, any impacts associated with implementation of the new focus areas would be a continuation of current impacts.

Some programs from the 2011 NRP would not be carried forward as a stand-alone program in the 2020 NRP, but would be implemented instead as a tool to support multiple other programs. For example, TVA would continue to be a member of the Wildlife Habitat Council, but the program devoted to this accreditation in the 2011 NRP has been removed. Because TVA would continue its membership and use it to support other programs, no adverse impacts are anticipated from these types of changes in the 2020 NRP.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on wildlife.

Overall, under Alternative B, there would be a combination of minor direct and indirect beneficial and adverse impacts to wildlife on TVA lands similar to those described under Alternative A. Because the programs and activities in the 2020 NRP are largely a continuation of current management, these impacts would be similar to those under Alternative A. Actions associated with focus areas on TVA lands would be subject to an appropriate level of site-specific environmental review (including those under ESA) to ensure adverse impacts to sensitive resources are addressed.

3.1.2.5 Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to benefit wildlife include those conservation and land management efforts described above for vegetation. In addition, state wildlife agencies would continue to benefit wildlife through research and management programs. Residential and commercial development would continue to fragment habitat and result in displacement of animals in those areas. Hunting on private and public lands is also expected to remain a popular activity throughout the TVA power service area. These actions are expected to continue through the life span of the 2011 or 2020 NRP.

Programs included in the 2011 and 2020 NRP that have a measurable potential to affect terrestrial animal species are intended to positively impact targeted resources on TVA lands. Often, these programs are implemented in cooperation with other local, state, federal, or non-profit conservation entities that have similar land management goals. This additive effect is expected to continue to result in beneficial impacts on wildlife.

When considered in a broader context, the incremental effect of implementing Alternative A or Alternative B would be beneficial cumulative impacts for the terrestrial ecology of the TVA region over the life span of either alternative, even if short-term adverse impacts may occur for species that are temporarily displaced or otherwise affected by habitat improvement projects and similar activities. Overall, implementation of Alternative A or Alternative B would result in beneficial cumulative impacts for the wildlife species and their habitat within the TVA region over the life span of either alternative.

3.2 Aquatic Ecology

3.2.1 Affected Environment

The 2011 Final EIS includes a general description of aquatic ecology resources in the TVA region, incorporated herein by reference. Since publication of the 2011 Final EIS, the general characteristics of the region's reservoirs, streams, and rivers are unchanged.

As noted in the 2011 Final EIS, the rivers located in the TVA region support a large variety of freshwater fishes and invertebrates, including freshwater mussels, snails, crayfish, and insects. Due to the number of major river systems found in this region, the Southeastern US is recognized as a globally important area for freshwater biodiversity (Stein et al. 2000; TVA 2011b).

Construction of the TVA dam and reservoir system fundamentally altered both the water quality and physical environment of the Tennessee River and many of its tributaries. While dams promote navigation, flood control, power benefits, and river-based recreation by moderating the flow effects of floods and droughts throughout the year, they also disrupt the daily, seasonal, and annual flow patterns that are characteristic of a river. Damming of the rivers was largely done at a time when there was less consideration of impacts on aquatic resources (Voigtlander and Poppe 1989). As was the case in 2011 when the Final EIS was completed, TVA continues to manage its reservoir system under the Reservoir Operations Study (TVA 2004).

Since 2011, TVA has contributed to numerous water quality improvement and species enhancement efforts to benefit aquatic communities throughout the TVA system. These efforts include stream buffer establishment and streambank stabilization efforts, dam removals, contributions to fish and mussel hatchery facilities to promote product and reintroduction of aquatic species (particularly rare, threatened, and endangered species), and other efforts to promote an increased knowledge of Tennessee River biodiversity and stewardship. The establishment of the Tennessee River Basin Network is an effort to engage knowledgeable stakeholders across the Valley to promote efforts to educate the public about the value of the system. Participants include states, federal agencies, academia, local government, economic development groups, and non-governmental organizations in a concerted effort to promote aquatic biodiversity across the TVA region. Since publication of 2011 Final EIS, TVA has also been part of a multi-agency monitoring and response effort to track and respond to the recent invasion of the Tennessee River system by the invasive nuisance Asian carps (silver carp and bighead carp).

TVA also continues to monitor the ecological health of its reservoirs, implementing guidance from the 2004 Reservoir Operations Study. In the 2011 NRP, TVA cited its Vital Signs Monitoring Program (now called the Ecological Health Monitoring Program) as its means to assess and monitor environmental conditions in reservoirs. These monitoring and assessment studies continue, utilizing five evaluation metrics: chlorophyll concentration, fish community health, bottom life, sediment contamination, and dissolved oxygen (DO). Ecological Health Monitoring Program ratings, major areas of concern, and fish consumption advisories are listed (see Section 3.6, Water Quality, for further detail).

The "free-flowing" streams within the Valley and in the Tennessee River watershed hold a much higher diversity of aquatic life (including state- and federally listed species) than are found in the TVA reservoir system. The Clinch River and Duck River in Tennessee and Virginia are recognized as globally important for freshwater biodiversity. While aquatic

communities in these rivers and streams are much more diverse than within the reservoir system, it is recognized that these watersheds have their own water quality issues. Land management practices such as agriculture; industrial, residential, and recreational development; and forestry have led to the degradation of water quality and habitat in many of the region's streams and rivers (TVA 2011b).

3.2.2 Environmental Consequences

3.2.2.1 Alternative A

The 2011 NRP includes two resource areas that oversee programs and activities related to aquatic ecology: Biological Resources and Water Resources.

Specific Programs and activities addressing aquatic ecology within those resource areas include:

- Threatened and Endangered Species Program
- Nuisance Animal Control
- Aquatic Ecology Management
- Stream and Tailwater Monitoring Program
- Climate Change Sentinel Monitoring
- Strategic Partnership Planning
- Water Resource Outreach Campaign
- Reservoir Shoreline Stabilization/Riparian Management Program
- Nutrient Source-Watershed Identification and Improvement Program
- Northern Gulf of Mexico/Mississippi River Basin Nutrient Load Reduction Program

TVA has been reasonably successful in implementing these programs although at a modified level based on available funding.

In the 2011 Final EIS, TVA concluded that implementing the Blended Management alternative would result in beneficial effects on aquatic resources. In general, conclusions in the 2011 Final EIS regarding the potential impacts of the NRP remain accurate. As such, TVA anticipates that beneficial impacts would continue and that no significant adverse impacts to the aquatic ecology of the TVA region would occur.

Specifically, TVA anticipates that management of aquatic communities and habitat would continue on the current trajectory and would not result in negative changes to aquatic communities. This is because such management is designed to improve overall water quality and aquatic habitat conditions. TVA has been reasonably successful in implementing programs in the 2011 NRP although at a modified level based on available funding. Therefore, the beneficial impacts projected were not completely attained. Programs within the Biological Resources resource area have provided beneficial impacts at discrete sites where projects are implemented; some short-term adverse impacts are noted during implementation of some activities (e.g., during construction of in-stream stabilization structures), but because these programs are designed to provide a net benefit to aquatic communities, no long-term adverse impacts are anticipated.

Under Alternative A, TVA water quality improvement and monitoring programs continue and would not be affected by changes proposed in the current SEIS. These programs would continue to provide beneficial impacts for as long as they are implemented.

In conclusion, implementation of the Cultural Resources, Public Engagement, Recreation Management, and Reservoir Lands Planning resource areas has the potential for minor, indirect beneficial or adverse impacts for aquatic communities because improvement of aquatic habitat is not a primary goal of these resource areas. Projects proposed that have the potential to adversely affect aquatic ecology would be subject to an individual, site-specific environmental review that would consider methods to avoid, minimize, or mitigate adverse impacts. These reviews would also comply with other regulatory requirements, including ESA, when considering new proposed projects with the potential to affect aquatic resources.

3.2.2.2 Alternative B

The 2020 NRP includes the following focus areas that include programs and activities related to aquatic ecology: Land and Habitat Stewardship, Water Resources Stewardship, Public Outreach and Information, and Nuisance and Invasive Species Management. Specific programs and activities within these focus areas include:

- Threatened and Endangered Species Program
- Nuisance Animal Control
- Nonnative Invasive Plant Management on TVA Lands
- Aquatic Ecology Management
- Stream Monitoring Program
- Sentinel Monitoring
- Water Resource Outreach Campaign
- Nutrient Source Management
- Strategic Partnership Planning and Reservoir Shoreline Stabilization/Riparian Management Programs

Of these eight programs and activities, TVA proposes changes to the Nutrient Source Management program and the Strategic Partnership Planning and Reservoir Shoreline Stabilization/Riparian Management program. The Nutrient Source Management in the 2020 NRP would combine the Nutrient Source-Watershed Identification program with the ongoing Improvement Program with Northern Gulf of Mexico/Mississippi River Basin Nutrient Load Reduction Program. The Strategic Partnership Planning and Reservoir Shoreline Stabilization/Riparian Management Programs would no longer be considered programs but would be considered tools to implement Water Resources Stewardship. These changes would not impact actual program implementation. Other programs would either not be changed or their names would simply be changed in the 2020 NRP (Stream Monitoring Program and Sentinel Monitoring).

Implementation of Alternative B would not result in significant changes to programs affecting aquatic ecology within the TVA region because the new programs have been implemented outside of the NRP framework for many years. For example, Nuisance and Invasive Species Management is included in the 2020 NRP as a new focus area, but it includes activities (e.g., invasive aquatic plant management and Asian carp management) which TVA has been conducting for a number of years either as part of the NRP (Nuisance Animal Control, Nonnative Invasive Plant Management) or as an independent program outside of the NRP framework (TVA's Aquatic Plant Management program). As such, all aquatic management activities occurring since the 2011 NRP would continue with adoption of Alternative B. Management of aquatic habitat would continue on the current trajectory and would not result in changes to aquatic communities when compared to Alternative A.

Alternative B, then, would be generally expected to result in beneficial effects on aquatic life in the TVA region.

Programs within the Land and Habitat Stewardship, Water Resources Stewardship, Public Outreach and Information, and Nuisance and Invasive Species Management focus areas are expected to continue to have beneficial impacts on discrete sites where projects are implemented; no adverse impacts are anticipated. These beneficial impacts are expected to continue as long as the programs continue.

TVA is including Section 26a and Land Use Agreements in the 2020 NRP as a focus area. TVA has been conducting these activities since its inception and manages these programs to ensure that impacts to aquatic ecology are minimized or avoided. In rare cases where a permitted activity could affect aquatic resources, TVA would work with the applicant and relevant state and/or federal resource management agencies to develop proper avoidance, minimization, or mitigation measures to protect aquatic communities and habitat.

As under Alternative A, all activities would be screened for possible adverse effects on aquatic habitat or communities, and avoidance, minimization, and/or mitigation measures would be developed to ensure that implementation of activities do not cause significant adverse impacts to aquatic communities or habitat.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on aquatic habitat and communities.

In summary, implementation of Alternative B is expected to result in similar impacts as described under Alternative A. Compared to Alternative A, the 3- to 5-year action plans could provide additional beneficial impacts via an improved framework for identifying opportunities and concerns.

3.2.2.3 Cumulative Impacts

Cumulative impacts are those impacts resulting from alterations of the stream, water quality, or instream habitats of the Tennessee River basin over time. Many of the past, present, and reasonably foreseeable future actions affecting aquatic ecology are shared with those for Water Quality. Runoff from agricultural, industrial, residential, and other land uses can contribute to long-term adverse impacts, while conservation practices including proper implementation of BMPs, stabilizing shorelines, and restoring vegetated areas can provide long-term benefits to aquatic ecology. TVA actions, including implementation of both alternatives, play a large role in regional efforts to maintain and improve aquatic ecology. No adverse cumulative impacts were identified in the 2011 Final EIS and this conclusion is expected to remain largely accurate under either alternative in this SEIS. Both alternatives would have beneficial cumulative impacts for the aquatic ecology of the TVA region. Any adverse impacts would be minimized or mitigated through site-specific environmental reviews and would therefore be minor or negligible.

3.3 Threatened and Endangered Species

3.3.1 Aquatic Animals

3.3.1.1 Affected Environment

In the 2011 Final EIS, TVA identified 94 aquatic species listed as endangered or threatened or candidates under the ESA that were documented or thought to occur in the TVA region (TVA 2011b). The list is based on a query of the USFWS Information for Planning and Consultation (IPaC) database and the TVA Regional Natural Heritage Database.

Since publication of the 2011 NRP, six fish and seven mussel species have been elevated from the federal Candidate list and given threatened or endangered species status under the ESA (Table 3-1). All of these species were considered in the 2011 NRP as Candidate species. TVA routinely evaluates and addresses impacts on state- and federally listed species (including Candidate species) during review of NRP projects.

Table 3-1. Federally Listed Aquatic Animal Species Present in the TVA Region – Listed Since 2011

Common Name	Scientific Name	Current Status	Year Listed
Fish			
Laurel Dace	*Chrosomus saylori*	Endangered	2011
Rush Darter	*Etheostoma phytophilum*	Endangered	2011
Cumberland Darter	*Etheostoma susanae*	Endangered	2011
Chucky Madtom	*Noturus crypticus*	Endangered	2011
Spring Pygmy Sunfish	*Elassoma alabamae*	Threatened	2013
Kentucky Arrow Darter	*Etheostoma spilotum*	Threatened	2016
Mussels			
Spectaclecase	*Cumberlandia monodonta*	Endangered	2012
Snuffbox	*Epioblasma triquetra*	Endangered	2012
Sheepnose	*Plethobasus cyphyus*	Endangered	2012
Rayed Bean	*Villosa fabalis*	Endangered	2012
Slabside Pearlymussel	*Pleuronaia dolabelloides*	Endangered	2013
Fluted Kidneyshell	*Ptychobranchus subtentum*	Endangered	2013
Rabbitsfoot	*Quadrula cylindrica cylindrica*	Threatened	2013

Updated species lists for state- and federally listed species are presented in Appendix E. With the exception of the addition of several federal Candidate species being given threatened or endangered species status, the endangered and threatened aquatic species information has not changed from information presented in the 2011 Final EIS, which is incorporated herein by reference. In summary, the 2011 Final EIS described the historic conditions in the Tennessee River watershed, the global significance of its exceptional aquatic diversity, and the population trends among species groups with the majority of listed species experiencing declines across their ranges.

3.3.1.2 Environmental Consequences

3.3.1.3 Alternative A

The 2011 NRP includes two resource areas that oversee programs and activities related to aquatic threatened and endangered species: Biological Resources and Water Resources.

Specific programs and activities addressing aquatic ecology within those resource areas include:

- Threatened and Endangered Species Program
- Nuisance Animal Control
- Aquatic Ecology Management
- Stream and Tailwater Monitoring Program
- Climate Change Sentinel Monitoring
- Strategic Partnership Planning
- Water Resource Outreach Campaign
- Reservoir Shoreline Stabilization/Riparian Management Program
- Nutrient Source-Watershed Identification and Improvement Program
- Northern Gulf of Mexico/Mississippi River Basin Nutrient Load Reduction Program

Since 2011, TVA has successfully implemented most programs affecting threatened and endangered aquatic species. As a federal agency, TVA will continue to fulfill the requirements of the ESA. Some programs have been limited by funding or resource requirements and would be unlikely to be implemented fully within the 20-year life span of the 2011 NRP.

Under Alternative A, TVA would continue current stewardship activities designed to protect and enhance populations of protected, listed, or rare species and their habitat while providing recreational opportunities. No listed aquatic species are known to occur on lands that would be directly managed by TVA as part of the NRP. However, state- and federally listed species do occur throughout the TVA region. TVA's natural resource management programs would continue to incorporate a variety of stewardship programs benefiting rare species and meeting regulatory responsibilities for protecting listed species and their habitat on the lands and waters within the TVA region.

Overall, while minor, short-term, direct and indirect adverse impacts could continue to result from implementation of specific projects under Alternative A, any direct, indirect, or cumulative impacts on aquatic resources (including listed species) would continue to be assessed, avoided, and/or minimized via existing regulatory mechanisms (particularly ESA and NEPA). It is anticipated that only beneficial long-term changes to aquatic resources including listed aquatic species from TVA's resource management activities would continue to occur. Thus, continued implementation of the 2011 NRP would not result in direct or indirect adverse impacts to state- or federally listed aquatic species or their habitat.

3.3.1.4 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to aquatic threatened and endangered species: Land and Habitat Stewardship, Water Resources Stewardship, Public Outreach and Information, and Nuisance and

Invasive Species Management. Specific programs and activities addressing listed aquatic species within these focus areas include:

- Threatened and Endangered Species Program
- Nuisance Animal Control
- Aquatic Ecology Management
- Stream Monitoring Program
- Sentinel Monitoring
- Water Resource Outreach Campaign
- Nutrient Source Management
- Strategic Partnership Planning and Reservoir Shoreline Stabilization/Riparian Management Programs

Of these programs and activities, TVA proposes changes to the Nutrient Source Management Program, the Strategic Partnership Planning Programs, and the Reservoir Shoreline Stabilization/Riparian Management Program. The Nutrient Source Management Program in the 2020 NRP would combine the Nutrient Source-Watershed Identification Program and Improvement Program with the Northern Gulf of Mexico/Mississippi River Basin Nutrient Load Reduction Program. The Strategic Partnership Planning and Reservoir Shoreline Stabilization/Riparian Management Programs would no longer be considered programs, but would be considered tools to implement Water Resources Stewardship. Other programs would either not be changed or their names would simply be changed in the 2020 NRP (e.g., Stream Monitoring Program and Sentinel Monitoring).

While this administrative reorganization of focus areas in the 2020 NRP differs from resource areas in the 2011 NRP, on-the-ground implementation of programs would be virtually unchanged under Alternative B compared with Alternative A.

All aquatic management activities occurring since the 2011 NRP would continue with adoption of Alternative B. Management of invasive species and aquatic habitat would continue on the current trajectory and would not result in changes to aquatic communities (including state- and federally listed species) when compared to Alternative A. Programs within the Land and Habitat Stewardship, Water Resources Stewardship, Public Outreach and Information, and Nuisance and Invasive Species Management Focus Areas are expected to have beneficial impacts on discrete sites where projects are implemented; no adverse impacts are anticipated. These beneficial impacts are expected to continue for as long as the programs continue.

Nuisance and Invasive Species Management would be a new focus area of the 2020 NRP. However, implementation of these activities (e.g., invasive aquatic plant management and Asian carp management) has been conducted for a number of years either as part of the NRP (Nuisance Animal Control) or outside of the NRP framework (TVA's Aquatic Plant Management program). All activities in these focus areas are screened for possible effects on state- or federally listed aquatic species or their habitat, and avoidance, minimization, and/or mitigation measures are developed to ensure that implementation of activities do not cause significant adverse impacts to state- or federally listed aquatic species or their habitat.

TVA has been conducting Section 26a and land use agreements since its inception and manages these programs to ensure that impacts to aquatic ecology are minimized or avoided. In rare cases where a permitted activity could affect aquatic resources, TVA would

work with the applicant and relevant state and/or federal resource management agencies to develop proper avoidance, minimization, or mitigation measures to protect aquatic communities, habitat, and the species listed above in Table 3-1. Thus, impacts would be a continuation of those under current management.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on listed aquatic animal species.

All new proposed projects with the potential to affect aquatic ecology or habitat would receive a stand-alone environmental review to assess potential impacts; all projects would comply with the ESA.

Overall, under Alternative B, there would be a combination of direct and indirect beneficial and adverse impacts on listed aquatic animal species similar to those described under Alternative A. Any adverse impacts would be short-term and would be minimized or mitigated to the extent practicable. Because the programs and activities in the 2020 NRP are largely a continuation of current management, these impacts would be similar to those under Alternative A. Compared to Alternative A, the 3- to 5- year action plans would provide additional beneficial impacts because they provide a more proactive framework to respond to concerns and opportunities. Actions would be subject to an appropriate level of site-specific environmental review (including those under ESA) to ensure adverse impacts to sensitive resources are addressed.

3.3.1.5 Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to benefit listed aquatic animals include continued implementation of water quality improvement projects, habitat enhancement, and BMPs that reduce runoff or other impacts that degrade aquatic animal species habitat. In addition, other land management agencies with shoreline property (e.g., US Forest Service) will continue to implement resource plans that include goals and objectives to maintain or improve these habitats. These impacts are expected to continue through the life span of the 2011 or 2020 NRP.

Programs included in the 2011 and 2020 NRP that have a measurable potential to affect threatened and endangered aquatic animal species are intended to positively impact state- and federally listed species on TVA lands. Often, these programs are implemented in cooperation with other local, state, federal, or non-profit conservation entities that have similar land management goals. This additive effect is expected to continue to result in beneficial impacts on listed aquatic animal species.

When considered in a broader context, the incremental effect of implementing Alternative A or Alternative B would be beneficial cumulative impacts for the threatened and endangered species of the TVA region over the life span of either alternative.

3.3.2 Terrestrial Animals

3.3.2.1 Affected Environment

In the 2011 Final EIS, TVA identified 33 federally listed, protected, or Candidate terrestrial animal species occurring in the TVA region (TVA 2011b). Since 2011, 14 species (the Eastern cougar, Louisiana black bear, Bachman's warbler, black Pine Snake, yellow-blotched map turtle, Surprising Cave beetle, American burying beetle, Baker Station Cave

beetle, Fowler's Cave beetle, Holsinger's Cave beetle, Inquirer Cave beetle, Indian Cave Point Cave beetle, Noblett's Cave beetle, and Ohio Emerald Dragonfly) were either not listed under the ESA after review, delisted, or are no longer thought to occur in the TVA region. The status of the Coleman Cave beetle is still under review. One terrestrial animal species (northern long-eared bat) was added to the Endangered Species list as a federally threatened species.

Currently, there are 19 federally listed, protected, or Candidate terrestrial animal species occurring in the TVA region (Appendix E). Of these species, six occur on TVA lands (Table 3-2). A seventh species, the red-cockaded woodpecker, has historically occurred on or near TVA lands. In recent decades, only two known active colonies occur in the TVA region: the extreme southern portion of the TVA region and not on TVA lands. TVA's resource management activities would not result in impacts to this species. Since the 2011 Final EIS, two species were added to the list of federally listed species that have the potential to be impacted by actions in the 2011 NRP: the northern long-eared bat and Mitchell's satyr butterfly.

Table 3-2. Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals Occurring on TVA Lands Potentially Impacted by the Natural Resource Plan

Common Name	Scientific Name	Federal Status
Mitchell's satyr butterfly	*Neonympha mitchellii*	LE
Bald eagle	*Haliaeetus leucocephalus*	DM
Interior least tern	*Sterna antillarum athalassos*	LE
Piping plover	*Charadrius melodus*	LT
Gray bat	*Myotis grisescens*	LE
Indiana bat	*Myotis sodalis*	LE
Northern long-eared bat	*Myotis septentrionalis*	LT

LE=Endangered; DM=Delisted, still being monitored; LT=Threatened.

Descriptions of each of these species (except for Mitchell's satyr butterfly and the recently listed northern long-eared bat) and their distribution across the TVA region are found in the 2011 Final EIS and are incorporated into this SEIS by reference. In summary, these species use a variety of habitats throughout the TVA region and reservoirs are particularly important.

Since the 2011 Final EIS was published, efforts by state, federal, and private partners to track Indiana bats have helped identify several previously unknown Indiana bat maternity roosts across the TVA region. During one of these efforts, a colony of summer roosting Indiana bats was tracked to TVA lands on Kentucky Reservoir. Since 2011, three individuals also were observed in a protected, TVA-managed cave in Marshall County, Alabama. TVA's survey efforts for Indiana bats have also changed since the USFWS issued guidelines for Indiana bat surveys; no Indiana bats have been captured by TVA since these guidelines were created.

Northern long-eared bats predominantly overwinter in hibernacula such as caves, abandoned mines, and cave-like structures. During the fall and spring, they utilize entrances of caves and the surrounding forested areas for swarming and staging. In the summer, northern long-eared bats roost individually or in small colonies beneath exfoliating

bark or in crevices of both live and dead trees. Tree roost selection by northern long-eared bats is similar to that of Indiana bats, but northern long-eared bats are more opportunistic in maternity roost site selection. Unlike Indiana bats, northern long eared bats also roost in anthropogenic structures. Northern long-eared bats emerge at dusk to forage below the canopy of mature forests on hillsides and roads and occasionally over forest clearings and along riparian areas (USFWS 2014). Northern long-eared bats used to be considered a common species across the TVA region prior to the introduction of the fungus causing WNS. While older records of this species exist across the Valley, recent caves and mist-netting surveys have resulted in very few captures/observations of this species in isolated, scattered locations. In 2015, this species was federally listed as threatened as a result of population declines due to WNS. Since its listing, no northern long-eared bats have been captured or visually observed on TVA lands.

Mitchell's satyr butterfly historically was relatively widespread across the Midwestern US. In recent decades, the range has reduced dramatically due to habitat loss and is now only known from a few sites in that region. Since its listing under the ESA in 1994, new populations of this species were discovered in the Southeastern US. In the early 2000s, a TVA biologist discovered individuals of this species in the TVA Region in Mississippi. Records of this species are now known from three counties in northeastern Mississippi. Specific habitat requirements of this particular population are still being researched. Individuals in this area have been found in open, emergent wetlands in close proximity to forested/shaded areas. A strong presence of sedges (*Carex* spp.) in these wetlands is also required as this is the food source for Mitchell's satyr caterpillars. This species has not yet been identified on TVA lands. Several natural resources projects in recent years have focused on improving pollinator habitat on TVA owned or leased lands. Mitchell's satyr butterfly has the potential to benefit from projects like these that may be planned in northeastern Mississippi.

The 2011 Final EIS also identified 701 state-listed or state-ranked terrestrial animal species that occur in the TVA region (see Appendix J of the 2011 Final EIS). Thirty-nine of these have been documented on TVA lands (Table 3-3). Overall, the diversity and density of these species across the TVA region and on TVA lands are similar to that documented in the 2011 Final EIS, except in relation to species of bats as described below.

Table 3-3. Terrestrial Animal Species of Conservation Concern Reported from TVA Lands

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
Amphibians					
Hellbender	*Cryptobranchus alleganiensis*	TN	PS	E	S3
Green Salamander	*Aneides aeneus*	AL	--	SP	S3
Seepage Salamander	*Desmognathus aeneus*	NC	--	W2	S3
Three-lined Salamander	*Eurycea guttolineata*	KY	--	T	S2
Tennessee Cave Salamander	*Gyrinophilus palleucus*	TN	--	T	S2
Four-toed Salamander	*Hemidactylium scutatum*	TN	--	D	S3
Green Treefrog	*Hyla cinerea*	KY	--	TRKD	S4
Birds					

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
Anhinga	*Anhinga*	TN	--	D	S1B
Great Egret	*Ardea alba*	KY	--	E	S2B
Great Egret	*Ardea alba*	TN	--	D	S2B,S3N
Yellow-crowned Night-heron	*Nyctanassa violacea*	KY	--	T	S2B
Osprey	*Pandion haliaetus*	AL	--	SP	S4
Osprey	*Pandion haliaetus*	KY	--	T	S2S3B
Peregrine Falcon	*Falco peregrinus*	AL	--	SP	SHB,S3N
Virginia Rail	*Rallus limicola*	TN	--	--	S1B,S3N
Common Barn-owl	*Tyto alba*	AL	--	SP	S3
Common Barn-owl	*Tyto alba*	TN	--	D	S3
Cerulean Warbler	*Setophaga cerulea*	NC	--	SC	S2B
Swainson's Warbler	*Limnothlypis swainsonii*	TN	--	D	S3
Mammals					
Southeastern Shrew	*Sorex longirostris*	TN	--	D	S4
Smoky Shrew	*Sorex fumeus*	TN	--	D	S4
Little Brown Bat	*Myotis lucifugus*	AL	--	SP	S3
Little Brown Bat	*Myotis lucifugus*	TN	--	T	S3
Eastern Small-footed Bat	*Myotis leibii*	TN	--	D	S2S3
Tricolored Bat	*Perimyotis subflavus*	AL	--	--	S3
Tricolored Bat	*Perimyotis subflavus*	TN	--	--	S2S3
Evening Bat	*Nycticeius humeralis*	KY	--	SC	S3
Rafinesque's Big-eared bat	*Corynorhinus rafinesquii*	AL	--	SP	S2
Allegheny Woodrat	*Neotoma magister*	TN	--	D	S3
Prairie Vole	*Microtus ochrogaster*	AL	--	--	S2
Southern Bog Lemming	*Synaptomys cooperi*	TN	--	D	S4
Long-tailed Weasel	*Mustela frenata*	AL	--	SP	S3
Reptiles					
Alligator Snapping Turtle	*Macrochelys temminckii*	TN	--	T	S2S3
Midland Smooth Softshell	*Apalone mutica mutica*	KY	--	TRKD	S3
Eastern Slender Glass Lizard	*Ophisaurus attenuatus longicaudus*	TN	--	D	S3
Eastern Milk Snake	*Lampropeltis triangulum triangulum*	AL	--	TRKD	S2
Northern Pine Snake	*Pituophis melanoleucus melanoleucus*	KY	--	T	S2
Northern Pine Snake	*Pituophis melanoleucus melanoleucus*	TN	--	T	S3
Western Pigmy Rattlesnake	*Sistrurus miliarius streckeri*	KY	--	T	S2

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
Western Pigmy Rattlesnake	*Sistrurus miliarius streckeri*	TN	--	T	S2S3
Invertebrates					
Nickajack Cave Isopod	*Caecidotea nickajackensis*	TN	--	--	S1
Nickajack Cave Beetle	*Pseudanophthalmus nickajackensis*	TN	--	--	S1
Duck River Cave Beetle	*Pseudanophthalmus tullahoma*	TN	--	--	S1
Allegheny Snaketail	*Ophiogomphus incurvatus alleghaniensis*	TN	--	--	S1
A Cave Obligate Spider	*Nesticus barri*	AL	--	--	S3

Source: TVA Natural Heritage Database, queried December 2018.
[1] Status Codes: D = Deemed in need of Management; E = Listed Endangered; PS = Partial Status; SC = Species of Concern; SP = State Protected; T = Listed Threatened; TRKD = Tracked; W2 = Rare but Questionable Taxonomy.
[2] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; SH = State Historic; S#B = Status of Breeding population; S#N = Status of Non-breeding population; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).

Trends of Listed Terrestrial Animals

As mentioned in Section 3.1.2, dramatic declines in bat populations have been observed in the TVA region and on TVA lands due to the introduction of fungus that causes WNS. In particular, Indiana bats, northern long-eared bats, little brown bats, and tricolored bats have shown the steepest declines. In response to this epidemic, TVA survey efforts of caves in the TVA region increased to monitor these declining populations. At present, no colonies of Indiana bats or northern long-eared bats are known to occur in TVA owned/managed caves, and individuals of these species have been observed in only two caves in recent years. In contrast, survey efforts documented tricolored bats in the majority of surveyed caves and colonies of up to 1,000 bats were documented. However, since 2010, TVA has observed decreases in tricolored bats of up to 76 percent in TVA-owned caves. Many of the caves along reservoirs support large numbers of summer roosting federally endangered gray bat colonies in the summer. Fortunately, declines in this species have not been observed despite the documented presence of the Pd fungus on these bats. As mentioned above, several targeted projects have focused on bat conservation, recovery, and research.

3.3.2.2 Environmental Consequences

3.3.2.3 Alternative A

The 2011 NRP includes the following Resource Area that oversees programs and activities related to threatened and endangered terrestrial animals: Biological Resources.

Specific programs and activities addressing threatened and endangered terrestrial animals within Biological Resources include:

- Threatened and Endangered Species
- TVA Sensitive Resources Data Management
- Conservation Planning
- Dewatering Projects Management

- Forest Resource Management
- Land Condition Assessment and Land Stewardship Maintenance
- Public Engagement
- Dispersed Recreation Management
- Leave No Trace
- Trails Management

Implementation of these programs has begun, but most are unlikely to be complete within the 20-year timeframe of the 2011 NRP.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. Consistent with the conclusions of the 2011 Final EIS, programs and activities associated with the management and protection of sensitive resources are intended to be solely beneficial to wildlife resources. Activities performed in support of most of the Sensitive Biological Resources projects such as those described in the "Trends of Listed Terrestrial Animals" section above would continue to benefit target species. These targeted efforts to support imperiled terrestrial animal species would continue to have beneficial impacts to the target species at those discrete sites and, if successful, may lead to population-level benefits over time.

The other resource areas with the potential to impact threatened and endangered terrestrial animals would continue to have minor direct and indirect beneficial or adverse impacts on listed terrestrial animal species on TVA lands. Any projects proposed on TVA lands would be subject to site-specific environmental reviews and would be subject to compliance with the ESA. These reviews would ensure that adverse impacts on threatened and endangered species are avoided or appropriately minimized or mitigated.

In conclusion, under Alternative A, TVA would continue a blended management approach to implement programs and activities identified in the 2011 NRP. Targeted species would continue to benefit from the programs and activities identified in the 2011 NRP and any direct or indirect adverse impacts on listed terrestrial animal species or their habitat would be avoided, minimized, or mitigated during site-specific environmental reviews and ESA consultation.

3.3.2.4 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to threatened and endangered terrestrial animals: Land and Habitat Stewardship, Reservoir Lands Planning, Recreation, Public Lands Protection, Nuisance and Invasive Species Management, Ecotourism, and Section 26a and Land Use Agreements.

Specific programs and activities addressing listed terrestrial animals within these focus areas include:

- Threatened and Endangered Species
- Sensitive Resources Data
- Natural Areas Management
- Dewatering Projects Management
- Comprehensive Valleywide Lands Plan
- Developed Recreation Management
- Dispersed Recreation Management

- Trails Management
- Recreation Partnerships
- Floating Cabins
- Education and Engagement
- Public Land Rules, Regulations, and Enforcement
- Comprehensive Land Condition Assessment
- Natural Resources Asset Inventory
- Property Management
- Ecotourism Partnerships
- Ecotourism and Recreation Assessments and Studies
- Section 26a and Land Use Implementation

Under Alternative B, TVA would continue to prioritize the protection and monitoring of sensitive resources on TVA land, including listed terrestrial animal species. Proposed Land and Habitat Stewardship programs, largely unchanged from the 2011 NRP programs and activities, would continue to result in beneficial impacts to these species.

Although the 2020 NRP identifies more programs and activities that have the potential to affect threatened and endangered terrestrial animals than the 2011 NRP, these changes are administrative in nature, as the programs have been implemented for many years outside of the NRP framework. As a result, impacts would be the same as under current management. Examples include programs under the Public Lands Protection, Ecotourism, and Section 26a and Land Use Agreements focus areas.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on listed terrestrial animal species.

As under Alternative A, any projects proposed on TVA lands would be subject to site-specific environmental reviews and would be subject to compliance with the ESA. These reviews would ensure that negative impacts to threatened and endangered species are appropriately mitigated.

In conclusion, implementation of Alternative B would result in the same impacts as under Alternative A, except that there may be additional beneficial impacts from the 3- to 5-year action plans due to more effective prioritization of site-specific projects.

3.3.2.5 Cumulative Impacts

Past, present, and reasonably foreseeable future actions with the potential to benefit listed terrestrial animals include land management and conservation planning efforts on other federal lands (e.g., National Park Service, US Forest Service), state and local lands (e.g., state and county parks), and private lands. Habitat improvement efforts carried out by other agencies and non-profit organizations will continue to benefit listed species. Changes in land use have the potential to adversely affect species through mortality, habitat removal, and habitat fragmentation. These impacts are expected to continue through the life span of the 2011 or 2020 NRP.

Programs included in the 2011 and 2020 NRP that have a measurable potential to affect threatened and endangered terrestrial animal species are intended to positively impact

state- and federally listed species on TVA lands. Often, these programs are implemented in cooperation with other local, state, federal, or non-profit conservation entities that have similar land management goals. This additive effect is expected to continue to result in beneficial impacts on listed terrestrial animal species.

When considered in a broader context, the incremental effect of implementing Alternative A or Alternative B would be beneficial cumulative impacts for the threatened and endangered species of the TVA region over the life span of either alternative.

3.3.3 Plants

3.3.3.1 Affected Environment

The 2011 Final EIS described 44 federally threatened or endangered plant species as occurring within the TVA region (TVA 2011b). Based on a query of the USFWS's IPaC database and the TVA Regional Natural Heritage Database, there are currently 39 such species (Table 3-4). In addition, 1,135 state-listed plants are known to occur within the TVA region (compared to 996 as described in the 2011 Final EIS) and can be found in Appendix E.

Since adoption of the 2011 NRP, TVA biologists have visited many populations of state- and federally listed plant species occurring on TVA lands designated in reservoir land management plans for sensitive resource management and natural resource conservation (i.e., Zones 3 and 4). Information from these visits provides a snapshot of the size and health of plant populations and helps biologists develop management recommendations that may ensure the viability of species populations over time. Typical recommendations include site manipulations like invasive species removal or introduction of prescribed fire. Prairie and glade restoration is currently underway at three locations on TVA lands that support remnants of these formerly common habitats. These projects are designed to remove encroaching woody vegetation and promote threatened and endangered plants and rare plant habitats that resemble open prairies.

Federally Listed Plants

The 2011 NRP recognized a subset of 11 federally listed plant species that have the potential to be impacted by TVA actions associated with the NRP (TVA 2011b). This selection was developed based on the proximity of TVA lands to known occurrences and potential habitat for these species. Currently only one federally listed plant, the large-flowered skullcap (*Scutellaria montana*), is known to occur on TVA lands. TVA properties along Chickamauga and Nickajack reservoirs comprise core habitat for the plant that is vital to the long-term recovery of the species. There are 41 occurrences of this species known to occur on TVA lands near Chattanooga, Tennessee.

Populations of large-flowered skullcap on TVA lands face several threats, including the proliferation of invasive species and unauthorized vegetation clearing of occupied habitat by adjacent private landowners. Development of TVA lands that are not presently designated for conservation could also threaten this species in the future. The most recent TVA monitoring data show that this species has declined at many locations over the past 10 years. The underlying reasons for these declines are unclear.

Table 3-4. Federally Listed Plant Species Reported from Counties that Intersect the TVA Region

Common Name	Scientific Name	Federal Status[1]
Price's Potato-bean	*Apios priceana*	T
Georgia Rock-cress	*Arabis georgiana*	T
Braun's Rock-cress	*Arabis perstellata*	E
American Hart's-tongue Fern	*Asplenium scolopendrium* var. *americanum*	T
Pyne's Ground Plum	*Astragalus bibullatus*	E
Morefield's Leather Flower	*Clematis morefieldii*	E
Alabama Leather Flower	*Clematis socialis*	E
Cumberland Rosemary	*Conradina verticillata*	T
Leafy Prairie-clover	*Dalea foliosa*	E
Smooth Coneflower	*Echinacea laevigata*	E
Spreading Avens	*Geum radiatum*	E
Rock Gnome Lichen	*Gymnoderma lineare*	E
Mountain Bluet	*Hedyotis purpurea* var. *montana*	E
Whorled Sunflower	*Helianthus verticillatus*	E
Swamp-pink	*Helonias bullata*	T
Dwarf-flowered Heartleaf	*Hexastylis naniflora*	T
Mountain Golden Heather	*Hudsonia montana*	T
Small Whorled Pogonia	*Isotria medeoloides*	T
Fleshy-fruit Gladecress	*Leavenworthia crassa*	E
Lyre-leaf Bladderpod	*Lesquerella lyrata*	T
Spring Creek Bladderpod	*Lesquerella perforata*	E
Heller's Blazing Star	*Liatris helleri*	T
Pondberry	*Lindera melissifolia*	E
Mohr's Barbara's Buttons	*Marshallia mohrii*	T
Cumberland Sandwort	*Minuartia cumberlandensis*	E
Short's Bladderpod	*Physaria globosa*	E
Ruth's Golden Aster	*Pityopsis ruthii*	E
White Fringeless Orchid	*Platanthera integrilabia*	T
Harperella	*Ptilimnium nodosum*	E
Michaux's Sumac	*Rhus michauxii*	E
Kral's Water-plantain	*Sagittaria secundifolia*	T
Green Pitcher Plant	*Sarracenia oreophila*	E
Large-flowered Skullcap	*Scutellaria montana*	T
Reflexed Blue-eyed Grass	*Sisyrinchium dichotomum*	E
Blue Ridge Goldenrod	*Solidago spithamaea*	T
Gentian Pinkroot	*Spigelia gentianoides*	E
Virginia Spiraea	*Spiraea virginiana*	T
Alabama Streak-sorus Fern	*Thelypteris pilosa* var. *alabamensis*	T
Tennessee yellow-eyed grass	*Xyris tennesseensis*	E

Source: TVA Natural Heritage Database, queried December 2018, and USFWS IPaC.
[1] Status Codes: E = Listed Endangered; T = Listed Threatened

State-listed Plants

TVA lands located across the seven-state region are known to support 307 occurrences of 137 different state-listed plant species (Table 3-5). These species occurrences are distributed throughout the TVA region and are found in all TVA power service area states except Virginia. The habitats supporting state-listed plants on TVA lands vary widely and include emergent and forested wetlands, riparian areas, upland oak-hickory forest, limestone glades, sandstone glades, and mixed mesophytic forest. While not monitored systematically, field investigations have found that species occupying steep bluffs, glades, and other relatively undisturbed habitat types have stable populations of state-listed plants. Generally, threats to state-listed plants are similar to those for large-flowered skullcap.

Table 3-5. Plant Species of Conservation Concern Reported from TVA Lands

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
Wild Columbine	*Aquilegia canadensis*	MS	-	S1	SLNS
Spreading Rockcress	*Arabis patens*	TN	-	S1	E
American Spikenard	*Aralia racemosa*	AL	-	S1	SLNS
Canada Wild-ginger	*Asarum canadense*	MS	-	S3	SLNS
Black-stem Spleenwort	*Asplenium resiliens*	MS	-	S1	SLNS
Wall-rue Spleenwort	*Asplenium ruta-muraria*	AL	-	S1	SLNS
Maidenhair Spleenwort	*Asplenium trichomanes*	AL	-	S2S3	SLNS
Spreading False-foxglove	*Aureolaria patula*	TN	-	S3	S
American barberry	*Berberis canadensis*	TN	-	S2	S
Nuttall's Rayless Golden-rod	*Bigelowia nuttallii*	AL	-	S3	SLNS
Smooth Blephilia	*Blephilia subnuda*	AL	-	S1S2	SLNS
River Bulrush	*Bolboschoenus fluviatilis*	TN	-	S1	S
Two-leaf Toothwort	*Cardamine diphylla*	MS	-	S1S2	SLNS
Howe Sedge	*Carex atlantica* ssp. *capillacea*	KY	-	S1S2	E
Epiphytic Sedge	*Carex decomposita*	KY	-	S2	T
Sedge	*Carex jamesii*	MS	-	S1S2	SLNS
Sedge	*Carex picta*	MS	-	S3	SLNS
Sedge	*Carex prasina*	MS	-	S1	SLNS
Sedge	*Carex purpurifera*	AL	-	S2	SLNS
Sedge	*Carex reniformis*	TN	-	S1	S
Sedge	*Carex reniformis*	KY	-	S1?	E
Dark Green Sedge	*Carex venusta*	KY	-	S1	E
Hairy Lipfern	*Cheilanthes lanosa*	MS	-	S1S2	SLNS
White Turtlehead	*Chelone glabra*	MS	-	S3	SLNS
Pink Turtlehead	*Chelone lyonii*	AL	-	S1	SLNS
Spotted Wintergreen	*Chimaphila maculata*	MS	-	S2	SLNS
Yellowwood	*Cladrastis kentukea*	MS	-	S2	SLNS
Carolina Spring-beauty	*Claytonia caroliniana*	AL	-	S1	SLNS
Wister Coral-root	*Corallorhiza wisteriana*	AL	-	S2	SLNS

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
Woodland Tickseed	*Coreopsis pulchra*	AL	-	S2	SLNS
American Smoke-tree	*Cotinus obovatus*	AL	-	S2	SLNS
American Smoke-tree	*Cotinus obovatus*	TN	-	S2	S
Three-flowered Hawthorn	*Crataegus triflora*	AL	-	S2	SLNS
Harper's Dodder	*Cuscuta harperi*	AL	-	S2	SLNS
Plukenet's Cyperus	*Cyperus plukenetii*	TN	-	S1	S
Pink Lady's-slipper	*Cypripedium acaule*	GA	-	S4	UNUS
White Prairie-clover	*Dalea candida*	TN	-	S2	T
Tall Larkspur	*Delphinium exaltatum*	TN	-	S2	E
Dwarf Larkspur	*Delphinium tricorne*	MS	-	S2	SLNS
American Beakgrain	*Diarrhena americana*	AL	-	S2	SLNS
Dutchman's Breeches	*Dicentra cucullaria*	AL	-	S2	SLNS
Dutchman's Breeches	*Dicentra cucullaria*	MS	-	S1	SLNS
Northern Bush-honeysuckle	*Diervilla lonicera*	TN	-	S2	T
Mountain Bush-honeysuckle	*Diervilla sessilifolia* var. *rivularis*	TN	-	S2	T
glade fern	*Diplazium pycnocarpon*	MS	-	S2S3	SLNS
Eastern Leatherwood	*Dirca palustris*	MS	-	S2	SLNS
Branching Whitlow-wort	*Draba ramosissima*	AL	-	S1	SLNS
Crested Woodfern	*Dryopteris cristata*	TN	-	S2	T
Walter's Barnyard Grass	*Echinochloa walteri*	TN	-	S1	S
Elliptic Spikerush	*Eleocharis elliptica*	TN	-	S1	E
Waterweed	*Elodea nuttallii*	TN	-	S2	S
Church's Wildrye	*Elymus churchii*	AL	-	S1	SLNS
Wahoo	*Euonymus atropurpureus*	MS	-	S2S3	SLNS
Witch-alder	*Fothergilla major*	AL	-	S2	SLNS
American Columbo	*Frasera caroliniensis*	AL	-	S2	SLNS
American Columbo	*Frasera caroliniensis*	NC	-	S2S3	SR-P
Blue Ash	*Fraxinus quadrangulata*	MS	-	S1	SLNS
Kentucky Coffee-tree	*Gymnocladus dioicus*	MS	-	S1S2	SLNS
Carolina Silverbell	*Halesia carolina*	KY	-	S1S2	E
Longleaf Sunflower	*Helianthus longifolius*	AL	-	S1S2	SLNS
Smaller Mud-plantain	*Heteranthera limosa*	TN	-	S1S2	T
Giant Alumroot	*Heuchera villosa* var. *macrorhiza*	MS	-	S1	SLNS
Green Violet	*Hybanthus concolor*	MS	-	S3	SLNS
Goldenseal	*Hydrastis canadensis*	AL	-	S2	SLNS
Gorge Filmy Fern	*Hymenophyllum tayloriae*	AL	-	S1	SLNS
Red Iris	*Iris fulva*	TN	-	S2	T
Blackfoot Quillwort	*Isoetes melanopoda*	TN	-	S1S2	E
Alabama Jamesianthus	*Jamesianthus alabamensis*	AL	-	S3	SLNS

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
Twinleaf	*Jeffersonia diphylla*	AL	-	S2	SLNS
Butternut	*Juglans cinerea*	TN	-	S3	T
Short-head Rush	*Juncus brachycephalus*	TN	-	S2	S
Pasture Glade-cress	*Leavenworthia exigua* var. *lutea*	AL	-	S1	SLNS
Slender Blazing-star	*Liatris cylindracea*	TN	-	S2	T
Loesel's Twayblade	*Liparis loeselii*	TN	-	S1	T
Southern Twayblade	*Listera australis*	TN	-	S1S2	E
Mountain Honeysuckle	*Lonicera dioica*	TN	-	S2	S
Woodrush	*Luzula acuminata*	MS	-	S3	SLNS
Fraser Loosestrife	*Lysimachia fraseri*	TN	-	S2	E
Meehania Mint (Heart-leaf Meehania)	*Meehania cordata*	TN	-	S2	T
Bunchflower	*Melanthium virginicum*	KY	-	S1	E
Muhly Grass	*Muhlenbergia sobolifera*	AL	-	S1	SLNS
Muhly	*Muhlenbergia tenuiflora*	MS	-	S1S2	SLNS
Nestronia	*Nestronia umbellula*	TN	-	S1	E
Alabama Snow-wreath	*Neviusia alabamensis*	AL	-	S2	SLNS
Alabama Snow-wreath	*Neviusia alabamensis*	MS		S1	SLNS
Alabama Snow-wreath	*Neviusia alabamensis*	TN		S2	THR
Oldenlandia	*Oldenlandia uniflora*	KY	-	S1	E
Hairy False Gromwell	*Onosmodium hispidissimum*	TN	-	S1	E
Limestone Adder's-tongue	*Ophioglossum engelmannii*	AL	-	S2S3	SLNS
One-flowered Broomrape	*Orobanche uniflora*	AL	-	S2	SLNS
Great Yellow Wood-sorrel	*Oxalis grandis*	AL	-	S1	SLNS
Allegheny-spurge	*Pachysandra procumbens*	AL	-	S2S3	SLNS
Allegheny-spurge	*Pachysandra procumbens*	MS	-	S3	SLNS
American ginseng	*Panax quinquefolius*	TN	-	S3S4	S-CE
Large-leaved Grass-of-parnassus	*Parnassia grandifolia*	TN	-	S3	S
Mountain Ricegrass	*Patis racemosa*	TN	-	S1	E
Purple Cliff-brake	*Pellaea atropurpurea*	MS	-	S1	SLNS
Phacelia	*Phacelia bipinnatifida*	MS	-	S1	SLNS
Streambank Mock Orange	*Philadelphus hirsutus*	MS	-	S1	SLNS
Moss Phlox	*Phlox subulata*	TN	-	S1	T
Virginia Pine	*Pinus virginiana*	MS	-	S2	SLNS
White Fringeless Orchid	*Platanthera integrilabia*	TN	T	S2S3	E
Greek Valerian	*Polemonium reptans*	MS	-	S2S3	SLNS
Seneca Snakeroot	*Polygala senega* var. *latifolia*	AL	-	S1	SLNS
Halberd-leaf Tearthumb	*Polygonum arifolium*	TN	-	S1	T

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
John Beck's Leafcup	*Polymnia johnbeckii*	TN	-	S1	E
Tennessee Leafcup	*Polymnia laevigata*	AL	-	S2S3	SLNS
Large-leaf Pondweed	*Potamogeton amplifolius*	TN	-	S1	T
Tennessee Pondweed	*Potamogeton tennesseensis*	TN	-	S2	T
White Rattlesnake-root	*Prenanthes alba*	TN	-	S1	S
Rough Rattlesnake-root	*Prenanthes aspera*	TN	-	S1	E
Spotted Mandarin	*Prosartes maculata*	AL	-	S1	SLNS
Hair-like Mock Bishop-weed	*Ptilimnium capillaceum*	KY	-	S1S2	T
Eastern Mock Bishop's-weed	*Ptilimnium costatum*	KY	-	S1?	E
Nuttall's Mock Bishop's-weed	*Ptilimnium nuttallii*	KY	-	S1S2	E
Yellow Water-crowfoot	*Ranunculus flabellaris*	AL	-	S1	SLNS
Alderleaf Buckthorn	*Rhamnus alnifolia*	TN	-	S1	E
Carolina Rhododendron	*Rhododendron minus*	AL	-	S2	SLNS
Horned Beakrush	*Rhynchospora capillacea*	TN	-	S1	E
Prickly Gooseberry	*Ribes cynosbati*	AL	-	S1S2	SLNS
Short-beak Arrowhead	*Sagittaria brevirostra*	TN	-	S1	T
Blue Sage	*Salvia azurea* var. *grandiflora*	TN	-	S3	S
Green Pitcher Plant	*Sarracenia oreophila*	GA	E	S1	E
Sunnybell	*Schoenolirion croceum*	AL	-	S2	SLNS
Large-flowered Skullcap	*Scutellaria montana*	TN	T	S4	T
Nevius' Stonecrop	*Sedum nevii*	TN	-	S1	E
Stonecrop	*Sedum ternatum*	MS	-	S1	SLNS
Spikemoss	*Selaginella arenicola* ssp. *riddellii*	AL	-	S2	SLNS
Cumberland Rosinweed	*Silphium brachiatum*	AL	-	S2	SLNS
Late Goldenrod	*Solidago tarda*	TN	-	SH	S
Swamp Wedgescale	*Sphenopholis pensylvanica*	KY	-	S1S2	S
Great Plains Ladies'-tresses	*Spiranthes magnicamporum*	TN	-	S1	E
Sweetscent Ladies'-tresses	*Spiranthes odorata*	TN	-	S1	E
American Bladdernut	*Staphylea trifolia*	MS	-	S3	SLNS
Longleaf Stitchwort	*Stellaria longifolia*	KY	-	S2S3	S
Giant Chickweed	*Stellaria pubera*	MS	-	S2	SLNS
Mountain Camellia	*Stewartia ovata*	NC	-	S2	SR-P
Sullivantia	*Sullivantia sullivantii*	TN	-	S1	E
Little Mountain Meadow-rue	*Thalictrum mirabile*	AL	-	S2	SLNS
Northern White Cedar	*Thuja occidentalis*	TN	-	S3	S

Common Name	Scientific Name	State	Federal Status[1]	State Status[1]	State Rank[2]
Trepocarpus	*Trepocarpus aethusae*	KY	-	S3	S
Appalachian Bristle Fern	*Trichomanes boschianum*	TN	-	S1S2	T
Chapman's Redtop	*Tridens flavus* var. *chapmanii*	TN	-	S1	E
Nodding Trillium	*Trillium flexipes*	MS	-	S1	SLNS
Horse-gentian	*Triosteum angustifolium*	AL	-	S1	SLNS
Ozark Bunchflower	*Veratrum woodii*	TN	-	S1	E
Canada Violet	*Viola canadensis*	AL	-	S2	SLNS

Source: TVA Natural Heritage Database, queried December 2018.

