SHADES CREEK WATERSHED MANAGEMENT PLAN

Submitted to:
The Nature Conservancy
Alabama Chapter Office
2100 1st Avenue North
Birmingham, AL 35203

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The Nature Conservancy
Alabama

Prepared and submitted by:

GMC

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 PLAN OVERVIEW 1-2
1.2 PLAN PURPOSE 1-2
1.3 PLAN VISION 1-3
1.4 GOALS AND OBJECTIVES 1-3
1.5 WATERSHED PLANNING COMMITTEES........ 1-4
1.5.1 Steering Committee 1-4
1.5.2 Other Committees and Community Input 1-5
1.6 EPA NINE KEY ELEMENTS 1-6

2.0 PUBLIC PARTICIPATION AND EDUCATION

2.1 STAKEHOLDER INVOLVEMENT 2-1
2.2 OPEN HOUSE COMMUNITY MEETINGS 2-1
2.2.1 Outreach and Publicity 2-1
2.2.2 Open House Meetings Program 2-2
2.2.3 Results 2-4
2.3 ONLINE SURVEY 2-6

3.0 PUBLIC PARTICIPATION AND EDUCATION

3.1 WATERSHED CHARACTERIZATION 3-1
3.2 WATERSHED BOUNDARY 3-1
3.3 LAND USE 3-3
3.4 SURFACE WATER 3-5
3.5 PHYSICAL SETTING 3-7
3.5.1 Ecoregions 3-7
3.5.2 Geology 3-9
3.5.3 Soils 3-10
3.5.4 Topography 3-13
3.6 HYDROLOGY 3-15
3.6.1 Rainfall and Climate 3-15
3.6.2 Groundwater Resources 3-15
3.6.3 FEMA Flood Zones 3-16
3.6.4 Wetlands 3-20
3.7 BIOLOGICAL RESOURCES 3-25
3.7.1 Flora and Fauna 3-25
3.7.2 Protected Species 3-26
3.7.3 Invasive Species 3-28
3.8 DEMOGRAPHIC AND SOCIOECONOMIC ENVIRONMENT 3-28

TABLE OF CONTENTS

4.0 WATERSHED CONDITIONS

4.1 WATER QUALITY OVERVIEW AND PROCESS 4-1

4.1.1 Previous Studies and Existing Data 4-1

4.1.2 Water Quality Standards 4-1

4.1.3 Stormwater Runoff 4-4

4.2 WATER QUALITY DATA 4-5

4.2.1 ADEM Water Quality Monitoring Data 4-6

4.2.2 Jefferson County Department of Health Water Quality Data 4-23

4.3 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMITS 4-26

4.3.1 Municipal Separate Storm Sewer System (MS4) 4-26

4.4 HABITAT CONDITIONS 4-27

4.4.1 Invasive Plant Species 4-27

4.4.2 Wetlands 4-32

4.4.3 Streams 4-32

4.4.4 Altered Hydrology 4-33

4.5 RESILIANCY 4-33

4.6 ACCESS 4-35

4.6.1 Land Use and Land Development 4-35

4.6.2 Recreational Opportunities 4-35

4.7 DATA GAPS 4-36

5.0 IDENTIFY CRITICAL ISSUES

5.1 WATER QUALITY AND POLLUTION 5-1

5.1.1 Erosion and Sedimentation 5-1

5.1.2 Litter Accumulation 5-2

5.1.3 Nutrient Loading and Pathogens 5-3

5.2 STORMWATER MANAGEMENT AND INFRASTRUCTURE 5-4

5.3 LOSS OF NATURAL HABITAT 5-5

5.4 PUBLIC EDUCATION AND AWARENESS 5-5

6.0 MANAGEMENT MEASURES

6.1 STORM WATER BEST MANAGEMENT 6-1

6.2 GREEN INFRASTRUCTURE 6-2

6.3 STREAM RESTORATION 6-6

6.3.1 In-Stream Restoration and Streambank Stabilization 6-6

6.3.2 Stream Buffer Restoration 6-12

6.4 ENCOURAGE IMPROVED FORESTRY AND AGRICULTURE BMPs 6-12

6.5 LITTER CONTROL MEASURES 6-14

6.6 IMPROVE WATERSHED RESILIENCE 6-14

TABLE OF CONTENTS

7.0 IMPLEMENTATION
7.1 MANAGEMENT STRATEGIES 7-1
7.2 INTERIM MILESTONES 7-1
7.3 IMPLEMENTATION SCHEDULE 7-2
7.4 INDICATORS TO MEASURE PROGRESS 7-2
7.5 ESTIMATION OF COSTS AND TECHNICAL ASSISTANCE NEEDED 7-2
7.6 EDUCATION PROGRAM 7-8
7.7 LOCAL PROGRAMS 7-11
7.8 EVALUATION FRAMEWORK 7-12
7.9 NEW DATA RECOMMENDATIONS 7-13
7.10 INITIAL IMPLEMENTATION OF MANAGEMENT MEASURES 7-14

8.0 REGULATORY FRAMEWORK
8.1 REGULATORY FRAMEWORK 8-2
8.1.1 Federal Authorities 8-2
8.1.2 State Authorities 8-5
8.1.3 County Authorities 8-6
8.1.4 City Authorities 8-6
8.2 REGULATORY OVERLAP 8-7
8.3 REGULATORY DEFICIENCIES 8-7
8.4 ENFORCEMENT 8-8

9.0 FUNDING SOURCES
9.1 INTRODUCTION 9-1
9.2 STORMWATER USER FEES 9-2
9.3 PROPERTY, SALES, OR OTHER TAXES (GENERAL FUND) 9-3
9.4 FEDERAL GRANTS, LOANS, AND REVENUE SHARING 9-3
9.4.1 State of Alabama Revolving Loan Fund 9-4
9.4.2 “Green” Stimulus Funding 9-4
9.4.3 Five Star Restoration Program 9-6
9.4.4 Clean Water Section 319(h) 9-6
9.4.5 Wetlands Program Development Grants 9-6
9.5 NON-GOVERNMENTAL ORGANIZATIONS AND OTHER PRIVATE FUNDING 9-7
9.6 IMPACT FEES 9-7
9.7 SPECIAL ASSESSMENTS 9-7
9.8 SYSTEM DEVELOPMENT CHARGES 9-8
9.9 ENVIRONMENTAL TAX SHIFTING 9-8
9.10 CAPITAL IMPROVEMENT COOPERATIVE DISTRICTS 9-8
9.11 ALABAMA IMPROVEMENT DISTRICTS 9-9

TABLE OF CONTENTS

9.12 REGIONAL COLLABORATION OPPORTUNITES 9-9

9.13 SUMMARY 9-9

10.0 MONITORING AND SAMPLING PLAN

10.1 LONG-TERM TREND WATER QUALITY MONITORING 10-1

10.2 POLLUTANT SOURCE TRACKING PROGRAM 10-2

10.3 BIOLOGICAL AND HABITAT ASSESSMENT 10-3

10.4 HYDROLOGICAL MODEL 10-3

REFERENCES

TABLES

Table 3.1 Summary of Watershed Area for the Shades Creek Sub-Watersheds 3-1
Table 3.2 Land Use Within Jefferson County for Shades Creek Sub-Watersheds 3-3
Table 3.3 Shades Creek Watershed Waterways 3-5
Table 3.4 Geologic Formations of the Shades Creek Watershed 3-9
Table 3.5 Drainage Classes 3-12
Table 3.6 Monthly precipitation data from the Birmingham Airport 3-15
Table 3.7 Flood Zones 3-16
Table 3.8 Wetland Type (USFWS National Wetland Inventory Map) 3-20
Table 3.9 Federally threatened or endangered species that may occur in SCW 3-26
Table 3.10 Animal Species of Conservation Concern in Jefferson County 3-27
Table 3.11 Population for Jefferson County (1990-2040) 3-28
Table 3.12 Population stats for cities partially or wholly within SCW 3-28
Table 4.1 Summary of primary ambient surface water quality data source 4-1
Table 4.2 ADEM water quality criteria for water use classifications 4-2
Table 4.3 Relative water quality summary assessment of Watershed 4-4
Table 4.4 Land use by category in each watershed of Shades Creek 4-35
Table 6.1 Advantages and Disadvantages of Priority Types 6-10
Table 6.2 CRS Points and Insurance Premium Reduction 6-15
Table 7.1 Shades Creek Watershed Stakeholders 7-1
Table 7.2 Proposed Overall Watershed Planning and Assessment Actions 7-3
Table 7.3 Educational Outreach Strategies, Connectivity & Visibility Strategies 7-5
Table 7.4 Proposed Site Specific BMPs for Identified Issues 7-6
Table 8.1 County Level Regulatory Table 8-8
Table 8.2 Local Level Regulatory Table 8-9
Table 9.1 Federal agencies offering funding programs 9-3