[1] Status Codes: E = Listed Endangered; RARE = Listed Rare; SLNS = State Listed, no status assigned; S = Listed Special Concern; SR-P = Significantly Rare-Peripheral; S-CE = Special Concern/ Commercially Exploited; T = Listed Threatened; UNUS = Unusual.

[2] State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; SH = State Historic; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2)

3.3.3.2 Environmental Consequences

3.3.3.3 Alternative A

The programs with measurable potential to affect plant communities and listed species on TVA lands all occur under the Biological Resources Resource Area, including:

- Sensitive Resources Data Management
- Threatened and Endangered Species
- Conservation Planning
- Natural Areas Management
- Grasslands and Agricultural Lands Management
- Forest Resources Management
- Nonnative Invasive Plant Management

Since 2011, TVA has had success in implementing most programs affecting threatened and endangered plant species, although some programs would be unlikely to be implemented fully within the 20-year life span of the 2011 NRP.

Under Alternative A, management of rare plant habitats in accordance with these programs would continue on the current trajectory and on-the-ground projects would be tailored to benefit species present on individual sites. Consistent with the conclusions of the 2011 Final EIS, continued implementation of the 2011 NRP would result in beneficial impacts on state or federally listed species within the TVA region.

In summary, implementation of programs within the Biological Resources Resource Area are expected to continue to result in beneficial impacts at discrete sites where projects are implemented; no adverse impacts are anticipated. Implementation of the other five resource areas would continue to have the potential for minor, indirect beneficial or adverse impacts for listed species on TVA lands because manipulation of terrestrial habitats is not a primary goal of these resource areas. TVA would continue to conduct appropriate site-specific environmental reviews, including compliance with ESA, when considering all new proposed

projects with the potential to affect state- and federally listed plants on TVA lands. This would help avoid or minimize adverse impacts.

3.3.3.4 Alternative B

In the 2020 NRP, programs that have the potential to directly impact threatened and endangered species are included in the Land and Habitat Stewardship and Nuisance and Invasive Species Management focus areas, including:

- Threatened and Endangered Species
- Wetland Management
- Sensitive Resources Data
- Natural Areas Management
- Grasslands and Agricultural Lands Management
- Dewatering Projects
- Forest Resource Management
- Conservation Planning
- Nonnative Invasive Plant Management on TVA Lands
- Nuisance Animal Control
- Aquatic Plant Management

The inclusion of additional programs related to threatened and endangered plants is largely administrative in nature. The programs themselves are not new and have been ongoing for many years. As a result, implementation and management activities would be similar to those occurring since the 2011 NRP. Thus, implementation of Alternative B would result in a continuation of the beneficial impacts described under Alternative A.

Similar to the 2011 NRP, programs within the Land and Habitat Stewardship and Nuisance and Invasive Species Management focus areas in the 2020 NRP are expected to have beneficial impacts on discrete sites where projects are implemented; no adverse impacts are anticipated. These beneficial impacts are expected to continue as long as the programs continue. Projects proposed on TVA lands and reservoirs that have the potential to affect habitat for listed plants would continue to be subject to an individual, site specific environmental review and would comply with the ESA.

Most programs included in the other eight focus areas proposed in the 2020 NRP only have the potential for minor, indirect beneficial or adverse impacts on state- and federally listed plants on TVA lands. This is because manipulation of terrestrial habitats is not a primary goal of these focus areas. Overall, adverse impacts would be minor because all new proposed projects with the potential to affect rare plant habitats on TVA lands would receive a stand-alone environmental review to assess potential impacts on threatened and endangered species; all projects would comply with the ESA.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging issues and trends because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on listed plant species.

In conclusion, overall impacts under Alternative B would be similar to those under Alternative A. There may be additional beneficial impacts from implementation of the 3- to

5-year action plans because the plans will likely result in more effective prioritization of future, site-specific projects that address listed plant species on TVA lands.

3.3.3.5 Cumulative Impacts

The 2011 Final EIS observed that adverse cumulative impacts, particularly to state-listed species which receive a lower level of legal protection, could occur from the continued development of other lands in the TVA region. This conclusion is still accurate, especially on private lands where residential, commercial, and other conversion of natural areas to developed uses has continued.

Implementation of either alternative, however, would continue to result in minor to major beneficial impacts on threatened and endangered plant species. Greater beneficial impacts would be expected where species occur on TVA lands and where TVA conservation efforts align with those of adjacent landowners (e.g., US Forest Service, National Park Service, The Nature Conservancy, state parks, and private landowners). When considered in this broader context, the incremental benefit of Alternatives A and B would positively affect state- and federally listed plants on a landscape scale. For that reason, implementation of either alternative would result in beneficial cumulative impacts on threatened and endangered plant species in the TVA region over the long term.

3.4 Wetlands

3.4.1 Affected Environment

As described in the 2011 Final EIS, wetlands are highly productive and biologically diverse ecosystems that provide multiple public benefits such as flood control, reservoir shoreline stabilization, improved water quality, and habitat for fish and wildlife resources. The 2011 Final EIS described the type, extent, and distribution of wetlands across the TVA region; that information is incorporated into this SEIS by reference. In summary, palustrine wetlands are the predominant wetlands in the TVA region. As described by Cowardin et al. (1979), these are nontidal wetlands dominated by trees, shrubs, persistent emergent vegetation, and emergent mosses or lichens. Approximately 15 percent of TVA lands were identified via remote sensing data and aerial photography to have wetlands. Approximately 90 percent of the wetlands on TVA lands are located on the mainstem Tennessee River reservoirs (TVA 2011b).

As described in the 2011 Final EIS, previous studies indicate approximately 197,000 acres of wetlands are found along the TVA reservoir system and within the groundwater influence area of the reservoirs (TVA 2004). This number has remained relatively consistent since 2011.

EO 11990 directs federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In addition, activities in wetlands are regulated under the authority of the federal CWA and state regulations. Wetlands are defined by TVA Environmental Review Procedures (TVA 1983) as "those areas inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances do or would support, a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, mud flats, and natural ponds."

On non-TVA lands regional trends in wetlands since 2011 have been closely tied to population growth and urban/suburban development. Studies show a slower rate of wetland

loss over the past seven years compared to previous decades. However, both forested and emergent wetland acreage continue to decline, while increases are seen in the presence of freshwater ponds.

On a broader scale, the National Wetland Condition Assessment (USEPA 2016) is the first national evaluation of the ecological condition of United States wetlands. This and other recent studies on wetland gains and losses by the USFWS indicate wetland loss continues, though at a much slower rate than in the past. Reasons for the slower rate of wetland loss is a combination of factors including wetland regulation, state wetland management programs, wetland restoration work, and economic and development growth changes. The main wetland stressor continues to be physical disturbances to wetlands and their surrounding habitat. Associated problems in wetlands are surface hardening, vegetation removal, ditching, and nonnative plants (USEPA 2016).

Current Management Issues
As described in the 2011 Final EIS, wetlands on TVA lands continue to face less threat of direct impacts related to development than wetlands on private land. Where direct impacts do occur as the result of TVA projects in areas designated in reservoir land management plans for industrial, developed recreation, or shoreline access uses, or through land disposal actions, impacts are typically mitigated to offset any direct or cumulative effects. Indirect impacts are more common across TVA lands and include:

- Invasive species
- Lack of buffer zones
- ATV impacts
- Encroachments, especially unauthorized removal or alteration of wetland vegetation
- Changes in vegetation community structure (e.g., decline of buttonbush on Kentucky Reservoir)
- Impacts of beaver populations/impoundments on forested wetlands (e.g., conversion to open water, scrub/shrub, and emergent wetlands)
- Impacts of climate change

These types of problems are recorded during land condition assessments and their trends will be assessed in future assessment efforts. Overall, these management problems are not unique to TVA lands, and lead to subtle, long-term changes in the type, extent, and quality of wetland habitats.

3.4.2 Environmental Consequences
This section analyzes direct, indirect, and cumulative impacts on wetlands associated with implementation of Alternatives A and B. Direct impacts result from disturbances that occur within the wetland and commonly include filling, grading, removal of vegetation, building construction, and changes in water levels and drainage patterns. Most disturbances that result in direct impacts to wetlands are controlled by federal and state wetland regulatory programs. Direct impacts may also be beneficial, as in the case of invasive plant removal, improvements to wetland hydrology, and other forms of wetland restoration and enhancement.

Indirect impacts result from disturbances that occur in areas outside of the wetland such as uplands, other wetlands, or waterways. Common indirect impacts include influx of surface water and sediments, fragmentation of a wetland from a contiguous wetland complex, loss

of recharge area, or changes in local drainage patterns. Most indirect impacts are beyond the authority of federal and state wetland regulatory programs.

Cumulative impacts reflect a net loss (or gain) of wetland area and functions as the result of the incremental direct and indirect impacts of human activities.

3.4.2.1 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to wetlands: Biological Resources and Reservoir Lands Planning.

Specific programs and activities addressing wetlands within those resource areas include:

- Wetlands Management
- TVA Sensitive Resources Data Management

Since 2011, TVA has made progress toward fully implementing these programs and activities. A draft wetland management plan has been developed, additional wetland inventories have been conducted on select reservoirs, wetland mapping data is added to the wetland database on an ongoing basis, and the Reservoir Operations Study wetland monitoring program will continue through 2019. Additional wetland projects are expected to be implemented within the 20-year life span of the 2011 NRP.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. TVA wetland management and protection practices would continue to be implemented on TVA-managed lands. In the 2011 Final EIS, TVA concluded that there would be beneficial impacts on wetlands due to identification, protection, and restoration efforts. This conclusion remains largely accurate and the 2011 NRP has provided a beneficial framework for managing, identifying, and restoring wetlands on TVA lands.

Under Alternative A, TVA would continue to implement programs and activities identified in the 2011 NRP that affect wetlands. A blended management approach would continue. Development pressure and changes in land use would continue to occur on non-TVA lands that would have both direct and indirect adverse impacts on wetlands. Wetlands on TVA lands are afforded a greater measure of protection, due to regulatory requirements as well as the identification and protection of wetlands through the lands planning process. This would result in continued beneficial impacts over the life of the NRP.

Overall, Alternative A would continue to provide a beneficial framework for managing, identifying, and restoring wetlands. Regulatory mechanisms would continue to minimize or mitigate any adverse impacts.

3.4.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to wetlands: Land and Habitat Stewardship, Water Resources Stewardship, Public Outreach and Information, Reservoir Lands Planning, Public Land Protection, Nuisance and Invasive Species Management, and Section 26a and Land Use Agreements.

Specific programs and activities addressing wetlands within these focus areas include:

- Wetland Management
- Sensitive Resources Data
- Natural Areas Management
- Dewatering Projects
- Forest Resource Management
- Conservation Planning
- Aquatic Ecology Management
- Community Support
- Environmental Education
- Stakeholder Engagement
- Comprehensive Valleywide Lands Plan
- Comprehensive Land Condition Assessment
- Section 26a and Land Use Implementation

The 2020 NRP includes more programs and activities affecting wetlands than the 2011 NRP. In general, this would improve TVA's knowledge of the type, quality, and extent of wetlands on TVA lands. This in turn would increase the agency's capability to proactively manage developing issues and provide increased certainty for addressing both direct and indirect impacts to wetlands on TVA lands. However, in many cases impacts would be negligible or minor when compared to Alternative A because many of these additions are administrative in nature (i.e., the programs themselves are longstanding and have not been included in the NRP itself). Examples include the addition of programs specific to wetland identification and mapping, wetland educational programs, regional conservation planning initiatives, and Section 26a permits.

Compared to Alternative A, the incorporation of these programs and activities into the 2020 NRP may provide minor benefits to wetlands on TVA land because their inclusion may result in a greater management focus and administrative awareness of how they relate to other aspects of natural resource management. This could lead to more effective and proactive prioritization of site-specific projects that address wetland restoration and enhancement.

Programs that expand wetland restoration and enhancement on TVA lands would increase regional wetland resources and the associated ecosystem services provided by wetlands. Partnerships in which TVA funds environmental education, water quality improvement projects, invasive species education and removal would have a long-term beneficial impact.

In addition, the 3- to 5-year action plans that TVA would prepare under the 2020 NRP would allow TVA to more quickly and efficiently respond to emerging wetlands needs and trends because they would incorporate more up-to-date information on resource needs and available funding. As specific wetland conservation needs are identified and matched with funding, strategic wetland enhancement and preservation activities could effectively benefit wetland resources on TVA lands. Depending on the type and location of wetland conservation activities, there could be a range of beneficial impacts on wetlands on TVA lands as well as other benefits to important environmental resources. For example, establishing natural buffers for floodplains or establishing native wetland vegetation would provide habitat and food sources necessary for native fauna.

In conclusion, implementation of Alternative B would provide greater benefits to wetlands, including a more comprehensive suite of wetland programs and activities, and improve TVA's ability to respond to emerging issues and needs. Combined with the issuance of 3- to 5-year action plans, implementation of Alternative B would likely result in more effective prioritization of future, site-specific projects that increase wetland habitat and improve existing wetlands within the Valley. This, in turn, improves ecosystem services associated with wetlands such as flood control and abatement, water quality improvement, and increased biodiversity

3.4.2.3 Cumulative Impacts

Wetlands are present on many TVA lands, as well as lands managed by other local, state, and federal entities, non-profit organizations, and private landowners. Wetlands protection, mitigation, and restoration projects have occurred in many locations throughout the TVA region and are expected to continue. In addition, federal and state regulatory programs would continue to avoid or minimize direct impacts on wetlands on TVA and other federal lands, but wetland loss would continue as a result of residential and commercial development on private lands across the TVA power service area. Implementation of Alternatives A and B would both provide long-term beneficial impacts to wetlands on TVA lands; on a cumulative scale this impact would be minor.

3.5 Floodplains

3.5.1 Affected Environment

As stated in the 2011 Final EIS, the integrated operation of the TVA reservoir system provides substantial protection against flooding in the Tennessee, Ohio, and Mississippi River basins (TVA 2011b). Floodplain areas along reservoir shorelines normally encompass TVA lands and other lands where TVA owns flowage easements. These floodplain areas provide and support diverse natural and economic resources.

The drainage basin of the Tennessee River is about 41,000 square miles and the TVA power service area encompasses about 80,000 square miles. The Tennessee River watershed and the power service area encompass portions of Alabama, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, and Virginia. The affected environment consists of the floodplains of streams within the Tennessee River watershed or the power service area, or both, in the areas where TVA would implement projects, administer programs, fund the work of outside entities, or conduct reviews for Land Use Permits, Section 26a permits, or licenses.

A floodplain is the relatively level land area along a stream or river that is subject to periodic flooding. The 100-year floodplain is defined as that area inundated by the 100-year flood. The 100-year flood is the level of flooding that has a 1 percent chance of being equaled or exceeded in any given year and does not indicate a time period of 100 years between floods of this magnitude. Similarly, the 500-year floodplain is defined as that area inundated by the 500-year flood. The 500-year flood is the level of flooding that has a 0.2 percent chance of being equaled or exceeded in any given year. It is necessary to evaluate development in the floodplain to ensure that the project is consistent with the requirements of EO 11988 as well as TVA's flood damage reduction objectives.

3.5.2 Environmental Consequences

As a federal agency, TVA adheres to the requirements of EO 11988, the objective of which is "to avoid to the extent possible the long- and short-term adverse impacts associated with

the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative." The EO is not intended to prohibit floodplain development in all cases, but rather to create a consistent government policy against such development under most circumstances (US Water Resources Council 1978). The EO requires that agencies avoid the 100-year floodplain unless there is no practicable alternative. For certain "Critical Actions", the minimum floodplain of concern is the 500-year floodplain.

Under either of the alternatives, TVA would apply criteria contained in EO 11988 during its review of all projects. EO 11988 directs federal agencies to use their authority to avoid (to the extent possible):

- Long-term and short-term adverse impacts associated with the occupancy and modification of floodplains
- Direct and/or indirect support of floodplain development wherever there is a practicable alternative

Long-term impacts are those observed or anticipated over about 20 years or more. Short-term impacts are those observed or anticipated from the moment an activity occurs up to about 20 years.

For activities under either alternative, a floodplain review would be conducted in accordance with TVA's NEPA procedures to ensure that the proposed activity is consistent with EO 11988 and TVA's flood damage reduction objectives. Regardless of the program implemented, compliance with EO 11988 should limit increases in flood damage associated with new development and ensure that the reservoir system can be operated for flood-control benefits. Under EO 11988, actions with no practicable alternative can proceed provided adverse impacts are minimized. Adverse impacts to facilities would be minimized by designing and constructing these facilities to withstand flooding with minimum damage and by using the least amount of fill possible to complete the project.

3.5.2.1 Alternative A

All six resource areas in the 2011 NRP are relevant to floodplains and flood risk: Biological Resources, Cultural Resources, Recreation Management, Water Resources Management, Reservoir Lands Planning, and Public Engagement.

Projects and activities under Biological Resources, Cultural Resources, Recreation Management, Water Resources Management, and Reservoir Lands Planning programs have the potential to directly or indirectly impact floodplains. Such impacts may be beneficial or adverse, depending largely on their proximity to shoreland, and would generally be minor. Public Engagement programs may have indirect beneficial impacts on floodplains as the public becomes more aware of floodplains and their importance. Such beneficial impacts, however, would be minor.

In the 2011 Final EIS, TVA found that under any NRP alternative compliance with EO 11988 would limit increases in flood damage associated with new development and would ensure that the reservoir system can be operated for flood-control benefits. The Final EIS noted that the amount of shoreland made available for these activities or for development would influence the extent to which natural and beneficial floodplain values are impacted. However, TVA has continued to require BMPs and other measures, such as those described in the SMI EIS (TVA 1998), to minimize these impacts.

In conclusion, hundreds of individual projects in the six resource areas have been planned and implemented since adoption of the 2011 NRP. When any such projects were proposed, they have been analyzed in accordance with TVA's NEPA procedures on a case-by-case basis, consistent with EO 11988. Conditions have been imposed, as appropriate, to minimize adverse impacts to floodplains and their natural and beneficial values, as well as to operation of the TVA reservoir system. Under the No Action Alternative, these types of minor beneficial and adverse impacts would continue.

3.5.2.2 Alternative B

Alternative B would eliminate the six resource areas and establish ten focus areas. As previously described, some of the resource areas and the programs within them would simply be renamed, most would be absorbed by one or more of the proposed focus areas, others would be new to the NRP, and the remainder being eliminated from the NRP entirely. Only those changes that may result in impacts are addressed below.

Programs that would be new to the NRP that relate to or have potential to impact floodplains fall under the following focus areas: Public Outreach and Information, Reservoir Lands Planning, Recreation, Public Land Protection, Nuisance and Invasive Species Management, Ecotourism, and Section 26a and Land Use Agreements.

Under the Public Outreach and Information Focus Area, TVA anticipates minor, beneficial, and indirect impacts from stakeholder engagement and community support activities. These activities would increase the public's awareness of floodplains and their benefits. TVA's new science program for children (TVA Science Kids – World Water Monitoring) would have similar benefits and would not include activities that result in ground disturbing or construction actions.

Under the Reservoir Lands Planning Focus Area, TVA would continue to adhere to the planning targets set in the CVLP. Adhering to these targets would have minor, indirect impacts that may be beneficial or adverse, depending on the nature of the proposed action(s) and its location. The comprehensive planning approach is intended to provide better management practices and consideration of floodplain resources.

Under the Recreation Focus Area, similar to the 2011 NRP, TVA's partnerships would have minor, indirect beneficial or adverse impacts, depending on the types of activities implemented and their location. For instance, facilities constructed under partnerships may include water-use facilities or facilities not subject to significant damage if flooded. Some facilities or activities may adversely affect floodplains, depending on their scope and location. Impacts associated with Recreation Contract Management or Floating Cabins would generally be minor, indirect, and beneficial to floodplains, as TVA improves its contract management to better manage these uses of public resources. Floating Cabins, as managed by TVA under the program, would not interfere with TVA reservoir operation and do not typically result in significant ground-disturbing activities.

Under the Public Land Protection Focus Area, TVA would improve its land management with programs to inventory natural resource assets, to educate and engage the public, and to establish and enforce public land rules and regulations. These programs would result in minor, indirect beneficial impacts to floodplains. The Natural Resource Asset Inventory database of important natural resource assets would improve TVA management and stewardship efforts and ensure TVA is aware of assets prior to implementing activities that may impact those assets. Education and outreach would increase public awareness of

floodplains and their importance. TVA's efforts to more clearly define rules for use of public lands improves its ability to manage natural resources, including floodplains, and enforce regulations intended to decrease adverse impacts to natural resources.

Under the Nuisance and Invasive Species Management Focus Area, TVA would implement aquatic plant management. Because activities to manage these plants do not require ground disturbance or construction of facilities or structures, no impacts to floodplains are anticipated.

Ecotourism program activities have the potential to impact floodplain resources, although such impacts are anticipated to be minor. Partnerships established by TVA may result in construction of water-use facilities or facilities not subject to significant damage if flooded. Such facilities and partnership activities may directly adversely affect floodplains, depending on their scope and location. The Ecotourism and Recreational Assessments and Studies that TVA conducts may result indirectly in minor beneficial impacts on floodplains, because analysis of regional recreational demand and activities would benefit TVA's recreation management by improved decision making. Examples of beneficial impacts would be removal of material from a river and reshaping a riverbank to allow for canoe access, which would improve the stream's flood-carrying capacity, or the maintenance of a floodplain as an open area that is part of an ecotourism activity. Like other programs that may lead to construction of facilities, the Dam Explorer program may result in minor, adverse impacts to floodplains. Under the program, facilities constructed would typically consist of water-use facilities or facilities not subject to significant damage if flooded. Some facilities or activities could adversely affect floodplains, depending upon their scope and location.

Under the Section 26a and Land Use Agreements Focus Area, stakeholder engagement, education and communication efforts would continue, as would TVA permitting activities. Improved stakeholder outreach and communication would increase public awareness of floodplains and their value, which would result in minor, indirect benefits to these resources over time. Continuation of Section 26a and land use permitting activities have potential for minor, direct impacts that may be beneficial or adverse, depending on the extent and scope of proposed activities in or near floodplains. The Shoreline Management Policy implemented standards that were later incorporated into current Section 26a regulations. Under Alternative B, there would be no change in TVA activities.

As mentioned earlier, by continued adherence to the requirements of EO 11988 and Section 26a regulations, projects implemented under either Alternative A or B would have no significant impact on floodplains and their natural and beneficial values, and no significant impact on TVA's flood damage reduction objectives.

Overall, impacts would be similar to those under Alternative A and there may be additional minor beneficial impacts from new programs such as Science Kids and additional stakeholder engagement and community support.

3.5.2.3 Cumulative Impacts

With the operation of the Tennessee River reservoir system, TVA contributes to the management and protection of floodplains in the Tennessee Valley. Generally, TVA ownership of public lands with floodplain resources and obligations under federal law to protect such resources result in cumulative beneficial effects on the regional scale. As with other sensitive resources, TVA's efforts to manage and minimize flood risk or effects to

floodplains are implemented in cooperation with other federal, state, or local entities that have similar objectives. When considered in a broader context, the incremental benefit of TVA's management of floodplains and its consideration of impacts to the floodplains when actions are proposed would positively affect the resources in the region. Thus, adoption of either Alternative A or B would generally have beneficial cumulative impacts for floodplains over the life span of either alternative.

However, certain NRP programs and activities, under both alternatives, have the potential to result in adverse cumulative effects on floodplain resources, particularly those that involve the development and use of shoreland due mainly to the placement of fill within the floodplain and flood storage zone. This is anticipated to be a minor contribution to floodplain changes regionally, and by adhering to the requirements of EO 11988 and TVA's Section 26a regulations, impacts from projects implemented under either the 2011 NRP or the 2020 NRP would be minimized or mitigated. Overall, either alternative would have minor cumulative impacts on floodplains and their natural and beneficial values and minor cumulative impacts on TVA's flood damage reduction objectives.

3.6 Water Quality

3.6.1 Affected Environment

The 2011 Final EIS includes a description of water resources in the 41,000-square mile Tennessee River basin that overlaps portions of seven states and is incorporated into this SEIS by reference. In summary, the 2011 Final EIS describes the economic and ecological value of the basin's water resources, its major features (e.g., dams, reservoirs, and tributaries), and an overview of its water quality, which is described as generally good (TVA 2011b). The 2011 Final EIS also describes how water quality can be affected by point sources (e.g., waste water treatment plants and industry) and nonpoint sources (e.g., deposition and runoff). Key points from the 2011 Final EIS and relevant updates are summarized in the following paragraphs.

The Tennessee River basin contains all except one of TVA's dams. A series of nine locks and dams built mostly in the 1930s and 1940s regulates the entire length of the Tennessee River and allows navigation from the Ohio River to Knoxville. Virtually all the major tributaries have at least one dam. In addition to the nine reservoirs on the mainstem of the Tennessee River, TVA operates 38 tributary dams for various combinations of power generation, flood control, navigation, recreation, water supply, economic development, and fish and wildlife habitat. This system of dams and their operation is the most significant factor affecting water quality and aquatic habitats in the Tennessee River and its major tributaries. Portions of several rivers downstream of dams are included on state CWA Section 303(d) lists of impaired waters (TVA 2019b) due to low DO levels, flow modifications, and thermal modifications resulting from impoundment. TVA is working to reduce these impacts (TVA 1995).

The 2011 Final EIS also describes the nine dewatering areas TVA maintains; these areas are seasonally flooded to provide waterfowl habitat and are farmed in the summer. Agricultural runoff typically dissipates, but 3.7 acres of the West Sandy Embayment is listed by the state of Tennessee as impaired by nutrients, low DO, and siltation, caused at least in part by discharges from the West Sandy Creek Dewatering Area.

According to 2008 305(d) lists for the seven states in the Tennessee River basin, there were 8,500 miles of streams not supporting their designated uses. Most of the state listings

for impaired streams in the TVA region are ascribed to pollution from sediment or bacterial contamination. Sediment sources are mostly erosion from agriculture, silviculture, and construction activities. Bacteria are from fecal material contamination from livestock, malfunctioning septic systems, leaking sewage collection systems, and urban runoff. Plant nutrients from agriculture, wastewater treatment plants, and urban runoff are also a common pollutant. These pollutants continue to impact water bodies in the region.

Additionally, water quality can be affected through other point sources, such as wastewater discharges and power generation cooling system intakes and discharges, and through nonpoint sources, such as air emissions and deposition, construction and development, urban runoff, mining, agriculture, and silviculture.

Since 2011, several actions have improved water quality. Repairs to Wolf Creek Dam were completed in late 2013 and river flows were greatly improved in the summer of 2014 leading to the delisting of DO as an impairment for the stream (TVA 2019b). TVA, in conjunction with TDEC, has also implemented multiple activities with goals to reduce sediments and phosphates entering TVA reservoirs. Currently implemented within the Elk River watershed, these activities are expected to provide major improvements to water quality. Barkley Reservoir has also been completely delisted from the state 303(d) list for thermal impacts, due to continued lowering of ambient temperatures in the water body (TVA 2019b).

Since 2011, programs have been implemented that foster partnerships and active participation in maintaining and enhancing aquatic biological communities in six priority watersheds: Clinch/Powell River, Little Tennessee River, Duck River, Paint Rock River, Elk River, and Bear Creek. In addition, TVA is leading the effort in developing the Tennessee River Basin Network. This network of agencies and organizations are working to protect aquatic biodiversity across the Tennessee River and are expected to provide significant long-term beneficial affects to water quality.

The Tennessee Valley Clean Marina Initiative is a voluntary program developed and implemented by TVA and its watershed partners to promote environmentally responsible marina and boating practices. This program, established in support of the National Clean Boating Campaign, helps marina operators protect the very resource that provides them with their livelihood: clean water. It is designed as an ongoing program to reduce water pollution and erosion in the Tennessee River watershed. The number of certified Clean Marinas fluctuates every year. As of January 2019, there were 40 Clean Marinas:

Blue Ridge Reservoir
- Blue Ridge Marina
- Boone Lake
- Boone Lake Marina

Chatuge Reservoir
- Boundary Waters Resort and Marina

Cherokee Reservoir
- Fall Creek Marina
- Greenlee of May Springs
- Greenlee Campground, RV and Marina

Chickamauga Reservoir
- Chickamauga Marina
- Gold Point Yacht Harbor
- Lakeshore Marina
- Island Cove Marina

Douglas Reservoir
- Mountain Cove Marina

Fontana Reservoir
- Almond Boat and RV Park
- Alarka Boat Dock
- Prince Boat Dock

Fort Loudoun Reservoir
- Volunteer Landing Marina

Guntersville Reservoir
- Goosepond Colony Resort Marina
- Lake Guntersville Marina and Sailing Club
- Jackson County Park Marina
- Sunrise Marina

Hiwassee Reservoir
- Mountain View Marina

Kentucky Reservoir
- Big Bear Resort
- Cuba Landing Marina
- Hesters Resort and Marina
- Lakeview Cottages and Marina
- Lighthouse Landing Resort and Marina
- Paris Landing State Park Marina
- Riverstone Marina

Nickajack Reservoir
- Erwin Marina—Riverfront

Nottely Reservoir
- Nottely Marina

Parksville Reservoir
- Lake Ocoee Inn and Marina

Pickwick Reservoir
- Aqua Yacht Harbor
- Florence Harbor Marina
- Grand Harbor Marina
- Pickwick Landing State Park Marina

South Holston Reservoir
- Friendship Marina
- Laurel Marina and Yacht Club
- Painter Creek Marina

Watauga Reservoir
- Cove Ridge Marina
- Watauga Lakeshore Resort and Marina

Watts Bar Reservoir
- Caney Creek Marina

A major water quality concern is low DO levels in reservoirs and in the tailwaters downstream of dams. Long stretches of river can be affected, especially in areas where pollution further depletes DO. In addition, flow in these tailwaters is heavily influenced by the amount of water released from the upstream dams; in the past, some of the tailwaters were subject to periods of little or no flow. Since the early 1990s, TVA has addressed these issues in the Tennessee River system by installing equipment and making operational changes to increase DO concentrations below 16 dams and to maintain minimum flows in tailwaters.

TVA regularly evaluates several water quality indicators as well as the overall ecological health of reservoirs through its Ecological Health Monitoring Program. This program evaluates five metrics: chlorophyll concentration, fish community health, bottom life, sediment contamination, and DO. The most recent monitoring results are listed in Table 3-6. Of the 31 reservoirs rated, 17 scores improved, 11 scores declined, and 3 were unchanged compared to the results shown in the 2011 Final EIS.

Table 3-6. Ecological Health Ratings of TVA Reservoirs

Reservoir	Ecological Health Rating/Score	Latest Survey Date	Concerns	Fish Consumption Advisory
Apalachia	Good – 75	2015	--	Mercury (NC statewide)
Bear Creek	Poor – 54	2017	DO[1], chlorophyll, bottom life	Mercury (dam forebay area)
Beech	Fair – 66	2015	DO, chlorophyll	Mercury
Blue Ridge	Good – 84	2017	--	Mercury
Boone	Fair – 63	2016	DO, chlorophyll, bottom life, sediments	PCBs[2], chlordane
Cedar Creek	Fair – 69	2017	DO	Mercury (dam forebay to 1 mile upstream of dam)
Chatuge	Fair – 62	2015	DO, chlorophyll	Mercury
Cherokee	Poor – 56	2015	DO, chlorophyll, bottom life	None
Chickamauga	Good – 83	2017	--	Mercury (Hiwassee River from Hwy 58 (river mile 7.4) upstream to river mile 18.9)
Douglas	Poor – 63	2016	DO, chlorophyll	None
Fontana	Fair – 67	2016	DO, bottom life	Mercury
Fort Loudoun	Fair – 60	2017	DO, chlorophyll, bottom life	PCBs, mercury (upstream US 129)
Fort Patrick Henry	Fair – 69	2016	Chlorophyll	None
Guntersville	Fair – 72	2016	Chlorophyll	Mercury (Vicinity of Tennessee River mile 408, just downstream of Widows Creek; Sequatchie River)
Hiwassee	Fair – 67	2015	DO	Mercury (State of Tennessee statewide advisory)
Kentucky	Good – 75	2017	Chlorophyll (Big Sandy only - DO, bottom life)	Mercury (State of Kentucky statewide advisory; State of Tennessee, Big Sandy River and embayment)

Reservoir	Ecological Health Rating/Score	Latest Survey Date	Concerns	Fish Consumption Advisory
Little Bear Creek	Fair – 69	2017	DO	Mercury
Melton Hill	Good – 80	2016	Sediments	PCBs, mercury (Poplar Creek embayment)
Nickajack	Good – 84	2016	--	PCBs, chlordane (Chattanooga Creek)
Normandy	Poor – 40	2016	DO, chlorophyll, bottom life	None
Norris	Fair – 69	2014	DO	Mercury (Clinch River portion)
Nottely	Poor – 47	2014	DO, chlorophyll, bottom life	Mercury
Parksville	Fair – 66	2017	Sediments	None
Pickwick	Fair – 59	2016	Chlorophyll	None
South Holston	Fair - 67	2015	DO, chlorophyll, bottom life	Mercury (Tennessee portion)
Tellico	Fair – 63	2015	DO, bottom life	PCBs
Tims Ford	Poor – 52	2016	DO, chlorophyll, bottom life	None
Watauga	Good - 77	2015	DO	Mercury
Watts Bar	Fair - 62	2016	DO, chlorophyll, bottom life	PCBs
Wheeler	Fair - 68	2015	DO, chlorophyll, bottom life	Mercury (Limestone Creek, Round Island Creek embayments); PFOS[3] (Baker Creek embayment, river miles 296-303)
Wilson	Poor - 57	2016	DO, chlorophyll, bottom life	Mercury (Big Nance Creek embayment)

[1] DO = Dissolved Oxygen , [2] PCBs = Polychlorinated biphenyls, [3] PFOS = Perfluorooctane sulfonate
Source: TVA 2019b

3.6.2 Environmental Consequences

Because nearly every aspect of natural resource management can affect water quality in some capacity, this section focuses on the programs and activities that would result in non-negligible direct and indirect impacts.

While most projects authorized under the NRP would be intended to benefit water quality, short-term adverse impacts could occur through soil disturbance, herbicide application, and other actions. Typical impacts include short-term increases in sedimentation and very localized alterations of shoreline and stream-bottom habitats. Under both alternatives, BMPs specific to water resource management projects would be implemented during construction as appropriate to minimize these short-term minor impacts.

3.6.2.1 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to water quality: Biological Resources, Cultural Resources, Recreational Management, and Water Resources Management.

Specific programs and activities addressing water quality within those resource areas include:

- Wetlands Management
- Natural Areas Management
- Grasslands and Agricultural Lands Management
- Dewatering Projects Management
- Forest Resource Management
- Conservation Planning
- Wildlife Habitat Enhancement Partnerships
- Dispersed Recreation Management
- Leave No Trace
- Trails Management
- Aquatic Ecology Management
- Stream and Tailwater Monitoring
- Climate Change Sentinel Monitoring
- Tennessee Valley Clean Marina
- Water Resource Outreach Campaign
- Nutrient Source – Watershed Identification and Improvement Program
- Northern Gulf of Mexico/Mississippi River Basin Nutrient Load Reductions Program
- Strategic Partnership Planning
- Reservoir Shoreline Stabilization/ Riparian Management Program

TVA has had mixed success in implementing these programs. Most of the water resource and recreation management programs are expected to be completed within the 20-year timeframe of the 2011 NRP. However, others are unlikely to be fully implemented within that timeframe.

TVA would continue to manage these programs and activities as provided in the 2011 NRP. In the 2011 Final EIS, TVA identified short-term minor impacts on water quality associated with terrestrial habitat management and land stewardship assessment tools. These included increased sedimentation from grading activities for revegetation, improving access roads, installing shoreline stabilization, and creating riparian buffers. Improving dewatering areas (refurbishment) was identified as likely to cause some short-term generation of pollutants, especially sediment.

The 2011 Final EIS also predicted long-term beneficial impacts from proposed terrestrial habitat improvement, which generally improves vegetative cover of soil. Adverse impacts associated with herbicide application or land disturbance would be minor and short-term.

These conclusions remain largely accurate and the 2011 NRP has provided a beneficial framework for protecting and improving water quality in the Tennessee River basin.

Under Alternative A, TVA would continue to implement programs and activities identified in the 2011 NRP that affect water quality. A blended management approach would continue.

The repair of heavily impacted dispersed recreation areas would continue to provide water quality benefits and would be proportional to the number of sites repaired. Continued implementation of best practices in trail construction and Leave No Trace would minimize adverse impacts through reduced runoff. Impacts from management of developed recreation areas would be similar. For example, campground improvements, as described in the 2011 NRP, would result in long-term beneficial improvements to water quality.

Once the Floating Cabins rulemaking process is complete, this program may result in greater awareness and proactive response to potential water quality issues associated with this use. This would be a minor beneficial impact on water quality.

The zone allocations in the CVLP, implemented in 2011 and updated in 2017, could also indirectly affect water quality by encouraging or discouraging development near water resources. For example, residential and commercial development of privately-owned lands adjacent to TVA reservoirs could adversely impact water quality at some reservoirs. The scale of impacts would correspond to the amount of shoreland made available for development and would be expected to continue to occur in the 5 to 6 percent of TVA lands allocated for Shoreline Access in the CVLP. TVA would continue to require BMPs and other measures such as those described in the SMI EIS (1998) to minimize these impacts.

Similar types of impacts would be expected from continued processing of Section 26a permit applications. The actions authorized under Section 26a can result in adverse impacts (e.g., from in-water construction and dredging) or beneficial impacts (e.g., from shoreline stabilization) on water quality. Section 26a permit applications would continue to be reviewed on an individual basis, with the permitting process including an environmental review designed to identify, analyze, and minimize environmental impacts. Thus, adverse and beneficial impacts on water quality would continue to be localized and minor to moderate over the long-term.

Wetland acreage across the TVA region has declined over the past 30 years, but the rate of loss has slowed over the past 10 years due to regulatory mechanisms for wetland protection. Timber harvesting, agriculture, natural succession, beaver activity, changes in land use (including urban and rural development, mining, and recreation such as golf courses), and conversion of bottomland forests to managed pine plantations played a role in these trends in wetland change. These trends are likely to continue to various degrees over the next 30 years. Impacts associated with improving wetlands management are intended to be solely beneficial and would provide direct and indirect benefits to water quality. Other surface-disturbing actions in the vicinity of wetlands could result in short-term adverse impacts. These impacts would be minimized or mitigated during the site-specific environmental review process.

Programs have been implemented that foster partnerships and active participation in maintaining and enhancing aquatic biological communities in six priority watersheds (Clinch/Powell River, Little Tennessee River, Duck River, Paint Rock River, Elk River, Bear Creek). In addition, TVA is leading the effort in developing the Tennessee River Basin Network. This network of agencies and organizations are working to protect aquatic biodiversity across the Tennessee River and are expected to continue to provide significant long-term beneficial affects to water quality.

Many TVA programs and activities would continue to have short-term adverse impacts on water quality. Long-term adverse impacts would continue as new roads, trails, and other

facilities are constructed. These facilities decrease the amount of land available for filtration and create runoff that can degrade water quality. With proper implementation of design features and BMPs to minimize long-term impacts, these impacts would be minor to moderate depending on their location in relation to areas with sensitive resources reliant on water quality.

In conclusion, over the long term, there would continue to be largely beneficial impacts from many activities such as water quality monitoring, shoreline stabilization, and partnerships. These beneficial impacts would be minor to major depending on their location and ability to address site-specific water quality issues. Adverse impacts would mostly occur over the short term and would be minimized or mitigated through the environmental review process.

3.6.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to water quality: Land and Habitat Stewardship, Recreation, Reservoir Lands Planning, Water Resources Stewardship, Public Land Protection, Nuisance and Invasive Species Management, and Section 26a and Land Use Agreements.

Specific programs and activities addressing water quality within these focus areas include:

- Wetland Management
- Natural Areas Management
- Grasslands and Agricultural Lands Management
- Dewatering Projects
- Forest Resource Management
- Conservation Planning
- Nonnative Invasive Plant Management on TVA Lands
- Aquatic Plant Management
- Developed Recreation Management
- Tennessee Valley Camp-Right Campground
- Dispersed Recreation Management
- Trails Management
- Floating Cabins
- Comprehensive Valleywide Lands Planning
- Aquatic Ecology Management
- Stream Monitoring
- Sentinel Monitoring
- Tennessee Valley Clean Marina
- Water Resource Outreach Campaign
- Nutrient Source Management
- Comprehensive Land Condition Assessment
- Property Management
- Education and Engagement
- Section 26a and Land Use Implementation

Many impacts would be the same as those described under Alternative A because most programs and activities with the greatest potential to impact water quality are carried over from the 2011 NRP. In addition, the new programs and focus areas in the 2020 NRP (e.g., Section 26a and CVLP) have been implemented as stand-alone programs for years or

decades. Therefore, the impacts associated with their implementation are largely a continuation of current management.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging water quality concerns and opportunities because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on water quality.

In conclusion, implementation of Alternative B would result in similar impacts on water quality as compared to Alternative A. The only measurable difference would be additional beneficial impacts from implementation of the 3- to 5-year action plans.

3.6.2.3 Cumulative Impacts

Past, present, and reasonably foreseeable future actions affecting water quality in the Tennessee River basin include actions similar to those described in the analysis of direct and indirect impacts. Runoff from agricultural, industrial, residential, and other land uses can contribute to long-term adverse impacts. Conservation practices including proper implementation of BMPs, stabilizing shorelines, and restoring vegetated areas can provide long-term benefits to water quality.

Most programs evaluated in the No Action Alternative would continue under Alternative B. Within these programs, activities identified as having potential adverse impacts associated with sedimentation (i.e., bank stabilization, equipment usage, and invasive species management) were described as short-term and localized. Through use of appropriate BMPs, public outreach and partnerships, these short-term adverse impacts should be negated, and program implementation can provide long-term benefits to water quality.

Under both alternatives, residential and commercial development of privately-owned lands adjacent to TVA reservoirs and other waterways in the Tennessee River basin would continue. Shoreline conversion to developed or recreational use can be a long-term or permanent change and can result in adverse cumulative impacts on water quality where such development is poorly planned. On TVA shorelines, the Land Protection and Section 26a and Land Use Agreements programs are designed to provide protections for TVA lands and water resources. Although there is potential for short-term adverse impacts, the programs' long-term protection against uncontrolled alterations to land use should provide an overall benefit to water quality.

3.7 Air Quality

3.7.1 Affected Environment

The importance of air quality as a valuable environmental resource is discussed in the 2011 Final EIS and that discussion is incorporated into this SEIS by reference. In summary, those discussions outline the steps that have been taken by the federal, state, and local governments to improve and protect air quality nationwide through permitting and regulatory development. Poor air quality not only adversely affects public health directly through inhalation exposure, it also negatively impacts crop production, forests, lakes, streams, and the general health of ecosystems. The CAA and 1990 Amendments passed by Congress are the foundation for protecting air quality. Under the CAA, the NAAQS were established for air pollutants directly linked to degraded air quality conditions such as smog formation, acid rain, and poor visibility.

As described in the 2011 Final EIS, the US Environmental Protection Agency (USEPA) periodically revises the NAAQS as the science advances. Table 3-7 lists the current NAAQS. Entries with an asterisk are those that have been put into effect since 2011.

Table 3-7. National Ambient Air Quality Standards

Pollutant	Type of Standard	Averaging Time	Concentration ($\mu g/m^3$)	Concentration (ppm)
Carbon Monoxide (CO)	Primary	8-hour[1]	10,000	9
	Primary	1-hour[1]	40,000	35
Nitrogen Dioxide (NO_2)	Primary and Secondary	Annual Arithmetic Mean	100	0.053
	Primary	1-hour [2]	189	0.100
O_3	Primary and Secondary	8-hour [3]	137*	0.070*
Particulate Matter (PM_{10})	Primary and Secondary	24-hour [4]	150	-
Particulate Matter ($PM_{2.5}$)	Primary	Annual Arithmetic Mean - 3 yr avg	12.0*	-
	Secondary	Annual Arithmetic Mean - 3 yr avg	15.0	-
	Primary and Secondary	24 hour [2]	35	-
Sulfur Dioxide (SO_2)	Primary	1-hour [5]	195	0.075
	Secondary	3-hour	1,300	0.5
Lead (Pb)	Primary and Secondary	Rolling 3 month	0.15 [6]	-

$\mu g/m^3$ micrograms per cubic meter
ppm parts per million
* Designation created since 2011

(1) Not to be exceeded more than once per year
(2) 98th percentile averaged over three years
(3) Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years. The 1997 O_3 standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour O_3 standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour O_3 standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.
(4) Not to be exceeded more than once per year on average over 3 years
(5) 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years. The 1971 annual and 24-hour SO_2 standards were revoked. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.
(6) The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard. In areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

Air quality is monitored continuously across the country by a network of ambient air monitors that operate according to USEPA reference specifications. Actual air quality monitoring data is used by federal, state, and local regulatory agencies to identify areas which are in attainment of the NAAQS as well as areas which have measurements that exceed the NAAQS and thus are not in attainment of the standard (i.e., "non-attainment" areas).