FIGURES

Figure 1.1 The Shades Creek Watershed boundary 1-1
Figure 2.1 The Nature Conservancy and GMC logos 2-1
Figure 2.2 Open House Flyers for the Shades Creek Watershed Management Plan 2-2
Figure 2.3 Open House Flyers for the Shades Creek Watershed Management Plan 2-2
Figure 2.4 Open House meeting in Homewood 2-3
Figure 2.5 Presentation at Open House meeting 2-3
Figure 2.6 Pie chart from open house showing percentage of comments on specific issues 2-4
Figure 2.7 Pie chart from open house showing percentage of comments on strong points 2-5
Figure 2.8 Pie chart from open house showing preferred BMPs 2-5
Figure 2.9 Results of online survey for how the participants use the various sub-watershed 2-6

TABLE OF CONTENTS

Figure 2.10	Results of online survey for the meaning of Shades Creek to the participants	2-7
Figure 2.11	Results of online survey regarding the work force segment of participants	2-7
Figure 2.12	Results of online survey regarding recreational uses	2-8
Figure 2.13	Results of online survey regarding environmental condition of the watershed	2-8
Figure 2.14	Results of online survey regarding issues that should be addressed in the watershed	2-9
Figure 2.15	Results of online survey regarding needs within the watershed	2-9
Figure 3.1	Shades Creek Watershed Boundaries	3-1
Figure 3.2	Shades Creek Watershed Land Use Map	3-4
Figure 3.3	Shades Creek Waterways (USGS NHD)	3-6
Figure 3.4	Level IV Ecoregions	3-8
Figure 3.6	Soil Types	3-10
Figure 3.7	Soil Characteristics (NRCS, 2019)	3-12
Figure 3.8	Topographic Map	3-14
Figure 3.9	FEMA Flood Zones in Cooley Creek-Mud Creek	3-17
Figure 3.10	FEMA Flood Zones in Lower Shades Creek	3-18
Figure 3.11	FEMA Flood Zones in Upper Shades Creek	3-19
Figure 3.12	Wetland Types in Cooley Creek-Mud Creek	3-21
Figure 3.13	Wetland Types in Lower Shades Creek	3-22
Figure 3.14	Wetland Types in Upper Shades Creek	3-23
Figure 3.15	The Palustrine wetland system (from FDGC, 2013)	3-24
Figure 3.16	The Riverine wetland system (from FDGC, 2013)	3-25
Figure 3.17	Population Distribution by Census Tract	3-30
Figure 3.18	Median Household Income	3-31
Figure 3.19	Percent in Poverty	3-32
Figure 4.1	Water quality sampling stations in the Cooley Creek-Mud Creek Watershed	4-7
Figure 4.2	Composite time series of DO concentrations in Cooley Creek-Mud Creek Watershed	4-8
Figure 4.3	Composite time series of TN concentrations in Cooley Creek-Mud Creek Watershed	4-9
Figure 4.4	Composite time series of TP concentrations in Cooley Creek- Mud Creek Watershed	4-10
Figure 4.5	Composite time series of fecal coliform concentration in Cooley/Mud Creek	4-11
Figure 4.6	Composite time series of E. coli concentration in Cooley Creek-Mud Creek	4-12
Figure 4.7	Water quality sampling stations in the Lower Shades Creek Watershed	4-13
Figure 4.8	Composite time series of DO concentrations in the Lower Shades Creek	4-14
Figure 4.9	Composite time series of TN concentrations on Shades and Little Shades Creek	4-15
Figure 4.10	Time series of TP concentrations on Shades Creek & Little Shades Creek	4-15
Figure 4.11	Composite time series of bacteria for multiple ADEM stations on Shades Creek	4-16
Figure 4.12	Composite time series of bacteria concentrations for in Lower Shades Creek	4-17
Figure 4.13	Water quality sampling locations in the upper Shades Creek	4-18
Figure 4.14	Composite time series of DO concentrations in upper Shades Creek	4-19
Figure 4.15	Composite time series of TN concentrations in upper Shades Creek	4-20
Figure 4.16	Composite time series of TP concentrations in upper Shades Creek	4-20
Figure 4.17	Time series of bacteria concentrations in upper Shades Creek	4-21
Figure 4.18	ADEM monitoring site locations in Upper and Lower Shades Creek Watersheds	4-22
Figure 4.19	Additional water quality sampling stations in the Upper Shades Creek Watershed	4-23
Figure 4.20	Composite time series of DO concentrations in upper Shades Creek	4-24
Figure 4.21	Composite time series of fecal concentrations in upper Shades Creek	4-25
Figure 4.22	Composite time series of E. coli concentrations in upper Shades Creek	4-26
Figure 4.23	Example of Chinese Privet (Courtesy of The Nature Conservancy)	4-28
Figure 4.24	Example of Kudzu (Courtesy of Kudzu © reophax/Flickr Creative Commons)	4-28

TABLE OF CONTENTS

Figure 4.25	Example of Cogongrass (courtesy of Alabama Cooperative Extension Service)	4-29
Figure 4.26	Example of Chinese Tallow or Popcorn Tree (Courtesy of AL Forestry Commission).	4-30
Figure 4.27	Japanese Climbing Fern (Photo credit: Nancy Loewenstein, Auburn University)	4-30
Figure 4.28	Example of Eurasian Watermilfoil	4-31
Figure 4.29	Example of Hydrilla (Photo credit: C. Smoot Major, University of South Alabama)	4-31
Figure 4.30	Alligatorweed (Photo credit: C. Smoot Major, University of South Alabama)	4-32
Figure 4.31	General overview of the hydrologic cycle (from Shultz, 2017)	4-34
Figure 5.1	Erosion and sediment runoff post rain event on bulldozed site	5-2
Figure 5.2	Streambank Erosion in Irondale, Shades Creek Watershed	5-2
Figure 5.3	Trash under bridge in Shades Creek	5-3
Figure 5.4	Algae bloom resulting from excessive nitrate and phosphate concentrations	5-3
Figure 6.1	Typical BRC Profile (ACES 2016)	6-4
Figure 6.2	Typical Profiles of Enhanced Swales (ACES 2016)	6-4
Figure 6.3	Example of Permeable Pavement	6-5
Figure 6.4	Typical CSW Profile	6-5
Figure 6.5	Conceptual cross section of Priority 1 restoration (Doll et al, 2003)	6-8
Figure 6.6	Conceptual cross section of Priority 2 restoration (Doll et al, 2003)	6-9
Figure 6.7	Conceptual cross section of Priority 3 restoration (Doll et al, 2003)	6-9
Figure 6.8	Riparian buffer zone diagram (LID Handbook for Alabama, 2014)	6-12
Figure 6.9	Litter control device in Griffin Brook (Source: Freshwater Land Trust website)	6-14

APPENDICES

Appendix A:	ArcGIS StoryMap on-line survey results
Appendix B:	Alabama Inventory List for Rare, Threatened and Endangered Plants & Animals of Alabama
Appendix C:	Alabama's Best Management Practices for Forestry Handbook
Appendix D:	Natural Resources Conservation Service Conservation Catalogue for Alabama

1.0 INTRODUCTION

In 2019, Goodwyn Mills Cawood (GMC) was contracted by The Nature Conservancy (TNC) to conduct a comprehensive Watershed Management Plan (WMP) for the Shades Creek Watershed located adjacent to Birmingham, Alabama. The greater Shades Creek Watershed as defined by this WMP is the geographical area identified by the following U.S. Geological Survey (USGS) 12-digit hydrologic unit codes (HUCs): HUC 031502020302 (Cooley Creek-Mud Creek), HUC 031502020303 (Lower Shades Creek), and HUC 031502020301 (Upper Shades Creek) (USGS, 2017). The Shades Creek Watershed encompasses approximately 139 square miles within Jefferson County as well as small portions of Tuscaloosa, Shelby and Bibb Counties as shown in **Figure 1.1** (USGS, 2017). The headwaters of Shades Creek begin near Irondale at the northeastern corner of Jefferson County.

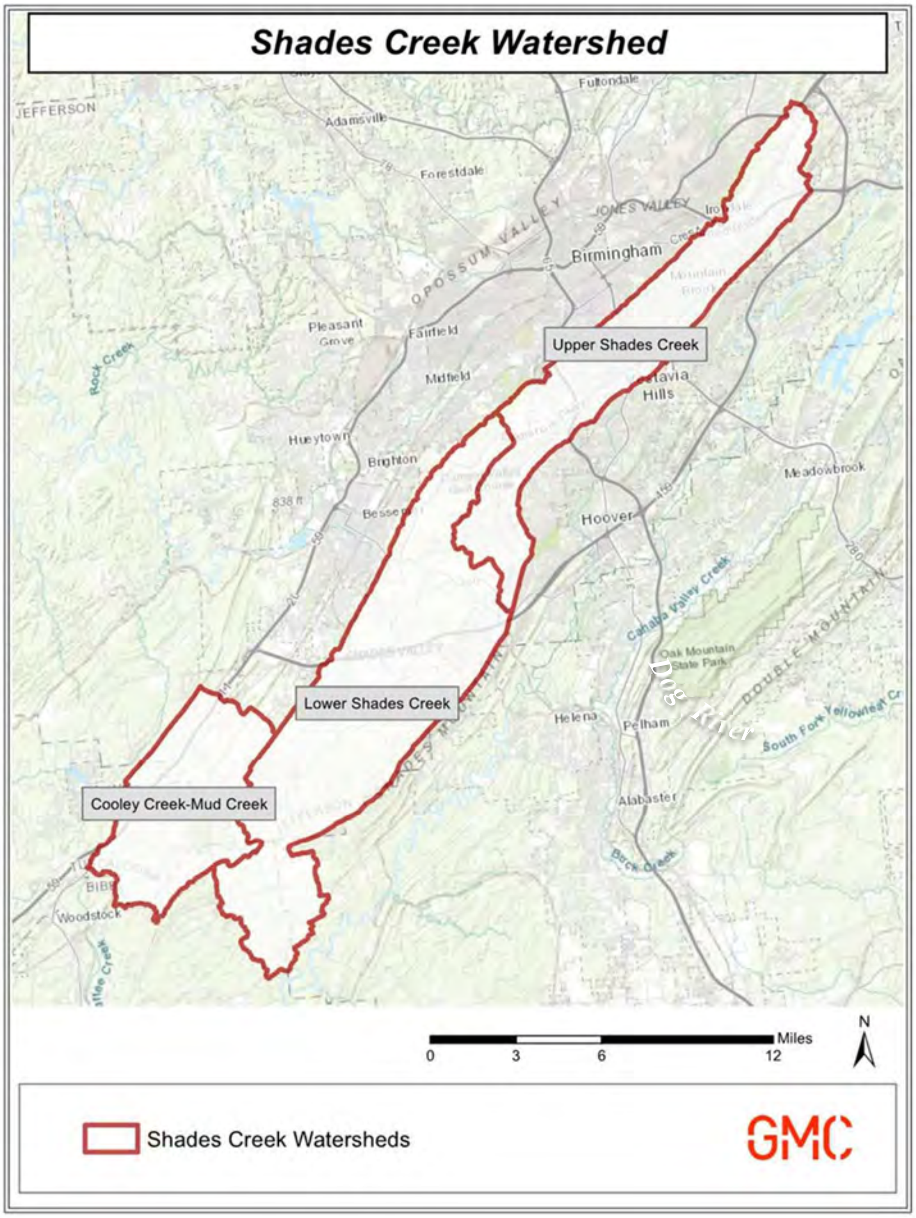


Figure 1.1: The Shades Creek Watershed boundary

1.0 INTRODUCTION

1.1 PLAN OVERVIEW

The purpose of this project is to develop a nine-key element WMP for the Shades Creek Watershed. The referenced Watershed was chosen for this project because it is a heavily impacted watershed which is a tributary to the Cahaba River. The Cahaba River is a drinking water source as well as a prime recreation spot. Watershed planning is a comprehensive, collaborative way to plan for the protection and improvement of Shades Creek water quality. Watershed planning involved gathering local stakeholders to share their knowledge, concerns, and ideas in developing the plan. The knowledge gathered from stakeholders, water quality data, background research, and proposed best management practices will be used to guide the reduction of sources of pollution. There has not been another study or Watershed Plan in the Shades Creek Watershed that was completed prior to this WMP.

Shades Creek and Cooley Creek-Mud Creek have had two separate Total Maximum Daily Load (TMDL) documents that addressed Fecal Coliform in addition to Siltation, Turbidity, and Habitat Alteration.

TNC has already identified some preliminary issues of concern which include:

1. Stream Erosion
2. Lack of Public Access
3. Sedimentation in Streams
4. Nutrient Levels
5. Land Development
6. Stormwater Runoff

This WMP aims to address all of these initial issues and provide detailed characterization for the Shades Creek Watershed. To achieve these goals, TNC identified a need for comprehensive watershed planning within the greater Shades Creek Watershed.

The Shades Creek Watershed's population, traffic, and impervious surfaces collectively affect not only the health of the Shades Creek Watershed, but also the health of the Cahaba River Basin. Realizing this, the Shades Creek Watershed was identified as a high priority for watershed planning in order to preserve and improve its existing environmental quality and the quality of the Cahaba River Basin.

1.2 PLAN PURPOSE

The purpose of the Shades Creek WMP is to guide watershed resource managers, policy makers, community organizations, and citizens to protect the chemical, biological, and cultural integrity of the greater Shades Creek Watershed, and specifically its waters and habitats supporting healthy populations of fish and wildlife and providing recreation in and on these waters of suburban Alabama.

1.0 INTRODUCTION

1.3 PLAN VISION

The vision of the Shades Creek WMP is a healthy watershed environment by fostering the coordinated effort to protect, restore, and enhance the overall quality of life by preserving and restoring water quality, natural habitats, biological resources, and recreational resources.

1.4 GOALS AND OBJECTIVES

Public engagement and participation are critical to the success of the WMP development and implementation. Two open houses were advertised to the public and held from 4:00 PM – 7:00 PM (CST) on February 11, 2020, at the Homewood City Hall, and February 25, 2020, at the Tannehill Historic State Park Cane Creek School House. There were approximately 40 participants present between these two public meetings. At these open houses, a short presentation was given explaining the watershed characteristics, known issues, and the WMP process and needs. Citizens and stakeholders were encouraged to complete a survey, identify locations and issues on provided watershed maps, and provide their opinions and feedback in regards to the WMP. During these meetings, the following goals were established:

1. **Improve water quality** to support a healthy stream ecosystem (sediment, trash, nutrients, and pathogens)
2. **Protect natural areas** to biological/ecological integrity of the watershed.
3. **Reduce flooding issues** utilizing hydrologic modeling, identifying flood storage, and implementing green infrastructure and low impact development technologies.
4. **Promote and improve access** with interpretive signage and access points.

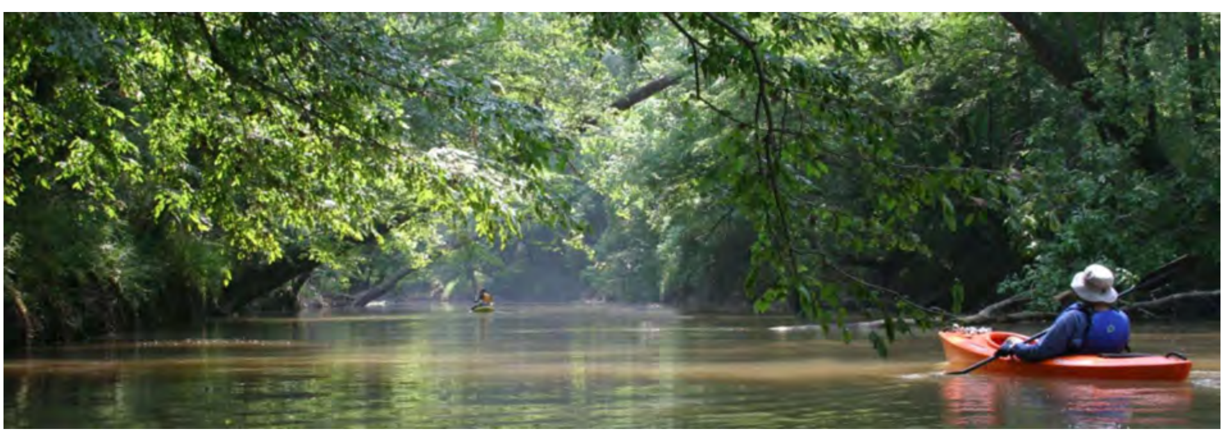


Photo Credit: Friends of Shades Creek (https://shadescreek.org/)

1.0 INTRODUCTION

Determining the success or failure of implementing management efforts to improve water quality, protect natural areas, reduce flooding, and promote and improve public access requires a reasonable means of measurement. The objectives of the Shades Creek WMP are to conform to the nine key elements of watershed planning defined by the U.S. Environmental Protection Agency (EPA), as outlined in **Section 1.6.1**. Specific monitoring protocols, best management practices (BMPs) and milestones to restore and maintain water quality can be found in subsequent chapters.

1.5 WATERSHED PLANNING COMMITTEES

1.5.1 Steering Committee

A Steering Committee comprising diverse stakeholders was established to guide the planning process. This group represented a cross-section of the community and included residents from different geographic locations across the greater Shades Creek Watershed as well as representatives from businesses, civic groups, environmental organizations, and government agencies. The Steering Committee acted as a working group serving as advocates and helped to make recommendations about the process and the substance of the vision.