There have been no changes to the attainment status in the TVA region as it is stated in the 2011 Final EIS for CO, lead, NO_2, SO_2, and PM_{10}. With respect to the NAAQS for which designations were made since the 2011 Final EIS was issued (see entries with an asterisk in Table 3-7 above), the TVA region is in attainment for the 1-hour SO_2, 1-hour NO_2, 2012 $PM_{2.5}$, and 2015 O_3 standards except for a discrete 3-kilometer radius circular area in Kingsport, Sullivan County, Tennessee, which was designated non-attainment for the 2010 1-hour SO_2 standard. Designations for the 2010 1-hour SO_2 standard were originally made October 4, 2013. A second round of area designations became effective September 12, 2016. A supplement to the second round of area designations subsequently became effective January 17, 2017, and a third round of area designations became effective April 9, 2018. Designation for the 2015 O_3 standard were made August 3, 2018. The TVA region is in attainment of the 2015 O_3 standard. Designations for the 2012 $PM_{2.5}$ standard were made April 15, 2015. The TVA region is in attainment of the 2012 $PM_{2.5}$ standard.

Since the publication of the 2011 Final EIS, air quality continues to improve in the TVA region. Emissions across the portfolio of TVA's power-generation facilities have declined significantly, following the implementation of several projects where coal-fired units were retired. More efficient gas-turbine power plants were brought online in their place. These gas-fired facilities are equipped with state-of-the-art air pollution control equipment which minimizes emissions of nitrogen oxides (NO_x), SO_2, volatile organic compounds (VOC), and CO. TVA's emissions reductions are responsible for the majority of the statewide Tennessee stationary source SO_2 and NO_x emission reductions since 1990. The utility sector SO_2 emissions in Tennessee, the vast majority of which were from TVA, decreased from 817,612 tons in 1990 to 24,293 tons in 2017, a decrease of over 97 percent. Utility sector NO_x emissions in Tennessee (most also due to TVA) increased from 240,359 tons in 1990 to 283,464 tons in 1997, before decreasing for the next two decades to 15,517 tons in 2017, a decrease of nearly 95 percent from the 1997 peak.

Section 112 of the CAA Amendments identifies 187 specific chemical compounds, referred to as Hazardous Air Pollutants (HAP), known to have toxic effects on human health and the environment. Exposure to these compounds has been linked to cancer or other serious health effects such as reproductive effects or birth defects. To reduce air emissions of HAP, USEPA developed technology-based emission standards called the National Emission Standards for Hazardous Air Pollutants that apply to specific source categories known to emit HAP. The utility sector is one of those categories, and on February 16, 2012, USEPA published the Mercury and Air Toxics Standards (MATS) for power plants. TVA operated several coal-fired units subject to MATS, some of which are now retired, and is continuing to manage compliance with the MATS. As a result of this rule and TVA's air emission control projects instituted since 2011, including the retirement of coal-fired units, emissions of toxic compounds have been substantially reduced (Table 3-8).

Table 3-8. TVA Toxic Air Emissions Reductions 2011-2017

2011 (lb)	2017 (lb)	% Reduction
16,095,494	2,277,367	86%

Source: TVA 2019d

3.7.2 Environmental Consequences

3.7.2.1 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to air quality: Biological Resources, Water Resources, and Reservoir Lands Planning.

Specific programs and activities addressing air quality within these resource areas include:

- Grasslands and Agricultural Lands Management
- Forest Resource Management
- Natural Areas Management
- Nonnative Invasive Plant Management

Direct sources of air pollutant emissions in the continued implementation of Alternative A are primarily from vehicles used in accessing TVA lands and from construction, farming, and forest management equipment. These emissions would have negligible effects on air quality. Prescribed burns would also result in emissions of air pollutants. TVA would continue to comply with local air quality regulations when planning any prescribed burns.

3.7.2.2 Alternative B

Overall, impacts under Alternatives A and B would be the same because program implementation under the 2020 NRP is unlikely to result in new long-term emissions sources.

3.7.2.3 Cumulative Impacts

The geographic scope of analysis for air quality extends beyond the TVA region to include all seven states in the TVA power service area. Many and diverse actions by federal, state, local, and private entities have resulted in improved air quality. Many counties in this region were previously designated as nonattainment for one or more NAAQS and in recent decades have come into attainment. The improvement in air quality and attainment of NAAQS in the region is even more remarkable considering that several of the NAAQS have been made substantially more stringent in the past two decades. TVA's reduction in emissions has had cumulative benefits within the TVA region and beyond as other industries and states have implemented programs to reduce emissions and attain or retain attainment designations.

Compared to these other actions, implementation of the 2011 NRP has likely had a negligible or minor effect on air quality in the seven-state analysis area. Because the actions occurring under Alternative B are substantially similar to those actions under Alternative A, cumulative impacts would be the same under both alternatives.

3.8 Climate

3.8.1 Affected Environment

The 2011 Final EIS includes a thorough description of historical seasonal weather conditions and trends that are characteristic of the overall climate across the TVA region.

Thirty-year average climate "normals" for temperature, precipitation, wind, and solar radiation are given. Those discussions remain relevant and representative and are incorporated here by reference. In summary, the data trends indicate increasing temperatures, decreasing precipitation, declining cloud cover, and increasing solar radiation in the region (TVA 2011b).

Generally, temperatures in the TVA power service area are mild and there is ample rainfall for agricultural and water resources. The regional climate is such that there are seasonal changes in temperatures that directly influence two distinct peak power demands: one occurring during the summer for cooling and a second during winter for heating.

The 2011 Final EIS also discusses the potential for climate change as a result of increasing levels of greenhouse gases (primarily carbon dioxide [CO_2], methane, and nitrous oxide) in the atmosphere as a direct result of human activity, such as burning fossil fuels. The global carbon cycle—which consists of sources of carbon (as CO_2) and absorbing media such as the oceans and living biomass that act as carbon "sinks"—are imbalanced due to the increased CO_2 concentrations in the atmosphere occurring since the start of the Industrial Revolution. This imbalance causes the Earth to warm as the greenhouse gases absorb and trap heat, having a so-called "greenhouse effect". The science of quantifying the magnitude of the warming effect from greenhouse gases continues to develop. Predicting future climatic conditions decades in advance is a complex, dynamic challenge with many uncertainties.

Since the publication of the 2011 Final EIS, TVA has taken an active role in preparing for the potential impacts of Climate Change by developing and maintaining its Climate Change Adaptation Plan (TVA 2016b). The Plan's objectives are:

- identifying possible impacts to TVA mission for economically supplying power,
- assessing potential consequences and ability to mitigate climate change,
- developing adaptation planning actions,
- ensuring resources are invested wisely, and
- supporting the Federal Government's leadership role in sustainability.

The Plan originated from EO (Federal Leadership in Environmental, Energy and Economic Performance) and was subsequently updated following the release of EO 13693 (Planning for Federal Sustainability in the Next Decade; 2013). The most recent update to this Plan was made in June 2016. The Plan identifies the most significant climate change related risks and vulnerabilities and outlines actions and policy decisions that TVA is taking to manage them. TVA has developed climate adaptation programs, policies, processes, and plans to help manage potential climate change risks by building resilience to power producing and delivery systems in both the short- and long-term periods. TVA has also developed a Strategic Sustainability Performance Plan (June 2017). The goal of TVA's adaptation planning process is to ensure the Agency continues "to achieve its mission and program goals and to operate in a secure, effective and efficient manner in a changing climate."

In 2013, TVA, in coordination with other federal agencies as well as state and local partners, initiated the Climate Change Sentinel Monitoring program with 19 stations designed to assess potential biological, ecological, and hydrological responses of aquatic ecosystems related to climate change. TVA is also monitoring effects of climate change on agriculture, forest resources, and recreation. TVA also participates in the Department of

Energy's Partnership for Energy Sector Climate Resilience, the aim of which is to improve the resilience of energy infrastructure to extreme weather and climate change impacts.

In the planning and policy development process, considerations have been given toward the potential challenges that may result from climate change including:

- growing power demand,
- reduced power generation efficiency at increased ambient temperatures,
- growing cooling water demands and elevated discharge temperatures into receiving waters,
- dam and reservoir functionality after extreme rainfall events or in periods of drought,
- flooding as a result of heavier precipitation,
- water demand stresses across the region due to drought,
- ecosystem disruptions at higher water temperatures, and
- detrimental air quality effects related to increased O_3 and $PM_{2.5}$ formation at higher ambient temperatures and increased frequency and duration of sunlight in summer months.

As described above, TVA power plant CO_2 emissions have dropped due to a multitude of emission reduction projects instituted by TVA in this period. TVA anticipates that CO_2 emissions will continue to drop as TVA continues to make changes to its power generating system in addition to other programs.

3.8.2 Environmental Consequences

3.8.2.1 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to climate change: Biological Resources, Water Resources, and Reservoir Lands Planning.

Specific programs and activities addressing climate change within these resource areas include:

- Conservation Planning
- Forest Resource Management
- Comprehensive Valleywide Lands Plan
- Terrestrial Greenhouse Gas Sequestration Management
- Climate Change Sentinel Monitoring

The potential for climate change ultimately exists on a global scale as a consequence of industrialization and widespread use of fossil fuels for power generation and transportation needs around the globe. Continued implementation of the 2011 NRP would benefit climate through management of lands for Natural Resource Conservation or Sensitive Resource Management under the CVLP. Similarly, programs and activities that enhance forest management could benefit climate when such actions increase carbon sequestration. Adverse impacts would continue where carbon sequestration is reduced due to harvesting or conversion of natural areas to developed areas. These actions, occurring as part of the NRP, would continue to have negligible to minor effects on climate. Information gathered by the Climate Change Sentinel Monitoring Program would continue to have minor benefits at the local and regional levels where it is used to influence TVA actions. The Terrestrial

Greenhouse Gas Sequestration Management Program has not yet been implemented and thus would not benefit climate change.

3.8.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to climate change: Land and Habitat Stewardship, Reservoir Lands Planning, and Water Resources Stewardship.

Specific programs and activities addressing climate change within these focus areas include:

- Conservation Planning
- Forest Resource Management
- Comprehensive Valleywide Lands Plan
- Sentinel Monitoring

There are no proposed changes to these four programs compared to Alternative A. Therefore, their impacts on climate change would be the same. Under Alternative B, TVA would discontinue the Terrestrial Greenhouse Gas Sequestration Management Program because it is better managed and implemented by universities or other entities. Impacts would be similar to those under Alternative A because TVA has not yet fully implemented this program in the 2011 NRP.

3.8.2.3 Cumulative Impacts

The geographic scope of analysis for climate extends beyond the TVA region to include all seven states in the TVA power service area. Other natural resource conservation and management programs in this area would have similar impacts as Alternative A or B. These include management of natural areas on other public lands, non-profit organization properties, and private property. Commercial, industrial, and government efforts to reduce CO_2 emissions would likewise be beneficial. TVA's Climate Change Adaptation Action Plan and Climate Change Sentinel Monitoring Program may have minor cumulative climate change benefits at the local and regional level.

Implementation of Alternatives A or B would result in a negligible or minor cumulative beneficial impact compared with other industrial, state, and federal initiatives to reduce CO_2 emissions. Either alternative is anticipated to have only a negligible beneficial cumulative impact on global climate change.

3.9 Cultural Resources

As stated in the 2011 Final EIS, TVA is obligated to protect cultural resources under its stewardship pursuant to numerous laws and regulations, including NHPA, ARPA, and NAGPRA.

3.9.1 Affected Environment

3.9.1.1 Archaeological Resources

The 2011 Final EIS describes TVA's rich history in archaeological resource management that dates back to when the agency first began. TVA incorporates this information into this SEIS by reference. Even prior to the development of the Tennessee River system, many individuals had explored and studied the archaeological sites now managed by the agency. After TVA's inception, archaeologists from around the Valley sought TVA support for the excavation of archaeological sites being inundated as a result of reservoir construction

projects. Since the passage of NHPA in 1966, the agency has taken a more systematic approach to the identification and management of archaeological sites on the lands it manages.

Since 2011, TVA has implemented NRP initiatives to evaluate its data on archaeological resources (and structures) in the Tennessee Valley and develop an integrated cultural resource database. From 2015 to the present, TVA has been developing a system for tracking and managing all agency related cultural resource information. This work is ongoing due to the large amount of cultural resource data involved. The exact number of archaeological resources identified on TVA lands is being determined through this data review. In the meantime, TVA continues to estimate that there are 11,500 sites on TVA lands, the same estimate provided in the 2011 Final EIS.

The total number of sites considered eligible for listing in the NRHP is not known. However, at least 19 archaeological sites and archaeological districts on TVA land are listed on the NRHP. In addition, TVA continues to manage a number of significant archaeological sites in the Southeastern US and has increased its knowledge of these resources as well as discovered new significant sites in the last few years.

Generally, the conditions of archaeological sites located on TVA lands continue to be the same as reported in 2011. Erosion and looting continue to impact these resources.

3.9.1.2 Historic Buildings and Structures

In the 2011 Final EIS, TVA reported that approximately 5,320 historic buildings and structures had been recorded on or near TVA lands. Over the years, TVA collected this data through its lands planning process and other initiatives. In 2018, this information was evaluated as part of TVA's integrated cultural resource database initiative, and it was determined that much of this data needed to be updated. A new project is under way to improve TVA's inventory of historic buildings and structures in order to continue to meet TVA's obligations under Section 110 of the NHPA. This project is an activity under the NRP's Preservation Program. The project will focus on those historic buildings and structures located on TVA land as well as any additional resources owned or leased by TVA.

TVA continues to list historic properties in the NRHP. The Warden's Residence in Madison County, Alabama, was listed in 2010; the Leadvale Coaling Station and Cut-Off in Cocke County, Tennessee, was listed in 2014; and the Shawnee Steam Plant in McCracken County, Kentucky, was listed in 2016.

Additionally, in 2016, TVA completed an NRHP Multiple Property Documentation Form entitled Historic Resources of the Tennessee Valley Authority Hydroelectric System, 1933-1979. Under this effort, TVA listed an additional 25 hydroelectric or recreational dams in 2016 and 2017. With these additions, all of TVA's hydroelectric dams are now either listed in the NRHP or determined eligible for listing in the NRHP as a result of consultation with SHPOs. The complete NRHP list now includes 29 dams (Table 3-9).

Table 3-9. NRHP-Listed TVA Dams

Name	Listing Date	Name	Listing Date
Apalachia	10/26/2017	Normandy	8/11/2017
Boone	10/26/2017	Norris	4/12/2016
Chatuge	8/11/2017	Nottely	8/11/2017
Cherokee	8/11/2017	Ocoee No. 1	7/5/1990
Chickamauga	8/11/2017	Ocoee No. 2	10/31/1979
Douglas	8/14/2017	Ocoee No. 3	8/14/2017
Fontana	8/11/2017	Pickwick Landing	8/11/2017
Fort Loudoun	8/11/2017	South Holston	8/14/2017
Fort Patrick Henry	10/26/2017	Tellico	8/14/2017
Great Falls	7/5/1990	Tims Ford	8/11/2017
Guntersville	7/26/2016	Watauga	8/11/2017
Hiwassee	8/11/2017	Watts Bar	8/14/2017
Kentucky	8/11/2017	Wheeler	7/26/2016
Melton Hill	8/11/2017	Wilson*	11/13/1966
Nickajack	8/14/2017		

*Listed as a National Historic Landmark

3.9.2 Environmental Consequences

3.9.2.1 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to cultural resources: Cultural Resources, Reservoir Lands Planning, and Public Engagement.

Specific programs and activities addressing cultural resources within those resource areas include:

- Archaeological Monitoring and Protection
- Archaeological Resource Protection Act
- Native American Consultation
- Native American Grave Protection and Repatriation Act
- National Historic Preservation Act Section 106
- Preservation Program
- Preserve America
- Archaeological Outreach (Thousand Eyes)
- Corporate History Program
- Environmental Education
- Foundation and Trust Fund

Since 2011, TVA has successfully developed and at least partially implemented all of the program areas identified. While some of the activity goals have not been met, the programs developed in the 2011 NRP have helped TVA to formalize the requirements of the federal laws protecting historic properties and given TVA a process for planning and implementing its cultural resource management responsibilities.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. In the 2011 EIS, TVA concluded that the development of these programs and their implementing goals would improve cultural resource management on TVA land. All effects from other NRP program areas were to be addressed in a PA developed for compliance with Section 106 of NHPA.

While implementation of the 2011 NRP programs has not met all of the NRP's goals (as outlined in the Blended Management alternative of the 2011 Final EIS), program activities have improved and continue to improve. Based on recent experience of project implementation, TVA has determined that the resources allocated to program implementation were not adequate to meet the 2011 NRP program goals. With these continued limitations, it is unlikely that TVA would be able to fully implement the Cultural Resource Management goals of the 2011 NRP.

Most program areas have operated at levels to ensure compliance with legal and policy requirements, with some exceptions (such as the Thousand Eyes Archaeological Outreach Program) that have been elevated. For example, Identification of Archaeological Sites was an activity that TVA stated in the 2011 NRP would be enhanced. In the 2011 NRP, TVA set a goal for this program to survey at least 3,000 acres of land each year. TVA has surveyed about 1,000 acres each year, short of the goal. Other activities, such as heritage tourism and nomination of historic properties to the NRHP, have also not met the goals established in the 2011 NRP. In spite of some shortcomings, TVA's management of cultural resources under the 2011 NRP has improved substantially since 2011 and would continue to improve under Alternative A pending availability of funding.

In general, conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative remain largely accurate and the 2011 NRP has provided a beneficial framework for prioritizing and managing cultural resources.

In conclusion, under Alternative A, TVA would continue to successfully implement programs and activities identified in the 2011 NRP, although at a modified level based on available funding. A blended management approach would continue. TVA will address potential effects to cultural resources that may occur as a result of other programs for Section 106 compliance as specific projects are implemented. Cultural resource effects would also be reviewed by TVA when site-specific actions are proposed on TVA lands to ensure compliance with NEPA and NHPA.

3.9.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to Cultural Resource Management: Cultural Resource Management, Reservoir Lands Planning, Public Outreach and Information, Public Land Protection, Section 26a and Land Use Agreements.

Specific programs and activities addressing cultural resources within these focus areas include:

- Preservation Program
- ARPA Enforcement
- Section 106 Compliance
- NAGPRA Compliance
- Thousand Eyes Archaeological Outreach

- Archaeological Monitoring and Protection
- Native American Consultation and Partnerships
- Corporate History
- Environmental Education
- Comprehensive Valleywide Lands Planning
- Public Land Rules, Regulations, and Enforcement
- Property Management
- Education and Engagement

TVA's proposal to change portions of the NRP under Alternative B would be primarily beneficial to cultural resources. Many of the proposed changes are administrative in nature, though, and thus would not have new effects on cultural resources.

With the addition of the Section 26a and Land Use Stakeholder Education and Communication program, TVA would improve its process by providing educational information to permittees on TVA's Section 26a process and the potential environmental reviews involved. This would help facilitate working with applicants on potential impacts and finding solutions that would avoid and minimize effects to historic properties. This program area may also help reduce the number of permit violations or unpermitted construction of shoreline facilities that may have adverse effects to cultural resources.

Changes in the Public Outreach and Information and the addition of Public Lands Protection would provide new opportunities for education and outreach for different audiences beyond those reached through TVA's Thousand Eyes Program. The addition of the Public Land Rules, Regulations, and Enforcement program would enhance TVA's ARPA Enforcement program by reducing unauthorized behaviors on TVA land that have adverse effects to cultural resources.

Under TVA's Property Management program, boundary marking would likely have a beneficial effect on archaeological resources as it would clearly define TVA lands.

Other focus area programs have the potential to affect historic properties. For example, construction of new trails or other recreation facilities, management of floating cabins, removal of small dams or other activities involving ground disturbance or alteration of historic structures may have a direct effect on archaeological sites or visual effects to above ground historic features. However, TVA would review these projects on an individual, site-specific basis through the Section 106 process outlined in the NRP PA, TVA's PA for management of floating houses and non-navigable houseboats, other relevant Section 106 compliance documents, and an appropriate environmental review under NEPA. TVA is also developing a Section 106 PA that that would also be part of the review process.

Compared to Alternative A, with some exceptions (i.e., those projects that may result in ground disturbance or visual effects to historic buildings or structures), the incorporation of these programs and activities into the 2020 NRP may provide minor benefits to cultural resources. These program areas include Preservation Program, ARPA Enforcement, NAGPRA Compliance, Thousand Eyes Archaeological Outreach, Archaeological Monitoring and Protection, and Native American Consultation and Partnerships. Activities that are implemented through this program are very similar to those outlined in the 2011 NRP. With the addition of the 3- to 5- year action plans, TVA cultural staff would be able to plan and meet long term goals that would be developed in consultation with SHPOs and federally recognized Indian tribes. This would allow for input from these key stakeholders on the

management and protection of cultural resources managed by the agency. The 3- and 5-year action plans would identify funding and resource concerns and provide opportunities to address them.

In conclusion, implementation of Alternative B would have similar impacts to cultural resources as Alternative A. While there are new focus areas included in Alternative B that have the potential to effect cultural resources, such as Section 26a and Land Use Agreements, these activities have been occurring for many decades with procedures in place to ensure compliance with Section 106 of the NHPA. The addition of these focus areas to the NRP would not create new impacts to cultural resources; rather they would continue to produce both beneficial and occasional negative impacts to archaeological sites and historic structures and buildings.

3.9.2.3 Cumulative Impacts

TVA makes important contributions to the management and protection of cultural resources in the region. Generally, TVA ownership of public lands with these resources and obligations under federal law to protect such resources result in cumulative beneficial effects on a regional scale. As with other sensitive resources, TVA's efforts to manage and protect cultural resources are implemented in cooperation with other federal, state, local, or non-profit entities that have similar objectives. When considered in a broader context, the incremental benefit of TVA programs to protect these resources would positively affect the resources in the region. For that reason, adoption of Alternative A or Alternative B would generally have beneficial cumulative impacts for cultural resources over the life span of either alternative.

However, certain NRP programs and activities, under both the 2011 NRP and the 2020 NRP, have the potential to result in adverse cumulative effects on cultural resources. Those program areas where new construction or development would continue to occur that may result in both direct and indirect effects to archaeological sites or historic buildings and structures would ultimately have a cumulative effect on the non-renewable cultural resources managed by the agency.

The potential for these impacts is reduced, however, by improvements to TVA's Cultural Resources Management programs implemented under the NRP. For example, increased survey and knowledge about the sensitive resources located on TVA lands may help reduce these effects through improved planning and coordination with other business units within TVA. Common to both alternatives, TVA's Comprehensive Land Planning process provides a mechanism for balancing the many different competing uses and needs of public land under the agency's stewardship. This process incorporates public and stakeholder input that helps guide TVA in making effective long-term land management decisions that would be balanced in meeting competing resource needs.

New focus areas programs and activities under Alternative B may result in similar improvements in balancing needs while protecting cultural resources. TVA's Section 26a and Land Use Implementation Program provides procedures for how to ensure that cultural resource impacts are considered through the Section 26a process. Conversely, the Public Lands Protection program provides a process for addressing those situations where proper permits or approvals were not obtained and resources were impacted as a result. Under Alternative B, the 2020 NRP presents an integrated approach to resource management of TVA public lands that considers many resource needs, including cultural resource

management, which should ultimately balance resource needs and reduce adverse cumulative impacts in the long term.

3.10 Recreation

3.10.1 Affected Environment

3.10.1.1 Developed Recreation

The 2011 Final EIS includes a description of recreation facilities and activities on TVA's approximately 650,000 acres of reservoir water surface area and 293,000 acres of land. That description is incorporated into this SEIS by reference. Specifically, the 2011 Final EIS describes the majority of developed recreation facilities as being located along TVA dam reservations and other TVA reservoir lands; TVA owns more than 80 stream access sites; TVA has agreements for the operation of more than 160 campgrounds and 135 marinas by private and other public operators; and TVA is a regionally important provider of developed recreation facilities. Finally, the 2011 Final EIS estimates that TVA provides approximately 5 to 10 percent of public recreation facilities in the region.

Since publication of the 2011 Final EIS, the regional population has increased 2.5 percent (US Census 2018) and with it demand for developed recreation has likewise increased. To assist the public with identifying desired developed recreation opportunities, TVA maintains web pages with detailed information on campgrounds and other recreation facilities.

TVA operates many day use public recreation areas throughout the Tennessee Valley region. These include areas for hiking, biking, fishing, nature watching, picnicking, boating, and other activities.

TVA currently manages approximately 500 agreements with commercial and public operators to provide recreational opportunities (e.g., marinas and campgrounds). This number has remained relatively consistent since 2011 and includes implementation and compliance with TVA's Commercial Recreation Guidelines established in 2010.

There are six campgrounds on TVA reservations (Figure 3-1), all of which are currently managed by a commercial operator under a concession agreement. The Douglas Dam Headwater and Tailwater campgrounds are adjacent.

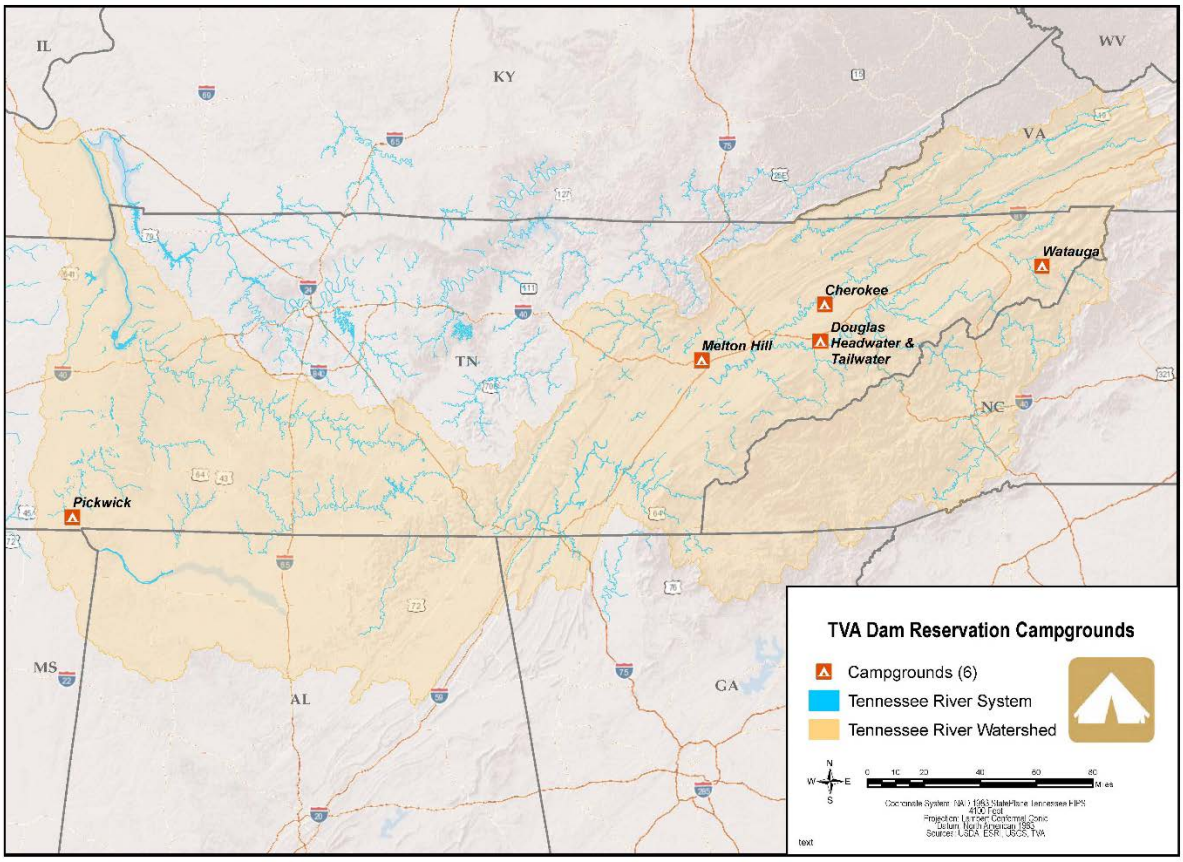

Figure 3-1. TVA Dam Reservation Campgrounds

3.10.1.2 Dispersed Recreation

The 2011 Final EIS includes a description of dispersed recreation activities on TVA land. Specifically, the 2011 Final EIS identifies popular dispersed recreation activities such as hiking, bank fishing, wildlife observation, hunting, and primitive camping. Approximately 6 million people engage in dispersed recreation on TVA lands annually, with increases expected over the life of the 2011 NRP. The 2011 Final EIS also identifies land along the shoreline of TVA reservoirs as especially important for dispersed recreation (both land-based recreation and as access to water-based activities). Finally, the 2011 Final EIS describes issues associated with the growth of dispersed recreation, including resource degradation and diminished user experience.

Regional population growth has also resulted in an increased demand for dispersed recreation opportunities. One tool TVA is using to address this demand is a series of online resources to help visitors identify locations and facilities conducive to their interests. For example, the Undeveloped Recreation Map is an interactive mapping program that shows the location of undeveloped recreation areas (TVA 2019e). The Tennessee Valley Water Trails interactive map provides a similar resource for water-based activities (TVA 2019f). Both of these online resources enhance knowledge of recreational opportunities, encourage recreation use in more areas, and support wellness and ecotourism.

TVA is also expanding dispersed recreation opportunities to accommodate more users. For example, there are now 170 miles of trails on TVA land, up from approximately 100 miles in

2011 (TVA 2019g). Many of these trails are managed in cooperation with volunteer and non-profit groups. While the number of miles of trail is a small percentage of the total number of trails regionally, these trails often provide an additional recreational opportunity around TVA reservoirs and complement other nearby activities.

Other TVA programs affect the quality and quantity of recreation opportunities. For example, there are more than 2,200 floating cabins on TVA reservoirs. In 2016, TVA completed an environmental review of the management of floating cabins and nonnavigable houseboats that addressed natural resource management and impacts on recreation opportunities in areas popular for floating cabins (TVA 2016b). Subsequently, in August 2018, TVA published amendments to its regulations addressing floating cabins in the Federal Register. TVA is preparing additional, more detailed health, safety, and environmental standards for floating cabins in a second rulemaking process that is ongoing.

TVA's aquatic plant management program focuses on the reduction of impacts of nuisance and invasive aquatic plants while balancing the multiple uses, including recreation, of TVA reservoirs. The nuisance animal control program also manages the effects of nuisance animals on TVA lands, facilities, and recreational users to protect against such impacts. Since the 2011 Final EIS was published, Asian carp species have become a more prevalent nuisance species in many waterways.

3.10.2 Environmental Consequences

3.10.2.1 Developed Recreation

3.10.2.2 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to developed recreation: Recreation Management and Reservoir Lands Planning.

Specific programs and activities addressing developed recreation within those resource areas include:

- Day-Use Areas off Dam Reservations
- Day-Use Areas on Dam Reservations
- Management of Campgrounds off Dam or Power Plant Reservations
- Management of Campgrounds on Dam or Power Plant Reservations
- Recreation Design Principles
- Recreation Information Management Boating Density Assessments
- Reservoir Lands Recreation Inventory Management
- Stream Access Sites
- Tennessee Valley Camp-Right Campground Program

TVA has largely been successful in implementing these programs and activities; a majority of activities within each program has been fully implemented or is expected to be implemented within the 20-year life span of the 2011 NRP.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. In the 2011 EIS, TVA concluded that there would be an increase in the quality but not quantity of developed recreation opportunities on TVA land.

In general, conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative remain largely accurate and the 2011

NRP has provided a beneficial framework for prioritizing and managing developed recreation. The 2011 Final EIS accurately forecasted impacts associated with increasing demand and how TVA's response to this issue could address those impacts (e.g., upgrading accessibility at campgrounds and day use areas).

The current floating cabin rulemaking process aims to provide long-term certainty for this popular use. The analysis of impacts of floating cabins on recreation in the 2016 Floating Cabins EIS is incorporated by reference. In summary, floating cabins can degrade recreational opportunities in areas where floating cabins are common and/or improperly moored (TVA 2016b).

In conclusion, under Alternative A, TVA would continue to successfully implement most programs and activities identified in the 2011 NRP that affect developed recreation demand and opportunity. A blended management approach would continue. However, as the regional population continues to grow, TVA's programs may not fully address increasing user demand over the long term. Actions to increase recreation opportunities would be needed and could include construction of additional developed recreation facilities. These impacts could be minor to moderate depending on the location and intensity of use.

3.10.2.3 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to developed recreation: Ecotourism, Recreation, Reservoir Lands Planning, and Section 26a and Land Use Agreements.

Specific programs and activities addressing developed recreation within these focus areas include:

- Comprehensive Valleywide Lands Plan
- Ecotourism and Recreational Assessments and Studies
- Developed Recreation Management
- Recreation Contract Management
- Recreation Partnerships
- Section 26a and Land Use Implementation
- Tennessee Valley Camp-Right Campground
- Water Access

The 2020 NRP includes more programs and activities affecting developed recreation than the 2011 NRP. In general, this would improve TVA's ability to proactively manage emerging issues and provide greater long-term certainty for addressing developed recreation demand and opportunities. However, in many cases, impacts would be negligible or minor when compared to Alternative A because many of these additions are administrative in nature (i.e., the programs themselves are longstanding but traditionally have been outside of the NRP). Examples include the addition of programs specific to recreational partnerships, recreation contract management, floating cabins, and Section 26a permits.

Compared to Alternative A, the incorporation of these programs and activities into the 2020 NRP may provide minor benefits to developed recreation demand and opportunity on TVA land. For example, including them in the 2020 NRP may result in a greater management focus and administrative awareness of how they relate to other aspects of natural resource management. This could lead to more effective and proactive prioritization of site-specific projects that address recreation.

Programs that expand developed recreational opportunities would help TVA continue to better respond to demand associated with an increasing population. These could include development of new partnerships and new or expanded developed recreation facilities. Likewise, recreational assessments and studies could result in targeted ecotourism efforts that better address increasing recreation demands. Many of these actions could result in minor or moderate benefits depending on their scale and location. For example, ecotourism efforts in counties with TVA reservoirs or other TVA land suitable for recreation could improve developed (and dispersed) recreational opportunities for residents and tourists alike. Improved ecotourism efforts could also complement existing recreation opportunities, providing a greater suite of opportunities that improve user experiences.

Continued implementation of the current CVLP would maintain the percentage of TVA lands allocated for or suitable for developed recreation, ensuring their continued availability for recreation into the future. Any future decrease or increase in lands allocated for Developed Recreation may affect TVA's ability to provide new developed recreation opportunities over the long term.

Impacts on recreation from floating cabins would be the same as those described under Alternative A.

In addition, the 3- to 5-year action plans would provide a more flexible and effective response to emerging recreational activities and trends because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on recreational demand and opportunities.

In conclusion, implementation of Alternative B would provide greater benefits to developed recreation than Alternative A. This is because Alternative B proposes to include a more comprehensive suite of recreation programs and activities with greater ability to respond to emerging issues. Combined with the issuance of 3- to 5-year action plans, implementation of Alternative B would likely result in more effective prioritization of future, site-specific projects that address issues of increased developed recreational demand and improved user experiences.

3.10.2.4 Dispersed Recreation

3.10.2.5 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to dispersed recreation: Biological Resources Management, Recreation Management, and Reservoir Lands Planning.

Specific programs and activities addressing dispersed recreation within those resource areas include:

- Annual Tours
- Dewatering
- Dispersed Recreation Management
- Leave No Trace
- Nuisance Animal Control
- Recreation Design Principles
- Reservoir Lands Recreation Inventory Management

- Trails Management

TVA has largely been successful in implementing these programs and activities; a majority of activities within each program has been fully implemented or is expected to be implemented within the 20-year life span of the 2011 NRP. Two activities have not been implemented as envisioned in the 2011 NRP: annual tours and boating density assessments. Annual tours have been redesigned as self-guided activities, and boating density assessments have been performed on an as-needed basis instead of in pursuit of a specific number of assessments. These changes are the result of decreased demand and the suitability of as-needed assessments to address any potential recreation issues.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. In the 2011 EIS, TVA identified a beneficial outcome in terms of meeting recreation demand and managing impacts associated with dispersed recreation.

Other impacts not explicitly analyzed in 2011 would remain unchanged. For example, TVA's dewatering program would continue to provide seasonal waterfowl hunting opportunities at Kentucky and Wheeler reservoirs. Likewise, nuisance animal control would continue to address species (e.g., feral hogs and Asian carp species) that negatively affect recreational opportunities.

In general, the environmental impacts would be the same as described for developed recreation. Although the 2011 analysis of the Blended Management alternative did not foresee an increase in the quantity of recreation opportunities, activities such as new trail construction have helped to alleviate congestion and conflict in localized areas.

In conclusion, under Alternative A, TVA would continue to successfully implement most programs and activities identified in the 2011 NRP that affect dispersed recreation demand and opportunity. As with developed recreation, regional population growth may prompt a need for TVA to provide additional dispersed recreation opportunities. Other changes since 2011 would limit TVA's ability to address emerging issues. For example, Alternative A does not provide a complete framework for benefiting fishing experiences via improved efforts to control Asian carp species. These impacts could be minor to moderate depending on the location and intensity of use.

3.10.2.6 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to dispersed recreation: Ecotourism, Land and Habitat Stewardship, Nuisance and Invasive Species Management, Recreation, and Reservoir Lands Planning.

Specific programs and activities addressing dispersed recreation within these focus areas include:

- Aquatic Plant Management
- Comprehensive Valleywide Lands Plan
- Dewatering Projects
- Dispersed Recreation Management
- Ecotourism and Recreational Assessments and Studies
- Floating Cabins
- Nuisance Animal Control

- Recreation Partnerships
- Trails Management

The impacts on dispersed recreation of adding more recreation-related programs and activities to the 2020 NRP would be the same as described for developed recreation.

Programs that expand dispersed recreational opportunities would help TVA continue to better respond to demand associated with an increasing population. These could include development of new partnerships, new trail construction, and increased opportunities in dispersed recreation areas. Many of these actions could result in minor or moderate benefits depending on their scale and location. The impacts of recreational assessments and studies and associated ecotourism efforts would be the same as described for developed recreation.

The nuisance animal control and aquatic plant management programs would better address issues that adversely affect recreation, including those that have become more prevalent since 2011, such as the proliferation of Asian carp species. Other actions, such as control of nuisance aquatic plants, may have adverse impacts on recreation if they degrade general boating opportunities, for example.

The 2011 CVLP established a goal of allocating 58 to 65 percent of TVA lands as Natural Resource Conservation (suitable for dispersed recreation). As part of TVA's Multiple Reservoirs Land Management Plans EIS, the CVLP allocations were updated. Specifically, the Natural Resource Conservation allocation decreased slightly to a range of 56 to 63 percent. The impacts of continued implementation of the current CVLP and any future decrease or increase in allocations would be the same as described for developed recreation.

Impacts on dispersed recreation as a result of implementing 3- to 5-year action plans are the same as described for developed recreation.

In conclusion, implementation of Alternative B would provide greater benefits to dispersed recreation than Alternative A for the same reasons as described for developed recreation.

3.10.2.7 Cumulative Impacts

Many public lands provide developed and dispersed recreational opportunities in the TVA power service area, including those administered by other federal agencies (e.g., US Forest Service and National Park Service), states, and local governments. Private operators and lands also provide important recreational opportunities where access is permitted. On a regional scale, these diverse lands offer a number of recreational activities and opportunities in addition to those provided by TVA. For example, local park facilities in Tennessee alone offer more than 500 miles of trails (TDEC 2009) and the Cherokee National Forest manages more than 600 miles of non-motorized trails (US Forest Service 2018b). Federal and state public lands often implement programs similar to TVA's NRP to promote recreational opportunities. As a result, when considered in combination with these other actions in the TVA power service area, it is anticipated that Alternatives A and B would have minor cumulative beneficial impacts on most recreational opportunities.

In certain locations, though, TVA fills an exclusive and vital role for recreational opportunities. For example, TVA reservoirs offer unique water-related recreational opportunities not common on other federal, state, or locally managed lands. In these

geographic areas, implementation of NRP programs would have a larger impact on recreational demand and opportunity. Overall, implementation of many of the 2020 NRP programs would have a minor cumulative beneficial impact on recreational demand and opportunities except near TVA reservoirs where the beneficial impacts would be greater. Because Alternative B brings all of TVA's recreation programs into the NRP framework, it would allow for a more cohesive and comprehensive approach to managing recreation and would result in greater beneficial cumulative impacts than Alternative A.

3.11 Natural Areas

3.11.1 Affected Environment

The 2011 Final EIS includes a description of natural areas, which are lands designated for a particular management objective or lands that are known to contain sensitive features or resources, and this description is incorporated into this SEIS by reference. In summary, the TVA natural areas program includes small wild areas, habitat protection areas, wildlife observation areas, and ecological study areas. In addition to natural areas directly managed by TVA, the TVA natural areas program also continues to identify and compile a database of the natural areas in the Tennessee Valley managed by other agencies and landowners. This inventory of areas allows TVA to improve upon our knowledge of the region's natural areas. These include state parks, national parks, conservation easements, Nationwide Rivers Inventory streams, mitigation banks, caves, and wildlife management areas. The 2011 Final EIS stresses that not only are natural areas managed for protection and enhancement of sensitive resources, they are also managed for the enhancement of human use and appreciation, primarily through recreational use. Recreational activities offered at natural areas include hunting, wildlife observation, hiking, and camping. This summary remains accurate today.

The 2011 Final EIS summarizes the characteristics of each type of TVA natural area and outlines their management objectives and a framework for maintaining the integrity of sensitive resources. In total, TVA manages 114 habitat protection areas, 31 Small Wild Areas, five ecological study areas, and six wildlife observation areas (TVA 2011b). Since publication of the 2011 Final EIS, three new TVA natural areas have been created, all of which are Habitat Protection Areas on Kentucky Reservoir.

TVA continues to conduct annual monitoring of natural areas, prioritizing specific areas with sensitive resources of concern (e.g., Habitat Protection Areas with large-flowered skullcap), and assessing areas on a rotational basis to monitor resources or identify needs.

Since the TVA natural areas program has expanded its natural heritage database to include natural areas managed by other agencies and landowners, it has grown to contain more than 3,000 natural areas Valley-wide. However, natural areas not directly managed by TVA are not subject to the NRP. Natural areas managed by TVA (e.g., Small Wild Areas, habitat protection areas, ecological study areas, and wildlife observation areas) are a small percentage of the natural areas in the Tennessee Valley.

There are many factors that affect the condition of TVA natural areas. These factors are summarized in the 2011 Final EIS and remain largely unchanged. Catastrophic natural events and human disturbance (littering, illegal dumping, high impact recreation, etc.) can eliminate plant and animal populations and destroy aesthetic qualities.

There are also a host of management issues that TVA contends with regarding its natural areas. These issues are described in the 2011 Final EIS and continue to be issues faced by TVA. They include frequency of monitoring, lack of management plans, invasive species, vegetation management, trail maintenance, boundary marking and signage, maintenance of facilities, gates and barriers, litter and dumping, improper use, and adjacent land use and encroachment.

Approximately 19 TVA natural areas, mostly Small Wild Areas, feature trails for low-impact public recreation. In order to maintain these natural areas to accommodate members of the public, it is necessary for TVA to engage in a variety of trail maintenance activities such as tree removal, hand railing and step repairs, and the installation of erosion control devices.

3.11.2 Environmental Consequences

3.11.2.1 Alternative A

The 2011 NRP includes the following resource areas that oversee programs and activities related to natural areas: Biological Resources, Recreation Management, and Reservoir Lands Planning.

Specific programs and activities addressing natural areas within those resource areas include:

- TVA Sensitive Resources Data Management
- Comprehensive Valleywide Lands Plan
- Dispersed Recreation Management
- Trails Management

Under the No Action Alternative, TVA would continue to implement the Natural Areas program in accordance with the 2011 NRP. In the 2011 EIS, TVA concluded that there would be beneficial impacts for those natural areas where a management plan is developed. In general, conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative remain accurate. TVA has monitored and assessed many of its natural areas in accordance with the goals of the 2011 NRP but has fallen short of its goal to draft and implement approximately 15 natural area management plans annually. As a result, most do not have an area-specific management plan. Therefore, management of the natural areas is not as efficient and effective as desired. This could result in deterioration of some or all natural areas to the extent that these areas are no longer suitable to be characterized for the scenic, aesthetic, and exemplary biological values that define them.

TVA would continue to utilize the Natural Heritage database to add new information and update and maintain natural areas records in support of environmental reviews and planning purposes, particularly to support TVA's reservoir land management decisions. Data sharing through formal exchanges with other federal and state resource agencies would continue under this alternative. The management of natural areas would continue to benefit from the use of the database.

The process of designating new natural areas or removing current natural areas from the program via the reservoir lands planning process would continue. No potential direct impacts to existing TVA natural areas are anticipated as a result of designation and removal through the reservoir lands planning process. However, opportunities to designate new natural areas may be limited because RLMPs are updated infrequently.

In conclusion, there would continue to be beneficial impacts for those natural areas where a management plan is developed and continued potential for degradation of other natural areas due to lack of active management.

3.11.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to natural areas: Land and Habitat Stewardship, Nuisance and Invasive Species Management, Public Land Protection, Recreation, and Reservoir Lands Planning.

Specific programs and activities addressing natural areas within these focus areas include:

- Sensitive Resources Data
- Nonnative Invasive Plant Management on TVA Lands
- Public Land Rules, Regulations, and Enforcement
- Dispersed Recreation Management
- Trails Management
- Comprehensive Valleywide Lands Plan

The 2020 NRP includes additional programs and activities regarding natural areas that have been ongoing outside of the NRP framework. In general, this expansion of programs and activities would not result in measurable changes to TVA natural areas or how TVA manages its natural areas.

The 3- to 5-year action plans would provide a more flexible and effective response to emerging natural areas issues and opportunities because they would allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on natural areas.

In conclusion, when compared to Alternative A, there would be minor additional benefits to natural areas. While many of the program additions are administrative in nature (i.e., the programs themselves are longstanding and traditionally have been implemented outside of the NRP itself), the action plans could provide additional benefits over the long term.

3.11.2.3 Cumulative Impacts

A wide variety of natural areas in the Tennessee Valley are owned and/or managed by various state and federal agencies, local governments, private operators, and non-profits. On a regional scale, these diverse lands not only offer protection and enhancement of sensitive resources, but they also provide opportunities for human use and appreciation. TVA natural areas and those managed by other agencies and organizations in the region form an environmentally significant collection of resource areas that protect and enhance the environment. TVA's development of a natural areas database also has potential to improve the protection of these areas, improving TVA's understanding of resources potentially affected by its actions.

As described above, natural areas on TVA lands represent a small percentage of all natural areas in the TVA power service area. As such, the continued management of TVA natural areas under Alternative A or B would result in minor, beneficial cumulative impacts. These impacts would not be fully realized in site-specific locations where management plans are not developed or where TVA is unable to actively manage a natural area.

3.12 Land Use

3.12.1 Affected Environment

Since its establishment by Congress in 1933, the public has entrusted TVA to manage its land and reservoir resources in a manner to provide multiple benefits to the people of the Tennessee Valley and to serve as a responsible steward of the Tennessee River System. These land and reservoir resources that fall under the care of TVA include a 41,000 square-mile watershed, 293,000 acres of reservoir land, 11,000 miles of reservoir shoreline, and thousands of miles of off-reservoir streams and rivers that span a seven-state region. TVA has a duty to manage these resources wisely for present and future generations. People throughout the Valley and visitors highly value these public lands and waters.

TVA manages the use of these lands and shorelines in a way that aligns with the purposes of the TVA Act. TVA developed regulations to implement Section 26a, the Shoreline Management Policy, and the Land Policy to manage the use of reservoir lands and waters under its control. As stewards of these critically important resources, TVA's policy is to manage its lands to protect the integrated operation of the TVA reservoir and power systems, to provide for appropriate public use and enjoyment of the reservoir system, and to provide for continuing economic growth.

Section 26a

On October 22, 1971, TVA promulgated regulations setting forth the Section 26a review and approval process. This section of the TVA Act is designed to ensure that construction along the shoreline and in the waters of the Tennessee River does not adversely impact or compromise TVA's ability to manage the river system. Section 26a provides that no dam, improvements, or other obstruction affecting navigation, flood control, or public lands or reservation will be constructed or operated without review and approval.

TVA implements Section 26a through its Shoreline Management Policy and Section 26a regulations. The Shoreline Management Policy was developed to address growing public concern surrounding how increases in residential shoreline development would affect shoreline resources and uses. The policy allows environmentally responsible development of the shoreline where residential access rights already exist and preserves public benefits along shorelines where residential access rights do not exist. TVA tries to balance residential shoreline development, recreational use, and resource conservation needs in a manner that maintains quality of life and other important values provided by its reservoir system. In 2003, the Section 26a regulations were updated to include the Shoreline Management Policy as well as permitting requirements for other non-residential uses.

Applications for shoreline construction are required for, among other things, boat docks, piers, boathouses, boat-launching ramps, shoreline stabilization, dredging, and floating cabins. TVA reviews approximately 1,500 construction permits each year, and approximately 85 percent of these reviews are for residential development. Section 26a approvals are federal actions and therefore, TVA addresses environmental impacts of each permit approval under NEPA and other federal laws.

Land Use

In 2006, the TVA Board approved its Land Policy, which provides for the public use and enjoyment of the reservoir system as well as for economic growth in the Valley. The Land Policy governs the planning, retention, and disposal of TVA land or interests in land. It

provides guidance for sustainable management of the public lands and associated resources.

The object of TVA's Land Policy is to preserve the reservoir lands under its control in public ownership. Under this land policy, TVA considers requests for a variety of land use actions. In some rare instances, transferring lands from TVA control to another entity is justified because of the significant public benefit. Each year, TVA reviews approximately 25 major reservoir property actions. These actions involve the sale or disposal of TVA's land or land rights, or easements on TVA lands. Examples of these actions include providing easements to municipalities and agencies for construction of public infrastructure, such as water lines, community docks, bridges, culverts, or roads; or private entities for commercial marinas, barge terminals and mooring cells, utility crossings, wastewater discharges, water intakes, sewage outfalls, dredging, placement of fill, and others. Land use agreements such as a fee sale or an easement provide the agreement holder the necessary rights for use of TVA property for industrial uses, commercial recreation, and/or public utilities. TVA must consider the effects of land uses on the environment while also complying with applicable laws and regulations.

In addition to grants of interests in real property, staff also reviews requests for licenses of TVA land for various purposes, including agricultural use, commercial recreation activities, industrial uses, public infrastructure (e.g., boat docks, piers, boathouses, fences, steps, and others), and special events. Special events, such as national fishing tournaments and local sporting events, support economic development and tourism in many communities in the Tennessee Valley.

3.12.2 Environmental Consequences

3.12.2.1 Alternative A

The 2011 NRP did not specifically address Section 26a regulations and land use as a separate resource area. Land use was generally discussed under various individual programs (e.g., Sustainable Land Use) and the 2011 Final EIS focused on land use zone allocations and potential impacts. Under Alternative A, TVA would continue to conduct environmental reviews to address site-specific issues prior to the approval of any proposed activity on lands under its control. Future activities and land uses would continue to be guided by the TVA Land Policy and other relevant policies as well as compatibility with surrounding land uses. Due to TVA's land use policies and project approval process, the potential for adverse effects is minimized.

3.12.2.2 Alternative B

The 2020 NRP proposes Section 26a Agreements as a Focus Area which supports TVA's goal of protecting the shoreline of the Tennessee River watershed while supporting recreational access to the waters and optimizing the land for the best public use. The Section 26a and Land Use Agreements Focus Area includes two programs which align the NRP more consistently with how TVA manages the natural resources of the Tennessee Valley:

- Section 26a and Land Use Implementation
- Section 26a and Land Use Stakeholder Education and Communication

TVA will continue to apply the Section 26a regulations in accordance with Section 26a of the TVA Act, TVA's Land Policy, and associated regulations and guidelines. This program

helps balance resource conservation, sustainable economic development, and recreation opportunities. TVA will continue to ensure compliance with Section 26a permits and land use agreements through shoreline and land inspections. TVA will also continue to evaluate and develop permitting and land use agreement procedural efficiencies and establish clear and meaningful policies, rules, and procedures.

Implementation of TVA's land use policies ensures a consistent management and best use of TVA land for commercial and public recreation, industrial development, agricultural use, public infrastructure, and public events. The land use approval process balances public access while protecting natural and cultural resources and TVA's management of the river system. The program will support community development and growth. TVA will ensure compliance with Section 26 permits and land use agreements through shoreline and land inspections. As part of this program, TVA will continue to evaluate, develop, and implement permitting and land use agreement procedural efficiencies and continue to establish and maintain clear policies, rules, and procedures. Section 26a and Land Use Implementation is anticipated to have a beneficial impact on sustainable public and private development opportunities while encouraging protection of natural and cultural resources.

TVA will engage in stakeholder outreach and communication regarding Section 26a, the Land Policy, and associated regulations and guidelines. Stakeholders include government entities, lakefront property owners, realtors, dock builders, recreational users, and industrial and commercial entities. TVA will use outlets, such as the TVA website, to provide user-friendly information for stakeholders regarding permitting and land use. To increase awareness of these policies, regulations, and guidelines, TVA will conduct stakeholder outreach workshops and campaigns.

Section 26a balances competing demands to provide public access to the reservoir while protecting natural and cultural resources and TVA's management of the river system. It provides guidance to support appropriate uses.

Section 26a and land use stakeholder education and communication efforts are expected to improve partnerships, increase public awareness concerning how land and shoreline use impact the environment and TVA's management of the reservoir system, as well as improve understanding and compliance with TVA's permitting and land use requirements. This education and communication program is anticipated to benefit implementation of TVA's land use policies as well as the public affected by land use decisions.

3.12.2.3 Cumulative Impacts

Under both alternatives, residential and commercial development of privately owned lands adjacent to the TVA reservoirs would continue, as would development of the TVA-managed residential access shorelands. This could result in adverse cumulative impacts to land use at individual reservoirs, but the potential is minimized due to the Section 26a and other land use approval process.

3.13 Prime Farmland

3.13.1 Affected Environment

The FPPA (7 US Code [USC] 4201 et seq.) promotes conservation of farmland soil and discourages the conversion of prime farmland soil to non-agricultural uses. The 2011 Final EIS describes how the FPPA requires all federal agencies to evaluate the impacts to prime farmland and farmland of statewide or local importance prior to conversion of the land to a

use incompatible with agriculture. The 2011 Final EIS also describes designations of farmland of statewide and/or local importance in Georgia, Kentucky, North Carolina, Tennessee, and Virginia. For the seven states comprising the TVA power service area, the 2011 Final EIS provides a summary of the declining number of farms, average farm size, and the number of acres of farmland protected by the FPPA by state and in areas surrounding TVA reservoirs (Table 3-10).

Table 3-10. Historical Prime Farmland Trends

State	1982	1992	2002	2012	2015	Loss by State (1982-2015)
Alabama	6,909	6,798	6,527	6,428	6,412	497
Georgia	7,552	7,385	7,105	6,999	6,999	553
Kentucky	5,576	5,477	5,313	5,263	5,253	323
Mississippi	9,683	9,537	9,368	9,274	9,260	423
North Carolina	6,998	6,715	6,371	6,249	6,223	775
Tennessee	5,774	5,623	5,422	5,340	5,319	455
Virginia	4,706	4,567	4,402	4,315	4,293	413
				Total TVA Region Loss		3,439

Source: USDA 2018

Approximately 22 percent of TVA's power service area is classified as prime farmland (not including approximately 20 counties for which soil survey information is incomplete or not available). An additional 4 percent of TVA's power service area would be classified as prime farmland if drained or protected from flooding (USDA 2018).

The 2011 Final EIS reported a decline in the average size of farms and a growth in the number of farms. However, it appears that this trend has reversed. More recent USDA data reveals that between 1982 and 2012, the average size of farms has increased 6.3 percent while the number of farms has decreased 14.7 percent (TVA 2019b).

3.13.2 Environmental Consequences

3.13.2.1 Alternative A

The 2011 NRP includes the following Resources Areas that oversee programs and activities relevant to prime farmland: Biological Resources, Cultural Resources, and Public Engagement.

Specific programs and activities addressing prime farmland within those resource areas include:

- Land Condition Assessment and Land Stewardship Maintenance
- Grasslands and Agricultural Lands Management
- Forest Resource Management
- Wildlife Habitat Enhancement Partnerships
- Terrestrial Greenhouse Gas Sequestration Management
- Archaeological Monitoring and Protection

Implementation of most of these programs is ongoing but unlikely to be completed within the 20-year timeframe of the 2011 NRP.

Under the No Action Alternative, TVA would continue to manage these programs in accordance with the 2011 NRP and continue to follow the FPPA's coordination requirements when considering development in areas that include prime farmland. In the 2011 Final EIS, TVA concluded that there would be beneficial impacts from programs and activities that enhance soil quality or provide support to local and regional agricultural services. The 2011 Final EIS also identified indirect beneficial impacts from land stewardship assessments and enhancement partnerships. TVA would continue to manage agricultural licensing and cooperative agreements, which protect and enhance soil quality, as well as provide support to local and regional agricultural services.

There would continue to be minor adverse impacts associated with the permanent conversion of prime farmland to nonagricultural uses. For projects where the potential for conversion of prime farmland exists, TVA would conduct site assessments and continue to use the Farmland Conversion Impact Rating form (AD 1006). TVA would consider modifications and other minimization measures to projects exceeding prime farmland impact thresholds.

In general, conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative as TVA's NRP remain generally accurate and the 2011 NRP has provided a primarily beneficial framework for managing prime farmland.

In conclusion, under Alternative A, TVA would continue to successfully implement most programs and activities identified in the 2011 NRP that affect prime farmland. The blended management approach would continue, which would benefit prime farmland through continued implementation of programs and partnerships that conserve prime farmland. Although some prime farmland would continue to be converted to nonagricultural uses, these conversions would occur after assessment and coordination under the FPPA and, given the general type and scale of development on TVA land, are expected to be minor over the long term.

3.13.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to prime farmland: Land and Habitat Stewardship, Cultural Resources Management, Reservoirs Lands Planning, Public Land Protection, and Section 26a and Land Use Agreements.

Specific programs addressing prime farmland within these focus areas include:

- Grasslands and Agricultural Lands Management
- Forest Resource Management
- Archaeological Monitoring and Protection
- Comprehensive Valleywide Lands Plan
- Comprehensive Land Condition Assessment
- Section 26a and Land Use Implementation

Impacts under Alternative B would be similar to those under Alternative A. TVA would continue to process Section 26a permit applications and conduct environmental reviews that include consideration of impacts on prime farmland. Adverse impacts would occur in localized areas where development converts shoreline that is considered prime farmland into nonagricultural use. However, prime farmland would also continue to benefit from

Section 26a environmental reviews when applicants revise their proposed activities to avoid or minimize adverse impacts on prime farmland surrounding the Tennessee River system. Agreements Focus Area is new to the 2020 NRP, it is a continuation of current TVA management as a stand-alone program. TVA would continue to process Section 26a permit applications and conduct environmental reviews that include consideration of impacts on prime farmland. Adverse impacts would occur in localized areas where development converts shoreline that is considered prime farmland into nonagricultural use. However, prime farmland would also continue to benefit from Section 26a environmental reviews when applicants revise their proposed activities to avoid or minimize adverse impacts on prime farmland surrounding the Tennessee River system.

The 2011 CVLP established a goal of allocating 15 to 18 percent of TVA lands for Sensitive Resource Management and 58 to 65 percent of TVA lands for Natural Resource Conservation. As part of TVA's Multiple Reservoirs Land Management Plans EIS, the CVLP allocations were updated and now constitute 14 to 18 percent for Sensitive Resource Management and 56 to 63 percent for Natural Resource Conservation to more accurately align land use allocations with current and anticipated uses as well as implementing a uniform allocation methodology across TVA lands. Continued implementation of the current CVLP would maintain the percentage of TVA lands that are less likely to be converted to nonagricultural uses. Any future decrease in allocations of lands for Sensitive Resource Management or Natural Resource Conservation may affect the number of acres of prime farmland on TVA land over the long term.

Compared to Alternative A, the incorporation of these programs and activities into the 2020 NRP may provide minor benefits to prime farmland. The greatest beneficial impacts would result from the continued allocation of lands for Sensitive Resource Management and Natural Resource Conservation in the CVLP. The intensity of adverse impacts would vary depending on the location of projects that convert prime farmland to nonagricultural uses, but would likely be minor overall, as the NRP and TVA's obligations under the FPPA would limit farmland conversion.

The 3- to 5-year action plans will provide a more flexible and effective framework but are unlikely to affect the rate of prime farmland converted to nonagricultural uses unless they contain specific projects that would prevent farmland conversion. Depending on the type and location of activities, there could be minor beneficial impacts on prime farmland.

In conclusion, the programs in Alternative B relevant to prime farmland are similar to the continuation of the current management practices under Alternative A but would provide minor additional beneficial impacts through the inclusion of additional focus areas and 3- to 5-year action plans in the NRP. Overall, both beneficial and adverse impacts are expected to be minor.

3.13.2.3 Cumulative Impacts

The number of acres of prime farmland in the seven states comprising the TVA power service area declined 13.7 percent from 1982 to 2015 (USDA 2018). The conversion of farmland to residential and other nonagricultural uses will likely continue over the next 20 years, with the rate contingent upon local ordinances and local and regional economic conditions. Because permanent conversion of prime farmland on private land is not subject to coordination under the FPPA, it is likely to be a larger driver of future decreases compared to prime farmland on federal land. As a result, at a regional scale, implementation of Alternative A or B would have negligible impacts on prime farmland.

3.14 Visual Resources

3.14.1 Affected Environment

The 2011 Final EIS includes a description of the criteria by which TVA measures visual resources that is incorporated into this SEIS by reference. In summary, a number of natural features and human alterations contribute to the aesthetic quality and character of a landscape. The evaluation of the extent and magnitude of potential changes in the visual environment that would result from a proposed action is typically based on the following criteria:

- The scenic and aesthetic character of the existing landscape
- The degree of discernible contrast between the proposed action and existing landscape
- The location and sensitivity levels of viewpoints available to the public
- The visibility of the proposed action from the public's viewpoint
- Any potential cumulative change to the visual landscape

TVA utilizes classification criteria adapted from the US Forest Service scenic management system and integrated with planning methods used by TVA. As part of this classification criteria, four categories of visual attributes are evaluated to determine the overall scenic value of an area and are described below.

- Scenic attractiveness is the measure of outstanding natural features, scenic variety, seasonal change, and strategic location
- Scenic integrity is the measure of visual unity and wholeness of the natural landscape character
- Human sensitivity is the expressed concern for the scenic qualities of the project area
- Viewing distance is the measure of how far an area can be seen by observers and the degree of visible detail

The 2011 Final EIS includes a description of TVA lands and areas of jurisdiction, including dam reservations, power plant sites, reservoirs, and tracts of land adjacent to reservoirs that range in size from tenths of an acre to several hundred acres. Because the scenic features of the landscape are not limited by land boundaries, landscape character extends across TVA lands and other public and private lands alike. Large parts of the Tennessee Valley have the characteristics of a scenic, rural countryside.

Since publication of the 2011 Final EIS, the land uses adjacent to existing TVA lands and the visual resources associated with them have not changed or been altered significantly. As described in the 2011 Final EIS, land uses adjacent to TVA lands and areas of jurisdiction are comprised of residential development, public parks, commercial development, and sporadic industrial facilities. The wide variety of land uses present throughout TVA's areas of jurisdiction result in differing levels of visual compatibility depending on the type of facility and its integration with the surrounding scenic resources.

The 2011 Final EIS describes reservoirs as offering a variety of scenic features in the form of the water bodies themselves as well as the surrounding vegetation while also heavily emphasizing the dynamic qualities reservoirs often have that can change their scenic integrity and compatibility with the surrounding landscape depending on the time of year or operating plan (e.g., lower winter pool levels may result in the exposure of reservoir

bottoms and flats). It is noted that dam reservations often visually contrast with the land that border them, as they appear predominately industrial. Similarly, power plant sites are also associated with industrial structures including transmission towers and lines, smokestacks, and cooling towers and would contrast significantly to residential development, public parks, or other rural lands.

The various combinations of development and land use patterns that are present in the viewed landscapes surrounding TVA lands ultimately contribute to the overall visual character of the area.

3.14.2 Environmental Consequences

3.14.2.1 Alternative A

The 2011 NRP includes the following Resources Areas that oversee programs and activities relevant to visual resources: Biological Resources, Recreation Management, and Water Resources.

Specific programs and activities addressing visual resources include:

- Wildlife Habitat Enhancement Partnerships
- Boundary Maintenance
- Comprehensive Valleywide Lands Plan
- Land Condition Assessment and Land Stewardship Maintenance
- Reservoir Shoreline Stabilization/Riparian Management Program
- Dispersed Recreation Management

TVA has begun implementing these programs and activities, but it is unlikely to be complete within the 20-year timeframe of the 2011 NRP.

Under Alternative A, TVA would continue implementing these programs and activities as under the 2011 NRP. In the 2011 Final EIS, TVA concluded that implementation of the Blended Management alternative would result in localized improvement in the scenic quality of TVA lands.

Although not specifically analyzed in the 2011 Final EIS, continued implementation of the Reservoir Shoreline Stabilization/Riparian Management program would result in short-term adverse impacts on visual resources through the use of tools such as bioengineering, geotextiles, and rock riprap. However, long-term impacts would be beneficial because this program would restore and maintain a more natural landscape.

The 2011 CVLP established a goal of allocating 15 to 18 percent of TVA lands for Sensitive Resource Management, 58 to 65 percent for Natural Resource Conservation, and 5 percent for Shoreline Access. As part of TVA's Multiple Reservoirs Land Management Plans EIS, the CVLP allocations were updated, with Sensitive Resource Management at 14 to 18 percent, Natural Resource Conservation at 56 to 63 percent, and Shoreline Access at 5 to 6 percent to more accurately align land use allocations with current and anticipated uses as well as implementing a uniform allocation methodology across TVA lands. Continued implementation of the current CVLP would maintain the percentage of TVA lands allocated for uses that would likely maintain aesthetic quality and scenic character of natural and/or sensitive landscapes over the long term. Any future decrease or increase in allocations in

Sensitive Resource Management or Natural Resource Conservation may affect TVA's ability to protect these visual resources over the long term.

Conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative remain largely accurate, as these programs have improved scenic quality in some locations, but their full implementation is not likely to be complete within the 20-year timeframe of the 2011 NRP. This would continue to prevent the full realization of beneficial impacts and, where programs are not fully implemented, may result in localized adverse impacts if the aesthetic quality and scenic character of specific landscapes is allowed to degrade.

3.14.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to visual resources: Land and Habitat Stewardship, Public Land Protection, Recreation, and Section 26a and Land Use Agreements.

Specific programs and activities addressing visual resources within these focus areas include:

- Wildlife Habitat Enhancement Partnerships
- Property Management
- Land Condition Assessment and Land Stewardship Maintenance
- Dispersed Recreation Management
- Floating Cabins
- Comprehensive Valleywide Lands Plan
- Section 26a and Land Use Implementation

Many of these programs are a continuation of current management under Alternative A. For example, TVA would continue engaging in partnerships with several agencies to improve habitat and increase wildlife-oriented recreational opportunities on TVA lands. These partnerships are used for developing and implementing techniques to restore productive wildlife habitat and further maintaining a sense of scenic integrity on these lands. Likewise, continued boundary maintenance and land condition assessment are important components to protecting the scenic attractiveness and integrity of an area, as the main focus of these programs is to establish and maintain TVA's property boundaries to help reduce encroachments, protect natural resources, and improve conditions of land through continued stewardship activities.

Dispersed recreation improvements would continue to offset the adverse visual impacts of activities. Improvements include litter removal, planting native vegetation, and potentially rezoning dispersed recreational sites to developed recreational areas so as not to further impact the scenic integrity of an area. Developed recreation areas would often confine adverse visual impacts to a more defined area than dispersed recreation areas.

Although new to the NRP, TVA has been processing Section 26a permit applications and land use agreements for decades. These have the potential to affect visual resources in localized areas, most notably by changing the scenic character of shorelines from natural to developed. Continued adherence to TVA's permit review process, which includes an environmental review addressing multiple resources including visual resources, would minimize adverse effects.

Impacts from implementing the CVLP would be the same as described under Alternative A.

The 3- to 5-year action plans will provide a more flexible and effective response to emerging visual resource issues because TVA will adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on aesthetic quality and visual character of localized areas.

In conclusion, implementation of Alternative B would provide minor additional beneficial impacts compared to Alternative A. This is primarily because the 3- to 5-year action plans provide a more appropriate structure under which programs benefitting visual resources would be implemented more successfully. Also, TVA's Section 26a and Land Use Implementation Program evaluates and seeks to minimize impacts, including on visual resources, during the permitting and land use agreement process.

3.14.2.3 Cumulative Impacts

Past, present, and reasonably foreseeable future actions affecting visual resources include conversion of natural or rural areas to residential, commercial, and industrial uses; local, state, and other federal conservation plans that preserve landscapes; development along reservoir shorelines; and continued development of infrastructure including power lines and roads. Viewpoints on TVA reservoirs would be most affected by uses on surrounding TVA, private, and other federal (e.g., US Forest Service) lands.

Collectively, these actions would have a greater impact on visual resources than implementation of the NRP under Alternative A or B. This is because they have the potential to affect a much larger number of landscapes and viewpoints and because the programs and activities in Alternatives A and B are largely a continuation of current TVA actions.

In the 2011 Final EIS, TVA forecasted that cumulative adverse impacts to visual resources resulting from residential and commercial development would be likely to continue. This assessment is still accurate but it does not account for the beneficial impacts resulting from conservation efforts occurring on private and public land throughout the TVA power service area. Resource management plans for state lands, local parks, and other federal agencies (e.g., National Park Service, US Forest Service, and USFWS) often include objectives and actions to benefit visual resources by preserving landscapes and viewpoints. These actions are consistent with the programs and activities in the 2011 and 2020 NRPs and would continue to occur under both alternatives.

In conclusion, the implementation of Alternative A or B would have minor beneficial cumulative impacts on visual resources because both alternatives are largely a continuation of current TVA programs.

3.15 Navigation

3.15.1 Affected Environment

As described in the 2011 Final EIS, TVA operates the Tennessee River and its tributaries as an integrated system for the purposes of navigation, flood control, and power production, which is consistent with the public benefits within the region (TVA 2011b). TVA has been involved with water resources planning and system integration since the creation of the agency in 1933 and the construction of the Tennessee River navigation channel in 1945.

The 2011 Final EIS describes the Tennessee River's role as part of the nation's Inland Waterway System, along with the Mississippi, Missouri, Illinois, and Arkansas rivers. The construction of the Tennessee River navigational channel included the construction of a series of 10 dams and navigation locks, which helped create an extensive commercial navigation network. As a result, the Tennessee River is an integral part of the interconnected 12,000-mile National Inland Waterway System. The navigation of commercial watercraft is an important resource management consideration in the region.

The Tennessee River's main navigable channel originates approximately one mile above Knoxville, Tennessee and extends approximately 652 miles to its convergence with the Ohio River at Paducah, Kentucky. Commercial navigation also extends into the following three major tributaries: 61 miles up the Clinch River, 29 miles up the Little Tennessee River, and 22 miles up the Hiwassee River (TVA 2018).

According to modern estimates, the navigational channel supports travel by over 28,000 barges annually and carries 45 to 50 million tons of goods up and down the Tennessee River (TVA 2018). As reported in the 2011 Final EIS (using data from 2007), annual waterborne commerce on the Tennessee River system totaled 49.6 million tons.

River freight is supported by approximately 185 public- and private-use terminals within the Tennessee River Valley. Public-use terminals are designed to support shipment of a broad range of commodities and they actively solicit business from a multitude of shippers, while private-use terminals are designed for the specific needs of their owners and are usually designed to support shipment of single types of products, such as coal, grain, or liquid chemicals. Port locations are largely determined by centers of industrial activity, with the Port of Decatur in Decatur, Alabama, being the busiest of the urban ports. Other major ports in the Tennessee River Valley include Paducah and Calvert City, Kentucky; Florence, Muscle Shoals, and Guntersville, Alabama; and Chattanooga and Lenoir City, Tennessee (TVA 2018; Tennessee River Valley Association 2014).

The original 1999 Tennessee River Waterway Management Plan and 2014 update were jointly prepared by the marine industry, US Coast Guard, US Army Corps of Engineers, and TVA. The goal of the plan is to serve as a guide for agency officials, operational planners, local emergency management agencies, and the marine industry during natural disasters, high or low-water events, spills, lock closures, or construction projects (TVA 2018; TRVA 2014). The 2014 update focused on the safe and orderly movement of barge traffic during navigation emergencies within the Tennessee River system.

Navigational operations and land use on and adjacent to existing TVA lands have not been significantly changed or altered since publication of the 2011 Final EIS.

3.15.2 Environmental Consequences

3.15.2.1 Alternatives A and B

Under the No Action Alternative, TVA would continue to implement the 2011 NRP. The 2011 NRP did not address TVA's Section 26a efforts or Land Use as a separate resource area, though these programs have been implemented for decades. Protection of navigable waterways within the region are established under Section 26a of the TVA Act, and TVA would continue to conduct Section 26a reviews to ensure the construction of water use facilities does not encroach upon the commercial navigation channel or marked recreational channels. Under this alternative, TVA would continue to manage Section 26a reviews

separate from the NRP itself. Consequently, the conclusion in the 2011 Final EIS that there would be no direct impact on commercial navigation remains accurate.

Impacts would be the same under Alternative B because TVA would continue to conduct Section 26a reviews to ensure the construction of water use facilities does not encroach upon the commercial navigation channel or marked recreational channels.

3.15.2.2 Cumulative Impacts

As described in the Affected Environment section, the geographic scope of analysis for navigation includes the Tennessee River's main navigable channel from approximately one mile above Knoxville, Tennessee to its convergence with the Ohio River at Paducah, Kentucky approximately 652 miles downstream. It also includes the following three major tributaries: 61 miles up the Clinch River, 29 miles up the Little Tennessee River, and 22 miles up the Hiwassee River.

Past, present, and reasonably foreseeable future actions with the potential to affect commercial navigation in this area include continued implementation of TVA infrastructure and related laws, regulations, and policies; the continued involvement of other federal agencies including the US Army Corps of Engineers and US Coast Guard; and continued use of the Tennessee River and its major tributaries by industry for transportation and other commercial uses.

Due to the importance of commercial and recreational navigation to these federal agencies' missions and the relatively unchanging tonnage of waterborne commerce, it is expected that cumulative impacts to navigation will be unchanged from the 2011 Final EIS and that there will continue to be no adverse impacts on navigation as the result of implementing either alternative in combination with other past, present, and reasonably foreseeable future actions.

3.16 Socioeconomics and Environmental Justice

3.16.1 Affected Environment

Depending on availability, the census data in this section derive from the US Census Bureau 2010 decennial census (2010 Census) or the 2010 – 2017 estimates of the US Census Population Estimates Program (2010 and 2017); these data were obtained utilizing the US Census American FactFinder and TIGER Products (taken from TVA 2019b).

3.16.1.1 Population

The 2011 Final EIS includes an overview of regional population and trends that is incorporated into this SEIS by reference. Specifically, the 2011 Final EIS describes the population of the TVA region as having increased by 10.9 percent from 2000 to 2010 and by 15.5 percent from 1990 to 2000. Although the growth rate had slowed, the 2011 Final EIS notes that it exceeds the national average for both decades. The population within the TVA region was projected to increase 8 percent by 2020 and 17 percent by 2030 (TVA 2011b).

The 2011 Final EIS identified 16 population centers within the region that are concentrated along the Tennessee, French Broad, Cumberland, and Tennessee rivers. According to 2009 US Census estimates, these 16 metropolitan areas account for 62.4 percent of the total population. Finally, the 2011 Final EIS described low population density on the

Cumberland Plateau in Tennessee, along the Tennessee River in western Tennessee, in Mississippi, and in western North Carolina (TVA 2011b).

The regional population has continued to grow from 2010 to 2017 (Table 3-11), though at a slower rate than the country or broader southern region. Based on TVA estimates, the annual rate of population growth in the TVA power service area is expected to decline to about 0.5 percent by 2043. The TVA power service area is also expected to continue to become more urban: the percentage of the population living in metropolitan areas is increasing and is projected to continue increasing in the future.

Table 3-11. Population Data Summary

Area	2010 Population[a]	2017 Population[b]	% Increase 2010 – 2017	% of TVA Svc. Area Pop., 2017
United States	308,745,538	325,719,178	5.3	--
Division 6	18,459,846	19,719,178	3.1	--
TVA Service Area	9,810,629	10,246,104	4.4	--
Metropolitan Statistical Areas in TVA Power Service Area				
Bowling Green, KY	159,309	174,835	9.7	1.7
Chattanooga, TN-GA	529,196	556,548	5.2	5.4
Clarksville, TN-KY	261,619	285,042	9.0	2.8
Cleveland, TN	115,913	122,317	5.5	1.2
Dalton, GA	142,315	144,440	1.5	1.4
Decatur, AL	153,949	151,867	-1.4	1.5
Florence-Muscle Shoals, AL	147,260	147,038	-0.2	1.4
Huntsville, AL	419,279	455,448	8.6	4.5
Jackson, TN	130,031	129,235	-0.6	1.3
Johnson City, TN	199,010	202,053	1.5	2.0
Kingsport-Bristol-Bristol, TN-VA	309,494	306,659	-0.9	3.0
Knoxville, TN	838,748	877,104	4.6	8.6
Memphis, TN-AR	1,326,280	1,348,260	1.7	13.2
Morristown, TN	114,219	118,081	3.4	1.2
Nashville- Davidson-Murfreesboro-Franklin, TN	1,675,757	1,903,045	13.6	18.6
TVA MSA TOTALS	**6,522,379**	**6,921,972**	**6.1**	**67.6**

Sources:
[a] Population Estimates Program 2010
[b] Population Estimates Program 2017

3.16.1.2 Employment

The 2011 Final EIS identified employment for the TVA region at 53.5 percent in 2009. Manufacturing accounted for 10.4 percent, higher than the national average of 7.1 percent. Manufacturing exceeded 20 percent of employment in some rural counties. Following the national trend, manufacturing employment declined 30 percent from 1999 to 2009 (TVA 2011b). These trends are considered likely to continue.

The 2011 Final EIS also identified farming employment as higher in the study area (2.8 percent) than the national average (1.5 percent), although much of it is part-time farming accounting for less than 1 percent of total income in the 2011 study area. In Tennessee, the average net cash farm income per farm was one tenth of the national average (TVA 2011b).

The conditions and trends described in the 2011 Final EIS have largely continued. The 2016 American Community Survey (ACS) lists the top three employment industries as 1) educational services, healthcare, and social assistance industries; 2) manufacturing; and 3) retail trades. Manufacturing continues to be an important employment sector and now accounts for 15 percent of the civilian working population; the 2016 ACS confirms a declining trend in manufacturing in the TVA Area, South region, and the United States as a whole.

3.16.1.3 Income

The 2011 Final EIS describes the 2009 per capita income in the 2011 TVA study area as 18 percent below the national average. In 2009, income varied across the study area ranging from 135 percent of the national average in Williamson County, Tennessee to 48 percent of the national average in Hancock County, Tennessee. Following the national trend, higher per capita income was typically associated with metropolitan areas where higher incomes are paired with higher cost of living (TVA 2011b).

Based on November 2018 US Bureau of Economic Analysis estimates derived in part from US Census data, per capita income in the TVA power service area is $42,578. This was approximately 1.9 percent higher than the Division 6 per capita income ($41,766) and 17.6 percent lower than that of the United States as a whole ($51,640). However, there was wide variation within the TVA power service area. Three counties, all in Tennessee, had incomes above the national average, in descending order: Williamson County, Davidson County, and Fayette County. Williamson and Davidson counties are within the Nashville metropolitan area. Fayette County is within the Memphis metropolitan area. Per capita income was below that in Division 6 and the nation in 166 counties and two independent cities in the TVA power service area, reflecting that higher per capita income concentrates in a few areas in the TVA power service area.

3.16.1.4 Low Income Populations

The 2011 Final EIS describes the 2009 poverty level for the study area as 17.4 percent, or 3.1 percent higher than the national average. Poverty levels were higher in the western portion of the study area and in counties along the Tennessee-Kentucky border. Metropolitan areas had relatively low poverty levels (TVA 2011b).

Based on the 2016 ACS, 19.7 percent of the TVA power service area population is living below the poverty level.

3.16.1.5 Minority Populations

The 2011 Final EIS identified minorities as constituting 22.2 percent of the study area population according to 2010 US Census figures. This is lower than the 2010 national average (36.3 percent). Minority population is unevenly distributed within the 2011 Final EIS study area, with a greater minority concentration in the western part of the study area and in metropolitan areas (TVA 2011b).

Based on 2016 ACS data, the minority population accounts for 21.3 percent of the TVA power service area. Eight counties have a minority population exceeding 50 percent (Haywood and Shelby counties, Tennessee; and Clay, Kemper, Marshall, Noxubee, Panola, and Tallahatchie counties, Mississippi; Table 3-12). An additional 31 counties have a minority population greater than the TVA power service area average.

Table 3-12. Counties in the TVA Service Area with Minority Populations Exceeding 50 Percent

Area	2016 Population	2016 Minority %	% African American	% Am. Indian / AK Native	% Asian	% Native Hawaiian / Other Pacific Islander	% Some Other Race	% Hispanic
Division 6	18,790,354	25.3	21.4	1.0	1.7	0.1	1.3	4.0
TVA Service Area	10,042,431	21.3	17.0	1.1	1.8	0.1	1.2	5.2
Noxubee County, MS	11,098	69.9	69.2	0.5	0.0	0.0	0.2	4.0
Kemper County, MS	10,128	64.5	60.8	3.7	0.0	0.0	0.0	1.5
Tallahatchie County, MS	14,776	62.3	46.7	0.6	1.6	0.4	13.3	15.2
Shelby County, TN	936,990	60.4	54.2	0.7	2.9	0.2	3.0	6.0
Clay County, MS	20,147	59.5	58.4	0.4	0.7	0.0	0.1	1.3
Haywood County, TN	18,129	54.0	51.1	0.6	0.2	0.5	2.6	4.2
Panola County, MS	34,319	51.5	51.0	0.2	0.1	0.1	0.2	1.6
Marshall County, MS	36,196	50.8	48.4	0.7	0.1	0.0	1.8	3.4

Source: 2016 ACS Demographic Profile 05

There are state-designated tribal statistical areas considered part of the minority population in Jackson, Cullman, Lawrence, Madison, and Marshall counties, Alabama (US Census 2012).

3.16.2 Environmental Consequences

The study area utilized for this section is the TVA power service area. This is consistent with other recent TVA environmental reviews and captures the area where direct and indirect impacts associated with implementing either alternative are expected to occur. The TVA power service area consists of 180 counties, including all Tennessee counties and portions of Alabama, Georgia, Kentucky, Mississippi, North Carolina, and Virginia.

3.16.2.1 Alternative A

The 2011 NRP includes the following Resources Areas that oversee programs and activities related to socioeconomics and environmental justice: Biological Resources, Recreation Management, and Public Engagement.

Specific programs and activities addressing socioeconomics and environmental justice within those resource areas include:

- Grasslands and Agricultural Lands Management
- Forest Resource Management
- Dispersed Recreation Management
- Trails Management
- Management of Campgrounds on Dam or Power Plant Reservations
- Management of Campgrounds off Dam or Power Plant Reservations
- Day-Use Areas on Dam Reservations
- Day-Use Areas off Dam Reservations
- Stream Access Sites
- Tennessee Valley Camp-Right Campground Program
- Dispersed Recreation Management
- Trails Management
- Annual Tours
- Leave No Trace
- Recreation Information Management Boating Density Assessments
- Recreation Design Principles
- Reservoir Lands Recreation Inventory Management
- Environmental Education
- Volunteer Program
- Foundation and Trust Fund

TVA has begun implementing most of the activities in the Biological Resources Management program, though it is not likely that they will be completed within the 20-year life span of the 2011 NRP. Implementation of most Recreation Management programs is ongoing, with many completed or scheduled to be completed within the life span of the 2011 NRP. Finally, implementation of the Public Outreach programs should be completed within the life span of the 2011 NRP except that no steps have been taken to implement the Foundation and Trust Fund Management program.

Under Alternative A, TVA would continue to manage these programs and activities in accordance with the 2011 NRP. In the 2011 Final EIS, TVA identified beneficial impacts related to the quality of visitors' experiences and potential local increases in employment, expenditures, and tax revenues. The scale and magnitude of these impacts was difficult to predict without details such as future development on TVA land.

In general, conclusions in the 2011 Final EIS regarding the environmental impacts of implementing the Blended Management alternative remain largely accurate and the 2011 NRP has provided socioeconomic benefits, largely related to visitor experience and increased expenditures by those visiting and recreating on TVA lands. Beneficial impacts on minority and low-income populations would be more likely to occur in areas where those populations overlap with TVA reservoirs or other facilities.

Beneficial impacts on population, employment, and income would be most likely to continue to occur in localized areas with commercial operators and high levels of developed and dispersed recreation.

Adverse impacts may occur if TVA fails to continue to implement programs or activities that benefit areas with minority and low-income populations.

In conclusion, under Alternative A, TVA would continue to make progress toward implementing most of the programs affecting socioeconomics and environmental justice. Beneficial and adverse impacts from continued implementation of Alternative A would be local and negligible to moderate depending on the type of program.

3.16.2.2 Alternative B

The 2020 NRP includes the following focus areas that oversee programs and activities related to socioeconomics and environmental justice: Ecotourism, Land and Habitat Stewardship, Public Outreach and Information, Recreation, and Reservoir Lands Planning.

Specific programs and activities addressing socioeconomics and environmental justice within these focus areas include:

- Grasslands and Agricultural Lands Management
- Forest Resource Management
- Developed Recreation Management
- Tennessee Valley Camp-Right Campground
- Dispersed Recreation Management
- Water Access
- Trails Management
- Recreation Partnerships
- Recreation Contract Management
- Floating Cabins
- Environmental Education
- Volunteer
- Stakeholder Engagement
- TVA Science Kids
- Community Support
- Section 26a and Land Use Implementation
- Section 26a and Land Use Stakeholder Education and Communication
- Ecotourism Partnerships
- Ecotourism and Recreational Assessments and Studies
- Dam Explorer

The 2020 NRP includes more programs and activities affecting socioeconomics and environmental justice than the 2011 NRP. In general, this would improve TVA's ability to address socioeconomic and environmental justice issues. However, in many cases, impacts would be negligible or minor when compared to Alternative A because many of these additions are administrative in nature (i.e., the programs themselves are longstanding and traditionally have been outside of the NRP itself). Examples include the addition of programs specific to recreation contract management, floating cabins, and Section 26a permits.

Compared to Alternative A, the incorporation of additional programs and activities into the 2020 NRP may provide additional beneficial impacts. For example, the formal inclusion of Ecotourism as a focus area should result in increased awareness and possibly additional projects that would benefit local communities. Likewise, the new Stakeholder Engagement program in the Public Outreach and Information Focus Area could help TVA identify, with the public's help, opportunities for targeted activities that benefit socioeconomic conditions. The scale and intensity of impacts would be dependent upon the types of projects and their location.

The 3- to 5-year action plans will provide a more flexible and effective response to emerging issues and opportunities because they will allow TVA to adapt more quickly to changes in interests, needs, and funding. Depending on the type and location of activities, there could be minor to moderate beneficial impacts on socioeconomics and environmental justice.

In conclusion, implementation of Alternative B would provide greater benefits to socioeconomics and environmental justice than Alternative A. This is because Alternative B proposes to include additional programs and activities with greater ability to respond to emerging issues and opportunities. Alternative B would likely result in more effective prioritization of future, site-specific projects that address employment, environmental justice, and income.

3.16.2.3 Cumulative Impacts

Past, present, and reasonably foreseeable future actions affecting socioeconomics and environmental justice are similar to those affecting recreation and include an increasing population; growing urban centers; and efforts by other federal, state, and local agencies to provide dispersed and developed recreation opportunities. Relevant actions also include land use trends, particularly agriculture on private lands and lands leased by TVA. Finally, efforts by state and local governments and non-profit organizations to attract visitors and improve employment would benefit socioeconomics and environmental justice. These actions are expected to continue over the long term throughout the TVA region. TVA is an important regional recreation provider and would be increasing ecotourism efforts under Alternative B; these two focus areas would likely produce greater socioeconomic and environmental justice benefits compared to other focus areas. TVA's contribution to beneficial cumulative impacts would be slightly greater under Alternative B.

3.17 Unavoidable Adverse Environmental Impacts

As described in the 2011 Final EIS, continuing regional development trends, such as residential development on non-TVA lands, would likely continue to result in degradation of aquatic and terrestrial habitat regardless of the alternative selected. Because the 2011 and 2020 NRPs have been designed to improve the management of natural resources located on TVA lands, few, if any, unavoidable potential environmental effects would result under either alternative. Furthermore, implementation of either alternative is not expected to result in significant adverse cumulative effects to any resources.

3.18 Relationship of Short-Term Uses and Long-Term Productivity

NEPA requires consideration of the "relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR § 1502.16). For the NRP, short-term uses generally are those that occur within the project's span of 20 years, and long-term refers to later decades. Productivity is the capability of the land to provide market and amenity outputs and values for future generations. The

capability of the land to maintain productivity is one factor that influences the quality of life for future generations.

Generally, implementation of the 2011 or 2020 NRP would result in very few actions that adversely affect long-term productivity. Where practicable, TVA manages public lands for multiple uses, including recreation, natural resources, and protection of sensitive resources, with the goal of protecting these values for the public. The primary change under the proposed action has been the reorganization of programs within the 2020 NRP and the addition of 3- to 5-year action plans to more reliably respond to changes in resource conditions, opportunities, and funding.

3.19 Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources generally occur through nonrenewable resource uses that have few or no alternative uses at the termination of the proposed action. Irretrievable commitments of resources result in the lost production or elimination of renewable resources such as timber, agricultural land, or wildlife habitat.

The 2011 Final EIS describes how construction of recreational facilities/structures, project operations, and industrial uses on TVA lands allocated during the reservoir lands planning processes would involve irreversible commitment of fuel, energy, and building material resources. This remains accurate and would occur to a similar degree under either alternative considered in this SEIS.

CHAPTER 4 – LIST OF PREPARERS

4.1 NEPA Project Management

Name:	**Matthew Higdon**
Education:	M.S., Environmental Planning and B.A., History
Project Role:	NEPA compliance, document preparation and project management
Experience:	16 years of experience in NEPA and natural resource planning.

Name:	**Drew Vankat (Copperhead Environmental Consulting, Inc.)**
Education:	M.S. Environmental Policy and Planning; B.Phil., Urban and Environmental Planning
Project Role:	Project Manager, Recreation
Experience:	12 years of experience with environmental policy including NEPA document preparation.

4.2 Other Contributors

Name	**Todd Amacker**
Education:	M.S., Wildlife and Fisheries Science and B.S., Environmental Studies
Project Role:	Natural Areas
Experience:	11 years of experience in wetland restoration, geographic information systems, database management, and fisheries/aquatic ecology.

Name	**John (Bo) Baxter**
Education:	M.S. and B.S., Zoology
Project Role:	Aquatic Ecology, Threatened and Endangered Species (Aquatics)
Experience:	28 years of experience in protected aquatic species monitoring, habitat assessment and recovery; 20 years in environmental review.

Name	**Adam Datillo**
Education:	M.S., Forestry and B.S., Natural Resource Conservation Management
Project Role:	Vegetation, Threatened and Endangered Species (Plants)
Experience:	16 years of experience in ecological restoration and plant ecology and 9 years in botany.

Name:	**Tiffany Foster**
Education:	M.S., Soil Science and B.S., Biology, Minor in Chemistry
Project Role:	Planning, document preparation and project management
Experience:	17 years of experience in public outreach and natural resource management, 10 years in water resource management.

Name:	**Elizabeth B. Hamrick**
Education:	M.S., Wildlife and B.S., Biology
Project Role:	Terrestrial Ecology (Animals), Terrestrial Threatened and Endangered Species
Experience:	18 years of experience in conducting field biology, 13 years technical writing, 9 years compliance with NEPA and ESA.

Name:	**Hallie Hearnes**
Education:	M.A., Public History and B.S., in Historic Preservation
Project Role:	Cultural Resources Management
Experience:	11 years of experience in historic preservation, cultural resource management, historic architectural recordation and assessment, and public outreach.

Name	**Robert Marker**
Education:	B.S., Recreation Resources Management
Project Role:	Recreation
Experience:	45 years of experience in recreation planning and management.

Name	**Kim Pilarski-Hall**
Education:	M.S. and B.S., Geography, Minor of Ecology
Project Role:	Wetlands and Natural Areas
Experience:	21 years of experience in wetlands assessment and delineation.

Name	**Erin Pritchard**
Education:	M.A., Anthropology
Project Role:	Cultural Resources Management
Experience:	20 years of experience in archaeology and cultural resource management.

Name	**Anthony Summit**
Education:	B.A. Geography; B.S. Environmental Studies
Project Role:	Planning, document preparation and project management
Experience:	12 years of experience in land use and permitting, policy and project management.

Name	**Carrie C. Williamson, P.E., CFM**
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Name	**Richard Borthwick (Copperhead Environmental Consulting, Inc.)**
Education:	B.S., Natural Resource and Environmental Management and Wildlife and Fisheries; M.S., Biology and Ecology; PhD, Biology (Candidate)
Project Role:	Prime Farmland
Experience:	10 years of experience performing environmental assessments and field surveys.

Name	**Marty Marchaterre, JD (Copperhead Environmental Consulting, Inc.)**
Education:	J.D., Law; B.A., History and Political Science
Project Role:	Land Use, Senior NEPA Review and QA/QC
Experience:	28 years of experience in NEPA document preparation.

Name	**Christopher McNees (Copperhead Environmental Consulting, Inc.)**
Education:	B.S., Environmental Studies
Project Role:	GIS
Experience:	15 years of experience in restoration, remediation, spatial analysis, sample collection, lab analysis, and habitat assessments.

Name	**Jeffrey Mihalik, QHP (Copperhead Environmental Consulting, Inc.)**
Education:	B.S., Environmental Science; M.S., Biology; M.S. GIS/Remote Sensing
Project Role:	Water Quality, Aquatic Ecology
Experience:	20+ years of experience with aquatic ecology, stream and wetland restoration and mitigation, GIS, GPS, and database technologies.

Name	**Piper Roby (Copperhead Environmental Consulting, Inc.)**
Education:	B.A., Biology; M.S., Biology; PhD, Animal Sciences (Candidate)
Project Role:	Technical Editing
Experience:	19 years of experience with ecological reporting and editing.

Name	**Price Sewell (Copperhead Environmental Consulting, Inc.)**
Education:	B.A., Environmental Science
Project Role:	Socioeconomics and Environmental Justice
Experience:	19 years of experience with ecological surveys and associated document writing, including NEPA and ESA.

Name	**Jeremy Henson, CE (Arcadis)**
Education:	B.S., Biology; M.S., Ecology
Project Role:	Navigation
Experience:	18 years of experience conducting and managing natural resource assessments and planning/permitting projects throughout the United States.

Name	**Jililan Neupauer (Arcadis)**
Education:	B.S., Environmental Studies; M.S., Urban and Regional Planning
Project Role:	Visual Resources
Experience:	3 years of experience as NEPA specialist and environmental planner.

Name	**Kevin Scott (Arcadis)**
Education:	B.S., Civil Engineering
Project Role:	Air Quality and Climate
Experience:	17 years of experience providing air quality consulting services including environmental impact studies.

CHAPTER 5 – Draft Supplemental Environmental Impact Statement Recipients

Following is a list of those who have received copies of the draft EIS or notices of its availability with instructions on how to access the EIS on the NRP project webpage.