The Shades Creek WMP Steering Committee was established to be a working group with a number of critical responsibilities related to 1) the planning process and 2) development of recommendations for the plan. These responsibilities include:

- Attend committee meetings (4 over the 15 months of the project)
- Represent residents and other stakeholders in the planning process
- Provide guidance and direction to the staff and consultants
- Act as spokespersons for the planning effort
- Serve as hosts at public events during the process
- Identify volunteers to support the process (i.e., distributing promotional materials, serving on outreach sub-committees, etc.)
- Volunteer to assist with community meetings
- Disseminate information during the planning process (using individual networks)
- Participate in formalizing and presenting the recommendations before appropriate recommending and adopting bodies
- Serve as stewards of the WMP once it is adopted

<u>The Shades Creek Watershed Steering Committee Members:</u>

Amanda Locascio, Non-Point Source Unit Manager – ADEM
Shannon McGlynn, Non-Point Source Unit Manager – ADEM
Christopher Brady – City of Vestavia Hills

Jennifer Andress, City Council – City of Homewood
Joshua Yates, Deputy Director of Public Works – City of Birmingham
David Spivey, City Council – City of Irondale
Mac Martin, City Planner – City of Hoover
Freddie Freeman, Stormwater Specialist – City of Bessemer
Virginia Caruthers Smith, City Council – City of Mountain Brook
Doug Neil, Private Developer – Redmont Consulting Group
Nan Baldwin, VP of Regional Development – Birmingham Business Alliance
Scott Hofer, Public Health Engineer – Jefferson County Department of Health
Stefan Graeber, Deputy Director & Assistant County Engineer – Jefferson County
Amanda Elledge, Environmental Biologist – Jefferson County
Jeff Gunter, Chief Civil Engineer – Jefferson County

1.5.1 Other Committees and Community Input

Community input from several other sources were utilized during the planning and development of this WMP. These sources included a technical advisory committee and individuals with extensive knowledge of the watershed and issues within the watershed. The following is a list of entities that provided valuable data and field knowledge for the completion of this WMP.

- The Nature Conservancy
- Cahaba River Society
- Cahaba Riverkeepers
- Friends of Shades Creek
- Freshwater Land Trust
- Alabama Department of Transportation
- Birmingham Southern College
- Samford University
- City of Birmingham – Stormwater
- Birmingham Historical Society
- Natural Resources Conservation Service
- Cawaco RC&D Council
- Citizen Volunteers

1.0 INTRODUCTION

1.6 EPA NINE KEY ELEMENTS

The EPA has identified nine key elements of watershed planning that are critical for achieving improvements in water quality. These nine elements and their relevant sections in this WMP are as follows:

1. **Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve needed load reductions, and any other goals identified in the watershed plan** (Section 4 and 5).

2. **An estimate of the load reductions expected from management measures** (Section 7).

3. **A description of the nonpoint source management measures that will need to be implemented to achieve load reductions in paragraph 2, and a description of the critical areas in which those measures will be needed to implement this plan** (Section 6 and 7).

4. **Estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon to implement this plan** (Section 7 and 9).

5. **An information and education component used to enhance public understanding of the project and encourage the public's early and continued participation in selecting, designing, and implementing the nonpoint source management measures that will be implemented** (Section 2 and 7).

6. **Schedule for implementing the nonpoint source management measures identified in this plan that is reasonably expeditious** (Section 7 and 10).

7. **A description of interim measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented** (Section 7).

8. **A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made toward attaining water quality standards** (Section 7 and 10).

9. **A monitoring component to evaluate the effectiveness of implementation efforts over time, measured against criteria established under item 8 immediately above** (Section 10).

1.0 INTRODUCTION

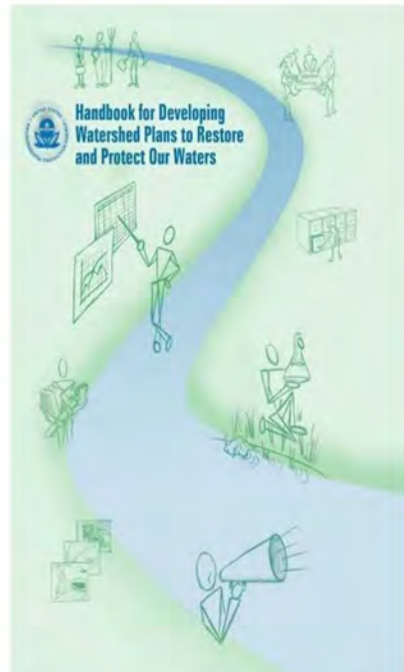
The objectives of the planning process are to conform with the listed nine key elements of watershed planning defined by the EPA and are indicated parenthetically below:

1. **Build partnerships,** including identification of key stakeholders and solicitation of community input and concerns.

2. **Characterize the Watershed,** including creation of a natural and cultural resource inventory, identification of causes and sources of impairments, identification of data gaps and estimation of pollutant loads (1).

3. **Set goals and identify solutions,** including determination of pollutant loads needed and management measures to achieve goals (2-3).

4. **Design implementation program,** including schedule, interim milestones, criteria to measure progress, monitoring component, information/education program, and identification of technical and financial assistance needed to implement plan (4-9).



The EPA Handbook for Developing Watershed Plans to Restore and Protect Our Waters
water.epa.gov/polwaste/nps/handbook_index.cfm

2.0 PUBLIC PARTICIPATION AND EDUCATION

2.1 STAKEHOLDER INVOLVEMENT

Stakeholder involvement was important to the creation of the Watershed Management Plan (WMP) because it allowed the community to share its aspirations for the future. This is critical to generating a shared understanding about the value of the plan, informing its priorities, and providing the broad base of support necessary to ensure its implementation. Stakeholder involvement included leadership from a Steering Committee that guided the process from start to finish and input from the general public through workshops, a survey, and open houses. Stakeholder involvement efforts were led by The Nature Conservancy (TNC) and Goodwyn Mills Cawood (GMC).

Figure 2.1: The Nature Conservancy and GMC logos

2.2 OPEN HOUSE COMMUNITY MEETINGS

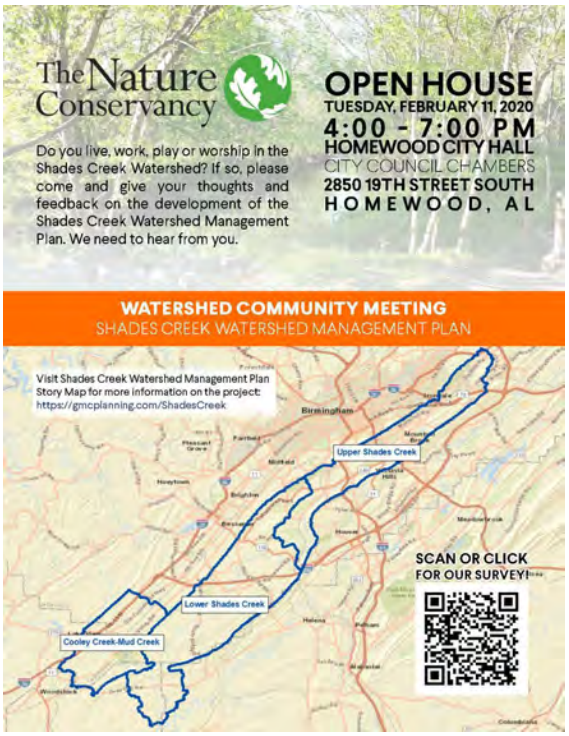
Two open house community meetings were held in two different areas of the Watershed (but covering the same content) on February 11 and 25, 2020 at Homewood City Hall and Tannehill State Park, respectively. The purpose of the community meetings was to create a shared understanding about the condition of the Shades Creek Watershed and to share ideas about what will make it better.

2.2.1 Outreach and Publicity

The Nature Conservancy (TNC), GMC, and the Steering Committee pursued a comprehensive outreach and publicity plan for the open house meetings in an effort to attract a wide range of interested individuals. Outreach and publicity efforts included the following:

- Establishment of a website (gmcplanning.com/ShadesCreek)
- Promotion on Ruffner Mountain website
- Promotion on the Friends of Shades Creek (FOSC) website
- Booth and printed media at local festival (Salamander Festival)
- Presentation at FOSC and Cahaba River Society (CRS) monthly meeting
- Presentation at the Alabama Rivers and Streams Network
- Presentation at TNC monthly board meeting
- Presentation at the Collaborative Environmental Network of Alabama (C.E.N.A.)
- Table and printed media at the CRS annual meeting
- Email blasts to lists from relevant area organizations

- Distribution of printed media Cawaco Resource and Conservation District
- Distribution of printed media to the county Soil and Water Conservation Districts (Jefferson, Shelby, and Bibb)
- Municipal public notice advertisements
- Flyers mailed to individual landowners
- Social media posts of relevant area organizations



Figures 2.2/2.3: Flyers distributed to advertise for the Shades Creek Watershed Management Plan Open House Community Workshops

2.2.2 Open House Meetings Program

The meetings were designed around two different tasks, the first being an approximate twenty-minute formal presentation on an overview of the watershed planning process. During the presentation, previously completed research on watershed characterization and conditions information, was given by the facilitators. The formal presentation was concluded by introducing the second task, seven (7) small group stations that provided an opportunity for the public to provide comments on each topic. During the small group station discussion, individual station moderators had maps and other supplemental material for meeting participants to review, discuss and provide commentary. The individual station discussion allowed for a dialogue between the participants to better understand the values of the of the community and their relationship to the watershed planning process. The following is a brief description of each station and the content for each station.