5.1 Federal Agencies

Advisory Council on Historic Preservation
National Park Service
United States Army Corps of Engineers, Nashville, Savannah and Wilmington Districts
United States Department of Agriculture, Forest Service, Region 8
United States Department of Agriculture, Natural Resources Conservation Service
United States Department of Energy
United States Department of the Interior
United States Environmental Protection Agency, Region 4, NEPA
United States Fish and Wildlife Service, Alabama, Asheville, Georgia, Kentucky, Mississippi, Tennessee and Virginia Field Offices

5.2 Federally Recognized Tribes

Absentee Shawnee Tribe of Indians of Oklahoma
Alabama-Coushatta Tribe of Texas
Alabama-Quassarte Tribal Town
Cherokee Nation
The Chickasaw Nation
The Choctaw Nation of Oklahoma
Coushatta Tribe of Louisiana
Delaware Nation
Eastern Band of Cherokee Indians
Eastern Shawnee Tribe of Oklahoma
Jena Band of Choctaw Indians
Kialegee Tribal Town
Mississippi Band of Choctaw Indians
The Muscogee (Creek) Nation
Osage Nation
Poarch Band of Creek Indians
The Seminole Nation of Oklahoma
Shawnee Tribe
Thlopthlocco Tribal Town
United Keetoowah Band of Cherokee Indians in Oklahoma

5.3 State Agencies

Alabama

Alabama Department of Agriculture and Industries
Alabama Department of Conservation and Natural Resources
Alabama Department of Environmental Management
Alabama Forestry Commission
Alabama Historical Commission
Alabama Office of Environmental Policy and Compliance

Georgia

Georgia Department of Natural Resources
Georgia Department of Natural Resources, Historic Preservation Division

Kentucky

Kentucky Heritage Council
Kentucky State Clearinghouse

Mississippi

Mississippi Department of Archives and History
Mississippi Department of Environmental Quality
Mississippi Department of Wildlife Fisheries and Parks

North Carolina

North Carolina State Environmental Review Clearing House
North Carolina State Historic Preservation Office
North Carolina Wildlife Resources Commission

Tennessee

Tennessee Department of Agriculture
Tennessee Department of Environment and Conservation
Tennessee Division of Archaeology, Office of Archives and History
Tennessee Duck River Development Agency
Tennessee Historical Commission
Tennessee State Environmental Review Clearinghouse
Tennessee Wildlife Resources Agency

Virginia

Virginia Department of Historic Resources
Office of Environmental Review Clearinghouse

5.4 Local Governments

Anderson County, Tennessee
Bedford County, Tennessee
Benton County, Tennessee
Blount County, Tennessee
Bradley County, Tennessee
Calloway County, Kentucky
Campbell County, Tennessee
Carter County, Tennessee
Catoosa County, Georgia
Cherokee County, North Carolina
Claiborne County, Tennessee
Clay County, North Carolina
Cocke County, Tennessee
Coffee County, Tennessee
Cumberland County, Tennessee
Decatur County, Tennessee

Fannin County, Georgia
Franklin County, Tennessee
Graham County, North Carolina
Grainger County, Tennessee
Greene County, Tennessee
Hamblen County, Tennessee
Hamilton County, Tennessee
Hancock County, Tennessee
Hardin County, Tennessee
Hawkins County, Tennessee
Henderson County, North Carolina
Henderson County, Tennessee
Henry County, Tennessee
Houston County, Tennessee
Humphreys County, Tennessee
Jackson County, North Carolina
Jefferson County, Tennessee
Johnson County, Tennessee
Knox County, Tennessee
Lee County, Virginia
Lincoln County, Tennessee
Livingston County, Kentucky
Lyon County, Kentucky
Macon County, North Carolina
Marion County, Tennessee
Marshall County, Kentucky
McMinn County, Tennessee
Meigs County, Tennessee
Monroe County, Tennessee
Moore County, Tennessee
Morgan County, Tennessee
Perry County, Tennessee
Polk County, Tennessee
Rhea County, Tennessee
Roane County, Tennessee
Scott County, Virginia
Sevier County, Tennessee
Smyth County, Virginia
Stewart County, Tennessee
Sullivan County, Tennessee
Swain County, North Carolina
Tishomingo County, Mississippi
Towns County, Georgia
Trigg County, Kentucky
Union County, Georgia
Union County, Tennessee
Washington County, Tennessee
Washington County, Virginia
Wayne County, Tennessee

5.5 Organizations

Alabama Chapter of the Sierra Club
Alabama Ornithological Society
Appalachian Trail Conservancy
Bear Creek Development Authority
Beech River Watershed Development Authority
Boone Lake Association
Carolina Bird Club
Cherokee Lake Users Association
Conservation Fisheries, Inc.
Cumberland Chapter of the Sierra Club
Discover Life in America
Ducks Unlimited, Inc.
Emory River Watershed Association
Flint River Conservation Association
Forever Wild Alabama State Lands Division
Foundation for Global Sustainability
Friends of the Smokies - North Carolina Office
Friends of the Smokies - Tennessee Office
Georgia Chapter of the Sierra Club
Georgia Ornithological Society
Green Steps
Hiwassee River Watershed Coalition
Ijams Nature Center
Keep Athens Limestone Beautiful
Keep the Shoals Beautiful
Lake Blue Ridge Civic Association
Lake Nottely Improvement Association
Land Between the Lakes Association/Friends of Land Between the Lakes
Legacy Parks Foundation
Little River Watershed Association
Living Lands and Waters
Middle Nolichucky Watershed Alliance
Mississippi Chapter of the Sierra Club
National Fish and Wildlife Foundation
National Wild Turkey Federation - Kentucky Chapter
National Wild Turkey Federation - Tennessee Chapter
North Carolina Chapter of the Sierra Club
North Carolina Wildlife Federation
One World Adventure
Quail Forever
Shoals Environmental Alliance
Southern Off-Road Bicycle Association
Tellico Reservoir Development Agency
Tennessee Chapter of the Sierra Club
Tennessee Citizens for Wilderness Planning
Tennessee Clean Water Network
Tennessee Ornithological Society
Tennessee River Rescue/TN Aquarium
Tennessee Scenic Rivers Association
Tennessee Wildlife Federation

The Land Trust for Tennessee
The Nature Conservancy
The Nature Conservancy Alabama Field Office
The Nature Conservancy Tennessee Chapter
Tims Ford Council
TN Department of Environment and Conservation - Chattanooga Field Office
TN Department of Environment and Conservation - Columbia Field Office
Trout Unlimited - Kentucky Council
Trout Unlimited - North Carolina Council
Trout Unlimited - Tennessee Council
Upper TN River Roundtable
Virginia Chapter of the Sierra Club
Virginia Society of Ornithology
Watts Bar Lake Association

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GLOSSARY

acre	A unit of measure of land area equal to 43,560 square feet
best management practices	Accepted construction practices designed to reduce environmental effects
biostabilization	Use of vegetative plants to control erosion
contiguous	Adjacent; touching
cultural resources	Archaeological, historic, and architectural resources
dispersed recreation	Recreation of an informal nature such as hunting, hiking, biking, bird watching, photography, primitive camping, bank fishing, and picnicking that occur on TVA land. These activities are not associated with developed facilities although some improvements may occur for access, health and safety, or to protect the environment.
drawdown	Area of reservoirs exposed between full pool and winter pool levels during annual drawdown of the water level for flood control
ecoregion	A geographic area with characteristic, distinct assemblages of natural communities and species
embayment	A bay or arm of the reservoir
endangered species	A species in danger of extinction throughout all or a significant part of its range. Endangered species recognized by the Endangered Species Act or similar state legislation have special legal status for their protection and recovery.
Environmental Policy	A TVA Board-approved policy that communicates guiding principles to lead TVA successfully in the reduction of its environmental impact while continuing to provide reliable and competitively priced power to the Valley
geographic information system	A collection of computer hardware and software that efficiently captures, stores, updates, manipulates, analyzes, and displays information about the location of the Earth's natural, cultural, economic, and human resources, and the man-made environment. Location is normally shown on maps with associated textual and numeric information that describes the characteristics of those resources.
Land Policy	A TVA Board-approved policy that guides retention, disposal, and planning of interests in real property

mitigation	An action that either will result in avoidance of an effect or cause the results of an activity to be minor in significance
natural areas	Ecologically significant sites, lands set aside for particular management objectives, and lands that contain sensitive biological, cultural or scenic resources. The TVA natural area program includes small wild areas, habitat protection areas, wildlife observation areas, and ecological study areas.
population (related to species)	Population is an ecological term that refers to the entirety of a group of individuals of a certain species. One population can contain numerous occurrences. A population includes that there is the potential for exchange of genetic material between individuals.
qualitative	Analysis based on professional judgment of quality
recreation strategy	A TVA strategy to collaborate with regional partners to enhance existing recreation opportunities and address unmet recreation needs, while managing resources on and along the Tennessee River system
Regional Resources Stewardship Council	A group of diverse stakeholders established to advise TVA on its stewardship activities and the priorities among competing objectives and values
reservoir lands planning	The development of plans used to guide future decisions on TVA-managed lands adjacent to reservoirs
riparian	Related to or located on the banks of a river or stream
runoff	That portion of total rainfall that eventually enters a stream or river
scenario planning	Method for determining the expected benefit per dollar spent of each program within the Natural Resource Plan
shoreland	The surface of land lying between the minimum pool elevation of a TVA reservoir and the maximum shoreline contour or TVA back-lying property (whichever is further)
shoreline	The line where the water of a TVA reservoir meets the shore when the water level is at the normal summer pool elevation.
tailwater	The part of a river just downstream from a dam where the flow and quality of the water are substantially affected by the dam discharge
threatened species	A species threatened with extinction throughout all or a significant portion of its range or territory. Threatened species recognized by the Endangered Species Act or similar state legislation have special legal status for their protection and recovery.

water resource management	A grouping of programs that encourages and helps implement efforts that protect and improve water resources for human health, fishing, swimming, boating, drinking, agricultural use, aquatic habitat, and economic development.
wetlands	As defined in TVA Environmental Review Procedures, “Wetlands are those areas inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances do or would support a prevalence of vegetation or aquatic life that requires saturated or seasonably saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, mud flats, and natural ponds.”

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Appendix A – 2011 and 2020 NRP Focus Area and Program Comparison

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2011 and 2020 NRP Focus Area and Program Comparison
Program Comparison Color Key:
Resource Area (2011 NRP) or Focus Area (2020 NRP)
Indicates programs with no changes or changes to the program name
Programs that have been combined or moved to a different focus area
Programs that have been removed from the 2020 NRP
New programs in the 2020 NRP

2011 NRP	2020 NRP	Comment
Resource Area: Reservoir Lands Planning	**Focus Area: Reservoir Lands Planning**	No change to focus area name proposed.
No programs were included in the 2011 NRP	CVLP	The CVLP was introduced in the 2011 NRP, but it was not categorized as a program in the proposed 2020 NRP.
Not included	**Focus Area: Section 26a and Land Use**	This is a new focus area that was not included in the 2011 NRP.
	Section 26a and Land Use Implementation	This is an existing TVA program that is new to the 2020 NRP.
	Section 26a and Land Use Stakeholder Education and Communication	This is an existing TVA program that is new to the 2020 NRP.
Not included as a specific resource area	**Focus Area: Public Land Protection**	TVA proposes Public Land Protection as a new Focus Area in the 2020 NRP. It includes two former Biological Resources programs, one of which is included in the 2020 NRP as a tool for implementation, and four new programs.
Land Conditions Assessment and Land Stewardship Maintenance	Comprehensive Land Condition Assessment	This former Biological Resources Program is now included in the Public Land Protection Focus Area, with a minor name change. The scope of the program is unchanged.
Boundary Maintenance	Property Management	The former Biological Resources Program Boundary Maintenance is now included as a tool in the proposed Property Management Program in the 2020 NRP.

2011 NRP	2020 NRP	Comment
	Natural Resources Asset Inventory	This is a new program proposed for the 2020 NRP.
	Public Land Outreach	This is a new program proposed for the 2020 NRP.
	Public Land Protection Enforcement	This is a new program proposed for the 2020 NRP.
Resource Area: Biological Resources	**Focus Area: Land and Habitat Stewardship**	The proposed Land and Habitat Stewardship Focus Area includes eight of the 19 programs included in the Biological Resources Resource Area of the 2011 NRP. TVA proposes to reclassify or combine the remaining 11 2011 NRP programs into other programs or focus areas.
Threatened and Endangered Species	Threatened and Endangered Species	There is no change proposed to this program.
Wetlands Management	Wetland Management	There is no change proposed to this program.
TVA Sensitive Resources Data Management	Sensitive Resources Data	There is no change proposed to this program.
Natural Areas Management	Natural Areas Management	There is no change proposed to this program.
Grasslands and Agricultural Lands Management	Grasslands and Agricultural Lands Management	There is no change proposed to this program.
Dewatering Projects Management	Dewatering Projects	There is no change proposed to this program.
Forest Resource Management	Forest Resource Management	There is no change proposed to this program.
Conservation Planning	Conservation Planning	There is no change proposed to this program.
Non-Native Invasive Plant Management	Non-Native Plant Management on TVA Lands	This former Biological Resources program has been renamed and is now included in the Nuisance and Invasive Species Management Focus Area.
Nuisance Animal Control	Nuisance Animal Control	This former Biological Resources program is now included in the Nuisance and Invasive Species Management Focus Area.

2011 NRP	2020 NRP	Comment
Land Condition Assessment and Land Stewardship Maintenance	Comprehensive Land Condition Assessment	This former Biological Resources program has been renamed and is now included in the Public Land Protection Focus Area.
Boundary Maintenance	Property Management	This former Biological Resources program has been renamed and is now included in the Public Land Protection Focus Area.
Non-Native Invasive Plant Management	Non-Native Plant Management on TVA Lands	This former Biological Resources program has been renamed and is now included in the Nuisance and Invasive Species Management Focus Area.
Nuisance Animal Control	Nuisance Animal Control	This former Biological Resources program is now included in the Nuisance and Invasive Species Management Focus Area.
Terrestrial Greenhouse Gas Sequestration Management		This program is better managed and implemented by universities or other entities.
Wildlife Habitat Council – Third-Party Certifications		TVA's membership in the Wildlife Habitat Council will continue. In the 2020 NRP, this former program will serve as a tool to implement the objectives of multiple Land and Habitat Stewardship programs.
Wildlife Habitat Enhancement Partnerships		TVA will continue to develop these partnerships to implement wildlife habitat enhancement projects. In the 2020 NRP, this former program will serve as a tool to implement the objectives of multiple Land and Habitat Stewardship programs.
Migratory Birds Management		Implementation of this program will be incorporated into other 2020 NRP programs in the Land and Habitat Stewardship Focus Area.
Leave No Trace		This former program is a tool that will be utilized to implement the programs in multiple focus areas.
Not included as a specific resource area	**Focus Area: Nuisance and Invasive Species Management**	TVA proposes to expand Nuisance and Invasive Species Management as a standalone focus area in the 2020 NRP. It includes two programs from the former Biological Resources Resource Area and one new program.
Nonnative Invasive Plant Management	Nonnative Invasive Plant Management	This former Biological Resources Program is now included in the Nuisance and Invasive Species Focus Area.
Nuisance Animal Control	Nuisance Animal Control	This former Biological Resources Program is now included in the Nuisance and Invasive Species Focus Area.
	Aquatic Plant Management	This is a new program proposed in the 2020 NRP.
Resource Area: Cultural Resources	**Focus Area: Cultural Resource Management**	Focus area name change only.

2011 NRP	2020 NRP	Comment
Preservation Program Preserve America	Preservation Program	The Preserve America Program will be incorporated into the Preservation Program.
Archaeological Resources Protection Act	ARPA Enforcement	There is no change proposed to this program.
National Historic Preservation Act Section 106	Section 106 Compliance	There is no change proposed to this program.
Native American Graves Protection and Repatriation Act	NAGPRA Compliance	There is no change proposed to this program.
Archaeological Outreach (Thousand Eyes)	Thousand Eyes Archaeological Outreach	There is no change proposed to this program.
Archaeological Monitoring and Protection	Archaeological Monitoring and Protection	There is no change proposed to this program.
Native American Consultation	Native American Consultation	There is no change proposed to this program.
Corporate History Program	Corporate History	There is no change proposed to this program.
Resource Area: Water Resources	**Focus Area: Water Resources Stewardship**	Minor focus area name change only.
Aquatic Ecology Management	Aquatic Ecology Management	There is no change proposed to this program.
Stream and Tailwater Monitoring	Stream Monitoring	The stream monitoring components of this program will remain the same. Tailwater monitoring will continue to support the operation of TVA's hydroelectric facilities, but will not be included in the NRP.
Climate Change Sentinel Monitoring	Sentinel Monitoring	There is no change proposed to this program, with the exception of a minor name change.
Tennessee Valley Clean Marina	Tennessee Valley Clean Marina	There is no change proposed to this program.
Water Resource Outreach Campaign	Water Resource Outreach	There is no change proposed to this program, with the exception of a minor name change.

2011 NRP	2020 NRP	Comment
Nutrient Source – Watershed Identification and Improvement Program	Nutrient Source Management	These programs will be combined to form the Nutrient Source Management Program in the 2020 NRP.
Northern Gulf of Mexico/Mississippi River Basin Nutrient Load Reductions Program		
Strategic Partnership Planning		This former program is a tool that is utilized to achieve the objectives of the Water Resources Stewardship Focus Area and Programs in the 2020 NRP.
Reservoir Shoreline Stabilization/Riparian Management Program		This former program is a tool that is utilized to achieve the objectives of multiple focus areas and programs in the 2020 NRP.
Resource Area: Recreation Management	**Focus Area: Recreation**	Focus area name change only.
Management of Campgrounds on Dam or Power Plant Reservations	Developed Recreation Management	These programs will be managed under the broader Developed Recreation Management program.
Day-Use Areas on Dam Reservations		
Management of Campgrounds off Dam or Power Plant Reservations		
Day-Use Areas off Dam Reservations		
Tennessee Valley Camp-Right Campground Program	Tennessee Valley Camp-Right Campground	There is no change proposed to this program.
Trails Management	Trails Management	There is no change proposed to this program.
Stream Access Sites	Water Access	This program has been expanded to include streams, rivers, and reservoirs.
Dispersed Recreation Management	Dispersed Recreation Management	The 2011 NRP included Dispersed Recreation Management Programs in both the Biological Resources and Recreation Management Resource Areas. TVA proposes to combine these programs in the Recreation Focus Area in the 2020 NRP.

2011 NRP	2020 NRP	Comment
	Recreation Partnerships	This is a new program proposed for the 2020 NRP.
	Recreation Contract Management	This is a new program proposed for the 2020 NRP.
	Floating Cabins	This is a new program proposed for the 2020 NRP.
Annual Tours		This program is implemented by other organizations in TVA.
Leave No Trace		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Recreation Information Management		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Boating Density Assessments		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Recreation Design Principles		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Reservoir Lands Recreation Inventory Management		This program is included in the NR Asset Inventory program in the Public Lands Protection Focus Area.
Recreation Planning, Assistance, and Technical Support		This former program is a tool that will be utilized to implement the programs in the Recreation Focus Area.
Not included	**Focus Area: Ecotourism**	This is a new focus area that was not included in the 2011 NRP.
	Ecotourism Partnerships	This is an existing TVA program that is new to the 2020 NRP.
	Ecotourism and Recreational Assessments and Studies	This is an existing TVA program that is new to the 2020 NRP.
	Dam Explorer	This is an existing TVA program that is new to the 2020 NRP.
Resource Area: Public Engagement	**Focus Area: Public Outreach and Information**	Minor focus area name change only.

2011 NRP	2020 NRP	Comment
Environmental Education Program	Environmental Education	There is no change proposed to this program.
Volunteer Program	Volunteer	There is no change proposed to this program.
	Stakeholder Engagement	This is an existing TVA program that is new to the 2020 NRP.
	TVA Science Kids - World Water Monitoring	This is an existing TVA program that is new to the 2020 NRP.
	Community Support	This is an existing TVA program that is new to the 2020 NRP.
Foundation and Trust Fund Management		This program was determined to not be a viable source of funding for TVA's stewardship activities and will not be included in the 2020 NRP.

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Appendix B – TVA Public Land Protection Policy

Policy Governing the Tennessee Valley Authority's Protection of Public Land and Resources

The Tennessee Valley Authority (TVA) has been charged by Congress with improving navigation, providing flood control of the Tennessee River, providing for the proper use of marginal lands, and other purposes. Congress also tasked TVA with land and shoreline management responsibilities, including the acquisition of reservoir areas and protection of watersheds.

TVA has custody and control of approximately 293,000 acres of federally-owned reservoir property and approximately 470,000 acres of inundated property on behalf of the United States of America and administers various land rights over privately-owned land for the purposes of managing the TVA reservoir system (collectively referred to as TVA public land). In TVA's Land Policy, the TVA Board of Directors (TVA Board) recognized the importance of TVA public land and TVA's duty to manage it wisely for present and future generations. Through TVA Board support and approval of the Shoreline Management Policy, the Environmental Policy, the Natural Resource Plan, various individual reservoir land management plans and the Comprehensive Valleywide Land Plan, and the Land Policy, as well as TVA's Section 26a regulations, TVA manages its public land in a way that is sustainable while balancing competing demands.

TVA public land and the reservoir system provide protection for the abundant wildlife of the region; promote world-class biodiversity of plants and animals; support clean water and thriving fisheries; offer a look into the lives of our ancestors through the rich historical and cultural resources of past generations; are a sanctuary for those seeking open space, quiet solace in nature, or recreational opportunities; play an integral part in the unified development of the Tennessee River and flood control objectives; and attract economic development and investment in the region, improving the lives and well-being of its residents. Various academic studies have shown tangible value in TVA's management of land and water resources and the significant benefit to the people of the region. The TVA Board in a 1936 report to Congress recognized the importance of reservoir property when it referred to these lands as "a protective belt" and described the permanent control of which as "a matter of critical importance in the interest of reservoir protection."

TVA public land and resources also offer opportunities for partnerships and collaborative management with local communities and state and federal agencies. Relationships with these communities and agencies are critical for the success of TVA's land management and stewardship objectives.

The TVA Board recognizes challenges associated with activities that abuse or privatize TVA public land or destroy the important resources on that land. Such activities degrade the quality of the TVA public land, resources, and the user experience. While some individual impacts may seem inconsequential, the cumulative effects threaten TVA's ability to fulfill its vital management responsibilities.

Policy

Because of the importance of TVA public land and resources to the region and to TVA's mission of service, TVA's policy is to manage its lands and resources to protect the integrated operation of the TVA reservoir and power systems, to provide for

appropriate public use and enjoyment of TVA public land, and to provide for continuing economic growth in the Valley. Further, it is TVA's commitment to prevent abuse and destruction of TVA public land and resources and take necessary steps to remedy unauthorized uses and encroachments. To that end, the TVA Board supports broad efforts to better protect TVA public land and resources, including the development of land management regulations.

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Appendix C – Land Use Agreements Overview

History of TVA's Land Use Agreements
TVA was created by Congress in 1933 and tasked with improving the quality of the Tennessee Valley Region by improving navigation, flood control, and economic development. In carrying out these responsibilities, TVA acquired land for the purposes of constructing dams and developing reservoirs. The TVA Act gave TVA broad regional development and planning responsibilities. To support comprehensive Valley-wide regional development and creation of the reservoir system, TVA purchased land throughout the seven state region. Soon after, it was realized regional development would be best handled by state, local, or other federal agencies so TVA sold or transferred land not needed to operate the reservoir system. This disposal of land contained certain deed restrictions for the purpose of controlling the amount and type of development around the reservoirs. In addition to land, TVA also purchased flowage easements which allowed for operation of the reservoir system without owning the land. These easements contain some of the same development restrictions as the disposal land. At one point, TVA owned approximately 1.3 million acres of land but today manages 293,000 acres of land around TVA's reservoirs.

TVA frequently receives requests for use of reservoir property called land use requests. These uses include public infrastructure projects (such as utilities, pipelines, etc.), industrial purposes, public recreation, and commercial recreation. Each request is thoroughly vetted to make sure it aligns with TVA's policies, procedures, and guidelines. TVA's permission for land use requests can be in the form of a term or permanent easement, lease, license, permits, or sale of the property depending on the nature of the request. Each request is reviewed for potential impacts on the environment and for alignment with TVA's programmatic interests.

TVA's Land Policy
As the Valley has become more densely populated and economic growth continues, TVA's land is under increasing development pressure. In response to this increasing pressure, in 2006, the TVA Board of Directors approved a Land Policy (Policy) which governs the planning, retention, and disposal of land under TVA's stewardship. The Policy guides TVA's decisions on development of lands to protect the integrated operation of the TVA reservoir and power systems, to provide for appropriate public use and enjoyment of the reservoir system, and to provide for continuing economic growth in the Valley. With the Board's approval of the Policy, TVA has worked to preserve reservoir lands remaining under its control.

The Policy addresses power and reservoir properties. Power properties will continue to be managed as power assets and retention and disposal decisions will be based on business needs. Although the Policy governs all retention, disposal, and planning of TVA property, its intricacies mostly involve reservoir land. Reservoir properties will be managed for the following:

- Lands Planning - TVA will continue to develop and update reservoir land plans
- Residential Use - land will not be allocated or used for residential use
- Economic Development - disposal of land for industrial purposes will be considered

- Recreation - limited easements will be considered for public or commercial recreation uses; term easements for commercial recreation will be considered for water-based recreation

- Deed Restrictions over Private Land - modification or abandonment of flowage rights may be released if they are no longer necessary for operation of the river system; TVA will consider other types of deed modifications if they facilitate recreational access or industrial development; TVA will not consider deed modifications that facilitate residential development

- Operational Uses of TVA Properties - TVA will continue to consider requests for public infrastructure needs (roads, pipelines, utilities, etc.)

Land Use Agreements Process
TVA thoroughly and objectively reviews the potential effects of land use requests. TVA's review includes a determination of impacts on the environment via compliance with NEPA, National Historic Preservation Act and the Endangered Species Act, an evaluation of compliance with other appropriate laws and regulations and applicable TVA policies and practices, and consideration of impact on applicable TVA programmatic interests such as navigation and flood control.

Future of Land Use Agreements
TVA continuously looks for opportunities to process land use requests in the most efficient and cost effective manner. Small changes to the process or to clarify instructions for applicants occur regularly. Other potential, more resource intensive considerations include efficiencies related to NEPA reviews.

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Appendix D – TVA Land Policy

Policy Governing the Tennessee Valley Authority's Retention, Disposal and Planning of Interests in Real Property

The Tennessee Valley Authority (TVA) has been charged by Congress with improving navigation, controlling floods, providing for the proper use of marginal lands, providing for industrial development and providing power at rates as low as feasible, all for the general purpose of fostering the physical, economic, and social development of the Tennessee Valley region. The lands which TVA stewards in the name of the United States are some of the most important resources of the region. They have provided the foundation for the great dams and reservoirs that protect the region from flooding and secure for its residents the benefits of a navigable waterway and low-cost hydro-electricity. TVA's lands are the sites for its power generating system and the arteries for delivering power to those that need it. Many of the region's parks, recreation areas, and wildlife refuges that are so important for the region's quality of life grew up from lands that TVA made available. And TVA's lands often have been the catalyst for public and private economic development activities that support all of these activities.

TVA originally acquired approximately 1.3 million acres of land in the Tennessee Valley. The construction and operation of the reservoir system inundates approximately 470,000 acres with water. TVA has already transferred or sold approximately 508,000 acres, the majority of which was transferred to other federal and state agencies for public uses. TVA currently owns approximately 293,000 acres which continue to be managed pursuant to the TVA Act.

As stewards of this critically important resource, TVA has a duty to manage its lands wisely for present and future generations. Accordingly, it is TVA's policy to manage its lands to protect the integrated operation of the TVA reservoir and power systems, to provide for appropriate public use and enjoyment of the reservoir system, and to provide for continuing economic growth in the Valley. Recognizing that historical land transfers have contributed substantially to meeting multipurpose objectives, it further is TVA's policy to preserve reservoir lands remaining under its control in public ownership except in those rare instances where the benefits to the public will be so significant that transferring lands from TVA control to private ownership or another public entity is justified. This policy is explicated below.

Reservoir Properties

Land Planning- TVA shall continue to develop reservoir land management plans for its reservoir properties with substantial public input and with approval of the TVA Board of Directors. The land use allocations will be determined with consideration of the social, economic and environmental conditions around the reservoir. TVA shall consider changing a land use designation outside of the normal planning process only for water-access purposes for industrial or commercial recreation operations on privately owned backlying land or to implement TVA's Shoreline Management Policy. Reservoir properties that have become fragmented from the reservoir will be evaluated to determine their public benefit. If it is determined by TVA's Chief Executive Officer that these fragmented properties have little or no public benefit they shall be declared surplus and sold at public auction to the highest bidder in the same manner as surplus power or commercial properties.

Residential Use- TVA shall not allocate lands or landrights for residential use or dispose of reservoir properties for residential use.

Economic Development- TVA shall consider disposing of reservoir lands or land rights for industrial purposes or other businesses if the TVA property is located in an existing industrial park, or is designated for such purposes in a current reservoir land management plan and verified as suitable for such use by RSO&E and ED staff in a property survey. The TVA Board directs staff to complete this survey within six months of the approval of this policy. The TVA Board recognizes that property with water access, for either navigation or water supply, is a limited resource in the Valley and has preference for businesses that require water access.

Future reservoir land management plans will consider industrial development opportunities as land allocations are made. TVA shall consider disposing of non-waterfront reservoir properties in industrial parks for any purpose permitted by the industrial park covenants. TVA shall not allocate lands or landrights for retail use or dispose of reservoir land or landrights for such use.

Recreation- TVA shall consider leasing or granting limited easements over lands for the development of commercial recreation facilities or public recreation purposes if the property is so designated in a reservoir land management plan and a survey conducted by RSO&E determines that the site remains suitable for recreational uses and a continued need exists for such use. The TVA Board directs staff to complete this survey within six months of the approval of this policy. Commercial recreation is defined as recreation with facilities that are provided for a fee to the public intending to produce a profit for the owner/operator. Public recreation is defined as recreation on publicly owned land with facilities developed by a public agency (or their concessionaire) and provides amenities open to the general public.

Commercial Recreation- TVA leases or easements for commercial recreation purposes shall limit the use primarily to water-based recreation designed to enhance the recreation potential of the natural resources of the river and be a stimulus for regional economic development. TVA leases or easements for commercial recreation purposes will contain restrictions against residential use, and no long term accommodations or individually owned units will be permitted.

Public Recreation- TVA leases or easements for public recreation purposes will contain restrictions against residential use, cabins, or other overnight accommodations (other than campgrounds) except if a recreation area is owned by a State or State agency and operated as a component of a State Park system in which case cabins and other overnight accommodations will be permitted.

Deed Restrictions over Private Lands- The TVA Board recognizes that much of TVA's lands were transferred upon specific agreement among the parties to conduct activities that would enhance recreation opportunities in the Valley. TVA will continue to consider the release or modification of flowage rights no longer necessary to TVA to operate the river system. TVA will consider the removal or modification of deed provisions to facilitate industrial development.

TVA will also consider the removal or modification of deed restrictions that result in the public having recreational access to the tract, or if the tract is already open to the public, maintains that access. TVA will not remove or modify other deed restrictions for the purpose of facilitating residential development. To the extent permitted by the language of deed or other transfer or contractual instrument, TVA will administer its interest in former TVA land to achieve the goals of this policy.

Operational Uses of TVA Properties- TVA shall continue to utilize reservoir properties to meet the operational needs of the agency and its distributors as well as provide for public infrastructure needs such as roads, water and sewer lines, and other utilities, but will only consider requests for private infrastructure where TVA determines no other practicable alternative exists. Nothing in this policy is intended to prevent the disposal of tracts of land upon the recommendation of the General Counsel to settle claims or litigation or to address issues of contamination or potential contamination. In addition, TVA will continue to work with development agencies (and other partners) throughout the Valley to implement previously executed agreements.

Power & Commercial Properties

TVA's nonreservoir property—primarily power and commercial properties and mineral holdings— shall continue to be managed as power assets. The TVA Board directs staff to undertake a review of TVA mineral holdings for later policy consideration. Retention and disposal decisions will be primarily based on business considerations consistent with the TVA Act and other applicable requirements. TVA may enter into special arrangements with the distributors of TVA power. In addition, TVA may relinquish transmission line rights, if they are determined to be unnecessary for present or future operations and the current owner agrees to pay the enhanced fair market value of the property. In all other instances, TVA shall emphasize sales that generate the maximum competition among bidders at public auction and where possible shall not include use restrictions other than those designed to protect TVA's program interests or to meet legal or environmental requirements.

Appendix E – State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants

State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants in Alabama Potentially Impacted by the Natural Resource Plan

SCIENTIFIC	COMMON	RANK	STATUS
Mammals			
Corynorhinus rafinesquii	Rafinesque's Big-eared bat	S2	SP
Microtus ochrogaster	Prairie Vole	S2	SLNS
Mustela frenata	Long-tailed Weasel	S3	SP
Myotis austroriparius	Southeastern Bat	S2	SP
Myotis grisescens	Gray Bat	S2	SP
Myotis lucifugus	Little Brown Bat	S3	SP
Myotis septentrionalis	Northern Long-eared Bat	S2	SP
Myotis sodalis	Indiana Bat	S2	SP
Neotoma magister	Allegheny Woodrat	S3	SLNS
Perimyotis subflavus	Tricolored Bat	S3	SLNS
Sciurus niger	Eastern Fox Squirrel	S3S4	GA
Sylvilagus obscurus	Appalachian Cottontail	S1	GA
Zapus hudsonius	Meadow Jumping Mouse	S1	SP
Birds			
Bonasa umbellus	Ruffed Grouse	S1	GBNOS
Chondestes grammacus	Lark Sparrow	S3B	SP
Falco peregrinus	Peregrine Falcon	SHB,S3N	SP
Haliaeetus leucocephalus	Bald Eagle	S4B	SP
Pandion haliaetus	Osprey	S4	SP
Peucaea aestivalis	Bachman's Sparrow	S3	SP
Picoides borealis	Red-cockaded Woodpecker	S2	SP
Thryomanes bewickii altus	Appalachian Bewick's Wren	SHB	SP
Thryomanes bewickii bewickii	Bewick's Wren	SHB,S1N	SP
Tyto alba	Common Barn-owl	S3	SP
Vireo gilvus	Warbling Vireo	S1B	SP
Amphibians			
Ambystoma tigrinum	Tiger Salamander	S3	SLNS
Cryptobranchus alleganiensis	Hellbender	S2	SP
Aneides aeneus	Green Salamander	S3	SP
Desmognathus ocoee	Ocoee salamander	S2	SLNS
Necturus alabamensis	Black Warrior Waterdog	S2	SP
Reptiles			
Macrochelys temminckii	Alligator Snapping Turtle	S3	SP
Sternotherus depressus	Flattened Musk Turtle	S2	SP
Plestiodon anthracinus	Coal Skink	S3	SP
Lampropeltis triangulum syspila	Red Milk Snake	S2	SLNS
Lampropeltis triangulum triangulum	Eastern Milk Snake	S2	TRKD
Masticophis flagellum	Coachwhip	S3	SP
Pituophis melanoleucus melanoleucus	Northern Pine Snake	S3	SP
Fishes			
Ichthyomyzon greeleyi	Mountain Brook Lamprey	S2	SLNS
Polyodon spathula	Paddlefish	S3	SP, CNGF
Hemitremia flammea	Flame Chub	S3	SLNS
Hybopsis amblops	Bigeye Chub	S3	TRKD
Notropis photogenis	Silver Shiner	S1	TRKD
Notropis albizonatus	Palezone Shiner	S1	SP
Notropis micropteryx	Highland Shiner	S2	TRKD

SCIENTIFIC	COMMON	RANK	STATUS
Notropis sp. *4*	Sawfin Shiner	S2	TRKD
Phenacobius uranops	Stargazing Minnow	S1S2	SLNS
Chrosomus erythrogaster	Southern Redbelly Dace	S3	TRKD
Cyprinella caerulea	Blue Shiner	S1	SP
Erimonax monachus	Spotfin Chub	SX	SP
Erimystax insignis	Blotched Chub	S2	SLNS
Carpiodes carpio	River Carpsucker	S2	CNGF
Moxostoma anisurum	Silver Redhorse	S2	CNGF
Noturus eleutherus	Mountain Madtom	S1	CNGF
Noturus flavus	Stonecat	S1	CNGF
Noturus miurus	Brindled Madtom	S1	CNGF
Noturus exilis	Slender Madtom	S3	CNGF
Speoplatyrhinus poulsoni	Alabama Cavefish	S1	SP
Typhlichthys subterraneus	Southern Cavefish	S3	SP
Elassoma alabamae	Spring Pygmy Sunfish	S1	SP
Etheostoma blennioides	Greenside Darter	S3	TRKD
Etheostoma boschungi	Slackwater Darter	S1	SP
Etheostoma camurum	Bluebreast Darter	S1	SLNS
Etheostoma flabellare	Fantail Darter	S3	TRKD
Etheostoma jessiae	Blueside Darter	S3	TRKD
Etheostoma kennicotti	Stripetail Darter	S3	TRKD
Etheostoma neopterum	Lollipop Darter	S1	SP
Etheostoma rufilineatum	Redline Darter	S3	TRKD
Etheostoma simoterum	Snubnose Darter	S3	TRKD
Etheostoma trisella	Trispot Darter	S1	SP
Etheostoma tuscumbia	Tuscumbia Darter	S2	SP
Etheostoma wapiti	Boulder Darter	S1	SP
Etheostoma corona	Crown Darter	S2	SLNS
Etheostoma douglasi	Tuskaloosa Darter	S3	SLNS
Percina burtoni	Blotchside Logperch	S1	SP
Percina evides	Gilt Darter	S2	TRKD
Percina lenticula	Freckled Darter	S2S3	SLNS
Percina shumardi	River Darter	S3	TRKD
Percina tanasi	Snail Darter	S1	SP
Mussels			
Actinonaias ligamentina	Mucket	S2	PSM
Actinonaias pectorosa	Pheasantshell	SX	PSM
Alasmidonta marginata	Elktoe	S1	PSM
Alasmidonta viridis	Slippershell Mussel	S1	SP
Arcidens confragosus	Rock Pocketbook	S3	PSM
Cumberlandia monodonta	Spectaclecase	S1	SP
Cyclonaias tuberculata	Purple Wartyback	S5	PSM
Cyprogenia stegaria	Fanshell	S1	SP
Dromus dromas	Dromedary Pearlymussel	S1	SP
Ellipsaria lineolata	Butterfly	S4	PSM
Elliptio crassidens	Elephant-ear	S5	CHM
Elliptio dilatata	Spike	S1	PSM
Epioblasma arcaeformis	Sugarspoon	SX	PSM
Epioblasma biemarginata	Angled Riffleshell	SX	PSM
Epioblasma brevidens	Cumberlandian Combshell	S1	SP
Epioblasma capsaeformis	Oyster Mussel	SX	SP
Epioblasma florentina walkeri	Tan Riffleshell	SX	SP
Epioblasma florentina florentina	Yellow-blossom Pearlymussel	SX	SP
Epioblasma haysiana	Acornshell	SX	PSM
Epioblasma lenior	Narrow Catspaw	SX	PSM
Epioblasma metastriata	Upland Combshell	SX	SP

SCIENTIFIC	COMMON	RANK	STATUS
Epioblasma obliquata obliquata	Purple Catspaw	SX	SP
Epioblasma othcaloogensis	Southern Acornshell	SX	SP
Epioblasma personata	Round Combshell	SX	PSM
Epioblasma propinqua	Tennessee Riffleshell	SX	PSM
Epioblasma stewardsonii	Cumberland Leafshell	SX	PSM
Epioblasma torulosa torulosa	Tuberculed Blossom Pearlymussel	SX	SP
Epioblasma triquetra	Snuffbox	S1	PSM
Epioblasma turgidula	Turgid Blossom Pearlymussel	SX	SP
Fusconaia barnesiana	Tennessee Pigtoe	S1	PSM
Fusconaia cor	Shiny Pigtoe Pearlymussel	S1	SP
Fusconaia cuneolus	Fine-rayed Pigtoe	S1	SP
Fusconaia subrotunda	Longsolid	S1	PSM
Hemistena lata	Cracking Pearlymussel	S1	SP
Lampsilis fasciola	Wavy-rayed Lampmussel	S2	PSM
Lampsilis abrupta	Pink Mucket	S1	SP
Lampsilis ovata	Pocketbook	S2	PSM
Lampsilis virescens	Alabama Lampmussel	S1	SP
Lasmigona complanata	White Heelsplitter	S2	PSM
Lasmigona costata	Flutedshell	S2	PSM
Lasmigona holstonia	Tennessee Heelsplitter	S1	PSM
Lemiox rimosus	Birdwing Pearlymussel	S1	SP
Leptodea fragilis	Fragile Papershell	S5	PSM
Leptodea leptodon	Scaleshell	SX	SP
Pleuronaia dolabelloides	Slabside Pearlymussel	S1	SP
Ligumia recta	Black Sandshell	S2	PSM
Medionidus acutissimus	Alabama Moccasinshell	S2	SP
Medionidus conradicus	Cumberland Moccasinshell	S1	SP
Obovaria olivaria	Hickorynut	SX	PSM
Obovaria retusa	Ring Pink	SH	SP
Obovaria subrotunda	Round Hickorynut	S2	PSM
Plethobasus cicatricosus	White Wartyback	S1	SP
Plethobasus cooperianus	Orange-foot Pimpleback	SH	SP
Plethobasus cyphyus	Sheepnose	S1	SP
Pleurobema clava	Clubshell	SX	SP
Pleurobema sintoxia	Round Pigtoe	S1	SP
Pleurobema cordatum	Ohio Pigtoe	S2	PSM
Pleurobema decisum	Southern Clubshell	S2	SP
Pleurobema georgianum	Southern Pigtoe	S1	SP
Pleurobema oviforme	Tennessee Clubshell	S1	PSM
Pleurobema perovatum	Ovate Clubshell	S1	SP
Pleurobema plenum	Rough Pigtoe	S1	SP
Pleurobema rubrum	Pyramid Pigtoe	S1	SP
Pleurobema rubellum	Warrior Pigtoe	S1	SP
Potamilus alatus	Pink Heelsplitter	S5	CHM
Potamilus ohiensis	Pink Papershell	S3	PSM
Ptychobranchus fasciolaris	Kidneyshell	S2	PSM
Ptychobranchus greenii	Triangular Kidneyshell	S1	SP
Ptychobranchus subtentum	Fluted Kidneyshell	SX	SP
Quadrula cylindrica cylindrica	Smooth Rabbitsfoot	S1	SP
Quadrula fragosa	Winged Mapleleaf	SNA	SP
Quadrula intermedia	Cumberland Monkeyface	SX	SP

SCIENTIFIC	COMMON	RANK	STATUS
Quadrula metanevra	Monkeyface	S3	PSM
Quadrula nodulata	Wartyback	SNA	PSM
Strophitus subvexus	Southern Creekmussel	S3	PSM
Strophitus undulatus	Squawfoot	S1	PSM
Toxolasma cylindrellus	Pale Lilliput	S1	SP
Toxolasma lividus	Purple Lilliput	S2	PSM
Toxolasma parvum	Lilliput	S3	PSM
Tritogonia verrucosa	Pistolgrip	S4	CHM
Truncilla truncata	Deertoe	S1	PSM
Villosa fabalis	Rayed Bean	SX	SP
Villosa iris	Rainbow Mussel	S3	PSM
Villosa nebulosa	Alabama Rainbow	S3	PSM
Villosa taeniata	Painted Creekshell	S2	PSM
Villosa trabalis	Cumberland Bean	SX	SP
Villosa vanuxemensis	Mountain Creekshell	S3	PSM
Snails			
Antrorbis breweri	Manitou snail	S1	SLNS
Athearnia anthonyi	Anthony's River Snail	S1	SP
Campeloma decampi	Slender Campeloma	S1	SP
Elimia interveniens	Slowwater Elimia	S2	SLNS
Elimia nassula	Round-rib Elimia	S1	TRKD
Glyphyalinia latebricola	Stone Glyph	SNR	SLNS
Io fluvialis	Spiny Riversnail	SX	EXTI
Leptoxis minor	Knob Mudalia	SX	EXTI
Lithasia armigera	Armored Rocksnail	S1	SLNS
Lithasia geniculata	Ornate Rocksnail	S1	SLNS
Lithasia lima	Warty Rocksnail	S1	SLNS
Lithasia salebrosa	Muddy Rocksnail	S1	SLNS
Lithasia verrucosa	Varicose Rocksnail	S3	SLNS
Marstonia pachyta	Armored marstonia	S1	SP
Pleurocera alveare	Rugged Hornsnail	S1	SLNS
Pleurocera corpulenta	Corpulent Hornsnail	S1	TRKD
Pleurocera curta	Shortspire Hornsnail	S1S2	TRKD
Pleurocera nobilis	Noble Hornsnail	S2	TRKD
Pleurocera pyrenella	Skirted Hornsnail	S2	TRKD
Pleurocera walkeri	Telescope Hornsnail	S3	SLNS
Rhodacme filosa	Wicker Ancylid	S1	HIST
Somatogyrus aureus	Golden Pebblesnail	SH	HIST
Somatogyrus coosaensis	Coosa Pebblesnail	SH	HIST
Somatogyrus excavatus	Ovate Pebblesnail	SH	HIST
Somatogyrus humerosus	Atlas Pebblesnail	SH	HIST
Somatogyrus obtusus	Moon Pebblesnail	SH	HIST
Somatogyrus strengi	Rolling Pebblesnail	S1	SLNS
Insects			
Agapetus gelbae	Glossosomatid Caddisfly	S1	SLNS
Agapetus hessi	A Glossosomatid Caddisfly	S1	SLNS
Agarodes stannardi	Stannard's Agarodes Caddisfly	S2	SLNS
Batriasymmodes spelaeus	A Beetle	S3	SLNS
Batrisodes jocuvestus	A Beetle	S1	SLNS
Batrisodes jonesi	A Beetle	S2S3	SLNS
Batrisodes specus	A Beetle	S2	SLNS
Batrisodes subterraneus	A Beetle	S1	SLNS
Batrisodes tumoris	A Beetle	S1	SLNS
Batrisodes valentinei	A Beetle	S2	SLNS
Catops gratiosa	A Beetle	S2	SLNS
Ceraclea alabamae	A Caddisfly	S1	SLNS
Ceraclea alces	A Caddisfly	S1	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Ceuthophilus stygius	A Cricket	S2	SLNS
Cheumatopsyche helma	Helma's Cheumatopsyche Caddisfly	S1	SLNS
Chimarra socia	A Caddisfly	S1	SLNS
Folsomia candida	A Springtail	S1	SLNS
Hydropsyche cuanis	A Caddisfly	S1	SLNS
Hydropsyche rotosa	A Caddisfly	S1	SLNS
Hydropsyche simulans	Imitating Net-spinning Caddisfly	S1	SLNS
Lesteva pallipes	A Beetle	S1	SLNS
Litocampa henroti	A Hexapod	S1	SLNS
Micrasema scotti	A Caddisfly	S1	SLNS
Phryganea sayi	A Caddisfly	S1	SLNS
Polycentropus nascotius	A Caddisfly	S1	SLNS
Pseudanophthalmus alladini	A Cave Obligate Beetle	S2	SLNS
Pseudanophthalmus assimilis	West Wills Valley Cave Beetle	S1	SLNS
Pseudanophthalmus distinguens	A Ground Beetle	S1	SLNS
Pseudanophthalmus fluviatilis	A Cave Obligate Beetle	S2	SLNS
Pseudanophthalmus lodingi	A Ground Beetle	S1S2	SLNS
Pseudanophthalmus meridionalis	A Cave Obligate Beetle	S2	SLNS
Pseudanophthalmus profundus	A Cave Obligate Beetle	S2	SLNS
Psilotreta labida	A Caddisfly	S1	SLNS
Ptomaphagus chromolithus	A Cave Obligate Beetle	S2	SLNS
Ptomaphagus laticornis	A Beetle	S1	SLNS
Ptomaphagus longicornis	A Cave Obligate Beetle	S2	SLNS
Ptomaphagus valentinei	A Beetle	S2	SLNS
Rhadine caudata	A Ground Beetle	S2	SLNS
Rhyacophila alabama	A Caddisfly	S1	SLNS
Rhyacophila fenestra	A Caddisfly	S1	SLNS
Speleochus synstygicus	A Cave Obligate Beetle	S1	SLNS
Arachnids			
Alabamocreagris pecki	A Cave Obligate Pseudoscorpion	S1S2	SLNS
Apochthonius russelli	A Cave Obligate Pseudoscorpion	S1	SLNS
Nesticus barri	A Cave Obligate Spider	S3	SLNS
Nesticus jonesi	Cave Spring Cave Spider	S1	SLNS
Arthropods			
Pseudotremia nyx	A Cave Obligate Millipede	S1	SLNS
Crustaceans			
Cambarus cracens	Slenderclaw	S1	TRKD
Cambarus hamulatus	Prickly Cave Crayfish	S2	SLNS
Cambarus jonesi	Alabama Cave Crayfish	S2	SLNS
Cambarus veitchorum	White Spring Cave Crayfish	S1	SLNS
Orconectes australis australis	Southern Cave Crayfish	S3	SLNS
Orconectes sheltae	Shelta Cave Crayfish	S1	SLNS
Palaemonias alabamae	Alabama Blind Cave Shrimp	S1	SP
Procambarus pecki	Phantom Cave Crayfish	S1S2	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Plants			
Actaea rubifolia	Appalachian Bugbane	SH	SLNS
Agastache nepetoides	Yellow Giant-hyssop	S1	SLNS
Allium speculae	Little River Canyon Onion	S2	SLNS
Allium tricoccum	Small White Leek	S1	SLNS
Apios priceana	Price's Potato-bean	S2	SLNS
Aplectrum hyemale	Puttyroot	S2	SLNS
Arabis georgiana	Georgia Rockcress	S1	SLNS
Aralia racemosa	American Spikenard	S1	SLNS
Armoracia lacustris	Lake-cress	S1	SLNS
Asplenium bradleyi	Bradley's Spleenwort	S2	SLNS
Asplenium ruta-muraria	Wall-rue Spleenwort	S1	SLNS
Asplenium scolopendrium var. *americanum*	American Hart's-tongue Fern	S1	SLNS
Asplenium trichomanes	Maidenhair Spleenwort	S2S3	SLNS
Astragalus canadensis	Canadian Milkvetch	S1	SLNS
Astragalus tennesseensis	Tennessee Milk-vetch	S1S2	SLNS
Aureolaria patula	Spreading False-foxglove	S1	SLNS
Bigelowia nuttallii	Nuttall's Rayless Golden-rod	S3	SLNS
Blephilia subnuda	Smooth Blephilia	S1S2	SLNS
Boykinia aconitifolia	Brook Saxifrage	S1	SLNS
Callirhoe alcaeoides	Clustered Poppy-mallow	S2	SLNS
Carex austrocaroliniana	South Carolina Sedge	S2?	SLNS
Carex decomposita	Epiphytic Sedge	S1	SLNS
Carex eburnea	Ebony Sedge	S2	SLNS
Carex purpurifera	Sedge	S2	SLNS
Castilleja coccinea	Scarlet Indian-paintbrush	S1	SLNS
Celastrus scandens	climbing bittersweet	S2	SLNS
Chelone lyonii	Pink Turtlehead	S1	SLNS
Claytonia caroliniana	Carolina Spring-beauty	S1	SLNS
Clematis morefieldii	Morefield's Leather-flower	S2	SLNS
Clematis socialis	Alabama Leather Flower	S1	SLNS
Collinsia verna	Blue-eyed Mary	S1	SLNS
Comandra umbellata	Bastard Toad-flax	S1	SLNS
Corallorhiza wisteriana	Wister Coral-root	S2	SLNS
Coreopsis pulchra	Woodland Tickseed	S2	SLNS
Cotinus obovatus	American Smoke-tree	S2	SLNS
Crataegus triflora	Three-flowered Hawthorn	S2	SLNS
Croomia pauciflora	Croomia	S2	SLNS
Cuscuta harperi	Harper's Dodder	S2	SLNS
Cyperus granitophilus	Granite-loving Flatsedge	S2	SLNS
Cypripedium candidum	White Lady-slipper	S1	SLNS
Cystopteris tennesseensis	Tennessee Bladderfern	S2	SLNS
Dalea foliosa	Leafy Prairie-clover	S1	SLNS
Dalea gattingeri	Gattinger Prairie-clover	S3	SLNS
Delphinium alabamicum	Alabama Larkspur	S2	SLNS
Desmodium ochroleucum	Creamflower Tick-trefoil	S1S2	SLNS
Diarrhena americana	American Beakgrain	S2	SLNS
Dicentra cucullaria	Dutchman's Breeches	S2	SLNS
Diphasiastrum tristachyum	Deep-root Clubmoss	S1	SLNS
Dodecatheon frenchii	French's Shootingstar	S1	SLNS
Draba ramosissima	Branching Whitlow-wort	S1	SLNS
Elodea canadensis	Waterweed	S1	SLNS
Elymus churchii	Church's Wildrye	S1	SLNS
Enemion biternatum	False Rue-anemone	S2	SLNS
Equisetum arvense	Common Horsetail	S2	SLNS
Eriogonum harperi	Harper's Umbrella-plant	S1	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Erythronium albidum	White Trout-lily	S1S2	SLNS
Eurybia spectabilis	Showy Aster	S1	SLNS
Eurybia surculosa	Creeping Aster	S1	SLNS
Fimbristylis brevivaginata	Glade Fimbristylis	S1	SLNS
Fothergilla major	Witch-alder	S2	SLNS
Frasera caroliniensis	American Columbo	S2	SLNS
Geum virginianum	Pale Avens	S2	SLNS
Helianthus eggertii	Eggert's Sunflower	S1	SLNS
Helianthus glaucophyllus	White-leaved Sunflower	SH	SLNS
Helianthus longifolius	Longleaf Sunflower	S1S2	SLNS
Helianthus verticillatus	Whorled Sunflower	S1	SLNS
Hottonia inflata	Featherfoil	S2	SLNS
Huperzia lucidula	Shining Clubmoss	S2	SLNS
Huperzia porophila	Rock Clubmoss	S1	SLNS
Hydrastis canadensis	Goldenseal	S2	SLNS
Hydrophyllum appendiculatum	Waterleaf	S2?	SLNS
Hymenophyllum tayloriae	Gorge Filmy Fern	S1	SLNS
Hypericum dolabriforme	Straggling St. John's-wort	SH	SLNS
Hypericum nudiflorum	St. John's-wort	S2	SLNS
Isoetes butleri	Butler's Quillwort	S2	SLNS
Isotria verticillata	Large Whorled Pogonia	S2	SLNS
Jamesianthus alabamensis	Alabama Jamesianthus	S3	SLNS
Jeffersonia diphylla	Twinleaf	S2	SLNS
Juglans cinerea	Butternut	S1	SLNS
Lathyrus venosus	Smooth Veiny Peavine	S1	SLNS
Leavenworthia alabamica	Alabama Glade-cress	S2	SLNS
Leavenworthia crassa	Fleshy-fruit Gladecress	S2	SLNS
Leavenworthia exigua var. *lutea*	Pasture Glade-cress	S1	SLNS
Leavenworthia torulosa	Necklace Glade-cress	SX	SLNS
Leavenworthia uniflora	Michaux Leavenworthia	S2	SLNS
Lesquerella lyrata	Lyre-leaf Bladderpod	S1	SLNS
Lilium canadense	Canada Lily	S2	SLNS
Lilium superbum	Turk's Cap Lily	S2	SLNS
Linum sulcatum var. *harperi*	Harper's Grooved-yellow Flax	S1	SLNS
Lobelia boykinii	Boykin's Lobelia	S1S2	SLNS
Lysimachia graminea	Grass-leaf Loosestrife	S1	SLNS
Marshallia mohrii	Mohr's Barbara's Buttons	S3	SLNS
Melanthium parviflorum	False Helleborne	S1S2	SLNS
Mirabilis albida	Pale Umbrella-wort	S2	SLNS
Mitella diphylla	Two-leaf Bishop's-cap	S1	SLNS
Monarda clinopodia	Horsemint	S2	SLNS
Monotropsis odorata var. *odorata*	Sweet Pinesap	S1	SLNS
Muhlenbergia sobolifera	Muhly Grass	S1	SLNS
Nestronia umbellula	Nestronia	S2	SLNS
Neviusia alabamensis	Alabama Snow-wreath	S2	SLNS
Onosmodium molle ssp. *molle*	Soft False Gromwell	S2	SLNS
Onosmodium molle ssp. *subsetosum*	False Gromwell	S1	SLNS
Ophioglossum engelmannii	Limestone Adder's-tongue	S2S3	SLNS
Orobanche uniflora	One-flowered Broomrape	S2	SLNS
Oxalis grandis	Great Yellow Wood-sorrel	S1	SLNS
Pachysandra procumbens	Allegheny-spurge	S2S3	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Panicum lithophilum	Swallen's Panic-grass	S1	SLNS
Parnassia asarifolia	Kidneyleaf Grass-of-parnassus	S2	SLNS
Paysonia densipila	Duck River Bladderpod	S1	SLNS
Pediomelum subacaule	Tuberous Scurfpea	S2	SLNS
Phemeranthus calcaricus	Limestone Fame-flower	S2	SLNS
Phemeranthus teretifolius	Roundleaf Fameflower	S1	SLNS
Phlox pulchra	Wherry's Phlox	S2	SLNS
Plantago cordata	Heartleaved Plantain	S2	SLNS
Platanthera integrilabia	White Fringeless Orchid	S2	SLNS
Platanthera lacera	Ragged Fringe Orchid	S2	SLNS
Polygala senega var. *latifolia*	Seneca Snakeroot	S1	SLNS
Polygonella americana	Southern Jointweed	S1	SLNS
Polymnia laevigata	Tennessee Leafcup	S2S3	SLNS
Prenanthes barbata	Barbed Rattlesnake-root	S1S2	SLNS
Prosartes maculata	Spotted Mandarin	S1	SLNS
Ptilimnium nodosum	Harperella	S1	SLNS
Pycnanthemum curvipes	Mountain-mint	S1?	SLNS
Pyrularia pubera	Buffalo-nut	S2	SLNS
Ranunculus flabellaris	Yellow Water-crowfoot	S1	SLNS
Rhododendron minus	Carolina Rhododendron	S2	SLNS
Rhynchospora thornei	Thorne's Beakrush	S1	SLNS
Ribes curvatum	Granite Gooseberry	S2	SLNS
Ribes cynosbati	Prickly Gooseberry	S1S2	SLNS
Rubus allegheniensis	Allegheny Blackberry	S1	SLNS
Rudbeckia heliopsidis	Sun-facing Coneflower	S2	SLNS
Sabatia capitata	Rose-gentian	S2	SLNS
Sagittaria secundifolia	Arrowhead	S1	SLNS
Salix humilis	Pussy Willow	S2S3	SLNS
Sarracenia oreophila	Green Pitcher Plant	S2	SLNS
Schoenolirion croceum	Sunnybell	S2	SLNS
Schoenolirion wrightii	Sunnybell	S1	SLNS
Scutellaria alabamensis	Alabama Skullcap	S2	SLNS
Selaginella arenicola ssp. *riddellii*	Spikemoss	S2	SLNS
Selaginella rupestris	Spikemoss	S2	SLNS
Silene caroliniana ssp. *wherryi*	Wherry's Catchfly	S2	SLNS
Silene ovata	Ovate Catchfly	S2	SLNS
Silene rotundifolia	Roundleaf Catchfly	S1S2	SLNS
Silphium brachiatum	Cumberland Rosinweed	S2	SLNS
Silphium mohrii	Mohr's Rosin-weed	S1	SLNS
Silphium pinnatifidum	Prairie-dock	S1	SLNS
Spiranthes lucida	Shining Ladies'-tresses	S1	SLNS
Stellaria fontinalis	Water Stitchwort	S1	SLNS
Stewartia malacodendron	Silky-camellia	S2S3	SLNS
Stewartia ovata	Mountain Camellia	S2S3	SLNS
Stylophorum diphyllum	Celandine Poppy	S1	SLNS
Synandra hispidula	Guyandotte Beauty	S1	SLNS
Thalictrum debile	Southern Meadow-rue	S2	SLNS
Thalictrum mirabile	Little Mountain Meadow-rue	S2	SLNS
Thelypteris pilosa var. *alabamensis*	Alabama Streak-sorus Fern	S1	SLNS
Thermopsis mollis	Soft-haired Thermopsis	S1	SLNS
Trichomanes petersii	Dwarf Filmy-fern	S2	SLNS
Trillium flexipes	Nodding Trillium	S2S3	SLNS
Trillium lancifolium	Lance-leaf Trillium	S2S3	SLNS
Trillium pusillum var. *1*	Interior Least Trillium	S2	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Trillium recurvatum	Prairie Trillium	S2	SLNS
Trillium sessile	Sessile Trillium	S2	SLNS
Trillium sulcatum	Southern Red Trillium	S1	SLNS
Triosteum angustifolium	Horse-gentian	S1	SLNS
Valeriana pauciflora	Valerian	S1	SLNS
Viburnum bracteatum	Arrow-wood	S1	SLNS
Viola canadensis	Canada Violet	S2	SLNS
Viola egglestonii	Eggleston's Violet	S1	SLNS
Xyris tennesseensis	Yellow-eyed-grass	S1	SLNS

Status Codes: GA = Game Animal (Managed Hunting Regulations); GBNOS = Game Bird – No Open Season; SLNS = State Listed, no status assigned; SP = State Protected.

State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; SH = Possibly Extirpated (Historical); S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); _B = Rank of Breeding Population; _N = Rank of Non-Breeding Population.

State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants in Georgia Potentially Impacted by the Natural Resource Plan

SCIENTIFIC	COMMON	RANK	STATUS
Mammals			
Corynorhinus rafinesquii	Rafinesque's Big-eared bat	S3	RARE
Mustela nivalis	Least Weasel	S1	TRKD
Myotis grisescens	Gray Bat	S1	E
Myotis leibii	Eastern small-footed bat	S2	TRKD
Myotis sodalis	Indiana Bat	S1	E
Neotoma floridana haematoreia	Southern Appalachian Woodrat	S3	TRKD
Parascalops breweri	Hairy-tailed Mole	S1	TRKD
Sylvilagus obscurus	Appalachian Cottontail	S1S2	RARE
Birds			
Falco peregrinus	Peregrine Falcon	S1	RARE
Peucaea aestivalis	Bachman's Sparrow	S2	RARE
Picoides borealis	Red-cockaded Woodpecker	S2	E
Reptiles			
Glyptemys muhlenbergii	Bog Turtle	S2	E
Graptemys geographica	Map Turtle	S1	RARE
Graptemys pulchra	Alabama Map Turtle	S3	RARE
Amphibians			
Aneides aeneus	Green Salamander	S3	RARE
Cryptobranchus alleganiensis	Hellbender	S2	RARE
Plethodon petraeus	Pigeon Mountain Salamander	S2	RARE
Fishes			
Cyprinella caerulea	Blue Shiner	S2	E
Cyprinella galactura	Whitetail Shiner	S3	TRKD
Cyprinella spiloptera	Spotfin Shiner	S2	TRKD
Erimonax monachus	Spotfin Chub	SX	EXTI
Erimystax insignis	Blotched Chub	S2	E
Etheostoma brevirostrum	Holiday Darter	S1	E
Etheostoma cinereum	Ashy Darter	SX	TRKD
Etheostoma ditrema	Coldwater Darter	S1	E
Etheostoma rufilineatum	Redline Darter	S2	TRKD
Etheostoma simoterum	Snubnose Darter	S1	TRKD
Etheostoma trisella	Trispot Darter	S1	E
Etheostoma vulneratum	Wounded Darter	S1	E
Fundulus catenatus	Northern Studfish	S2	RARE
Hemitremia flammea	Flame Chub	S1	E
Hybopsis amblops	Bigeye Chub	S1S2	RARE
Ichthyomyzon bdellium	Ohio Lamprey	S1	RARE
Luxilus chrysocephalus	Striped Shiner	S3	TRKD
Lythrurus fasciolaris	Rosefin Shiner	S2	TRKD
Moxostoma carinatum	River Redhorse	S3	RARE
Moxostoma sp. 2	Sicklefin Redhorse	S1	E
Notropis ariommus	Popeye Shiner	S1	E
Notropis asperifrons	Burrhead Shiner	S2	T
Notropis lineapunctata	Lined Chub	S2	RARE
Notropis photogenis	Silver Shiner	S1	E
Noturus flavipinnis	Yellowfin Madtom	SX	EXTI
Noturus munitus	Frecklebelly Madtom	S1	E
Percina antesella	Amber Darter	S1	E

SCIENTIFIC	COMMON	RANK	STATUS
Percina aurantiaca	Tangerine Darter	S2	E
Percina aurolineata	Goldline Darter	S2	E
Percina jenkinsi	Conasauga Logperch	S1	E
Percina kusha	Bridled Darter	S1	E
Percina lenticula	Freckled Darter	S2	E
Percina sciera	Dusky Darter	S3	RARE
Percina squamata	Olive Darter	S1	E
Percina tanasi	Snail Darter	S1	E
Phenacobius crassilabrum	Fatlips Minnow	S2	E
Phenacobius uranops	Stargazing Minnow	S1	T
Typhlichthys subterraneus	Southern Cavefish	S1	E
Mussels			
Epioblasma metastriata	Upland Combshell	SX	E
Epioblasma othcaloogensis	Southern Acornshell	SX	E
Lampsilis altilis	Fine-lined Pocketbook	S2	T
Medionidus acutissimus	Alabama Moccasinshell	S1	T
Medionidus parvulus	Coosa Moccasinshell	S1	E
Pleurobema chattanoogaense	Painted Clubshell	S1	TRKD
Pleurobema decisum	Southern Clubshell	S1	E
Pleurobema georgianum	Southern Pigtoe	S1	E
Pleurobema hanleyianum	Georgia Pigtoe	S1	E
Pleurobema perovatum	Ovate Clubshell	SH	E
Ptychobranchus greenii	Triangular Kidneyshell	S1	E
Strophitus connasaugaensis	Alabama Creekmussel	S1	E
Villosa trabalis	Cumberland Bean	SH	HIST
Snails			
Pleurocera pyrenella	Skirted Hornsnail	S2	HIST
Plants			
Agastache nepetoides	Yellow Giant-hyssop	S1	SPCO
Arabis georgiana	Georgia Rockcress	S1	T
Baptisia australis var. *aberrans*	Tall Blue Wild Indigo	S2	SPCO
Carex biltmoreana	Biltmore Sedge	S1	T
Carex manhartii	Manhart's Sedge	S2S3	SPCO
Carex purpurifera	Sedge	S2	SPCO
Cymophyllus fraserianus	Fraser's Sedge	S1	T
Cypripedium acaule	Pink Lady's-slipper	S4	UNUS
Cypripedium parviflorum	Small Yellow Lady's-slipper	S3	RARE
Cypripedium pubescens	Large Yellow Lady's-slipper	S3	RARE
Dalea gattingeri	Gattinger Prairie-clover	S2S3	SPCO
Delphinium tricorne	Dwarf Larkspur	S2	SPCO
Dryopteris celsa	Log Fern	S2	SPCO
Erigeron strigosus var. *calcicola*	Limestone Fleabane	S1	SPCO
Gentianopsis crinita	Fringed Gentian	S1	T
Helonias bullata	Swamp-pink	S1	T
Hydrastis canadensis	Goldenseal	S2	E
Hypericum dolabriforme	Straggling St. John's-wort	S3	SPCO
Hypericum sphaerocarpum	Barrens St. Johnswort	S1	SPCO
Isotria medeoloides	Small Whorled Pogonia	S2	T
Jeffersonia diphylla	Twinleaf	S1	RARE

SCIENTIFIC	COMMON	RANK	STATUS
Leavenworthia exigua var. *exigua*	Glade Cress	S2	T
Lilium canadense	Canada Lily	S2?	SPCO
Lysimachia fraseri	Fraser Loosestrife	S2	RARE
Lysimachia terrestris	Swamp Loosestrife	S1	SPCO
Marshallia mohrii	Mohr's Barbara's Buttons	S2	T
Mertensia virginica	Virginia Bluebells	S2	SPCO
Neviusia alabamensis	Alabama Snow-wreath	S1	T
Ophioglossum engelmannii	Limestone Adder's-tongue	S2S3	SPCO
Panax quinquefolius	American ginseng	S3	SPCO
Parnassia grandifolia	Large-leaved Grass-of-parnassus	S1	SPCO
Pedicularis lanceolata	Swamp Lousewort	S1	E
Platanthera flava var. *herbiola*	Pale Green Orchid	SH	SPCO
Platanthera peramoena	Purple Fringeless Orchid	S1	SPCO
Polemonium reptans	Greek Valerian	S1S2	SPCO
Potentilla tridentata	Three-toothed Cinquefoil	S1	E
Pycnanthemum virginianum	Virginia Mountain Mint	S2	SPCO
Sabatia capitata	Rose-gentian	S2	RARE
Sanguisorba canadensis	Canada Burnet	S1	T
Sarracenia oreophila	Green Pitcher Plant	S1	E
Sarracenia purpurea	Mountain Purple Pitcherplant	S1	E
Scutellaria montana	Large-flowered Skullcap	S3	T
Silene regia	Royal Catchfly	S1	E
Silene rotundifolia	Roundleaf Catchfly	S1	SPCO
Smilax pulverulenta	Downy Carrion-flower	S1?	SPCO
Spiraea virginiana	Virginia Spiraea	S1	T
Spiranthes magnicamporum	Great Plains Ladies'-tresses	S1	E
Spiranthes ovalis var. *erostellata*	Lesser Ladies'-tresses	S2S3	SPCO
Thalictrum debile	Southern Meadow-rue	S1	T
Trientalis borealis	Northern Starflower	S1S2	E
Trillium lancifolium	Lance-leaf Trillium	S3	SPCO
Trillium pusillum	Least Trillium	S1	E
Viburnum bracteatum	Arrow-wood	S1	E
Viola egglestonii	Eggleston's Violet	S2	SPCO
Xerophyllum asphodeloides	Eastern Turkeybeard	S1	RARE
Xyris tennesseensis	Yellow-eyed-grass	S1	E

Status Codes: E = Endangered; HIST = Historical; RARE = Listed Rare; SLNS = State Listed, no status assigned; TRKD = Tracked.

State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).

State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants in Kentucky Potentially Impacted by the Natural Resource Plan

SCIENTIFIC	COMMON	RANK	STATUS
Mammals			
Corynorhinus rafinesquii	Rafinesque's Big-eared bat	S3	SC
Myotis austroriparius	Southeastern Bat	S1S2	E
Myotis grisescens	Gray Bat	S2	T
Myotis leibii	Eastern small-footed bat	S2	T
Myotis septentrionalis	Northern Long-eared Bat	S3	T
Myotis sodalis	Indiana Bat	S1S2	E
Nycticeius humeralis	Evening Bat	S3	SC
Perimyotis subflavus	Tricolored Bat	S4S5	N
Peromyscus gossypinus	Cotton Mouse	S2	T
Sorex cinereus	Common Shrew	S3	TRKD
Birds			
Accipiter striatus	Sharp-shinned Hawk	S3B,S4N	TRKD
Ammodramus henslowii	Henslow's Sparrow	S3B	TRKD
Anas clypeata	Northern shoveler	S1	E
Anas discors	Blue-winged Teal	S1S2B	T
Ardea alba	Great Egret	S2B	E
Botaurus lentiginosus	American Bittern	SHB	HIST
Bubulcus ibis	Cattle Egret	S1S2B	TRKD
Certhia americana	Brown Creeper	S1S2	E
Chondestes grammacus	Lark Sparrow	S2S3B	T
Circus hudsonius	Northern Harrier	S1S2B,S4N	T
Cistothorus platensis	Sedge Wren	S3B	TRKD
Corvus ossifragus	Fish Crow	S3B	TRKD
Egretta caerulea	Little Blue Heron	S1B	E
Fulica americana	American Coot	S1	E
Gallinula galeata	Common Gallinule	S1S2B	N
Haliaeetus leucocephalus	Bald Eagle	S2B,S2S3N	T
Ictinia mississippiensis	Mississippi Kite	S2B	TRKD
Ixobrychus exilis	Least Bittern	S1S2B	T
Lophodytes cucullatus	Hooded Merganser	S1S2B,S3S4N	T
Nyctanassa violacea	Yellow-crowned Night-heron	S2B	T
Nycticorax nycticorax	Black-crowned Night-heron	S1S2B	T
Pandion haliaetus	Osprey	S2S3B	T
Peucaea aestivalis	Bachman's Sparrow	S1B	E
Phalacrocorax auritus	Double-crested Cormorant	S2B	E
Podilymbus podiceps	Pied-billed Grebe	S1B,S4N	E
Rallus elegans	King Rail	S1B	E
Riparia riparia	Bank Swallow	S3B	TRKD
Sterna antillarum athalassos	Interior Least Tern	S2B	E
Thryomanes bewickii	Bewick's Wren	S3B	TRKD
Tyto alba	Common Barn-owl	S3	TRKD
Vireo bellii	Bell's Vireo	S2S3B	TRKD
Reptiles			
Apalone mutica mutica	Midland Smooth Softshell	S3	TRKD
Chrysemys picta dorsalis	Southern Painted Turtle	S2	T
Clonophis kirtlandii	Kirtland's Snake	S2	T
Elaphe guttata	Corn Snake	S3	TRKD
Eumeces inexpectatus	Southeastern Five-lined Skink	S3	TRKD

SCIENTIFIC	COMMON	RANK	STATUS
Farancia abacura reinwardtii	Western Mud Snake	S3	TRKD
Lampropeltis triangulum elapsoides	Scarlet Kingsnake	S3	TRKD
Macrochelys temminckii	Alligator Snapping Turtle	S2	T
Nerodia cyclopion	Mississippi Green Water Snake	S1	E
Nerodia fasciata confluens	Broad-banded Water Snake	S1	E
Ophisaurus attenuatus longicaudus	Eastern Slender Glass Lizard	S2	T
Pituophis melanoleucus melanoleucus	Northern Pine Snake	S2	T
Plestiodon anthracinus	Coal Skink	S2	T
Sistrurus miliarius streckeri	Western Pigmy Rattlesnake	S2	T
Thamnophis proximus	Western Ribbon Snake	S1S2	T
Thamnophis proximus proximus	Western Ribbon Snake	S1S2	T
Thamnophis sauritus	Eastern Ribbon Snake	S3	TRKD
Thamnophis sauritus sauritus	Common Ribbon Snake	S3	S
Amphibians			
Amphiuma tridactylum	Three-toed Amphiuma	S1	E
Cryptobranchus alleganiensis alleganiensis	Eastern Hellbender	S1	E
Eurycea guttolineata	Three-lined Salamander	S2	T
Hyla avivoca	Bird-voiced Treefrog	S3	TRKD
Hyla cinerea	Green Treefrog	S4	TRKD
Hyla gratiosa	Barking Treefrog	S3	TRKD
Hyla versicolor	Gray Treefrog	S2S3	TRKD
Lithobates blairi	Plains Leopard Frog	S1S3	S
Rana areolata circulosa	Northern Crawfish Frog	S3	TRKD
Fishes			
Acipenser fulvescens	Lake Sturgeon	S1	E
Alosa alabamae	Alabama Shad	S1	E
Ammocrypta clara	Western Sand Darter	S1	E
Ammocrypta vivax	Scaly Sand Darter	SX	SX
Atractosteus spatula	Alligator Gar	S1	E
Chrosomus cumberlandensis	Blackside Dace	S2	T
Cyprinella camura	Bluntface Shiner	S1	E
Cyprinella venusta	Blacktail Shiner	S3	TRKD
Erimystax insignis	Blotched Chub	S1	E
Erimyzon sucetta	Lake Chubsucker	S2	T
Esox niger	Chain Pickerel	S3	TRKD
Etheostoma chienense	Relict Darter	S1	E
Etheostoma fusiforme	Swamp Darter	S1	E
Etheostoma lemniscatum	Tuxedo Darter	S1	E
Etheostoma lynceum	Brighteye Darter	S1	E
Etheostoma maculatum	Spotted Darter	S2	T
Etheostoma microlepidum	Smallscale Darter	S1	E
Etheostoma parvipinne	Goldstripe Darter	S1	E
Etheostoma proeliare	Cypress Darter	S2	T
Etheostoma pyrrhogaster	Firebelly Darter	S1	E
Etheostoma sagitta	Arrow Darter	S3	S
Etheostoma susanae	Cumberland Darter	S1	E
Etheostoma swaini	Gulf Darter	S1	E
Etheostoma tecumsehi	Shawnee Darter	S2S3	S

SCIENTIFIC	COMMON	RANK	STATUS
Etheostoma tippecanoe	Tippecanoe Darter	S2	TRKD
Fundulus chrysotus	Golden Topminnow	S1	E
Fundulus dispar	Starhead Topminnow	S1	E
Hemitremia flammea	Flame Chub	S1	SX
Hybognathus hayi	Cypress Minnow	S1	E
Ichthyomyzon castaneus	Chestnut Lamprey	S2	TRKD
Ichthyomyzon gagei	Southern Brook Lamprey	SH	HIST
Ichthyomyzon greeleyi	Mountain Brook Lamprey	S2	T
Ictiobus niger	Black Buffalo	S3	TRKD
Lampetra appendix	American Brook Lamprey	S2	T
Lampetra sp. 1	A brook lamprey	S1	E
Lepomis marginatus	Dollar Sunfish	S1	E
Lepomis miniatus	Redspotted Sunfish	S2	T
Menidia beryllina	Inland Silverside	S2	T
Moxostoma poecilurum	Blacktail Redhorse	S1	E
Notropis albizonatus	Palezone Shiner	S1	E
Notropis amnis	Pallid Shiner	S1	HIST
Notropis maculatus	Taillight Shiner	S2S3	T
Noturus exilis	Slender Madtom	S1	E
Noturus hildebrandi	Least Madtom	S1	E
Noturus phaeus	Brown Madtom	S1	E
Percina macrocephala	Longhead Darter	S1	E
Percopsis omiscomaycus	Trout-perch	S3	TRKD
Phenacobius uranops	Stargazing Minnow	S2S3	TRKD
Scaphirhynchus albus	Pallid Sturgeon	S1	E
Thoburnia atripinnis	Blackfin Sucker	S2	TRKD
Typhlichthys subterraneus	Southern Cavefish	S2S3	TRKD
Umbra limi	Central Mudminnow	S2S3	T
Mussels			
Alasmidonta marginata	Elktoe	S2	T
Anodontoides denigratus	Cumberland Papershell	S1	E
Cumberlandia monodonta	Spectaclecase	S1	E
Cyprogenia stegaria	Fanshell	S1	E
Dromus dromas	Dromedary Pearlymussel	S1	SX
Epioblasma florentina florentina	Yellow-blossom Pearlymussel	SX	SX
Epioblasma obliquata obliquata	Purple Catspaw	S1	E
Epioblasma torulosa rangiana	Northern Riffleshell	S1	E
Epioblasma triquetra	Snuffbox	S1	E
Fusconaia subrotunda	Longsolid	S3S4	TRKD
Fusconaia subrotunda subrotunda	Long-solid	S3	TRKD
Hemistena lata	Cracking Pearlymussel	SX	SX
Lampsilis abrupta	Pink Mucket	S1	E
Lampsilis ovata	Pocketbook	S1	E
Leptodea leptodon	Scaleshell	SX	SX
Obovaria retusa	Ring Pink	S1	E
Pegias fabula	Little-wing Pearlymussel	S1	E
Plethobasus cooperianus	Orange-foot Pimpleback	S1	E
Plethobasus cyphyus	Sheepnose	S1	E
Pleurobema clava	Clubshell	S1	E
Pleurobema oviforme	Tennessee Clubshell	S1	E
Pleurobema plenum	Rough Pigtoe	S1	E
Pleurobema rubrum	Pyramid Pigtoe	S1	E
Pleuronaia dolabelloides	Slabside Pearlymussel	SX	SX
Potamilus capax	Fat Pocketbook	S1	E
Potamilus purpuratus	Bleufer	S1	E

SCIENTIFIC	COMMON	RANK	STATUS
Quadrula cylindrica	Rabbitsfoot	S2	T
Quadrula fragosa	Winged Mapleleaf	SX	SX
Toxolasma lividus	Purple Lilliput	S1	E
Toxolasma texasense	Texas Lilliput	S1	E
Villosa lienosa	Little Spectaclecase	S3S4	TRKD
Villosa ortmanni	Kentucky Creekshell	S2	T
Villosa trabalis	Cumberland Bean	S1	E
Villosa vanuxemensis	Mountain Creekshell	S2	T
Snails			
Fumonelix wetherbyi	Clifty Covert	S2	S
Helicodiscus notius specus	A Land Snail	S1	T
Leptoxis praerosa	Onyx Rocksnail	S3S4	TRKD
Lioplax sulculosa	Furrowed Lioplax	S3S4	S
Lithasia armigera	Armored Rocksnail	S3S4	TRKD
Lithasia geniculata	Ornate Rocksnail	S1	TRKD
Lithasia salebrosa	Muddy Rocksnail	S3/S4	TRKD
Lithasia verrucosa	Varicose Rocksnail	S3S4	TRKD
Pleurocera alveare	Rugged Hornsnail	S3S4	S
Pleurocera curta	Shortspire Hornsnail	S2	TRKD
Rabdotus dealbatus	Whitewashed Rabdotus	S1S2	T
Triodopsis multilineata	Striped Whitelip Snail	S2	T
Insects			
Allocapnia cunninghami	Karst Snowfly	S1S2	T
Amphiagrion saucium	Eastern Red Damsel	S1S2	E
Arigomphus maxwelli	Bayou Clubtail	S1S2	T
Batriasymmodes quisnamus	A Cave Obligate Beetle	SH	T
Batrisodes henroti	ant loving beetle	SH	T
Euphyes dukesi	Dukes' Skipper	S2	TRKD
Gomphus hybridus	Cocoa Clubtail	S1	E
Nicrophorus americanus	American Burying Beetle	SX	HIST
Papaipema sp. 5	Rare Cain Borer Moth	S1S2	T
Papaipema speciosissima	Osmunda Borer Moth	S2	E
Poanes viator		S1	T
Pseudanophthalmus calcareus	Limestone Cave Beetle	S1	N
Pseudanophthalmus pubescens intrepidus	A Cave Beetle	S1S2	T
Pseudanophthalmus transfluvialis	A Cave Obligate Ground Beetle	SH	TRKD
Satyrium favonius ontario	Northern Hairstreak	S2	TRKD
Stylurus notatus	Elusive Clubtail	S1	E
Arachnids			
Kleptochthonius microphthalmus	A Cave Obligate Pseudoscorpion	SH	T
Arthropods			
Scoterpes copei	A Cave Obligate Millipede	S3S4	TRKD
Crustaceans			
Barbicambarus cornutus	Bottlebrush Crayfish	S2	TRKD
Cambarellus shufeldtii	Cajun Dwarf Crayfish	S2	TRKD
Cambarus friaufi	Hairy Crayfish	S3S4	S
Crangonyx longidactylus	An Amphipod	S2	T
Orconectes burri	Blood River Crayfish	S2	T
Orconectes lancifer	Shrimp Crayfish	S1	E
Orconectes palmeri palmeri	Gray-Speckled Crayfish	S1	E
Orconectes pellucidus	Mammoth Cave Crayfish	S3	TRKD
Orconectes ronaldi	Mud River Crayfish	S2S3	T

SCIENTIFIC	COMMON	RANK	STATUS
Palaemonias ganteri	Mammoth Cave Shrimp	S1	E
Procambarus viaeviridis	Vernal Crayfish	S1	T
Stygobromus vitreus	An Amphipod	S1	TRKD
Plants			
Adiantum capillus-veneris	Southern Maidenhair Fern	S2S3	T
Aesculus pavia	Red Buckeye	S2S3	T
Agalinis auriculata	Earleaf Foxglove	S1	E
Amianthium muscitoxicum	Fly Poison	S1	E
Amsonia tabernaemontana var. *gattingeri*	A Blue-star	S2?	E
Anagallis minima	Chaffweed	S2	SPCO
Apios priceana	Price's Potato-bean	S1	E
Arabis hirsuta	Western Hairy Rock-cress	SH	T
Aralia nudicaulis	Wild Sarsaparilla	S2S3	E
Armoracia lacustris	Lake-cress	S1S2	T
Aureolaria patula	Spreading False-foxglove	S3	SPCO
Baptisia australis	Wild False Indigo	S3	SPCO
Baptisia australis var. *minor*	Blue Wild-indigo	S2S3	SPCO
Baptisia bracteata var. *leucophaea*	Cream Wild Indigo	S3	SPCO
Bartonia virginica	Screwstem	S2	T
Berchemia scandens	Supple-jack	S1S2	T
Bouteloua curtipendula	Side-oats Grama	S3?	SPCO
Cabomba caroliniana	Carolina Fanwort	S2	T
Callicarpa americana	American Beautyberry	S1	E
Carex alata	Broadwing Sedge	S1S2	T
Carex atlantica ssp. *capillacea*	Howe Sedge	S1S2	E
Carex corrugata	Prune-fruit sedge	S3?	SPCO
Carex crawei	Sedge	S3	SPCO
Carex crebriflora	Sedge	S1?	E
Carex decomposita	Epiphytic Sedge	S2	T
Carex gigantea	Large Sedge	S1S2	E
Carex reniformis	Sedge	S1?	E
Carex seorsa	Weak Stellate Sedge	S2	T
Carex venusta	Dark Green Sedge	S1	E
Carya aquatica	Water Hickory	S2S3	T
Carya carolinae-septentrionalis	Southern Shagbark Hickory	S3S4	T
Ceanothus herbaceus	Prairie Redroot	S2	T
Chelone obliqua var. *speciosa*	Rose Turtlehead	S3	SPCO
Clematis crispa	Blue Jasmine Leather-flower	S2	T
Collinsonia verticillata	Whorled Horsebalm	S1?	E
Dalea purpurea	Purple Prairie-clover	S3?	SPCO
Delphinium carolinianum	Carolina Larkspur	S1S2	T
Didiplis diandra	Water-purslane	S1S2	E
Dodecatheon frenchii	French's Shootingstar	S3	SPCO
Draba cuneifolia	Wedge-leaf Whitlow-grass	S1	E
Echinodorus berteroi	Burhead	S2	T
Echinodorus parvulus	Dwarf Burhead	S1	E
Echinodorus tenellus	Dwarf Burhead	S1	E
Eryngium integrifolium	Button Snakeroot	S1	E

SCIENTIFIC	COMMON	RANK	STATUS
Erysimum capitatum var. *capitatum*	Western Wallflower	S1?	E
Euphorbia mercurialina	Mercury Spurge	S1S2	T
Eurybia hemispherica	Tennessee Aster	S1	E
Fimbristylis perpusilla	Harper's Fimbristylis	S1?	SPCO
Fimbristylis puberula	Hairy Fimbristylis	S2	T
Forestiera ligustrina	Upland Swamp Privet	S2S3	T
Gentiana puberulenta	Downy Gentian	S1	E
Glandularia canadensis	Rose Vervain	S1?	E
Gleditsia aquatica	Water Locust	S3?	SPCO
Gratiola pilosa	Shaggy Hedgehyssop	S2	T
Gratiola quartermaniae	Quarterman's Hedge-hyssop	S1	E
Gymnopogon ambiguus	Broadleaf Beardgrass	S2S3	SPCO
Halesia carolina	Carolina Silverbell	S1S2	E
Halesia tetraptera var. *tetraptera*	Common Silverbell	S1S2	E
Hedeoma hispida	Rough Pennyroyal	S2	T
Helianthemum bicknellii	Plains Frostweed	S1S2	E
Helianthus eggertii	Eggert's Sunflower	S2	T
Heteranthera dubia	Grassleaf Mud-plantain	S3	SPCO
Heteranthera limosa	Smaller Mud-plantain	S2S3	SPCO
Heterotheca subaxillaris var. *latifolia*	Broad-leaf Golden-aster	S2	T
Hieracium longipilum	Hairy Hawkweed	S2	T
Hydrocotyle americana	American Water-pennywort	S1	E
Hydrocotyle ranunculoides	Floating Pennywort	S1S2	E
Hydrolea ovata	Hydrolea	S1	E
Hydrolea uniflora	One-flower Fiddleleaf	S1	E
Iris fulva	Red Iris	S1	E
Isoetes butleri	Butler's Quillwort	S1	E
Isoetes melanopoda	Blackfoot Quillwort	S1	E
Juglans cinerea	Butternut	S2S3	T
Juncus filipendulus	Plain's Rush	S2?	T
Leavenworthia torulosa	Necklace Glade-cress	S2	T
Lespedeza capitata	Round-head Bush-clover	S3	SPCO
Lespedeza stuevei	Tall Bush-clover	S2S3	T
Liatris cylindracea	Slender Blazing-star	S2S3	T
Lilium superbum	Turk's Cap Lily	S1S2	T
Limnobium spongia	American Frog's-bit	S2S3	T
Lobelia nuttallii	Nuttall's Lobelia	S2	T
Ludwigia hirtella	False Looestrife	S1	E
Lycopodiella appressa	Southern Bog Clubmoss	S1	E
Lysimachia terrestris	Swamp Loosestrife	S1	E
Malus ioensis	Iowa Crabapple	S2?	SPCO
Malvastrum hispidum	Hispid Falsemallow	S2?	T
Matelea carolinensis	Carolina Anglepod	S1?	E
Melanthium virginicum	Bunchflower	S1	E
Muhlenbergia cuspidata	Plains Muhlenbergia	S2	T
Muhlenbergia glabrifloris	Muhly	S2S3	SPCO
Myriophyllum heterophyllum	Broadleaf Water Milfoil	S3?	SPCO
Najas gracillima	Naiad	S2S3	SPCO
Nemophila aphylla	Nemophila	S2?	T
Oenothera linifolia	Sundrops	S1S2	E
Oenothera perennis	Small Sundrops	S1S2	E
Oenothera triloba	Sundrops	S1S2	T
Oldenlandia uniflora	Oldenlandia	S1	E

SCIENTIFIC	COMMON	RANK	STATUS
Onosmodium hispidissimum	Hairy False Gromwell	S1	E
Onosmodium molle ssp. *occidentale*	Western False Gromwell	S1	E
Paspalum boscianum	Bull-grass	S2S3	SPCO
Perideridia americana	Perideridia	S2	T
Phacelia ranunculacea	Blue Scorpion-weed	S3	SPCO
Phemeranthus calcaricus	Limestone Fame-flower	S1	E
Philadelphus inodorus	Mock-orange	S1S2	T
Phlox bifida ssp. bifida	Cleft Phlox	S1S2	T
Polygala cruciata	Crossleaf Milkwort	S1	E
Polymnia laevigata	Tennessee Leafcup	S1S2	E
Potamogeton pulcher	Spotted Pondweed	S1S2	T
Prenanthes aspera	Rough Rattlesnake-root	S1	E
Prenanthes crepidinea	Nodding Rattlesnake-root	S3	T
Ptilimnium capillaceum	Hair-like Mock Bishop-weed	S1S2	T
Ptilimnium costatum	Eastern Mock Bishop's-weed	S1?	E
Ptilimnium nuttallii	Nuttall's Mock Bishop's-weed	S1S2	E
Quercus texana	Nuttall's Oak	S2S3	T
Rhododendron canescens	Hoary Azalea	S1	E
Rhynchosia tomentosa	Hairy Snoutbean	S1S2	E
Rudbeckia subtomentosa	Sweet Coneflower	S1	E
Sabatia campanulata	Slender Marsh Pink	S1	E
Sagittaria graminea	Grassleaf Arrowhead	S1S2	T
Sagittaria platyphylla	Ovate-leaved Arrowhead	S1	E
Schoenoplectus hallii	Hall's Bulrush	S1	E
Scleria ciliata	Fringed Nutrush	S2	E
Silene ovata	Ovate Catchfly	S1	E
Silphium laciniatum	Compass-plant	S2	T
Silphium laciniatum var. *robinsonii*	Compass Plant	S2	T
Silphium pinnatifidum	Prairie-dock	S3	SPCO
Solidago buckleyi	Buckley's Goldenrod	S2S3	SPCO
Solidago puberula	Downy Goldenrod	S2	SPCO
Sphenopholis pensylvanica	Swamp Wedgescale	S1S2	SPCO
Spiranthes magnicamporum	Great Plains Ladies'-tresses	S2	T
Sporobolus clandestinus	Rough Dropseed	S2S3	T
Stellaria longifolia	Longleaf Stitchwort	S2S3	SPCO
Styrax grandifolius	Bigleaf Snowbell	S1S2	E
Symphyotrichum pratense	Barrens Silky Aster	S3	SPCO
Symphyotrichum priceae	White Heath Aster	S1	E
Trepocarpus aethusae	Trepocarpus	S3	SPCO
Trifolium reflexum	Buffalo Clover	S1S2	E
Trillium pusillum	Least Trillium	S1	E
Ulmus serotina	September Elm	S3	SPCO
Utricularia macrorhiza	Greater Bladder-wort	S1	E
Veratrum woodii	Ozark Bunchflower	S2	T
Viburnum molle	Kentucky Viburnum	S3?	T
Viburnum nudum	Possum-haw Viburnum	S1	E
Viola egglestonii	Eggleston's Violet	S3	SPCO
Vitis rupestris	Sand Grape	S2	T
Zizaniopsis miliacea	Southern Wildrice	S1S2	T

Status Codes: E = Endangered; HIST = Historical; N = None; S = Special Concern; SC = Special Concern; T = Threatened; TRKD = Tracked.

State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; SH = Possibly Extirpated (Historical); SX = Presumed Extirpated; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2).); S#B = Rank of Breeding Population; S#N = Rank of Non-Breeding Population.

State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants in Mississippi Potentially Impacted by the Natural Resource Plan