1. SIGN-IN AND GENERAL OVERVIEW – This station provided an opportunity for the public to sign in and access general information in the form of flyers. A TNC or GMC representative was also available to provide information and answer any questions about the watershed management plan.
2. STORY MAP – This station was established to assist people in accessing the Shades Creek WMP webpage. The intent of this station was to educate interested parties on how to access information and navigate the online resources. In addition, the public could provide comments on how to make the story map more efficient or useful.
3. SURVEY – This station was established to provide the public an opportunity to complete the survey discussed in Section 2.3 below. The station provided printed hard copies of the survey, several computers with access to the survey, and the ability to scan a QR code and take the survey from a mobile device.
4. ISSUES – A large roll out map of the entire watershed was provided along with numbered stickers and printed note sheets. The intent was to give the public an opportunity to inform the planning team of any watershed issues. In addition, it provided the public an opportunity to provide recommendations on how to resolve the issues.
5. STRONG PLACES – A large roll out map of the entire watershed was provided along with numbered stickers and printed note sheets. The intent of this station was to give the public an opportunity to inform the planning team of places in the watershed that bring cultural, biological, ecological, or aesthetic value to the watershed.
6. BEST MANAGEMENT PRACTICES – This station was established to give the public an opportunity to express what potential Best Management Practices (BMP's) they would like to see in the watershed. Each participant received 4 stickers and placed them on the BMP's they deemed most important. BMP's included various green infrastructure, litter removal, public access (trails, parks, etc.), restoration activities, and preservation BMP's.
7. FUNDING OPPORTUNITES – This station was established to provide information regarding ADEM's 319 funding program and to give the public the opportunity to let the planning team know of other funding opportunities at the federal, state, and local level (public and private).

Figure 2.4: Open House meeting in Homewood


Figure 2.5: Presentation at Open House meeting

2.2.3 Results

An estimated 40 people attended the two workshops. A total of five printed surveys were completed along with numerous participants completing the online survey. A total of approximately 58 issues and approximately 32 strong points were identified in the watershed. In addition, seventy-one stickers were placed on the BMP board that contained 14 BMP's. The responses were organized into similar categories and graphed to depict the issues, the important watershed features, and the preferred BMP's among the stakeholders.

Figure 2.6 shown below is a representation of comments regarding issues and concerns in the watershed. As indicated in **Figure 2 .6**, 21% of the commenters were concerned with erosion, followed by flooding (19%), promotion and public access (17%), water quality and pollution (15%), stormwater and infrastructure issues (9%), litter (7%), stormwater management (5%), stream/wetland impairments (5%), and invasive species (2%).

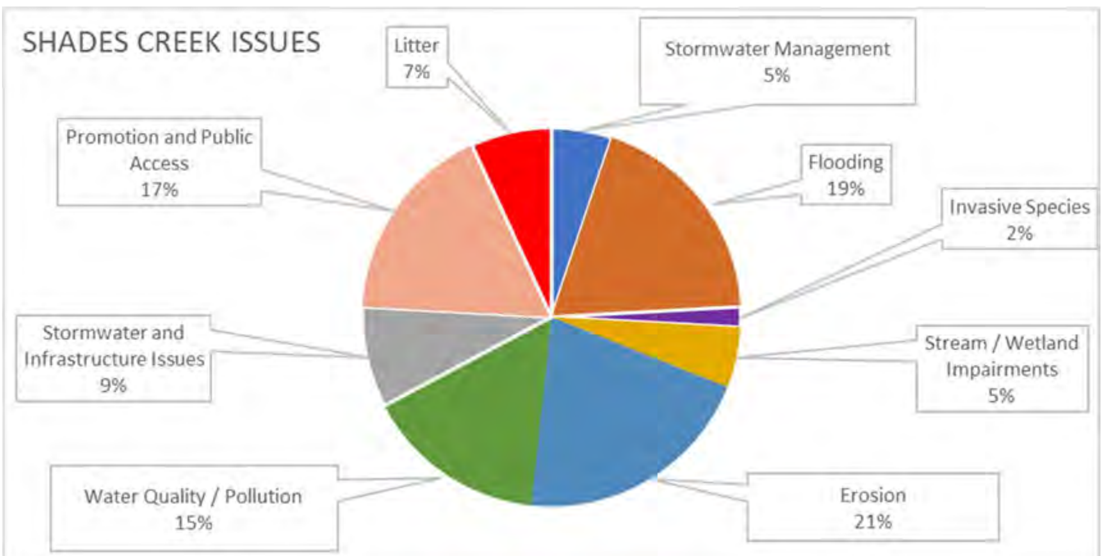


Figure 2.6: Based on comments from the open house meeting, the pie chart shows the percentage of comments on specific issues in the Shades Creek Watershed.

Figure 2.7 is a representation of comments regarding areas of the watershed that bring specific value to the watershed. As indicated in **Figure 2.7**, 37% of the commenters indicated area that contained recreational value (hiking, biking, birding, and canoeing), followed by scenic views (28%), cultural values (16%), ecological and biological values (13%), and educational values (6%).

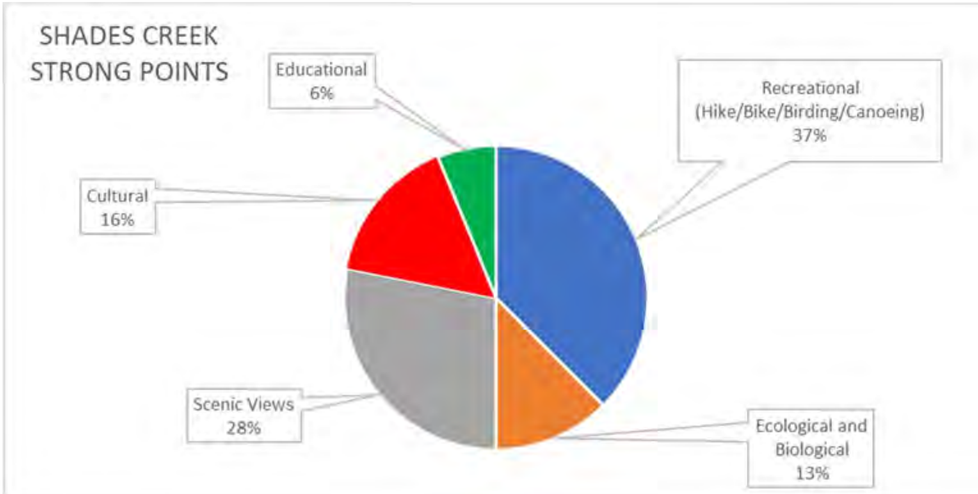


Figure 2.7: Based on comments from the open house meeting, the pie chart shows the percentage of comments regarding the strong points in the Shades Creek Watershed.

Figure 2.8 is a representation of the selection of preferred BMPs made by commenters. There was a total of fourteen BMPs listed and commenters were able to select a maximum of four BMPs. As indicated in **Figure 2.8**, 18% of the commenters selected bioretention, followed by trails (14%), streambank stabilization (13%), riparian buffers (9%), permeable pavements (9%), in-stream restoration (7%), green streets (6%), urban forestry (6%), litter removal and prevention (4%), land preservation (4%), wetland restoration (4%), passive parks (4%), ecotourism facilities (1%), and green and blue roofs (1%).

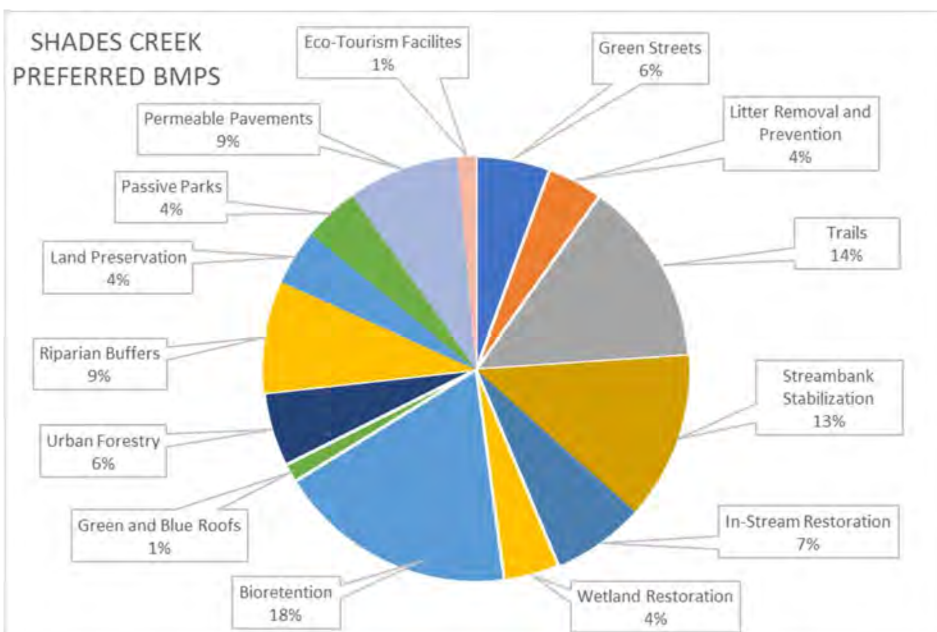
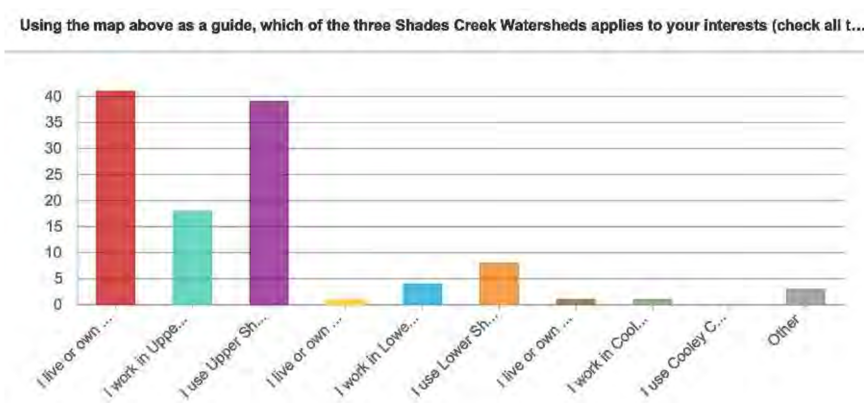