SCIENTIFIC	COMMON	RANK	STATUS
Mammals			
Corynorhinus rafinesquii	Rafinesque's Big-eared bat	S3	SLNS
Myotis austroriparius	Southeastern Bat	S3	SLNS
Myotis grisescens	Gray Bat	S1	LE
Myotis septentrionalis	Northern Long-eared Bat	S1N	SLNS
Myotis sodalis	Indiana Bat	S1B	LE
Peromyscus polionotus	Oldfield Mouse	S2	SLNS
Ursus americanus luteolus	Louisiana Black Bear	S1	LE
Zapus hudsonius	Meadow Jumping Mouse	S1	SLNS
Birds			
Accipiter cooperii	Cooper's Hawk	S3?B	SLNS
Accipiter striatus	Sharp-shinned Hawk	S1?B	SLNS
Falco sparverius	American Kestrel	S3B,S4S5N	SLNS
Haliaeetus leucocephalus	Bald Eagle	S2B,S2N	SLNS
Loxia curvirostra	Red Crossbill	SNA	SLNS
Pandion haliaetus	Osprey	S3B,S1S2N	SLNS
Peucaea aestivalis	Bachman's Sparrow	S3B,S3S4N	TRKD
Picoides borealis	Red-cockaded Woodpecker	S1	LE
Reptiles			
Graptemys nigrinoda	Black-knobbed Map Turtle	S2	LE
Graptemys oculifera	Ringed Map Turtle	S2	LE
Lampropeltis nigra	Black Kingsnake	S3	SLNS
Lampropeltis rhombomaculata	Mole Kingsnake	S3?	SLNS
Macrochelys temminckii	Alligator Snapping Turtle	S3	SLNS
Plestiodon anthracinus pluvialis	Southern Coal Skink	S2S3	SLNS
Regina septemvittata	Queen Snake	S2S3	SLNS
Amphibians			
Aneides aeneus	Green Salamander	S1	LE
Cryptobranchus alleganiensis	Hellbender	S1	LE
Eurycea lucifuga	Cave Salamander	S1	LE
Gyrinophilus porphyriticus	Spring Salamander	S1	LE
Hemidactylium scutatum	Four-toed Salamander	S2S3	SLNS
Plethodon ventralis	Southern Zigzag Salamander	S2	SLNS
Plethodon websteri	Webster's Salamander	S2	SLNS
Pseudacris brachyphona	Mountain Chorus Frog	S3	SLNS
Pseudotriton ruber	Red Salamander	S3	SLNS
Fishes			
Alosa alabamae	Alabama Shad	S1	SLNS
Ammocrypta meridiana	Southern Sand Darter	S3	SLNS
Chrosomus erythrogaster	Southern Redbelly Dace	S2	LE
Crystallaria asprella	Crystal Darter	S1	LE
Cycleptus elongatus	Blue Sucker	S3	SLNS
Cyprinella callistia	Alabama Shiner	S2	SLNS
Cyprinella spiloptera	Spotfin Shiner	S2	SLNS
Cyprinella whipplei	Steelcolor Shiner	S3	SLNS
Etheostoma asprigene	Mud Darter	S3	SLNS
Etheostoma flabellare	Fantail Darter	S2	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Etheostoma kennicotti	Stripetail Darter	S2	SLNS
Etheostoma raneyi	Yazoo Darter	S2	SLNS
Etheostoma rufilineatum	Redline Darter	S2	SLNS
Etheostoma rupestre	Rock Darter	S3	TRKD
Etheostoma zonistium	Bandfin Darter	S2	SLNS
Hypentelium etowanum	Alabama Hog Sucker	S3	SLNS
Lythrurus fasciolaris	Rosefin Shiner	S2S3	SLNS
Morone saxatilis	Striped Bass	SH	TRKD
Moxostoma duquesnei	Black Redhorse	S1	SLNS
Moxostoma macrolepidotum	Shorthead Redhorse	S1	TRKD
Notropis boops	Bigeye Shiner	S1	LE
Notropis micropteryx	Highland Shiner	S2	SLNS
Noturus munitus	Frecklebelly Madtom	S2	LE
Noturus stigmosus	Northern Madtom	S1	LE
Percina kathae	Mobile Logperch	S3	SLNS
Percina lenticula	Freckled Darter	S2	SLNS
Phenacobius mirabilis	Suckermouth Minnow	S1	LE
Rhinichthys obtusus	Blacknose Dace	S1	SLNS
Scaphirhynchus suttkusi	Alabama Sturgeon	S1	LE
Mussels			
Arcidens confragosus	Rock Pocketbook	S2S3	SLNS
Cyclonaias tuberculata	Purple Wartyback	S1	LE
Ellipsaria lineolata	Butterfly	S2S3	SLNS
Elliptio arca	Alabama Spike	S1S2	SLNS
Epioblasma penita	Southern Combshell	S1	LE
Lampsilis perovalis	Orange-nacre Mucket	S1	LE
Lampsilis straminea straminea	Rough Fatmucket	S3	SLNS
Lasmigona complanata	White Heelsplitter	S3	TRKD
Ligumia recta	Black Sandshell	S1	SLNS
Medionidus acutissimus	Alabama Moccasinshell	S1	LE
Obovaria jacksoniana	Southern Hickorynut	S1	SLNS
Obovaria unicolor	Alabama Hickorynut	S1S2	SLNS
Pleurobema curtum	Black Clubshell	SX	LE
Pleurobema decisum	Southern Clubshell	S1	LE
Pleurobema marshalli	Flat Pigtoe	SX	LE
Pleurobema perovatum	Ovate Clubshell	S1	LE
Pleurobema taitianum	Heavy Pigtoe	SX	LE
Potamilus alatus	Pink Heelsplitter	S2	SLNS
Potamilus ohiensis	Pink Papershell	S3?	SLNS
Ptychobranchus fasciolaris	Kidneyshell	S1	LE
Quadrula rumphiana	Ridged Mapleleaf	S2	SLNS
Quadrula stapes	Stirrupshell	SX	LE
Strophitus subvexus	Southern Creekmussel	S2	SLNS
Strophitus undulatus	Squawfoot	S1	SLNS
Strophitus radiatus	Rayed Creekshell	S2	SLNS
Uniomerus declivis	Tapered Pondhorn	S2S3	SLNS
Insects			
Neonympha mitchellii	Mitchell's Satyr	S1	LE
Nicrophorus americanus	American Burying Beetle	SX	LE
Crustaceans			
Hobbseus petilus	Tombigbee Riverlet Crayfish	S2	SLNS
Orconectes hartfieldi	Yazoo Crayfish	S2	SLNS
Procambarus lagniappe	Lagniappe Crayfish	S1	SLNS
Procambarus lylei	Shutispear Crayfish	S2	SLNS
Plants			
Actaea racemosa	Black Bugbane	S1S2	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Adiantum capillus-veneris	Southern Maidenhair Fern	S2	SLNS
Aesculus glabra	Ohio Buckeye	S2	SLNS
Agalinis auriculata	Earleaf Foxglove	S2	SLNS
Agalinis oligophylla	Ridge-stem False-foxglove	S2	SLNS
Alisma subcordatum	Broad-leaved Water-plantain	S1	SLNS
Amphiachyris dracunculoides	Broom-snakeroot	SNA	SLNS
Anemone quinquefolia	Wood Anemone	S1	SLNS
Antennaria solitaria	Single-head Pussytoes	S3S4	SLNS
Apios priceana	Price's Potato-bean	S1	SLNS
Aplectrum hyemale	Puttyroot	S1	SLNS
Aquilegia canadensis	Wild Columbine	S1	SLNS
Arabis canadensis	Sicklepod	S2	SLNS
Arabis patens	Spreading Rockcress	S1	SLNS
Aralia racemosa	American Spikenard	S1	SLNS
Armoracia lacustris	Lake-cress	S1	SLNS
Asarum canadense	Canada Wild-ginger	S3	SLNS
Asclepias hirtella	Green Milkweed	S2	SLNS
Asplenium pinnatifidum	Pinnatifid Spleenwort	S1	SLNS
Asplenium resiliens	Black-stem Spleenwort	S1	SLNS
Asplenium rhizophyllum	Walking Fern	S1	SLNS
Asplenium trichomanes	Maidenhair Spleenwort	S1	SLNS
Astragalus canadensis	Canadian Milkvetch	S2	SLNS
Botrychium jenmanii	Alabama Grapefern	S1S2	SLNS
Cacalia muehlenbergii	Great Indian-plantain	S1	SLNS
Callirhoe triangulata	Poppy-mallow	S1	SLNS
Camassia scilloides	Wild Hyacinth	S2	SLNS
Cardamine angustata	Slender Toothwort	S2	SLNS
Cardamine diphylla	Two-leaf Toothwort	S1S2	SLNS
Carex communis	Fibrous-root Sedge	S1	SLNS
Carex gracilescens	Slender Sedge	S1	SLNS
Carex grayi	Asa Gray Sedge	S2	SLNS
Carex impressinervia	Impressed-nerved Sedge	S1	SLNS
Carex jamesii	Sedge	S1S2	SLNS
Carex microdonta	Small-toothed Sedge	S3	SLNS
Carex oligocarpa	Eastern Few-fruit Sedge	S1	SLNS
Carex oxylepis var. *pubescens*	Hairy sharp-scaled Sedge	S2S3	SLNS
Carex picta	Sedge	S3	SLNS
Carex prasina	Sedge	S1	SLNS
Carex scoparia var. *scoparia*	Broom Sedge	S2	SLNS
Carex seorsa	Weak Stellate Sedge	S1S2	SLNS
Carex stricta	Sedge	S2	SLNS
Carex virescens	Ribbed Sedge	S1	SLNS
Carya glabra var. *hirsuta*	Swamp Hickory	S3	SLNS
Carya laciniosa	Big Shellbark Hickory	S2	SLNS
Castilleja coccinea	Scarlet Indian-paintbrush	S1	SLNS
Celastrus scandens	climbing bittersweet	S3	SLNS
Cheilanthes lanosa	Hairy Lipfern	S1S2	SLNS
Chelone glabra	White Turtlehead	S3	SLNS
Chelone lyonii	Pink Turtlehead	S1	SLNS
Chelone obliqua	Red Turtlehead	SH	SLNS
Chimaphila maculata	Spotted Wintergreen	S2	SLNS
Cladrastis kentukea	Yellowwood	S2	SLNS
Clematis beadlei	Leather-flower	SNR	SLNS
Coelorachis cylindrica	Pitted Jointgrass	S1	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Coreopsis auriculata	Lobed Tickseed	S2S3	SLNS
Cuphea viscosissima	Blue Waxweed	S1	SLNS
Cypripedium parviflorum var. *pubescens*	Large Yellow Lady's-slipper	S2S3	SLNS
Decodon verticillatus	Water-willow	S2	SLNS
Delphinium tricorne	Dwarf Larkspur	S2	SLNS
Deparia acrostichoides	Silvery Glade Fern	S1S2	SLNS
Desmodium ochroleucum	Creamflower Tick-trefoil	S1	SLNS
Dicentra cucullaria	Dutchman's Breeches	S1	SLNS
Diplazium pycnocarpon	glade fern	S2S3	SLNS
Dirca palustris	Eastern Leatherwood	S2	SLNS
Dodecatheon meadia	Shooting Star	S2	SLNS
Echinacea purpurea	Eastern Purple Coneflower	S3	SLNS
Eleocharis erythropoda	Bald Spikerush	SNR	SLNS
Erythronium albidum	White Trout-lily	S2	SLNS
Erythronium americanum	Yellow Trout-lily	S1S2	SLNS
Eulophia ecristata	Crested Fringed Orchid	S1	SLNS
Euonymus atropurpureus	Wahoo	S2S3	SLNS
Evax prolifera	Big-head Evax	S1	SLNS
Forestiera ligustrina	Upland Swamp Privet	S1S2	SLNS
Frasera caroliniensis	American Columbo	S2S3	SLNS
Fraxinus profunda	Pumpkin Ash	S3	SLNS
Fraxinus quadrangulata	Blue Ash	S1	SLNS
Galearis spectabilis	Showy Orchis	S1	SLNS
Gentianella quinquefolia	Stiff Gentian	S1	SLNS
Goodyera pubescens	Downy Rattlesnake-plantain	S1	SLNS
Gymnocladus dioicus	Kentucky Coffee-tree	S1S2	SLNS
Hedeoma drummondii	Drummond Pennyroyal	S1	SLNS
Heuchera parviflora	Little Flowered Alumroot	S1	SLNS
Heuchera villosa var. *macrorhiza*	Giant Alumroot	S1	SLNS
Hexalectris spicata	Crested Coralroot	S2	SLNS
Hexastylis shuttleworthii	Large-flowered Heartleaf	S1	SLNS
Hieracium venosum	Rattlesnake Hawkweed	S1	SLNS
Hottonia inflata	Featherfoil	S1	SLNS
Hybanthus concolor	Green Violet	S3	SLNS
Hydrastis canadensis	Goldenseal	S1	SLNS
Hydrophyllum appendiculatum	Waterleaf	S1	SLNS
Hydrophyllum macrophyllum	largeleaf waterleaf	S1	SLNS
Iris brevicaulis	Lamance Iris	S1	SLNS
Iris fulva	Red Iris	S3	SLNS
Isoetes engelmannii	Appalachian Quillwort	S1S2	SLNS
Isoetes valida	True Quillwort	S1	SLNS
Juglans cinerea	Butternut	S2	SLNS
Lesquerella gracilis	Bladderpod	S1	SLNS
Ligusticum canadense	Lovage	S1	SLNS
Lilium michiganense	Michigan Lily	S1	SLNS
Lilium superbum	Turk's Cap Lily	S3S4	SLNS
Lindera melissifolia	Pondberry	S2	SLNS
Linum sulcatum	Grooved Yellow Flax	S3	SLNS
Lobelia appendiculata	Ear-flower Lobelia	S2S3	SLNS
Luzula acuminata	Woodrush	S3	SLNS
Matelea carolinensis	Carolina Anglepod	S3	SLNS
Matelea obliqua	Climbing Milkweed	S2	SLNS
Melanthium virginicum	Bunchflower	S3	SLNS
Menispermum canadense	Canada Moonseed	S3	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Mertensia virginica	Virginia Bluebells	S1	SLNS
Mimulus ringens	Monkey-flower	S1	SLNS
Muhlenbergia glabrifloris	Muhly	S1	SLNS
Muhlenbergia sylvatica	Muhly	S2	SLNS
Muhlenbergia tenuiflora	Muhly	S1S2	SLNS
Nemastylis geminiflora	Prairie Pleatleaf	S2	SLNS
Nestronia umbellula	Nestronia	S1	SLNS
Neviusia alabamensis	Alabama Snow-wreath	S1	SLNS
Oenothera grandiflora	Large-flowered Evening-primrose	S1	SLNS
Oenothera triloba	Sundrops	S1	SLNS
Ophioglossum engelmannii	Limestone Adder's-tongue	S2	SLNS
Osmorhiza longistylis	Smoother Sweet-cicely	S3	SLNS
Pachysandra procumbens	Allegheny-spurge	S3	SLNS
Palafoxia callosa	Small Palafoxia	S1	SLNS
Panax quinquefolius	American ginseng	S3	SLNS
Pellaea atropurpurea	Purple Cliff-brake	S1	SLNS
Penstemon tenuiflorus	Beard-tongue	S3	SLNS
Penstemon tenuis	Beard-tongue	S2	SLNS
Perideridia americana	Perideridia	S1S2	SLNS
Phacelia bipinnatifida	Phacelia	S1	SLNS
Phacelia strictiflora	Prairie Scorpion-weed	S1	SLNS
Philadelphus hirsutus	streambank mock orange	S1	SLNS
Philadelphus inodorus	Mock-orange	S2	SLNS
Pinus virginiana	Virginia Pine	S2	SLNS
Platanthera cristata	Yellow-crested Orchid	S3S4	SLNS
Platanthera integrilabia	White Fringeless Orchid	S1	SLNS
Platanthera lacera	Ragged Fringe Orchid	S1S2	SLNS
Platanthera peramoena	Purple Fringeless Orchid	S2S3	SLNS
Polemonium reptans	Greek Valerian	S2S3	SLNS
Polytaenia nuttallii	Prairie Parsley	S2	SLNS
Ponthieva racemosa	Shadow-witch Orchid	S2	SLNS
Prenanthes aspera	Rough Rattlesnake-root	S2	SLNS
Prenanthes barbata	Barbed Rattlesnake-root	S1	SLNS
Pycnanthemum muticum	Mountain-mint	S2S3	SLNS
Pycnanthemum verticillatum var. *pilosum*	Mountain-mint	S1	SLNS
Quercus macrocarpa	Bur Oak	S2	SLNS
Rhamnus lanceolata	Lance-leaved Buckthorn	S2	SLNS
Rhododendron arborescens	Smooth Azalea	S1S2	SLNS
Rudbeckia grandiflora	Rough Coneflower	S1	SLNS
Sabatia campestris	Sabatia	S2	SLNS
Salix caroliniana	Carolina Willow	S1	SLNS
Salvia urticifolia	Nettle-leaf Sage	S2	SLNS
Schisandra glabra	Bay Starvine	S3	SLNS
Sedum pulchellum	Rock Stonecrop	S1	SLNS
Sedum ternatum	Stonecrop	S1	SLNS
Silene ovata	Ovate Catchfly	S1S2	SLNS
Solidago flaccidifolia	Appalachian Golden-rod	S1	SLNS
Solidago sphacelata	Autumn Goldenrod	S1	SLNS
Spiranthes magnicamporum	Great Plains Ladies'-tresses	S2	SLNS
Spiranthes ovalis	Lesser Ladies'-tresses	S2S3	SLNS
Staphylea trifolia	American Bladdernut	S3	SLNS
Stellaria pubera	Giant Chickweed	S2	SLNS
Stenanthium gramineum	Eastern Featherbells	S1	SLNS
Stewartia ovata	Mountain Camellia	S1	SLNS

SCIENTIFIC	COMMON	RANK	STATUS
Symphyotrichum ericoides	White Heath Aster	S2	SLNS
Symphyotrichum pratense	Barrens Silky Aster	S1	SLNS
Taenidia integerrima	Yellow Pimpernel	S1	SLNS
Thalictrum debile	Southern Meadow-rue	S1S2	SLNS
Thelesperma filifolium	Stiff-greenthread	S1	SLNS
Tiarella cordifolia	Heart-leaved Foam-flower	S2	SLNS
Tradescantia ernestiana	Ernest's Spider-wort	S1	SLNS
Trautvetteria caroliniensis	Carolina Tassel-rue	S1	SLNS
Trichomanes boschianum	Appalachian Bristle Fern	S1	SLNS
Trillium flexipes	Nodding Trillium	S1	SLNS
Triosteum angustifolium	Horse-gentian	S3	SLNS
Triphora trianthophora	Three-birds-orchids	S2	SLNS
Ulmus serotina	September Elm	S2	SLNS
Viburnum acerifolium	Mapleleaf Viburnum	S1	SLNS

Status Codes: LE = Listed Endangered; SLNS = State Listed, no status assigned; TRKD = Tracked.
State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; S5 = Secure; SNA = not applicable; SX = Presumed Extinct; S? = Inexact or uncertain S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); S#B = Rank of Breeding Population; S#N = Rank of Non-Breeding Population.

State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants in North Carolina Potentially Impacted by the Natural Resource Plan

SCIENTIFIC	COMMON	RANK	STATUS
Mammals			
Corynorhinus rafinesquii	Rafinesque's Big-eared bat	S3	T
Corynorhinus townsendii virginianus	Virginia Big-eared Bat	S1	E
Glaucomys sabrinus coloratus	Carolina Northern Flying Squirrel	S2	E
Lasiurus cinereus	Hoary Bat	S3S4	W2
Microtus chrotorrhinus carolinensis	Southern Rock Vole	S3	SC
Mustela nivalis	Least Weasel	S2	SR-G
Myotis austroriparius	Southeastern Bat	S2	SC
Myotis grisescens	Gray Bat	S1	E
Myotis leibii	Eastern small-footed bat	S2	SC
Myotis lucifugus	Little Brown Bat	S3	SR
Myotis septentrionalis	Northern Long-eared Bat	S2	T
Myotis sodalis	Indiana Bat	S1S2	E
Neotoma floridana haematoreia	Southern Appalachian Woodrat	S3S4	W2
Neotoma magister	Allegheny Woodrat	S2S3	SC
Perimyotis subflavus	Tricolored Bat	S3	SR
Sorex hoyi winnemana	Southern Pygmy Shrew	S3	TRKD
Sorex palustris punctulatus	Southern Water Shrew	S3	SC
Spilogale putorius	Eastern Spotted Skunk	S2	SR-G
Sylvilagus obscurus	Appalachian Cottontail	S3	SR-G
Synaptomys cooperi	Southern Bog Lemming	S3S4	TRKD
Birds			
Accipiter striatus	Sharp-shinned Hawk	S2B,S4N	SR
Aegolius acadicus	Northern Saw-whet Owl	S2B,S2N	T
Catharus guttatus	Hermit Thrush	S2B,S5N	SR
Certhia americana	Brown Creeper	S3B,S5N	SC
Coccyzus erythropthalmus	Black-billed Cuckoo	S2B	SR
Contopus cooperi	Olive-sided Flycatcher	SNA	W3,SC
Empidonax alnorum	Alder Flycatcher	S2B	SR
Falco peregrinus	Peregrine Falcon	S1B,S2N	E
Haliaeetus leucocephalus	Bald Eagle	S3B,S3N	T
Loxia curvirostra	Red Crossbill	S3B,S3N	SC
Peucaea aestivalis	Bachman's Sparrow	S3B,S2N	SC
Poecile atricapilla	Black-capped Chickadee	S3	SC
Pooecetes gramineus	Vesper Sparrow	S2B,S2N	SC
Setophaga cerulea	Cerulean Warbler	S2B	SC
Setophaga magnolia	Magnolia Warbler	S2B	SR
Sphyrapicus varius	Yellow-bellied Sapsucker	S2S3B,S5N	SC
Thryomanes bewickii altus	Appalachian Bewick's Wren	SXB	E
Vermivora chrysoptera	Golden-winged Warbler	S2S3B	SC
Vermivora pinus	Blue Winged Warbler	S2B	SR
Vireo gilvus	Warbling Vireo	S2B	SR
Reptiles			
Apalone spinifera spinifera	Eastern Spiny Softshell	S1	SC
Crotalus horridus	Timber Rattlesnake	S3	SC
Glyptemys muhlenbergii	Bog Turtle	S2	T

SCIENTIFIC	COMMON	RANK	STATUS
Pituophis melanoleucus melanoleucus	Northern Pine Snake	S2	SC
Sternotherus minor	Stripeneck Musk Turtle	S1	SC
Amphibians			
Ambystoma talpoideum	Mole Salamander	S2S3	SC
Aneides aeneus	Green Salamander	S2	E
Cryptobranchus alleganiensis	Hellbender	S3	SC
Cryptobranchus alleganiensis alleganiensis	Eastern Hellbender	S3	SC
Desmognathus aeneus	Seepage Salamander	S3	W2
Desmognathus organi	Northern Pygmy Salamander	S2	SR
Desmognathus santeetlah	Santeetlah Dusky Salamander	S3S4	W2
Desmognathus wrighti	Southern Pygmy Salamander	S2S3	SR
Eurycea junaluska	Junaluska Salamander	S1S2	T
Hemidactylium scutatum	Four-toed Salamander	S3	SC
Plethodon ventralis	Southern Zigzag Salamander	S1	SC
Plethodon welleri	Weller's Salamander	S2	SC
Plethodon yonahlossee pop. 1	Crevice Salamander	S2	SC
Pseudacris brachyphona	Mountain Chorus Frog	S2	SC
Fishes			
Aplodinotus grunniens	Freshwater Drum	S1	SC
Clinostomus funduloides ssp. 1	Smoky Dace	S2	SC
Cottus carolinae	Banded Sculpin	S1	T
Erimonax monachus	Spotfin Chub	S1	T
Erimystax insignis	Blotched Chub	S2	SR
Etheostoma acuticeps	Sharphead Darter	S1	T
Etheostoma jessiae	Blueside Darter	SX	SC
Etheostoma simoterum	Snubnose Darter	S1	SC
Etheostoma vulneratum	Wounded Darter	S2	SC
Hiodon tergisus	Mooneye	S1	SC
Ichthyomyzon bdellium	Ohio Lamprey	S1	SR
Lampetra appendix	American Brook Lamprey	S1	T
Luxilus chrysocephalus	Striped Shiner	S1	SC
Moxostoma sp. 2	Sicklefin Redhorse	S2	T
Notropis lutipinnis	Yellowfin Shiner	S2	SC
Notropis micropteryx	Highland Shiner	S2	SR
Noturus eleutherus	Mountain Madtom	S1	SC
Noturus flavus	Stonecat	S1	E
Percina burtoni	Blotchside Logperch	S1	E
Percina caprodes	Logperch	S1	T
Percina sciera	Dusky Darter	SNA	E
Percina squamata	Olive Darter	S2	SC
Polyodon spathula	Paddlefish	SH	E
Mussels			
Alasmidonta raveneliana	Appalachian Elktoe	S1	E
Alasmidonta varicosa	Brook Floater	S2	E
Alasmidonta viridis	Slippershell Mussel	S1	E
Elliptio dilatata	Spike	S2	SC
Fusconaia barnesiana	Tennessee Pigtoe	S1	E
Fusconaia subrotunda	Longsolid	S1	SR
Lampsilis fasciola	Wavy-rayed Lampmussel	S2	SC
Lasmigona holstonia	Tennessee Heelsplitter	SH	E

SCIENTIFIC	COMMON	RANK	STATUS
Lasmigona subviridis	Green Floater	S2	E
Pegias fabula	Little-wing Pearlymussel	S1	E
Pleurobema oviforme	Tennessee Clubshell	S1	E
Villosa iris	Rainbow Mussel	S2	SC
Villosa trabalis	Cumberland Bean	SH	SR
Villosa vanuxemensis	Mountain Creekshell	S1?	T
Snails			
Anguispira mordax	Appalachian Disc	S3S4	W3
Discus bryanti	Saw-tooth Disc	S2	SC
Elimia interrupta	Knotty Elimia	SNA	E
Glyphyalinia clingmani	Fragile Glyph	S1	E
Glyphyalinia junaluskana	Dark Glyph	S2	SC
Glyphyalinia vanattai	Honey Glyph	S1	SC
Helicodiscus bonamicus	Spiral Coil	S1	SC
Mesodon jonesianus	Big-tooth Covert	S1?	T
Mesodon orestes	Engraved Covert	S1	T
Pallifera hemphilli	Black Mantleslug	S2S3	SC
Paravitrea andrewsae	High Mountain Supercoil	S2	SC
Paravitrea lacteodens	Ramp Cove Supercoil	SH	SC
Paravitrea placentula	Glossy Supercoil	S2S3	SC
Paravitrea ternaria	Sculpted Supercoil	S1	T
Paravitrea varidens	Roan Supercoil	S1S2	T
Patera clarki nantahala	Noonday Globe	S1	T
Ventridens coelaxis	Bidentate Dome	S3?	SC
Insects			
Autochton cellus	Golden-banded Skipper	S2	SR
Celastrina ebenina	Dusky Azure	S2	SR
Erora laeta	Early Hairstreak	S2S3	SR
Euchloe olympia	Olympia Marble	S1	SR
Eulonchus marialiciae	Mary Alice's Small-headed Fly	S3?	W3
Euphydryas phaeton	Baltimore	S2	SR
Hesperia sassacus	Indian Skipper	S3	W2
Macromia margarita	Margaret's River Cruiser	S2?	SR
Polygonia faunus	Green Comma	S1S2	SR
Polygonia faunus smythi	Smyth's Green Coma	S1S2	SR
Polygonia progne	Gray Comma	S1	SR
Satyrium caryaevorum	Hickory Hairstreak	S1	SR
Satyrium edwardsii	Edwards' Hairstreak	S2	SR
Speyeria idalia	Regal Fritillary Butterfly	SX	SR
Trechus balsamensis	A Carabid Beetle	SU	W3
Trechus mitchellensis	A Carabid Beetle	SU	W3
Trechus novaculosus	A Carabid Beetle	SU	W3
Trechus roanicus	A Carabid Beetle	SU	W3
Trechus rosenbergi	A Carabid Beetle	SU	W3
Trechus satanicus	A Carabid Beetle	SU	W3
Trechus subtilis	A Carabid Beetle	SU	W3
Arachnids			
Hypochilus coylei	A Cave Spider	S3?	SR
Hypochilus sheari	A Lampshade Spider	S2S3	SR
Microhexura montivaga	Spruce-fir Moss Spider	S1	SR
Nesticus cooperi	Lost Nantahala Cave Spider	S1	SR
Vaejovis carolinianus	Carolina Scorpion	S2?	W2,W3
Crustaceans			
Cambarus brimleyorum	Valley River Crayfish	S3	E
Cambarus eeseeohensis	Grandfather Mountain Crayfish	S1	E
Cambarus georgiae	Little Tennessee Crayfish	S2	SC
Cambarus hiwasseensis	Hiwassee Crayfish	S3S4	W2

SCIENTIFIC	COMMON	RANK	STATUS
Cambarus parrishi	Hiwassee Headwaters Crayfish	S1	SC
Cambarus reburrus	French Broad Crayfish	S2	SR
Skistodiaptomus carolinensis	Yancey Sideswimmer	SH	SC
Stygobromus carolinensis	Carolina Seep Scud	SH	SR
Stygobromus sp. 4	Plott Balsam Sideswimmer	S1?	W3
Plants			
Abies fraseri	Fraser Fir	S2	W5
Acer nigrum	Black Maple	S1?	W7
Agrostis mertensii	Arctic Bentgrass	S1	E
Allium cuthbertii	striped garlic	S2	T
Alnus viridis ssp. crispa	Green Alder	S1	SC-V
Amelanchier sanguinea	Round-leaved Serviceberry	S3	W1
Arabis hirsuta var. adpressipilis	Hairy Rockcress	S1	E
Arabis patens	Spreading Rockcress	S1	SR-T
Arethusa bulbosa	Bog-rose	S1	E
Berberis canadensis	American barberry	S2	SC-V
Betula papyrifera var. cordifolia	Heart-leaved Paper Birch	S1	SC-V
Botrychium oneidense	Blunt-lobe Grapefern	S2	SR-P
Botrychium simplex var. simplex	Little Grape-fern	S2	SR-P
Buckleya distichophylla	piratebush	S2	T
Calamagrostis cainii	Reedgrass	S1	E
Calamagrostis porteri	Porter's Reedgrass	S1	SR-P
Cardamine clematitis	mountain bittercress	S2S3	SR-T
Cardamine rotundifolia	Roundleaf Water-cress	S2	E
Carex barrattii	Barratt's Sedge	SH	SC-H
Carex buxbaumii	Buxbaum's Sedge	S2	SC-V
Carex collinsii	Collins' sedge	S3	W1
Carex hitchcockiana	Sedge	S1	SC-V
Carex leptonervia	Sedge	S3	W1
Carex misera	Wretched Sedge	S3	W1
Carex oligosperma	Few-seeded Sedge	S1	E
Carex projecta	Sedge	S1	SR-P
Carex purpurifera	Sedge	S3	SC-V
Carex roanensis	Sedge	S2	SR-T
Carex ruthii	Ruth's Sedge	S3	W1
Carex utriculata	beaked sedge	S1	SR-P
Celastrus scandens	climbing bittersweet	S2?	E
Celtis occidentalis	common hackberry	S2	W7
Cerastium nutans	nodding chickweed	S3?	W7
Cheilanthes alabamensis	Alabama Lipfern	S1	SR-P
Coeloglossum viride var. virescens	American Frog Orchid	S1	E
Conioselinum chinense	Hemlock Parsley	S1	T
Corydalis micrantha ssp. micrantha	Slender Corydalis	S1	T
Cystopteris bulbifera	bulblet fern	S1S2	W7
Cystopteris fragilis	Fragile Fern	S1	SR-P
Dalibarda repens	Robin Runaway	S2	E
Delphinium exaltatum	Tall Larkspur	S2	E
Dicentra eximia	bleeding heart	S3	SR-P
Diervilla sessilifolia var. rivularis	Mountain Bush-honeysuckle	S1	T
Diplazium pycnocarpon	glade fern	S3	W1

SCIENTIFIC	COMMON	RANK	STATUS
Dryopteris cristata	crested woodfern	S3	W1
Elymus riparius	riverbank wildrye	S1S2	W7
Elymus trachycaulus ssp. trachycaulus	Slender Wheatgrass	S1	T
Epilobium ciliatum	Willow-herb	S2	SR-P
Euphorbia purpurea	Glade Spurge	S2	SR-T
Filipendula rubra	Queen-of-the-prairie	S1	E
Frangula caroliniana	Carolina buckthorn	S3	W1
Frasera caroliniensis	American Columbo	S2S3	SR-P
Gentiana austromontana	Appalachian Gentian	S2S3	W1
Geum aleppicum	Yellow Avens	S1	E
Geum geniculatum	Bent Avens	S1S2	SC-V
Geum laciniatum var. trichocarpum	Rough Avens	S1	E
Geum radiatum	Spreading Avens	S2	E
Glyceria nubigena	Smoky Mountain Manna-grass	S2	SR-L
Grammitis nimbata	Dwarf Polypody	S1	T
Hedyotis purpurea var. montana	Mountain Bluet	S2	E
Helenium brevifolium	Shortleaf Sneezeweed	S1	E
Helianthemum bicknellii	Plains Frostweed	S1	SC-V
Helianthemum propinquum	Low Frostweed	S1	T
Helianthus occidentalis	naked-stem sunflower	SX	SC-H
Helonias bullata	Swamp-pink	S2	T
Heuchera longiflora	long-flower alumroot	S2	W7
Hexastylis contracta	Southern Heartleaf	S1	E
Hexastylis rhombiformis	French Broad Heartleaf	S3	SR-L
Huperzia appalachiana	Appalachian Fir-clubmoss	S3	W1
Huperzia porophila	Rock Clubmoss	S2	SR-P
Hydrastis canadensis	Goldenseal	S3	SR-O
Hydrophyllum macrophyllum	largeleaf waterleaf	S3	W1
Hymenophyllum tayloriae	Gorge Filmy Fern	S1S2	SR-O
Hypericum graveolens	Mountain St. John's-wort	S2S3	W1
Hypericum mitchellianum	Blue Ridge St. John's-wort	S2S3	W1
Isotria medeoloides	Small Whorled Pogonia	S1	T
Juglans cinerea	Butternut	S2S3	W5
Juncus caesariensis	New Jersey Rush	S1	E
Juncus trifidus	Highland Rush	S1	SR-D
Lespedeza frutescens	shrubby bushclover	S2?	W7
Liatris helleri	Heller's Blazing Star	S2	T
Lilium grayi	Gray's Lily	S3	T
Luzula multiflora	common woodrush	S2?	W7
Lysimachia fraseri	Fraser Loosestrife	S3	E
Minuartia groenlandica	Mountain Sandwort	S2	T
Monotropsis odorata	Sweet Pinesap	S3	SC-V
Muhlenbergia glomerata	Muhly	S1	SC-V
Packera millefolium	Blue Ridge Ragwort	S2	T
Packera schweinitziana	Schweinitz's Ragwort	S2	T
Panax quinquefolius	American ginseng	S3S4	W1
Parnassia grandifolia	Large-leaved Grass-of-parnassus	S2	T
Phegopteris connectilis	Northern Beechfern	S2	E
Philadelphus hirsutus	streambank mock orange	S2	W1
Phlox subulata	Moss phlox	S1	SR-P
Poa palustris	Fowl Bluegrass	S1	SR-P
Quercus muehlenbergii	chinquapin oak	S2	W1

SCIENTIFIC	COMMON	RANK	STATUS
Ranunculus flabellaris	Yellow Water-crowfoot	S1	SC-H
Rhodiola rosea	Roseroot Stonecrop	SH	E
Rugelia nudicaulis	Rugel's Ragwort	S3	SR-L
Sagittaria fasciculata	Bunched Arrowhead	S1	E
Sarracenia jonesii	Mountain Sweet Pitcherplant	S1	E
Sarracenia oreophila	Green Pitcher Plant	S1	E
Saxifraga careyana	golden eye saxifrage	S3	W7
Saxifraga caroliniana	Carolina saxifrage	S3	SR-T
Shortia galacifolia var. galacifolia	Southern Shortia	S2	SC-V
Silene ovata	Ovate Catchfly	S3	SC-V
Solidago spithamaea	Blue Ridge Goldenrod	S2	T
Spiraea virginiana	Virginia Spiraea	S2	T
Sporobolus heterolepis	Northern Dropseed	S1	T
Stachys clingmanii	Clingman's Hedge-nettle	S2?	W2
Stewartia ovata	Mountain Camellia	S2	SR-P
Synandra hispidula	Guyandotte Beauty	S1	E
Thaspium pinnatifidum	cutleaf meadow-parsnip	S1	T
Trichomanes boschianum	Appalachian Bristle Fern	S1	E
Trichomanes petersii	Dwarf Filmy-fern	S2	SR-T
Trichophorum cespitosum	Tufted Clubrush	S2S3	SR-D
Trisetum spicatum	Narrow False Oats	SH	SC-H
Turritis glabra	Tower-mustard	S1	E
Vaccinium macrocarpon	Large Cranberry	S2	T
Viola walteri	prostrate blue violet	S1	SR-T
Zigadenus glaucus	White Camas	S1	SR-P

Status Codes: E = Endangered; SC = Special Concern; SR = Significantly Rare; SR-G = Significantly Rare-Game; T = Threatened; TRKD = Tracked; W2 = Rare but questionable taxonomy; W3 = Rare but questionable documentation.

State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; S5 = Secure; SH = Possibly Extirpated (Historical); SNA = Not Applicable; SU = Unknown; SX = Presumed Extinct; S? = Inexact or uncertain; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); S#B = Rank of Breeding Population; S#N = Rank of Non-Breeding Population.

State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants in Tennessee Potentially Impacted by the Natural Resource Plan

SCIENTIFIC	COMMON	RANK	STATUS
Mammals			
Condylura cristata	Star-nosed Mole	S2	D
Corynorhinus rafinesquii	Rafinesque's Big-eared bat	S3	D
Corynorhinus townsendii virginianus	Virginia Big-eared Bat	S1	E
Glaucomys sabrinus coloratus	Carolina Northern Flying Squirrel	S1S2	E
Microtus chrotorrhinus carolinensis	Southern Rock Vole	S2	D
Mustela nivalis	Least Weasel	S2	R
Myotis austroriparius	Southeastern Bat	S3	R
Myotis grisescens	Gray Bat	S2	E
Myotis leibii	Eastern small-footed bat	S2S3	D
Myotis lucifugus	Little Brown Bat	S3	T
Myotis septentrionalis	Northern Long-eared Bat	S1S2	T
Myotis sodalis	Indiana Bat	S1	E
Napaeozapus insignis	Woodland Jumping Mouse	S4	D
Neotoma floridana haematoreia	Southern Appalachian Woodrat	S2	D
Neotoma floridana illinoensis	Eastern Woodrat	S3	D
Neotoma magister	Allegheny Woodrat	S3	D
Parascalops breweri	Hairy-tailed Mole	S3	D
Perimyotis subflavus	Tricolored Bat	S5	T
Sorex cinereus	Common Shrew	S4	D
Sorex dispar	Long-tailed Shrew	S2	D
Sorex fumeus	Smoky Shrew	S4	D
Sorex hoyi	Pygmy Shrew	S2	R
Sorex longirostris	Southeastern Shrew	S4	D
Sorex palustris	Water Shrew	S2	D
Spilogale putorius	Eastern Spotted Skunk	S3	R
Synaptomys cooperi	Southern Bog Lemming	S4	D
Zapus hudsonius	Meadow Jumping Mouse	S4	D
Birds			
Accipiter striatus	Sharp-shinned Hawk	S3B,S4N	D
Actitis macularia	Spotted Sandpiper	S2B	R
Aegolius acadicus	Northern Saw-whet Owl	S1	T
Ammodramus henslowii	Henslow's Sparrow	S1B	T
Anhinga anhinga	Anhinga	S1B	D
Aquila chrysaetos	Golden Eagle	S1	D
Ardea alba	Great Egret	S2B,S3N	D
Botaurus lentiginosus	American Bittern	S1	R
Buteo jamaicensis	Red-tailed Hawk	S5	R
Chondestes grammacus	Lark Sparrow	S1B	T
Contopus cooperi	Olive-sided Flycatcher	S1	D
Corvus corax	Common Raven	S2	T
Egretta caerulea	Little Blue Heron	S2B,S3N	D
Empidonax alnorum	Alder Flycatcher	S1	R
Falco peregrinus	Peregrine Falcon	S1B	E
Haliaeetus leucocephalus	Bald Eagle	S3	D
Ictinia mississippiensis	Mississippi Kite	S2S3	D
Ixobrychus exilis	Least Bittern	S2B	D
Laterallus jamaicensis	Black Rail	S1	R
Limnothlypis swainsonii	Swainson's Warbler	S3	D

Passerculus sandwichensis	Savannah Sparrow	S1B,S4N	R
Peucaea aestivalis	Bachman's Sparrow	S1B	E
Poecile atricapilla	Black-capped Chickadee	S2B	D
Pooecetes gramineus	Vesper Sparrow	S1B,S4N	D
Rallus elegans	King Rail	S2	D
Rallus limicola	Virginia Rail	S1B,S3N	R
Setophaga cerulea	Cerulean Warbler	S3B	D
Sphyrapicus varius	Yellow-bellied Sapsucker	S1B,S4N	D
Sterna antillarum athalassos	Interior Least Tern	S2S3B	E
Tyto alba	Common Barn-owl	S3	D
Vermivora chrysoptera	Golden-winged Warbler	S3B	T
Reptiles			
Chrysemys picta	Painted Turtle	S5	R
Glyptemys muhlenbergii	Bog Turtle	S1	T
Macrochelys temminckii	Alligator Snapping Turtle	S2S3	T
Nerodia cyclopion	Mississippi Green Water Snake	S2	D
Ophisaurus attenuatus longicaudus	Eastern Slender Glass Lizard	S3	D
Pituophis melanoleucus melanoleucus	Northern Pine Snake	S3	T
Plestiodon anthracinus	Coal Skink	S1	D
Sistrurus miliarius streckeri	Western Pigmy Rattlesnake	S2S3	T
Amphibians			
Acris gryllus	Southern Cricket Frog	S2	D
Ambystoma barbouri	Streamside Salamander	S2	E
Aneides aeneus	Green Salamander	S3	R
Cryptobranchus alleganiensis	Hellbender	S3	E
Desmognathus abditus	Cumberland Dusky Salamander	S2	D
Desmognathus aeneus	Seepage Salamander	S1	D
Desmognathus organi	Northern Pygmy Salamander	SNR	R
Desmognathus welteri	Black Mountain Salamander	S3	D
Desmognathus wrighti	Southern Pygmy Salamander	S2S3	D
Eurycea junaluska	Junaluska Salamander	S2	D
Gyrinophilus gulolineatus	Berry Cave Salamander	S1	T
Gyrinophilus palleucus	Tennessee Cave Salamander	S2	T
Hemidactylium scutatum	Four-toed Salamander	S3	D
Hyla gratiosa	Barking Treefrog	S3	D
Plethodon wehrlei	Wehrle's Salamander	S1	D
Plethodon welleri	Weller's Salamander	S2	D
Rana capito	Gopher Frog	S1	R
Fishes			
Acipenser fulvescens	Lake Sturgeon	S1	E
Ammocrypta beani	Naked Sand Darter	S2	D
Ammocrypta clara	Western Sand Darter	S1	T
Ammocrypta vivax	Scaly Sand Darter	S2	D
Atractosteus spatula	Alligator Gar	S1	D
Carpiodes velifer	Highfin Carpsucker	S2S3	D
Chrosomus cumberlandensis	Blackside Dace	S2	T
Chrosomus saylori	Laurel Dace	S1	E
Chrosomus tennesseensis	Tennessee Dace	S3	D

Clinostomus funduloides ssp. 1	Smoky Dace	S1S2	D
Crystallaria asprella	Crystal Darter	SX	D
Cycleptus elongatus	Blue Sucker	S2	T
Cyprinella caerulea	Blue Shiner	S1	E
Erimonax monachus	Spotfin Chub	S2	T
Erimystax cahni	Slender Chub	S1	T
Etheostoma akatulo	Bluemask Darter	S1	E
Etheostoma aquali	Coppercheek Darter	S2S3	T
Etheostoma baileyi	Emerald Darter	S2	D
Etheostoma barbouri	Teardrop Darter	S2	D
Etheostoma barrenense	Splendid Darter	S3	D
Etheostoma bellum	Orangefin Darter	S3	D
Etheostoma boschungi	Slackwater Darter	S1	T
Etheostoma brevirostrum	Holiday Darter	S1	T
Etheostoma cinereum	Ashy Darter	S2S3	E
Etheostoma corona	Crown Darter	S1S2	E
Etheostoma denoncourti	Golden Darter	S2	D
Etheostoma ditrema	Coldwater Darter	S1	T
Etheostoma forbesi	Barrens Darter	S1	E
Etheostoma gutselli	Tuckasegee Darter	S1	E
Etheostoma lemniscatum	Tuxedo Darter	S1	E
Etheostoma luteovinctum	Redband Darter	S4	D
Etheostoma marmorpinnum	Marbled Darter	S1	E
Etheostoma microlepidum	Smallscale Darter	S2	D
Etheostoma neopterum	Lollipop Darter	S1S2	D
Etheostoma olivaceum	Sooty Darter	S3	D
Etheostoma pseudovulatum	Egg-mimic Darter	S1	E
Etheostoma pyrrhogaster	Firebelly Darter	S2	D
Etheostoma sagitta	Arrow Darter	S2	D
Etheostoma sitikuense	Citico Darter	S1	E
Etheostoma striatulum	Striated Darter	S1	T
Etheostoma susanae	Cumberland Darter	S1	E
Etheostoma tippecanoe	Tippecanoe Darter	S1S2	D
Etheostoma trisella	Trispot Darter	S1	T
Etheostoma tuscumbia	Tuscumbia Darter	SX	D
Etheostoma wapiti	Boulder Darter	S1	E
Fundulus chrysotus	Golden Topminnow	S1S2	D
Fundulus julisia	Barrens Topminnow	S1	E
Hemitremia flammea	Flame Chub	S3	D
Ichthyomyzon gagei	Southern Brook Lamprey	S1	D
Ichthyomyzon unicuspis	Silver Lamprey	S2	D
Macrhybopsis gelida	Sturgeon Chub	S1	D
Macrhybopsis meeki	Sicklefin Chub	S2	D
Macrhybopsis sp. 1	Cf. M. Aestivalis	S1	E
Moxostoma lacerum	Harelip Sucker	SX	D
Notropis albizonatus	Palezone Shiner	SH	E
Notropis asperifrons	Burrhead Shiner	S2	R
Notropis buccatus	Silverjaw Minnow	S1	E
Notropis dorsalis	Bigmouth Shiner	S1	D
Notropis lineapunctata	Lined Chub	S1	D
Notropis rubellus	Rosyface Shiner	S2	D
Notropis rupestris	Bedrock Shiner	S2	D
Notropis stilbius	Silverstripe Shiner	S3	R
Noturus baileyi	Smoky Madtom	S1	E
Noturus crypticus	Chucky Madtom	S1	E
Noturus fasciatus	Saddled Madtom	S2	T
Noturus flavipinnis	Yellowfin Madtom	S1	E
Noturus munitus	Frecklebelly Madtom	S1	T
Noturus stanauli	Pygmy Madtom	S1	E

Noturus stigmosus	Northern Madtom	S3	D
Percina antesella	Amber Darter	S1	E
Percina aurantiaca	Tangerine Darter	S3	D
Percina burtoni	Blotchside Logperch	S2	D
Percina jenkinsi	Conasauga Logperch	S1	E
Percina kathae	Mobile Logperch	S2S3	R
Percina kusha	Bridled Darter	S1	R
Percina macrocephala	Longhead Darter	S2	T
Percina phoxocephala	Slenderhead Darter	S3	D
Percina squamata	Olive Darter	S2	D
Percina stictogaster	Frecklebelly Darter	S1	D
Percina tanasi	Snail Darter	S2S3	T
Phenacobius catostomus	Riffle Minnow	S2	D
Polyodon spathula	Paddlefish	S3	TRKD
Scaphirhynchus albus	Pallid Sturgeon	S1	E
Thoburnia atripinnis	Blackfin Sucker	S2	D
Typhlichthys subterraneus	Southern Cavefish	S3	D

Mussels

Alasmidonta atropurpurea	Cumberland Elktoe	S1S2	E
Alasmidonta raveneliana	Appalachian Elktoe	S1	E
Cumberlandia monodonta	Spectaclecase	S2S3	E
Cyprogenia stegaria	Fanshell	S1	E
Dromus dromas	Dromedary Pearlymussel	S1	E
Epioblasma brevidens	Cumberlandian Combshell	S1	E
Epioblasma capsaeformis	Oyster Mussel	S1	E
Epioblasma florentina florentina	Yellow-blossom Pearlymussel	SX	E
Epioblasma florentina walkeri	Tan Riffleshell	S1	E
Epioblasma metastriata	Upland Combshell	SH	E
Epioblasma obliquata obliquata	Purple Catspaw	S1	E
Epioblasma torulosa gubernaculum	Green Blossom Pearlymussel	SX	E
Epioblasma torulosa torulosa	Tuberculed Blossom Pearlymussel	SX	E
Epioblasma triquetra	Snuffbox	S3	E
Epioblasma turgidula	Turgid Blossom Pearlymussel	SX	E
Fusconaia cor	Shiny Pigtoe Pearlymussel	S1	E
Fusconaia cuneolus	Fine-rayed Pigtoe	S1	E
Hemistena lata	Cracking Pearlymussel	S1	E
Lampsilis abrupta	Pink Mucket	S2	E
Lampsilis altilis	Fine-lined Pocketbook	S1S2	T
Lampsilis siliquoidea	Fatmucket	S2	R
Lampsilis virescens	Alabama Lampmussel	S1	E
Lasmigona holstonia	Tennessee Heelsplitter	S2	R
Lemiox rimosus	Birdwing Pearlymussel	S1	E
Medionidus acutissimus	Alabama Moccasinshell	S1	T
Medionidus parvulus	Coosa Moccasinshell	S1	E
Obovaria jacksoniana	Southern Hickorynut	S1	R
Obovaria retusa	Ring Pink	S1	E
Obovaria subrotunda	Round Hickorynut	S2S3	R
Pegias fabula	Little-wing Pearlymussel	S1	E
Plethobasus cicatricosus	White Wartyback	S1	E
Plethobasus cooperianus	Orange-foot Pimpleback	S1	E
Plethobasus cyphyus	Sheepnose	S2S3	E

Pleurobema chattanoogaense	Painted Clubshell	S1?	R
Pleurobema clava	Clubshell	SH	E
Pleurobema georgianum	Southern Pigtoe	S1	E
Pleurobema gibberum	Cumberland Pigtoe	S1	E
Pleurobema hanleyianum	Georgia Pigtoe	S1	E
Pleurobema oviforme	Tennessee Clubshell	S2S3	R
Pleurobema perovatum	Ovate Clubshell	SH	E
Pleurobema plenum	Rough Pigtoe	S1	E
Pleurobema rubrum	Pyramid Pigtoe	S1S2	R
Pleuronaia dolabelloides	Slabside Pearlymussel	S2	E
Ptychobranchus foremanianus	Rayed Kidneyshell	S1	E
Ptychobranchus greenii	Triangular Kidneyshell	S1	E
Ptychobranchus subtentum	Fluted Kidneyshell	S2	E
Quadrula cylindrica	Rabbitsfoot	S3	T
Quadrula fragosa	Winged Mapleleaf	S1	E
Quadrula intermedia	Cumberland Monkeyface	S1	E
Quadrula sparsa	Appalachian Monkeyface	S1	E
Simpsonaias ambigua	Salamander Mussel	S1	R
Strophitus connasaugaensis	Alabama Creekmussel	S1	R
Toxolasma cylindrellus	Pale Lilliput	S1	E
Toxolasma lividus	Purple Lilliput	S1S2	R
Uniomerus declivis	Tapered Pondhorn	S2	R
Villosa fabalis	Rayed Bean	S1	E
Villosa perpurpurea	Purple Bean	S1	E
Villosa trabalis	Cumberland Bean	S1	E
Villosa vanuxemensis	Mountain Creekshell	S4	R
Villosa vibex	Southern Rainbow	S2	R
Snails			
Anguispira picta	Painted Snake Coiled Forest Snail	S1	E
Athearnia anthonyi	Anthony's River Snail	S1	E
Carychium stygium	Cave Thorn	S2	R
Daedalochila auriformis	Rockpile Liptooth	S1	R
Discus bryanti	Saw-tooth Disc	S1S2	R
Discus clappi	Channelled Disc	S1	R
Elimia interrupta	Knotty Elimia	S1	R
Fumonelix archeri	Ocoee Covert	S1	R
Glyphyalinia ocoae	Blue-gray Glyph	S1	R
Helicodiscus hexodon	Toothy Coil	S1	R
Helicodiscus notius specus	A Land Snail	S1?	R
Inflectarius smithi	Alabama Shagreen	S2	R
Io fluvialis	Spiny Riversnail	S2	R
Leptoxis umbilicata	Umbilicate River Snail	S1	R
Leptoxis virgata	Smooth Mudalia	S1	R
Lithasia armigera	Armored Rocksnail	S1S2	R
Lithasia duttoniana	Helmet Rocksnail	S2	R
Lithasia geniculata	Ornate Rocksnail	S2	R
Lithasia lima	Warty Rocksnail	S2	R
Lithasia salebrosa	Muddy Rocksnail	S2	R
Marstonia ogmorhaphe	Royal Springsnail	S1	E
Paravitrea ternaria	Sculpted Supercoil	S1S2	R
Pilsbryna aurea	Ornate Bud	S1	R
Pleurocera alveare	Rugged Hornsnail	S2	R
Pleurocera corpulenta	Corpulent Hornsnail	S1	R
Pleurocera curta	Shortspire Hornsnail	S2	R
Somatogyrus sp. 2	A Freshwater Snail (From Tennessee)	S1	R

Stenotrema altispira	Highland Slitmouth	S2?	R
Stenotrema cohuttense	Cohutta Slitmouth	S2	R
Striatura exigua	Ribbed Striate	S1	R
Triodopsis anteridon	Carter Threetooth	S1S2	R
Triodopsis multilineata	Striped Whitelip Snail	S2	R
Ventridens coelaxis	Bidentate Dome	S2S3	R
Vertigo clappi	Cupped Vertigo	S1	R
Vertigo pygmaea	Crested Vertigo	S1	R
Insects			
Aloconota diversiseta	A Rove Beetle	S1	R
Atheta lucifuga	A Rove Beetle	S2	R
Batrisodes barri	A Cave Obligate Beetle	S1S2	R
Batrisodes clypeospecus	A Cave Obligate Beetle	S1S2	R
Batrisodes ferulifer	A Cave Obligate Beetle	S1	R
Bombus affinis	Rusty-patched Bumble Bee	SH	R
Folsomia sp. 2 nr. macrochaeta	A Springtail From Indian Cave	S1	R
Glyphopsyche sequatchie	Sequatchie Caddisfly	S1	R
Gomphus consanguis	Cherokee Clubtail	S1	R
Gomphus sandrius	Tennessee Clubtail Dragonfly	S1	R
Hadenoecus opilionides	A Cave Cricket	S3	R
Hypogastrura sp. 1	A Viatica Group Springtail	S1	R
Litocampa sp. 5	Rumbling Falls Cave Dipluran	S1	R
Macromia margarita	Margaret's River Cruiser	S2S3	R
Neanura sp. 1	Swamp River Cave Neanura	S1	R
Nelsonites walteri	a cave obligate beetle	S3	R
Nicrophorus americanus	American Burying Beetle	SH	R
Onychiurus sp. 2	Swamp River Cave Onychiurus	S1	R
Ophiogomphus acuminatus	Acuminate Snaketail	S2	R
Ophiogomphus edmundo	Edmund's Snaketail	S1	R
Ophiogomphus incurvatus alleghaniensis	Allegheny Snaketail	S1	R
Pseudanophthalmus acherontis	Echo Cave Beetle	S1	R
Pseudanophthalmus bendermani	Benderman's Cave Beetle	S1S2	R
Pseudanophthalmus catherinae	Catherine's Cave Beetle	S1	R
Pseudanophthalmus farrelli	A Cave Obligate Beetle	S1S2	R
Pseudanophthalmus fowlerae	Fowler's Cave Beetle	S1	R
Pseudanophthalmus insularis	Baker Station Cave Beetle	S1	R
Pseudanophthalmus jonesi	Grassy Cove Cave Beetle	S1S2	R
Pseudanophthalmus loganensis	A Cave Obligate Beetle	S1S2	R
Pseudanophthalmus longiceps	Long-headed Cave Beetle	S1	R
Pseudanophthalmus macradei	A Cave Obligate Beetle	S1S2	R
Pseudanophthalmus nickajackensis	Nickajack Cave Beetle	S1	R
Pseudanophthalmus nortoni	Norton's Cave Beetle	S1	R