Figure 2.8: Based on comments from the open house meeting, the pie chart shows the percentage of specific BMP's preferred in the Shades Creek Watershed.

2.3 ONLINE SURVEY

In addition to public workshops, the Shades Creek Watershed planning team advertised and provided an online survey to stakeholders in the watershed. In addition to availability on the Shades Creek Watershed website, the survey was advertised and made available during the open house meetings, during local presentations, on social media, and on printed flyers that were distributed to interested parties. The following is a description of the questions asked for the online survey and a summary of the responses received:

1. PARTICIPANTS INTERESTS IN THE SUB-WATERSHEDS COMPRISING THE SHADES CREEK WATERSHED: Participants were asked which of the three Shades Creek sub-watersheds applies to their interests (multiple answers allowed). A total of 67% of participants lived or owned property in the Upper Shades Creek, 64% use the Upper Shades Creek for recreation, and 29.5% work in the Upper Shades Creek. A total of 13% use the Lower Shades Creek for recreation, 6.5% work in the Lower Shades Creek, and 1.6% live or own property in the Lower Shades Creek. A total of 1.6% of participants work or live/own property in the Cooley Creek/Mud Creek and 4.9% listed “Other” as their answer. The following **Figure 2.9** provides a graphical depiction of this survey question.



Answers	Count	Percentage
I live or own property in Upper Shades Creek	41	67.21%
I work in Upper Shades Creek	18	29.51%
I use Upper Shades Creek for recreation	39	63.93%
I live or own property in Lower Shades Creek	1	1.64%
I work in Lower Shades Creek	4	6.56%
I use Lower Shades Creek for recreation	8	13.11%
I live or own property in Cooley Creek/Mud Creek	1	1.64%
I work in Cooley Creek/Mud Creek	1	1.64%
I use Cooley Creek/Mud Creek for recreation	0	0%
Other	3	4.92%

Answered: 59 Skipped: 2

Figure 2.9: Results of online survey for how the participants use the various sub-watershed

2.0 PUBLIC PARTICIPATION AND EDUCATION

2. MEANING OF SHADES CREEK: Participants were asked to describe in a few words, the meaning of Shades Creek to them. The words were counted and to determine the common meaning upon participants. The following **Figure 2.10** is a visual depiction of the most common words shared, with the larger words representing the words mentioned most frequently.

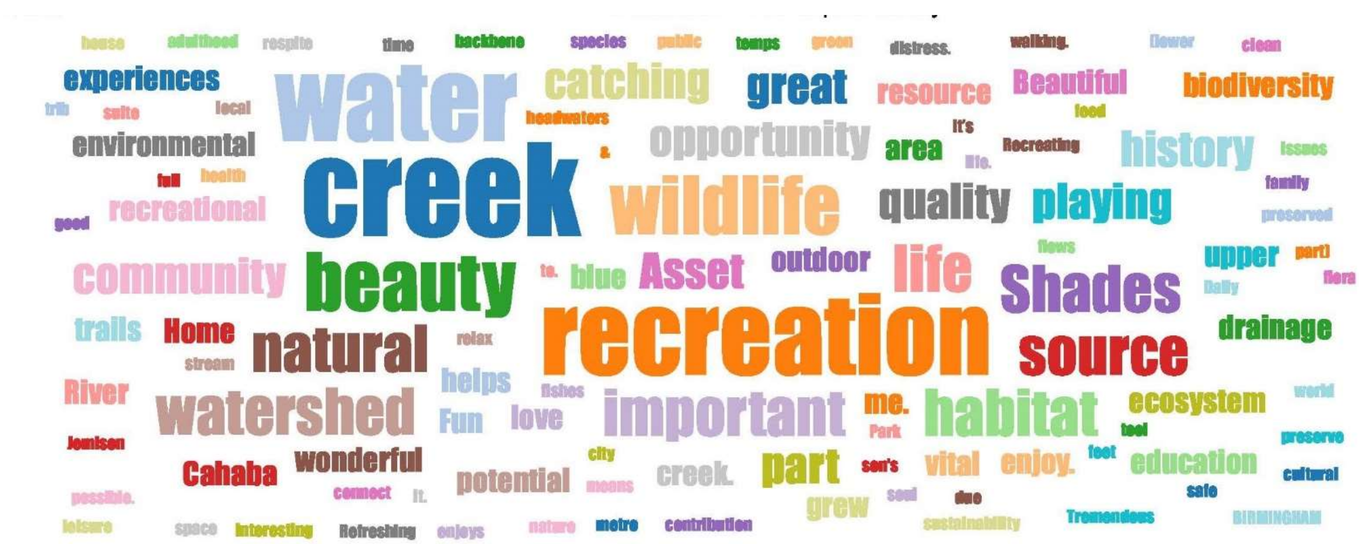


Figure 2.10: Results of online survey for the meaning of Shades Creek to the participants

3. TYPE OF WORK PARTICIPANTS DO IN WATERSHED: Participants that work in the watershed were asked to indicate what segment of the work force they are in. A total of 14.75% indicated that they worked for a non-profit, 9.8% indicated professional or other, 6.56 were government/public sector and small business owners, 4.9% in the service industry, and 1.6% in the retail and manufacturing category. The following **Figure 2.11** provides a graphical depiction of answers to this survey question:

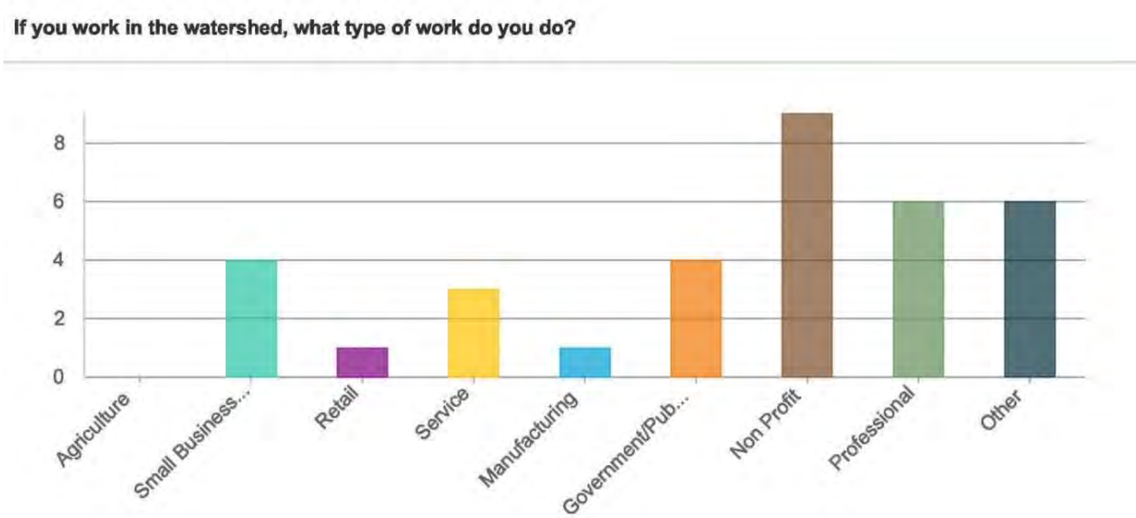


Figure 2.11: Results of online survey regarding the work force segment of participants

2.0 PUBLIC PARTICIPATION AND EDUCATION

4. RECRATIONAL USES: Participants were asked how they and/or their families use the Shades Creek Watershed for recreational purposes. A total of 82% of participants use the Shades Creek Watershed for walking/hiking, 73.7% us it for natural observation, 37.7% for canoeing and kayaking, 32.8% for dog walking, 29.5% for biking, 21.3% for fishing, 13.1% for swimming and playgrounds/ballfields, 9.8% listed as other, 6.5% for camping or no recreational use, and 1.6% for hunting. The following **Figure 2.12** provides a graphical depiction of answers to this survey question:

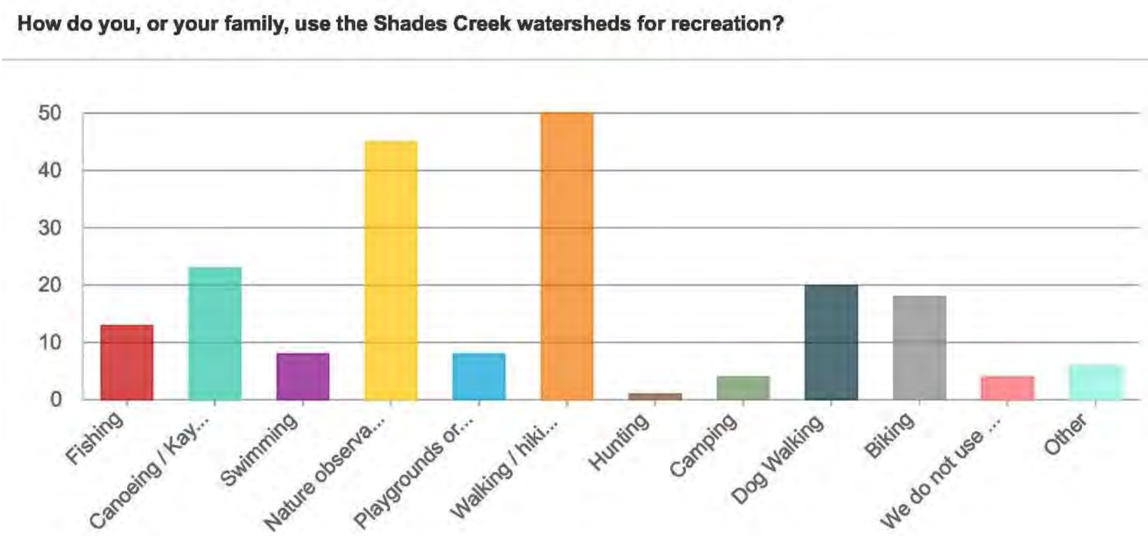


Figure 2.12: Results of online survey regarding recreational uses

5. ENVIRONMENTAL CONDITION OF THE WATERSHED: Participants were asked their thoughts on the environmental condition of the watershed today versus five years ago. A total of 44.3% indicated that they thought the watershed was in worse condition today, 23% indicated that they did not know if it was better or worse, 21.3% indicated that they had not noticed a change, and 4.9% indicated it was better today than it was five years ago. The following **Figure 2.13** provides a graphical depiction of answers to this survey question:

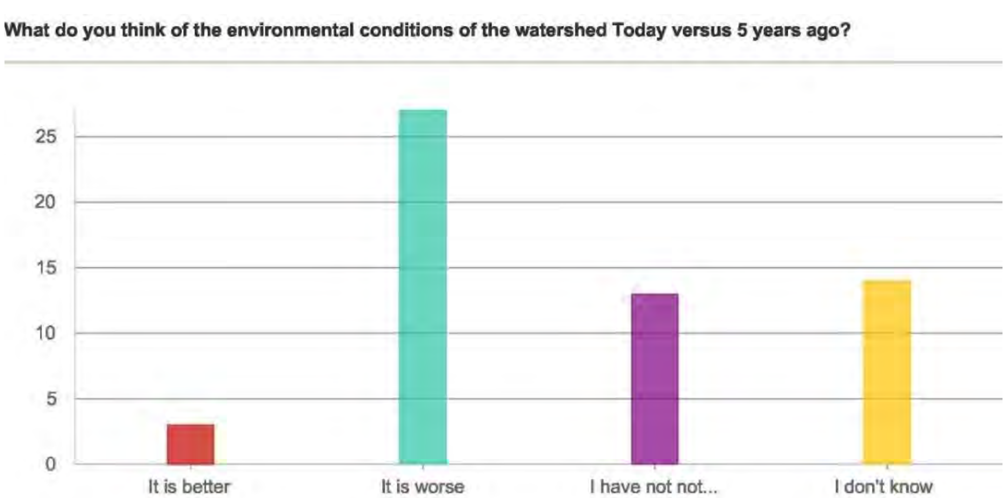


Figure 2.13: Results of online survey regarding environmental condition of the watershed

6. WATERSHED ISSSUES NEEDING TO BE ADDRESSED: Participants were asked what issues they think needs to be addressed within the watershed. A total of 90.2% indicated that water quality/pollution needs to be addressed, 85.3% indicated litter as an issue, 72.1% indicated sedimentation as an issue, 70.5% indicated erosion, 67.2 % indicated lack of public education/awareness as an issue, 57.4% selected flooding, 55.7% noted sanitary sewer overflows, 54.1% noted overdevelopment/urbanization, 52.5% noted loss of natural areas as an issue, 32.8% noted inconsistent regulations as an issue, and 13.1% noted "other". The following **Figure 2.14** provides a graphical depiction of answers to this survey question:

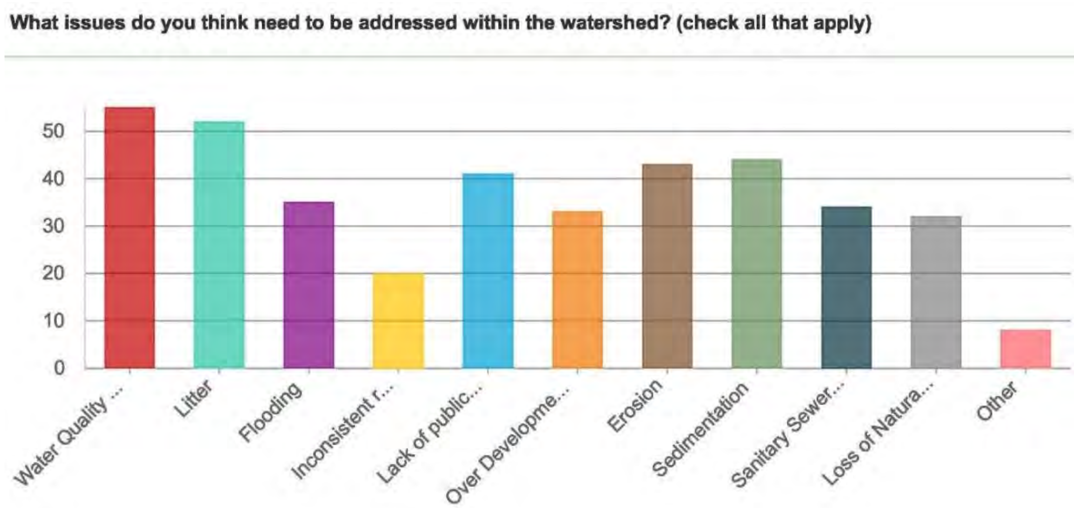


Figure 2.14: Results of online survey regarding issues that should be addressed in the watershed

7. NEEDS WITHIN THE WATERSHED: Participants were asked their input on what is needed in the watershed. A total of 86.9% of responders indicated habitat conservation is needed, 83.6% noted preservation of natural areas, 44.3% noted public access and trash facilities as a need, 36.1% noted preservation of historic sites and dog waste receptacles, 16.4% listed park benches and picnic tables, and 11.5% noted public restrooms and "other" as needs in the watershed. The following **Figure 2.15** provides a graphical depiction of answers to this survey question:

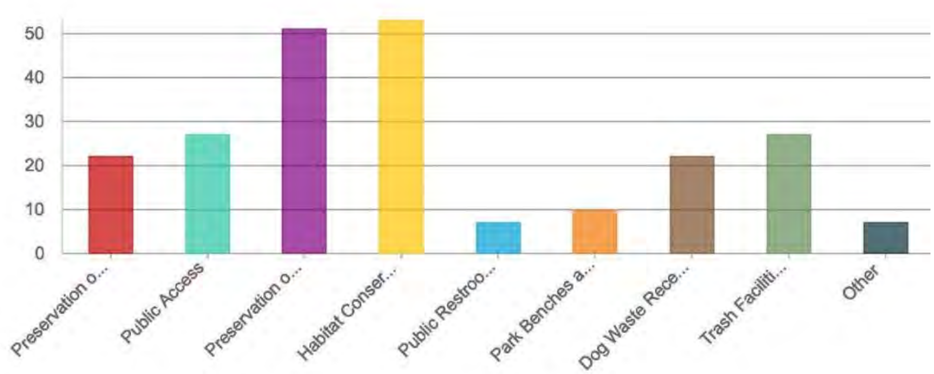


Figure 2.15: Results of online survey regarding needs within the watershed

8. SPECIFIC ISSUES NOTED ON A MAP: Participants were provided an interactive map where they cold denote specific issues within the watershed that they perceived as a problem. In addition, participants noted the type of issue that was noted on the map. The results of these noted issues by percentage are as follows:

- Water Pollution – 16.4%
- Erosion – 13.1%
- Litter – 13.1%
- Loss of Habitat – 6.5%
- Flooding – 4.9%
- Sedimentation – 4.9%
- Other – 4.9%
- Over Development – 1.6%
- Unanswered – 35%

9. OPTIONAL DEMOGRAPHIC QUESTIONS: The last two questions of the survey were optional and included one question asking the age of the participant and one question asking the gender of the participant. The results of these questions indicated that a total of 42.6% of the respondents were between the ages of 40 and 60, 36.1% were over the age 60, 8.2% between the ages 18 and 24, and 8.2% between the ages 25 and 39. A total of 49.1 % of the responders were female and 47.5% male, with 2 participants leaving this question unanswered.