Pseudanophthalmus occidentalis	Western Cave Beetle	S1	R
Pseudanophthalmus paradoxus	Ridgetop Cave Beetle	S1	R
Pseudanophthalmus paulus	Nobletts Cave Beetle	S1	R
Pseudanophthalmus paynei	Payne's Cave Beetle	S1	R
Pseudanophthalmus pusillus	Tiny Cave Beetle	S1	R
Pseudanophthalmus robustus	A Cave Obligate Beetle	S3	R
Pseudanophthalmus simplex	Simple Cave Beetle	S1S2	R
Pseudanophthalmus sp. 27	Rumbling Falls Cave Beetle	S1	R
Pseudanophthalmus templetoni	A Cave Obligate Beetle	S1	R
Pseudanophthalmus tiresias	Indian Cave Point Cave Beetle	S1	R
Pseudanophthalmus tullahoma	Duck River Cave Beetle	S1	R
Pseudanophthalmus vanburenensis	A Cave Obligate Beetle	S1	R
Pseudanophthalmus ventus	Blowing Cave Beetle	S1	R
Pseudosinella aera	A Cave Obligate Springtail	S2	R
Pseudosinella christianseni	A Cave Obligate Springtail	S2	R
Pseudosinella hirsuta	A Springtail	S3	R
Pseudosinella sp. 5	Swamp River Cave Pseudosinella	S1	R
Pseudosinella spinosa	A Cave Obligate Springtail	S2	R
Ptomaphagus barri	A Cave Obligate Beetle	S1S2	R
Ptomaphagus fecundus	A Cave Obligate Beetle	S1	R
Sinella cavernarum	A Springtail	S3	R
Trechus cumberlandus	Cumberland Ground Beetle	S2	R
Triacanthella copelandi	Copeland's Springtail	S1	R
Tychobythinus strinatii	A Cave Obligate Beetle	S1S2	R
Arachnids			
Appaleptoneta sp. 1	A Leptonetid Spider From Ghost River Cave	S1	R
Kleptochthonius daemonius	A Cave Obligate Pseudoscorpion	S1S2	R
Microhexura montivaga	Spruce-fir Moss Spider	S1	R
Phalangodes appalachius	A Cave Obligate Harvestman	S3	R
Theromaster sp. 1	A Harvestman From Cummings Cove Cave	S1	R
Annelids			
Cambarincola alienus	A Cave Obligate Worm	S1	R
Arthopods			
Chaetaspis mollis	A Cave Millipede	S1	R
Scoterpes ventus	A Cave Obligate Millipede	S1	R
Tetracion tennesseensis	A Cave Obligate Millipede	S2S3	R
Crustaceans			
Caecidotea circulus	A Cave Obligate Isopod	S1	R
Caecidotea incurva	Incurved Cave Isopod	S1	R

Caecidotea nickajackensis	Nickajack Cave Isopod	S1	R
Caecidotea scyphus	A Cave Obligate Isopod	S1	R
Cambarus bouchardi	Big South Fork Crayfish	S1	E
Cambarus cymatilis	Conasauga Blue Burrower	S1	E
Cambarus extraneus	Chickamauga Crayfish	S1S2	E
Cambarus obeyensis	Obey Crayfish	S2	E
Cambarus pristinus	Pristine Crayfish	S2	E
Cambarus sp. 1	Emory River Crayfish	S1	R
Cambarus williami	Brawleys Fork Crayfish	S2	T
Diacyclops yeatmani	Yeatmans Groundwater Copepod	S1	R
Fallicambarus hortoni	Hatchie Burrowing Crayfish	S1	E
Orconectes alabamensis	Alabama Crayfish	S2	D
Orconectes incomptus	Tennessee Cave Crayfish	S1	E
Orconectes shoupi	Nashville Crayfish	S1S2	E
Orconectes wrighti	Hardin Crayfish	S2	E
Stygobromus barryi	A Cave Obligate Amphipod	S1	R
Stygobromus fecundus	A Cave Amphipod	S1	R
Stygobromus finleyi	Finleys Cave Amphipod	S1	R
Stygobromus nortoni	Nortons Cave Amphipod	SH	R
Stygobromus sp. 22	Swamp River Cave Amphipod	S3	R
Stygobromus sparsus	A Cave Obligate Isopod	S1S2	R
Plants			
Abies fraseri	Fraser Fir	S1S2	T
Acalypha deamii	Deam's Copperleaf	S1	S
Aconitum reclinatum	White Monkshood	S1	E
Adlumia fungosa	Climbing Fumitory	S2	T
Agalinis auriculata	Earleaf Foxglove	S2	E
Agalinis oligophylla	Ridge-stem False-foxglove	S1	E
Agalinis plukenetii	Purple Gerardia	S1	E
Agalinis setacea	Thread-leaved Gerardia	SH	S
Agastache scrophulariifolia	Giant Hyssop	S1S2	T
Ageratina luciae-brauniae	Lucy Braun's White Snakeroot	S3	T
Agrostis mertensii	Arctic Bentgrass	SH	S
Allium burdickii	Narrow-leaved Wild Leek	S1S2	T-CE
Allium stellatum	Glade Onion	S1	E
Allium tricoccum	Small White Leek	S1S2	S-CE
Alnus viridis ssp. crispa	Green Alder	S1	S
Amelanchier sanguinea	Round-leaved Serviceberry	S2	T
Ammoselinum popei	Pope Sand-parsley	S2	T
Amsonia tabernaemontana var. gattingeri	A Blue-star	S3	S
Anemone caroliniana	Carolina Anemone	S1S2	E
Apios priceana	Price's Potato-bean	S3	E
Arabis hirsuta	Western Hairy Rock-cress	S1	T
Arabis patens	Spreading Rockcress	S1	E
Arabis perstellata	Braun's Rock-cress	S1	E
Arenaria lanuginosa	A Sandwort	S1	E
Aristida ramosissima	Branched Three-awn Grass	S1	E
Armoracia lacustris	Lake-cress	S2	S

Arnoglossum plantagineum	Fen Indian-plantain	S2	T
Asclepias purpurascens	Purple Milkweed	S1	S
Asplenium scolopendrium var. americanum	American Hart's-tongue Fern	S1	E
Astragalus bibullatus	Pyne's Ground Plum	S1	E
Astragalus tennesseensis	Tennessee Milk-vetch	S3	S
Athyrium filix-femina ssp. angustum	Lady Fern	S2	S
Aureolaria patula	Spreading False-foxglove	S3	S
Baptisia bracteata var. leucophaea	Cream Wild Indigo	S1S2	S
Berberis canadensis	American barberry	S2	S
Betula papyrifera var. cordifolia	Heart-leaved Paper Birch	S1	E
Boechera shortii	Short's Rock-cress	S1S2	S
Bolboschoenus fluviatilis	River Bulrush	S1	S
Botrychium jenmanii	Alabama Grapefern	S1	T
Botrychium matricariifolium	Matricary Grapefern	S1	S
Botrychium oneidense	Blunt-lobe Grapefern	S1	S
Brachyelytrum aristosum	Northern Shorthusk	S2	S
Buckleya distichophylla	piratebush	S2	T
Bulbostylis ciliatifolia var. coarctata	Beak-rush	S1	E
Calamagrostis cainii	Reedgrass	S1	E
Calamagrostis porteri	Porter's Reedgrass	S1	E
Calamovilfa arcuata	Sandreed Grass	S2	T
Caltha palustris	Marsh-marigold	S1	E
Campanula aparinoides	Marsh Bellflower	S2	S
Cardamine clematitis	mountain bittercress	S2	T
Cardamine flagellifera	Bitter Cress	S2	T
Cardamine rotundifolia	Roundleaf Water-cress	S2S3	S
Carex argyrantha	Hay Sedge	S1	T
Carex barrattii	Barratt's Sedge	S2	E
Carex bromoides ssp. montana	Brome-like Sedge	S1	T
Carex buxbaumii	Buxbaum's Sedge	S1	E
Carex comosa	Sedge	S2	T
Carex davisii	Davis' Sedge	S1	S
Carex echinata ssp. echinata	Little Prickly Sedge	S1?	S
Carex folliculata	northern long sedge	S1	T
Carex hirtifolia	Sedge	S1S2	S
Carex hitchcockiana	Sedge	S1	T
Carex hyalina	Tissue Sedge	S1	S
Carex manhartii	Manhart's Sedge	S2	E
Carex misera	Wretched Sedge	S2	T
Carex muskingumensis	Sedge	S1	E
Carex ouachitana	Ouachita Sedge	S1	S
Carex pallescens	Sedge	S1	S
Carex pellita	Wooly Sedge	S1	E
Carex reniformis	Sedge	S1	S
Carex roanensis	Sedge	S2	S
Carex ruthii	Ruth's Sedge	S2	T
Carex tetanica	Rigid Sedge	S1	E
Castanea dentata	American Chestnut	S2S3	S
Caulophyllum giganteum	Blue Cohosh	S1	T
Cerastium arvense ssp. velutinum	Velvety Cerastium	S1	E
Ceratophyllum echinatum	Prickly Hornwort	S1	S
Chelone obliqua	Red Turtlehead	S1	S

Chrysogonum virginianum	Green-and-gold	S2	T
Clematis fremontii	Fremont's Virgin's-bower	S1	E
Clematis glaucophylla	Whiteleaf Leatherflower	S1	S
Clematis morefieldii	Morefield's Leather-flower	S2	E
Clethra alnifolia	Coast Pepper-bush	S1	E
Coeloglossum viride var. virescens	American Frog Orchid	S1	E
Collinsia verna	Blue-eyed Mary	S1	E
Comptonia peregrina	Sweet Fern	S1	E
Conradina verticillata	Cumberland Rosemary	S3	T
Corallorhiza maculata	Spotted Coral-root	S1	T
Coreopsis latifolia	Broad-leaved Tickseed	S1S2	E
Corydalis sempervirens	Pale Corydalis	S1S2	S
Cotinus obovatus	American Smoke-tree	S2	S
Crataegus harbisonii	Harbison Hawthorn	S1	E
Cymophyllus fraserianus	Fraser's Sedge	S3	S
Cyperus dentatus	Toothed Sedge	S1	S
Cyperus plukenetii	Plukenet's Cyperus	S1	S
Cypripedium kentuckiense	Lady-slipper	S2	E
Cypripedium reginae	Showy Lady-slipper	S1	E
Dalea candida	White Prairie-clover	S2	T
Dalea foliosa	Leafy Prairie-clover	S2S3	E
Dalea purpurea	Purple Prairie-clover	S1	E
Danthonia epilis	Bog Oat-grass	S1S2	S
Delphinium exaltatum	Tall Larkspur	S2	E
Desmodium ochroleucum	Creamflower Tick-trefoil	S1	E
Diamorpha smallii	Small's Stonecrop	S1S2	E
Diarrhena obovata	Beak Grass	S1	S
Dichanthelium acuminatum ssp. leucothrix	Panic-grass	S1	S
Dichanthelium acuminatum ssp. spretum	Eaton's Witchgrass	S1	E
Dichanthelium ensifolium ssp. curtifolium	Panic-grass	S1	E
Didiplis diandra	Water-purslane	S1	T
Diervilla lonicera	Northern Bush-honeysuckle	S2	T
Diervilla sessilifolia var. rivularis	Mountain Bush-honeysuckle	S2	T
Draba cuneifolia	Wedge-leaf Whitlow-grass	S1S2	S
Draba ramosissima	Branching Whitlow-wort	S2	S
Drosera brevifolia	Dwarf Sundew	S2	T
Drosera capillaris	Sundew	S1	T
Drosera intermedia	Spoon-leaved Sundew	S2	S
Drosera rotundifolia	Roundleaf Sundew	S1	T
Dryopteris carthusiana	Spinulose Woodfern	S1	T
Dryopteris cristata	crested woodfern	S2	T
Echinacea pallida	Pale-purple Coneflower	S1	E
Echinacea simulata	Wavy-leaf Purple-coneflower	S2	T
Echinacea tennesseensis	Tennessee Coneflower	S2	T
Echinochloa walteri	Walter's Barnyard Grass	S1	S
Eleocharis compressa	Flat-stemmed Spike-rush	S1	S
Eleocharis elliptica	Elliptic Spikerush	S1	E
Eleocharis equisetoides	Horse-tail Spikerush	S1	E
Eleocharis intermedia	Spike-rush	S1	E
Eleocharis lanceolata	Lance-like Spikerush	S1	S
Eleocharis tortilis	Twisted Spike-rush	S1	S

Eleocharis wolfii	Wolf Spikerush	S1	E
Elodea nuttallii	Waterweed	S2	S
Elymus svensonii	Svenson's Wild-rye	S2	T
Epilobium angustifolium	Fireweed	S1	T
Epilobium ciliatum	Willow-herb	S1	T
Epilobium leptophyllum	Willow-herb	S1	T
Eriocaulon decangulare	Ten-angle Pipewort	S1	E
Eriogonum harperi	Harper's Umbrella-plant	S1	E
Eriophorum virginicum	Tawny Cotton-grass	S1S2	E
Eryngium integrifolium	Button Snakeroot	S1	T
Erysimum capitatum	Western Wallflower	S1S2	E
Erythronium rostratum	Yellow Trout-lily	S2	S
Eupatorium leucolepis	White-bract Thoroughwort	S1	E
Eurybia saxicastellii	Rockcastle Aster	S1S2	E
Eurybia schreberi	Schreber Aster	S1	S
Evolvulus nuttallianus	Evolvulus	S3	S
Festuca paradoxa	Cluster Fescue	S1	S
Fimbristylis perpusilla	Harper's Fimbristylis	S1	E
Fimbristylis puberula	Hairy Fimbristylis	S1S2	T
Fothergilla major	Witch-alder	S2	T
Fuirena squarrosa	Hairy Umbrella-sedge	S1	S
Galium asprellum	Rough Bedstraw	S1	S
Galium palustre	Marsh Bedstraw	S1	S
Gaylussacia dumosa	Dwarf Huckleberry	S3	T
Gentiana linearis	Narrowleaf Gentian	S1	T
Gentiana puberulenta	Downy Gentian	S1	E
Geranium robertianum	Herb-robert	S1	S
Geum aleppicum	Yellow Avens	S1	E
Geum geniculatum	Bent Avens	S1	E
Geum laciniatum	Rough Avens	S1	S
Geum radiatum	Spreading Avens	S1	E
Glyceria acutiflora	Manna-grass	S2	S
Glyceria laxa	Northern Manna-grass	S1	E
Glyceria nubigena	Smoky Mountain Manna-grass	S1S2	T
Goodyera repens	Dwarf Rattlesnake-plantain	S1	S
Gratiola floridana	Florida Hedge-hyssop	S1	E
Gymnopogon brevifolius	Shortleaf Beardgrass	S1S2	S
Hasteola suaveolens	Sweet-scented Indian-plantain	S2	S
Hedyotis purpurea var. montana	Mountain Bluet	S1	E
Helenium brevifolium	Shortleaf Sneezeweed	S1	E
Helianthemum propinquum	Low Frostweed	S1S2	E
Helianthus eggertii	Eggert's Sunflower	S3	S
Helianthus glaucophyllus	White-leaved Sunflower	S1	T
Helianthus occidentalis	naked-stem sunflower	S2	S
Helianthus verticillatus	Whorled Sunflower	S1	E
Heracleum maximum	Cow Parsnip	S2	S
Heteranthera limosa	Smaller Mud-plantain	S1S2	T
Heteranthera multiflora	Multiflowered Mud-plantain	S1	S
Hexastylis virginica	Virginia Heartleaf	S2	S
Hieracium longipilum	Hairy Hawkweed	S1	S
Hieracium scabrum	Rough Hawkweed	S2	T
Hottonia inflata	Featherfoil	S2	S
Huperzia appalachiana	Appalachian Fir-clubmoss	S1	T
Hydrocotyle americana	American Water-pennywort	S1	E
Hydrolea ovata	Hydrolea	S1	S

Hydrophyllum virginianum	Virginia Waterleaf	S3	T
Hymenophyllum tayloriae	Gorge Filmy Fern	S2	S
Hypericum adpressum	Creeping St. John's-wort	S1	E
Hypericum ellipticum	Pale St. John's-wort	S1	E
Hypericum graveolens	Mountain St. John's-wort	S3	E
Hypericum mitchellianum	Blue Ridge St. John's-wort	S2	T
Hypericum nudiflorum	St. John's-wort	S2	S
Iris brevicaulis	Lamance Iris	S1	E
Iris fulva	Red Iris	S2	T
Iris prismatica	Narrow Blue Flag	S2S3	T
Isoetes melanopoda	Blackfoot Quillwort	S1S2	E
Isotria medeoloides	Small Whorled Pogonia	S1	E
Juglans cinerea	Butternut	S3	T
Juncus brachycephalus	Short-head Rush	S2	S
Krigia montana	False Dandelion	S1	T
Lachnanthes caroliana	Red Root	S1	E
Lathyrus palustris	Marsh Pea	S1	S
Lechea pulchella	Leggett's Pinweed	S1	E
Lespedeza angustifolia	Narrowleaf Bushclover	S2	T
Lesquerella perforata	Spring Creek Bladderpod	S1	E
Leucothoe racemosa	Fetter-bush	S2	T
Liatris cylindracea	Slender Blazing-star	S2	T
Lilium grayi	Gray's Lily	S1	E
Lilium philadelphicum	Wood Lily	S1	E
Liparis loeselii	Loesel's Twayblade	S1	T
Listera australis	Southern Twayblade	S1S2	E
Lobelia amoena	Southern Lobelia	S1S2	T
Lonicera canadensis	American Fly-honeysuckle	S1	T
Lonicera dioica	Mountain Honeysuckle	S2	S
Lonicera flava	Yellow Honeysuckle	S1	T
Ludwigia sphaerocarpa	Globe-fruited Ludwigia	S1	T
Lycopodiella alopecuroides	Foxtail Clubmoss	S2	T
Lycopodium dendroideum	Treelike Clubmoss	S1	S
Lysimachia fraseri	Fraser Loosestrife	S2	E
Lysimachia quadriflora	Four-flowered Loosestrife	S1	E
Lysimachia terrestris	Swamp Loosestrife	S1	E
Lysimachia x producta	Loosestrife	S1	S
Magnolia virginiana	Sweetbay Magnolia	S2	T
Maianthemum stellatum	Starflower Solomons-seal	S1	E
Marshallia grandiflora	Large-flowered Barbara's-buttons	S2	E
Marshallia obovata	Obovate Marshallia	S1	E
Marshallia trinervia	Broadleaf Barbara's-buttons	S2S3	T
Meehania cordata	Meehania Mint (Heart-leaf Meehania)	S2	T
Melanthium latifolium	Broadleaf Bunchflower	S1S2	E
Melanthium virginicum	Bunchflower	S1	E
Menziesia pilosa	Fetterbush	S2	S
Milium effusum	Millet-grass	S1	S
Minuartia cumberlandensis	Cumberland Sandwort	S2	E
Minuartia godfreyi	Godfrey's Stitchwort	S1	E
Minuartia groenlandica	Mountain Sandwort	S1	E
Mirabilis albida	Pale Umbrella-wort	S2	T
Monotropsis odorata	Sweet Pinesap	S2	T
Muhlenbergia cuspidata	Plains Muhlenbergia	S1	E
Muhlenbergia glabrifloris	Muhly	S1	S
Muhlenbergia torreyana	Torrey Muhly	S1	E

Myriophyllum pinnatum	Water-milfoil	S1	E
Nestronia umbellula	Nestronia	S1	E
Neviusia alabamensis	Alabama Snow-wreath	S2	T
Oenothera macrocarpa ssp. macrocarpa	Missouri Evening-primrose	S2	T
Oenothera parviflora	Northern Evening-primrose	S1	S
Onosmodium hispidissimum	Hairy False Gromwell	S1	E
Onosmodium molle ssp. occidentale	Western False Gromwell	S1S2	T
Onosmodium molle ssp. subsetosum	False Gromwell	S1	E
Packera plattensis	Prairie Ragwort	S1	S
Packera schweinitziana	Schweinitz's Ragwort	S1	T
Panax quinquefolius	American ginseng	S3S4	S-CE
Panicum hemitomon	Maidencane	S2	S
Parnassia grandifolia	Large-leaved Grass-of-parnassus	S3	S
Paronychia argyrocoma	Silverling	S1S2	T
Patis racemosa	Mountain ricegrass	S1	E
Paxistima canbyi	Canby's Mountain-lover	S1	E
Paysonia densipila	Duck River Bladderpod	S3	S
Paysonia stonensis	Stones River Bladderpod	S1	E
Pedicularis lanceolata	Swamp Lousewort	S1S2	S
Penstemon tubiflorus	Small Flowered Beardtongue	S1	S
Perideridia americana	Perideridia	S2	E
Phegopteris connectilis	Northern Beechfern	S1	E
Phemeranthus calcaricus	Limestone Fame-flower	S3	S
Phemeranthus mengesii	Fame-flower	S2	T
Phemeranthus teretifolius	Roundleaf Fameflower	S2	T
Phlox bifida ssp. stellaria	Cleft Phlox	S3	T
Phlox ovata	Wideflower phlox	S2S3	S
Phlox pilosa ssp. ozarkana	Downy Phlox	S1S2	S
Phlox subulata	Moss phlox	S1	T
Physaria globosa	Lesquereux's Mustard	S2	E
Pieris floribunda	Mountain Fetter-bush	S2	T
Pilularia americana	American Pillwort	S1S2	S
Pityopsis ruthii	Ruth's Golden Aster	S1	E
Plantago cordata	Heartleaved Plantain	S1	E
Platanthera cristata	Yellow-crested Orchid	S2S3	S
Platanthera flava var. herbiola	Pale Green Orchid	S2	T
Platanthera grandiflora	Large Purple Fringed Orchid	S2	E
Platanthera integra	Yellow Fringeless Orchid	S1	E
Platanthera integrilabia	White Fringeless Orchid	S2S3	E
Platanthera nivea	Snowy Orchid	S1	E
Platanthera psycodes	Small Purple Fringe Orchid	S2	S
Poa palustris	Fowl Bluegrass	S1	E
Poa saltuensis	Drooping Bluegrass	S1	T
Pogonia ophioglossoides	Rose Pogonia	S2	E
Polygala boykinii	Boykin's Milkwort	S2	T
Polygala mariana	Maryland Milkwort	S1	S
Polygala nana	Dwarf Milkwort	S1	E
Polygala nuttallii	Nuttall's Milkwort	S1	E
Polygonella americana	Southern Jointweed	S1S2	E
Polygonum arifolium	Halberd-leaf Tearthumb	S1	T
Polygonum cilinode	Fringed Black Bindweed	S1S2	T

Polymnia johnbeckii	John Beck's Leafcup	S1	E
Polytaenia nuttallii	Prairie Parsley	S1	T
Ponthieva racemosa	Shadow-witch Orchid	S1	E
Potamogeton amplifolius	Large-leaf Pondweed	S1	T
Potamogeton epihydrus	Creekgrass	S1S2	S
Potamogeton tennesseensis	Tennessee Pondweed	S2	T
Potentilla tridentata	Three-toothed Cinquefoil	S1S2	T
Prenanthes alba	White Rattlesnake-root	S1	S
Prenanthes aspera	Rough Rattlesnake-root	S1	E
Prenanthes barbata	Barbed Rattlesnake-root	S2	S
Prunus pumila	Sand Cherry	S1	E
Prunus virginiana	Chokecherry	S1	S
Pseudognaphalium helleri	Heller's Catfoot	S2	S
Pycnanthemum torreyi	Torrey's Mountain Mint	S1	E
Pycnanthemum verticillatum	Mountain-mint	S1	E
Pyrola americana	American Wintergreen	S2	E
Quercus margaretta	Sand Post Oak	S1	S
Ranunculus aquatilis var. diffusus	White Water Buttercup	S1	E
Ranunculus flabellaris	Yellow Water-crowfoot	S2	T
Rhamnus alnifolia	Alderleaf Buckthorn	S1	E
Rhynchospora caduca	Falling Beaked-rush	S1	S
Rhynchospora capillacea	Horned Beakrush	S1	E
Rhynchospora chalarocephala	Loose-head Beakrush	S1	T
Rhynchospora inexpansa	Nodding Beakrush	S1	S
Rhynchospora perplexa	Beakrush	S2	T
Rhynchospora rariflora	Beakrush	S1	E
Ribes curvatum	Granite Gooseberry	S1	T
Ribes missouriense	Missouri gooseberry	S2	S
Ribes odoratum	Buffalo Currant	S1	T
Rudbeckia subtomentosa	Sweet Coneflower	S2	T
Rugelia nudicaulis	Rugel's Ragwort	S2	E
Sabatia capitata	Rose-gentian	S2	E
Sacciolepis striata	Gibbous Panic-grass	S1	S
Sagittaria brevirostra	Short-beak Arrowhead	S1	T
Sagittaria graminea	Grassleaf Arrowhead	S1	T
Sagittaria platyphylla	Ovate-leaved Arrowhead	S2S3	S
Sagittaria rigida	Sessile-fruited Arrowhead	S1	E
Salvia azurea var. grandiflora	Blue Sage	S3	S
Sanguisorba canadensis	Canada Burnet	S1	E
Saxifraga caroliniana	Carolina saxifrage	S1S2	E
Saxifraga pensylvanica	Swamp Saxifrage	S1	E
Schisandra glabra	Bay Starvine	S2	T
Schoenolirion croceum	Sunnybell	S3	T
Schoenoplectus subterminalis	Water Bulrush	S1	S
Scleria verticillata	Low Nutrush	S2	S
Scutellaria montana	Large-flowered Skullcap	S4	T
Sedum nevii	Nevius' Stonecrop	S1	E
Silene caroliniana ssp. pensylvanica	Wild Pink	S1S2	T
Silene ovata	Ovate Catchfly	S2	E
Silphium brachiatum	Cumberland Rosinweed	S3	E
Silphium laciniatum	Compass-plant	S2	T
Silphium pinnatifidum	Prairie-dock	S2	T
Smilax laurifolia	Laurel-leaf Greenbrier	S1	S
Solidago gattingeri	Gattinger's Goldenrod	S1	E
Solidago lancifolia	Broad-leaf Golden-rod	S1	E

Solidago porteri	Porter's Goldenrod	S1	E
Solidago ptarmicoides	Prairie Goldenrod	S1S2	E
Solidago rupestris	Rock Goldenrod	S1	E
Solidago stricta var. gracillima	A Goldenrod	S1	S
Solidago tarda	Late Goldenrod	SH	S
Sparganium androcladum	Branching Burreed	S1	E
Spiraea alba	Narrow-leaved Meadow-sweet	S1	E
Spiraea virginiana	Virginia Spiraea	S2	E
Spiranthes lucida	Shining Ladies'-tresses	S1S2	T
Spiranthes magnicamporum	Great Plains Ladies'-tresses	S1	E
Spiranthes ochroleuca	Yellow Nodding Ladies'-tresses	S1	E
Spiranthes odorata	Sweetscent Ladies'-tresses	S1	E
Sporobolus heterolepis	Northern Dropseed	S1	T
Sporobolus junceus	A Dropseed	S1	E
Stachys clingmanii	Clingman's Hedge-nettle	S1S2	T
Stellaria alsine	Trailing Stitchwort	S1	E
Stellaria fontinalis	Water Stitchwort	S3	S
Stellaria longifolia	Longleaf Stitchwort	S1	E
Streptopus amplexifolius	Clasping Twisted-stalk	S1	T
Streptopus lanceolatus	Rosy Twisted-stalk	S2	S
Stylisma humistrata	Southern Southern Morning-glory	S1	T
Sullivantia sullivantii	Sullivantia	S1	E
Symphyotrichum ericoides	White Heath Aster	S1	E
Symphyotrichum praealtum	Willow Aster	S1	E
Symphyotrichum pratense	Barrens Silky Aster	S1	E
Symplocarpus foetidus	Skunk Cabbage	S1	E
Symplocos tinctoria	Horsesugar	S2	S
Taxus canadensis	Canadian Yew	S1	E
Thaspium pinnatifidum	cutleaf meadow-parsnip	S1	E
Thermopsis fraxinifolia	Ash-leaved Bush-pea	S3	T
Thermopsis mollis	Soft-haired Thermopsis	S2S3	S
Thuja occidentalis	Northern White Cedar	S3	S
Torreyochloa pallida	Pale Manna Grass	S1	S
Triadenum fraseri	Fraser's Marsh St. Johnswort	S1?	S
Triantha glutinosa	Sticky False-asphodel	S1	E
Triantha racemosa	Coastal False-asphodel	S1	E
Trichomanes boschianum	Appalachian Bristle Fern	S1S2	T
Trichomanes petersii	Dwarf Filmy-fern	S2	T
Trichophorum cespitosum	Tufted Clubrush	S1	E
Tridens flavus var. chapmanii	Chapman's Redtop	S1	E
Trientalis borealis	Northern Starflower	S1	T
Trifolium calcaricum	Running Glade Clover	S1	E
Trifolium reflexum	Buffalo Clover	S1	E
Trillium decumbens	Trailing Trillium	S1	E
Trillium lancifolium	Lance-leaf Trillium	S1	E
Trillium pusillum	Least Trillium	S2	E
Trillium rugelii	Southern Nodding Trillium	S2	E
Trillium tennesseense	Lilly	S1	E
Tsuga caroliniana	Carolina Hemlock	S3	T
Turritis glabra	Tower-mustard	S1	S
Ulmus crassifolia	Cedar Elm	S2	S

Utricularia cornuta	Horned Bladderwort	S1	E
Utricularia subulata	Zigzag Bladderwort	S1	T
Vaccinium elliottii	Elliott's Blueberry	S1	E
Vaccinium macrocarpon	Large Cranberry	S2	T
Veratrum woodii	Ozark Bunchflower	S1	E
Veronica americana	American Speedwell	S1	S
Veronica catenata	Sessile Water-speedwell	S1	E
Veronica scutellata	Marsh-speedwell	S1	E
Viburnum bracteatum	Arrow-wood	S2	S
Vitis rupestris	Sand Grape	S1	E
Woodsia scopulina ssp. appalachiana	Appalachian Cliff-fern	S1S2	S
Woodwardia virginica	Virginia Chainfern	S2	S
Xerophyllum asphodeloides	Eastern Turkeybeard	S3	T
Xyris ambigua	Coastal-plain Yellow-eyed-grass	S1	E
Xyris fimbriata	Fringed Yellow-eyed-grass	S1	E
Xyris laxifolia var. iridifolia	Yellow-eyed-grass	S2	T
Xyris tennesseensis	Yellow-eyed-grass	S1	E
Zanthoxylum americanum	Northern Prickly-ash	S2	S
Zigadenus glaucus	White Camas	S1	E
Zigadenus leimanthoides	Death-camas	S2	T

Status Codes: D = Deemed in need of management; E = Endangered; R = Rare, Not State Listed; T = Threatened; TRKD = Tracked.

State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; S5 = Secure; SH = Possibly Extirpated (Historical); SNR = State not Ranked; SX = Presumed Extirpated; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); S#B = Rank of Breeding Population; S#N = Rank of Non-Breeding Population.

State and Federally Listed Endangered, Threatened, and Candidate Terrestrial Animals and Plants in Virginia Potentially Impacted by the Natural Resource Plan

SCIENTIFIC	COMMON	RANK	STATUS
Mammals			
Corynorhinus townsendii virginianus	Virginia Big-eared Bat	S1	E
Glaucomys sabrinus fuscus	Virginia Northern Flying Squirrel	S1	E
Myotis grisescens	Gray Bat	S1	E
Myotis leibii	Eastern small-footed bat	S2	SLNS
Myotis septentrionalis	Northern Long-eared Bat	S1S3	LT
Myotis sodalis	Indiana Bat	S1	E
Perimyotis subflavus	Tricolored Bat	S1S3	PE
Corynorhinus townsendii virginianus	Virginia Big-eared Bat	S1	E
Glaucomys sabrinus fuscus	Virginia Northern Flying Squirrel	S1	E
Myotis grisescens	Gray Bat	S1	E
Myotis leibii	Eastern small-footed bat	S2	SLNS
Birds			
Accipiter cooperii	Cooper's Hawk	S3B,S3N	TRKD
Accipiter striatus	Sharp-shinned Hawk	S3S4	SLNS
Aegolius acadicus	Northern Saw-whet Owl	S1B,S2N	SLNS
Catharus guttatus	Hermit Thrush	S1B,S5N	SLNS
Empidonax alnorum	Alder Flycatcher	S1S2B	SLNS
Falco peregrinus	Peregrine Falcon	S1B,S2N	LT
Haliaeetus leucocephalus	Bald Eagle	S3S4B,S3S4N	LT
Lanius ludovicianus	Loggerhead Shrike	S1B,S2N	LT
Limnothlypis swainsonii	Swainson's Warbler	S2B	SLNS
Picoides borealis	Red-cockaded Woodpecker	S1	E
Regulus satrapa	Golden-crowned Kinglet	S2B,S5N	SLNS
Setophaga magnolia	Magnolia Warbler	S2B	SLNS
Sitta canadensis	Red-breasted Nuthatch	S2B,S4N	SLNS
Thryomanes bewickii altus	Appalachian Bewick's Wren	SHB	E
Reptiles			
Apalone spinifera	Spiny Softshell	S2	SLNS
Apalone spinifera spinifera	Eastern Spiny Softshell	S2	SLNS
Graptemys geographica	Map Turtle	S3	TRKD
Lampropeltis nigra	Black Kingsnake	S2	TRKD
Sternotherus minor	Stripeneck Musk Turtle	S2	SLNS
Trachemys scripta troostii	Cumberland Slider	S1	SLNS
Apalone spinifera	Spiny Softshell	S2	SLNS
Apalone spinifera spinifera	Eastern Spiny Softshell	S2	SLNS
Amphibians			
Cryptobranchus alleganiensis	Hellbender	S2	SLNS
Desmognathus marmoratus	Shovelnose Salamander	S2	SLNS
Desmognathus organi	Northern Pygmy Salamander	S2	SLNS
Necturus maculosus	Mudpuppy	S2	SLNS
Plethodon welleri	Weller's Salamander	S2	SLNS
Ammocrypta clara	Western Sand Darter	S1	LT
Aplodinotus grunniens	Freshwater Drum	S2	SLNS

Chrosomus cumberlandensis	Blackside Dace	S1	LT
Chrosomus tennesseensis	Tennessee Dace	S1	E
Cottus baileyi	Black Sculpin	S2	TRKD
Cottus sp. 4	Clinch Sculpin	S1S2	TRKD
Cyprinella whipplei	Steelcolor Shiner	S1	LT
Erimonax monachus	Spotfin Chub	S1	LT
Erimystax cahni	Slender Chub	S1	LT
Etheostoma acuticeps	Sharphead Darter	S1	E
Etheostoma camurum	Bluebreast Darter	S2	SLNS
Etheostoma chlorobranchium	Greenfin Darter	S1	LT
Etheostoma cinereum	Ashy Darter	S1	SLNS
Etheostoma denoncourti	Golden Darter	S1	LT
Etheostoma jessiae	Blueside Darter	S1	SLNS
Etheostoma meadiae	Bluespar darter	S2	SLNS
Etheostoma percnurum	Duskytail Darter	S1	E
Etheostoma vulneratum	Wounded Darter	S2S3	SLNS
Ichthyomyzon bdellium	Ohio Lamprey	S2	SLNS
Ichthyomyzon greeleyi	Mountain Brook Lamprey	S2	SLNS
Labidesthes sicculus	Brook Silverside	S2	SLNS
Lythrurus lirus	Mountain Shiner	S2S3	SLNS
Moxostoma carinatum	River Redhorse	S2S3	SLNS
Moxostoma lacerum	Harelip Sucker	SX	SLNS
Notropis ariommus	Popeye Shiner	S2S3	SLNS
Notropis atherinoides	Emerald Shiner	S1S2	LT
Notropis spectrunculus	Mirror Shiner	S2	SLNS
Noturus eleutherus	Mountain Madtom	S2S3	SLNS
Noturus flavipinnis	Yellowfin Madtom	S1	LT
Noturus flavus	Stonecat	S2	SLNS
Percina aurantiaca	Tangerine Darter	S2S3	SLNS
Percina burtoni	Blotchside Logperch	S1	SLNS
Percina copelandi	Channel Darter	S2	SLNS
Percina evides	Gilt Darter	S2	SLNS
Percina sciera	Dusky Darter	S1S2	SLNS
Percina williamsi	Sickle Darter	S1S2	LT
Phenacobius crassilabrum	Fatlips Minnow	S2	SLNS
Pimephales vigilax	Bullhead Minnow	S1	SLNS
Polyodon spathula	Paddlefish	S1	LT
Stizostedion canadense	Sauger	S2S3	SLNS
Mussels			
Alasmidonta marginata	Elktoe	S1S2	SLNS
Alasmidonta viridis	Slippershell Mussel	S1	E
Cumberlandia monodonta	Spectaclecase	S1	E
Cyprogenia stegaria	Fanshell	S1	E
Dromus dromas	Dromedary Pearlymussel	S1	E
Elliptio crassidens	Elephant-ear	S1	E
Epioblasma brevidens	Cumberlandian Combshell	S1	E
Epioblasma capsaeformis	Oyster Mussel	S1	E
Epioblasma florentina aureola	Golden Riffleshell	S1	E
Epioblasma torulosa gubernaculum	Green Blossom Pearlymussel	SX	E
Epioblasma triquetra	Snuffbox	S1	E
Fusconaia barnesiana	Tennessee Pigtoe	S2	SLNS
Fusconaia cor	Shiny Pigtoe Pearlymussel	S1	E
Fusconaia cuneolus	Fine-rayed Pigtoe	S1	E
Hemistena lata	Cracking Pearlymussel	S1	E

Lampsilis abrupta	Pink Mucket	SX	E
Lasmigona holstonia	Tennessee Heelsplitter	S1	E
Lemiox rimosus	Birdwing Pearlymussel	S1	E
Leptodea fragilis	Fragile Papershell	S1	LT
Pleuronaia dolabelloides	Slabside Pearlymussel	S2	LT
Ligumia recta	Black Sandshell	S2	LT
Pegias fabula	Little-wing Pearlymussel	S1	E
Plethobasus cyphyus	Sheepnose	S1	E
Pleurobema cordatum	Ohio Pigtoe	S1	E
Pleurobema oviforme	Tennessee Clubshell	S2S3	SLNS
Pleurobema plenum	Rough Pigtoe	SH	E
Pleurobema rubrum	Pyramid Pigtoe	SH	E
Ptychobranchus subtentum	Fluted Kidneyshell	S2	E
Quadrula cylindrica strigillata	Rough Rabbitsfoot	S2	E
Quadrula intermedia	Cumberland Monkeyface	S1	E
Cyclonaias pustulosa	Pimpleback	S2	LT
Quadrula sparsa	Appalachian Monkeyface	S1	E
Toxolasma lividus	Purple Lilliput	SH	E
Truncilla truncata	Deertoe	S1	E
Villosa fabalis	Rayed Bean	SX	E
Villosa perpurpurea	Purple Bean	S1	E
Villosa trabalis	Cumberland Bean	SX	E
Villosa vanuxemensis	Mountain Creekshell	S3S4	SLNS
Snails			
Holsingeria unthanksensis	Unthanks Cave Snail	S2	E
Io fluvialis	Spiny Riversnail	S2	LT
Insects			
Aeshna tuberculifera	Black-tipped Darner	S2S3	SLNS
Arianops jeanneli	A Beetle	S1	SLNS
Arrhopalites carolynae	Carolyn's Cave Springtail	S3	TRKD
Arrhopalites commorus	A Cave Springtail	S2S3	SLNS
Arrhopalites marshalli	A Cave Springtail	S3	SLNS
Arrhopalites pavo	A Cave Springtail	S3	TRKD
Atheta troglophila		S1	SLNS
Gomphus consanguis	Cherokee Clubtail	S2	SLNS
Gomphus ventricosus	Skillet Clubtail	S1	SLNS
Gomphus viridifrons	Green-faced Clubtail	S2	SLNS
Litocampa sp. 4	A Dipluran	S1S2	SLNS
Macromia alleghaniensis	Allegheny River Cruiser	S2	SLNS
Neurocordulia yamaskanensis	Stygian Shadowdragon	S2	SLNS
Oncopodura hubbardi	A Cave Springtail	S1S2	SLNS
Ophiogomphus mainensis	Twin-horned Snaketail	S1	SLNS
Pseudanophthalmus cordicollis	Little Kennedy Cave Beetle	S1	SLNS
Pseudanophthalmus deceptivus	Deceptive Cave Beetle	S1	SLNS
Pseudanophthalmus delicatus	A Ground Beetle	S2	SLNS
Pseudanophthalmus hirsutus	Cumberland Gap Cave Beetle	S1	SLNS
Pseudanophthalmus hoffmani	A Ground Beetle	S1S2	SLNS
Pseudanophthalmus holsingeri	Holsinger's Cave Beetle	S1	E
Pseudanophthalmus hubrichti	Hubricht's Cave Beetle	S1	SLNS
Pseudanophthalmus longiceps	Long-headed Cave Beetle	S1	SLNS

Pseudanophthalmus praetermissus	Overlooked Cave Beetle	S1	SLNS
Pseudanophthalmus rotundatus	A Ground Beetle	S1	SLNS
Pseudanophthalmus sanctipauli	Saint Paul Cave Beetle	S1	SLNS
Pseudanophthalmus seclusus	A Ground Beetle	S2	SLNS
Pseudanophthalmus sericus	Silken Cave Beetle	S1	SLNS
Pseudanophthalmus sp. 10	A Ground Beetle	S1	SLNS
Pseudanophthalmus sp. 4	A Ground Beetle	S1	SLNS
Pseudanophthalmus sp. 5	A Ground Beetle	S1	SLNS
Pseudanophthalmus sp. 9	A Ground Beetle	S1	SLNS
Pseudanophthalmus thomasi	Thomas' Cave Beetle	S1	SLNS
Pseudanophthalmus vicarius	Vicariant Cave Beetle	S1S2	SLNS
Pseudanophthalmus virginicus	Maiden Spring Cave Beetle	SH	SLNS
Pseudosinella bona	A Cave Springtail	S2	SLNS
Pseudosinella erehwon	A Cave Springtail	S2	SLNS
Pseudosinella extra	A Cave Springtail	S1	SLNS
Pseudosinella gisini virginia	A Cave Springtail	S2	SLNS
Pseudosinella hirsuta	A Springtail	S1	SLNS
Spelobia tenebrarum	A Cave Obligate Fly	S1	SLNS
Typhlogastrura valentini	A Cave Springtail	S1	SLNS
Arachnids			
Anthrobia mammouthia	A Sheetweb Weaver	S2	TRKD
Kleptochthonius binoculatus	A Pseudoscorpion	S1S2	SLNS
Kleptochthonius gertschi	A Pseudoscorpion	S1	SLNS
Kleptochthonius lutzi	A Pseudoscorpion	S1	SLNS
Kleptochthonius proximosetus	A Pseudoscorpion	S1	SLNS
Kleptochthonius similis	A Pseudoscorpion	S1	SLNS
Kleptochthonius sp. 1	A Pseudoscorpion	S1	SLNS
Microcreagris valentinei	A Pseudoscorpion	S1	SLNS
Nesticus mimus	A Cave Spider	S1	SLNS
Nesticus paynei	A Cave Cobweb Spider	S1	SLNS
Vaejovis carolinianus	Carolina Scorpion	S1	SLNS
Anthrobia mammouthia	A Sheetweb Weaver	S2	TRKD
Kleptochthonius binoculatus	A Pseudoscorpion	S1S2	SLNS
Kleptochthonius gertschi	A Pseudoscorpion	S1	SLNS
Kleptochthonius lutzi	A Pseudoscorpion	S1	SLNS
Kleptochthonius proximosetus	A Pseudoscorpion	S1	SLNS
Kleptochthonius similis	A Pseudoscorpion	S1	SLNS
Kleptochthonius sp. 1	A Pseudoscorpion	S1	SLNS
Microcreagris valentinei	A Pseudoscorpion	S1	SLNS
Nesticus mimus	A Cave Spider	S1	SLNS
Nesticus paynei	A Cave Cobweb Spider	S1	SLNS
Vaejovis carolinianus	Carolina Scorpion	S1	SLNS
Anthrobia mammouthia	A Sheetweb Weaver	S2	TRKD
Arthropods			
Brachoria cedra	A Millipede	S2S3	SLNS
Brachoria dentata	A Millipede	S2S3	SLNS
Desmonus earlei	A Millipede	S1	SLNS
Nannaria sp. 1	A Millipede	S1?	SLNS

Pseudotremia armesi	A Millipede	S2	SLNS
Pseudotremia deprehendor	A Cave Obligate Millipede	S1S3	SLNS
Pseudotremia fremens	A Cave Obligate Millipede	S1	TRKD
Pseudotremia momus	A Millipede	S2	SLNS
Pseudotremia tuberculata	A Millipede	S2	SLNS
Brachoria cedra	A Millipede	S2S3	SLNS
Brachoria dentata	A Millipede	S2S3	SLNS
Desmonus earlei	A Millipede	S1	SLNS
Nannaria sp. 1	A Millipede	S1?	SLNS
Pseudotremia armesi	A Millipede	S2	SLNS
Pseudotremia deprehendor	A Cave Obligate Millipede	S1S3	SLNS
Pseudotremia fremens	A Cave Obligate Millipede	S1	TRKD
Pseudotremia momus	A Millipede	S2	SLNS
Pseudotremia tuberculata	A Millipede	S2	SLNS
Crustaceans			
Amerigoniscus henroti	Powell Valley Terrestrial Cave Isopod	S1S2	SLNS
Bactrurus angulus	Cumberland Gap Cave Amphipod	S1	SLNS
Caecidotea cumberlandensis	Cumberland Gap Cave Isopod	S1	SLNS
Caecidotea incurva	Incurved Cave Isopod	S2	SLNS
Caecidotea recurvata	Southwestern Virginia Cave Isopod	S3	SPCO
Caecidotea richardsonae	Tennessee Valley Cave Isopod	S3	SPCO
Crangonyx antennatus	Appalachian Valley Cave Amphipod	S3	SPCO
Lirceus culveri	Rye Cave Isopod	S1	SLNS
Lirceus usdagalun	Lee County Cave Isopod	S1	E
Stygobromus cumberlandus	Cumberland Cave Amphipod	S1S2	SLNS
Stygobromus finleyi	Finleys Cave Amphipod	S1	SLNS
Stygobromus leensis	Lee County Cave Amphipod	S1S2	SLNS
Stygobromus mackini	Southwestern Virginia Cave Amphipod	S3S4	SPCO
Plants			
Actaea rubifolia	Appalachian Bugbane	S1	SLNS
Arabis hirsuta var. adpressipilis	Hairy Rockcress	S1S2	SLNS
Betula uber	Virginia Round-leaf Birch	S1	E
Buchnera americana	Bluehearts	S1S2	SLNS
Camassia scilloides	Wild Hyacinth	S1	SLNS
Campanula rotundifolia	American Harebell	S1	SLNS
Cardamine clematitis	mountain bittercress	S1	SLNS
Carex crawei	Sedge	S2	SLNS
Cleistes bifaria	Spreading Pogonia	S2	SLNS
Cocculus carolinus	Red-berried Moonseed	S1	SLNS
Crataegus calpodendron	Pear Hawthorn	S1	SLNS
Desmodium cuspidatum var. cuspidatum	Toothed Tick-trefoil	S2	SLNS
Euphorbia purpurea	Glade Spurge	S2	SLNS
Eurybia surculosa	Creeping Aster	S1S2	SLNS
Fleischmannia incarnata	Pink Thoroughwort	S2	SLNS
Houstonia canadensis	Canada Bluets	S2	SLNS
Isotria medeoloides	Small Whorled Pogonia	S2	E
Leucothoe fontanesiana	Highland Dog-hobble	S1S2	SLNS
Liparis loeselii	Loesel's Twayblade	S2	SLNS
Manfreda virginica	False Aloe	S2	SLNS

Packera millefolium	Blue Ridge Ragwort	S2	SLNS
Parnassia grandifolia	Large-leaved Grass-of-parnassus	S2	SLNS
Paxistima canbyi	Canby's Mountain-lover	S2	SLNS
Phlox amplifolia	Large-leaved Phlox	S1	SLNS
Poa saltuensis	Drooping Bluegrass	S2	SLNS
Potentilla tridentata	Three-toothed Cinquefoil	S2	SLNS
Rhamnus lanceolata ssp. glabrata	Lanceleaf Buckthorn	S1	SLNS
Rhododendron arborescens	Smooth Azalea	S2	SLNS
Rudbeckia triloba var. beadlei	Pinnate-lobed coneflower	S1	SLNS
Saxifraga careyana	golden eye saxifrage	S1	SLNS
Scleria verticillata	Low Nutrush	S2	SLNS
Silene ovata	Ovate Catchfly	S1	SLNS
Silene rotundifolia	Roundleaf Catchfly	S2	SLNS
Sisyrinchium albidum	White Blue-eyed-grass	S2	SLNS
Smilax ecirrata	Upright Greenbriar	S1	SLNS
Solidago rigida ssp. rigida	Prairies Bold Goldenrod	S2	SLNS
Sparganium emersum	Narrow-leaf bur-reed	S1	SLNS
Spartina pectinata	Freshwater Codgrass	S2	SLNS
Spiraea virginiana	Virginia Spiraea	S1	E
Spiranthes lucida	Shining Ladies'-tresses	S1S2	SLNS
Spiranthes magnicamporum	Great Plains Ladies'-tresses	S1	SLNS
Sporobolus compositus var. compositus	Longleaf Dropseed	S2	SLNS
Sporobolus neglectus	Small Dropseed	S1	SLNS
Stylophorum diphyllum	Celandine Poppy	S2	SLNS
Sullivantia sullivantii	Sullivantia	S1	SLNS
Symphyotrichum pratense	Barrens Silky Aster	S1	SLNS
Synandra hispidula	Guyandotte Beauty	S2	SLNS
Trifolium calcaricum	Running Glade Clover	S1	E
Trillium flexipes	Nodding Trillium	SH	SLNS
Triphora trianthophora	Three-birds-orchids	S1	SLNS
Vicia americana ssp. americana	American Purple Vetch	S1	SLNS

Status Codes: E = Endangered; LT = Listed Threatened; PE = Proposed Endangered; SLNS = State Listed, no status assigned; SPCO = Species of Concern; TRKD = Tracked.

State Ranks: S1 = Critically Imperiled; S2 = Imperiled; S3 = Vulnerable; S4 = Apparently Secure; SH = Possibly Extirpated (Historical); S? = Inexact or uncertain; S#S# = Denotes a range of ranks because the exact rarity of the element is uncertain (e.g., S1S2); S#B = Rank of Breeding Population; S#N = Rank of Non-Breeding Population.

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