3.0 WATERSHED CHARACTERIZATION

3.1 WATERSHED CHARACTERIZATION

The Shades Creek Watershed (SCW) is comprised of the Cooley Creek/Mud Creek, Upper Shades Creek and Lower Shades Creek watersheds, encompassing a total area of approximately 88,752 acres (139 square miles). The watershed is shown in **Figure 3.1**. Major transportation routes include Interstates 459, 65, and 20.

3.2 WATERSHED BOUNDARY

The boundary of the Shades Creek Watershed is determined by the topography and hydrography of the area. A topographic map illustrates natural and man-made features on the surface area of the land with contour lines delineating the elevation changes. Hydrography includes the study of the movement of water as it crosses the surface of the land. Therefore, the outer-most boundaries of the SCW are located where the water travels between the mountains of the region and converge with the Cahaba River.

Located in Jefferson, Shelby, Bibb, and Tuscaloosa Counties, Alabama, the Shades Creek Watershed as defined by this Watershed Management Plan (WMP) is the geographical area identified by the following U.S. Geological Survey (USGS) 12-digit hydrologic unit codes (HUCs): HUC 031502020302 (Cooley Creek-Mud Creek), HUC 031502020303 (Lower Shades Creek), and HUC 031502020301 (Upper Shades Creek) (USGS, 2017). The amount of area contained within each sub watershed in the Shades Creek Watershed is summarized in the table below.

Table 3.1 Summary of Watershed Area for the Shades Creek Sub-Watersheds

Sub-Watershed	Area (Acres)	Area (Square Miles)
Cooley Creek-Mud Creek	17,905.75	27.98
Lower Shades Creek	44,466.57	69.48
Upper Shades Creek	26,395.85	41.24
TOTAL	***88,768.16***	***138.70***

3.0 WATERSHED CHARACTERIZATION

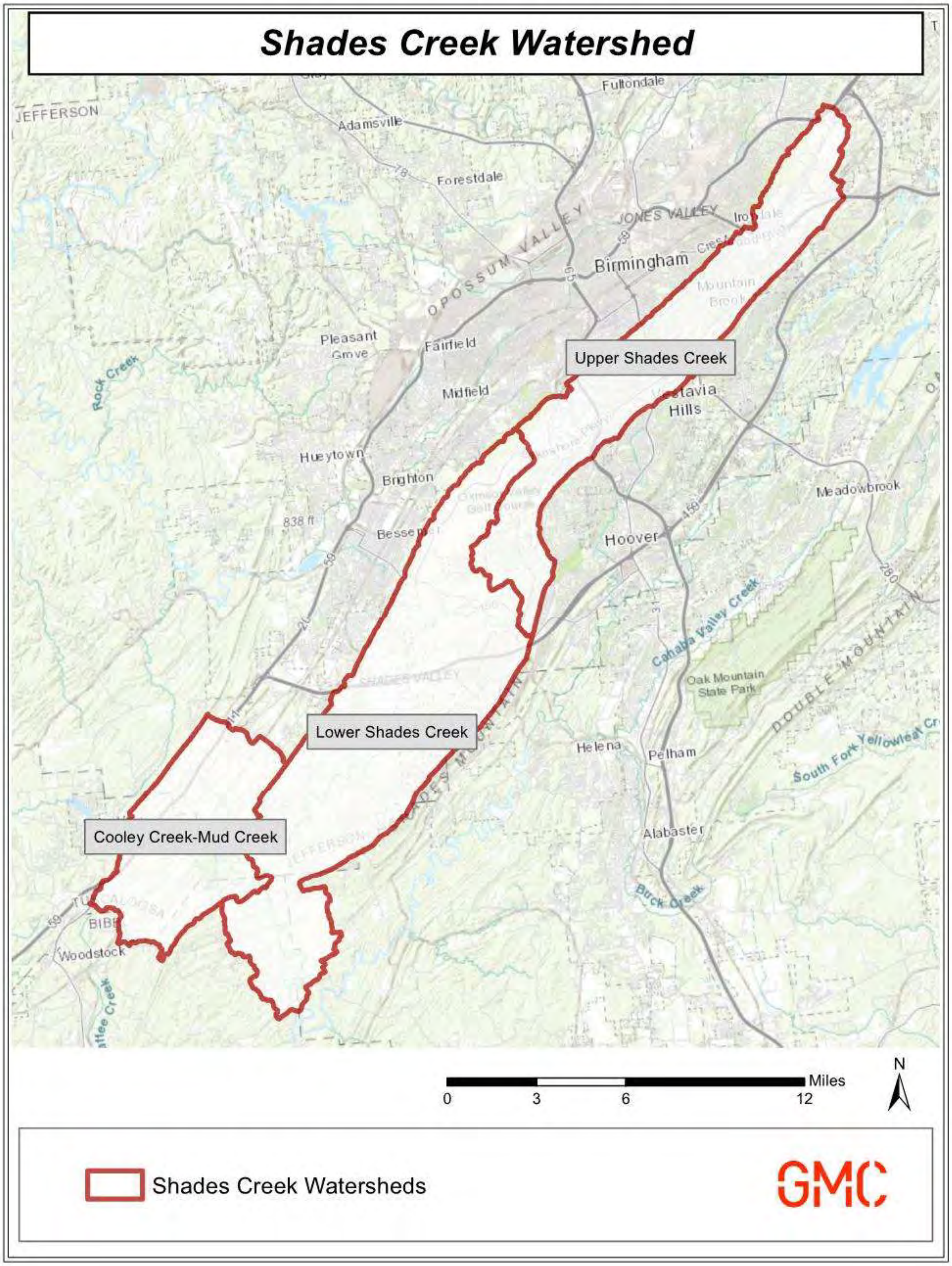


Figure 3.1 Shades Creek Watershed Boundaries

3.3 LAND USE

Land use data was derived from land cover information acquired from the National Land Cover Database (NLCD) for 2016. The NLCD is made available by the Multi-Resolution Land Characteristics (MRLC) Consortium which is a group of federal agencies who generate land cover information at the national scale for public use. The table below summarizes land uses types and areas within each of the sub-watersheds within the SCW.

Table 3.2 Summary of Land Use Within Jeferson County for the Shades Creek Sub-Watersheds

Sub-Watershed Land Use	Cooley-Mud Creek		Lower Shades Creek		Upper Shades Creek	
	(Acres)	(%)	(Acres)	(%)	(Acres)	(%)
Agricultural	1,620.10	21.3%	2,810.41	8.1%	43.71	0.2%
Cultural and Recreation	340.34	4.5%	389.83	1.1%	1,838.05	8.7%
General Commercial	3.52	0.05%	81.32	0.2%	792.11	3.8%
General Industry	1.64	0%	166.14	0.5%	27.86	0.1%
Heavy Commercial	3.32	0.05%	515.95	1.5%	227.69	1.1%
Heavy Industry	16.96	0.2%	223.52	0.6%	601.79	2.9%
High-Density Residential					543.38	2.7%
Institutional	46.59	0.6%	0.79	0%	604.30	2.9%
Light Commercial					7.99	0%
Light Industry	475.06	6.2%	426.22	1.2%	722.28	3.4%
Low Density Residential	927.67	12.2%	4,088.86	11.8%	4,889.98	23.2%
Medium Density Residential	0.68	0%	265.08	0.8%	1,471.57	7%
Mobile Homes	68.38	0.9%	382.01	1.1%	42.14	0.2%
Non-Classifiable S.I.C. Codes			9.36	0.1%	133.57	0.6%
Office	16.14	0.2%	128.33	0.4%	737.06	3.5%
Other	37.51	0.5%	70.88	0.2%		
Utility	4.57	0.1%	31.06	0.1%	132.70	0.6%
Vacant or Undeveloped	4,046.17	53.2%	25,169.42	72.4%	8,244.50	39.2%
TOTAL	***7,608.64***		***34,759.18***		***21,060.65***	

***Land Use date for Tuscaloosa, Bibb, and Shelby County not included in this table.**

The majority of the Upper Shades Creek Watershed lies adjacent to the City of Birmingham and within Jefferson County. The majority of the watershed is highly developed with commercial, industrial, and high-density residential uses and includes the fast-growing cities of Homewood and Mountain Brook. It has the least amount of undeveloped land in Jefferson County compared to the other watersheds. The Lower Shades Creek Watershed has the largest amount of undeveloped land in Jefferson County at 72% and Colley-Mud Creek is the next with 53%. A map of the land uses within the SCW is shown in **Figure 3.2**.

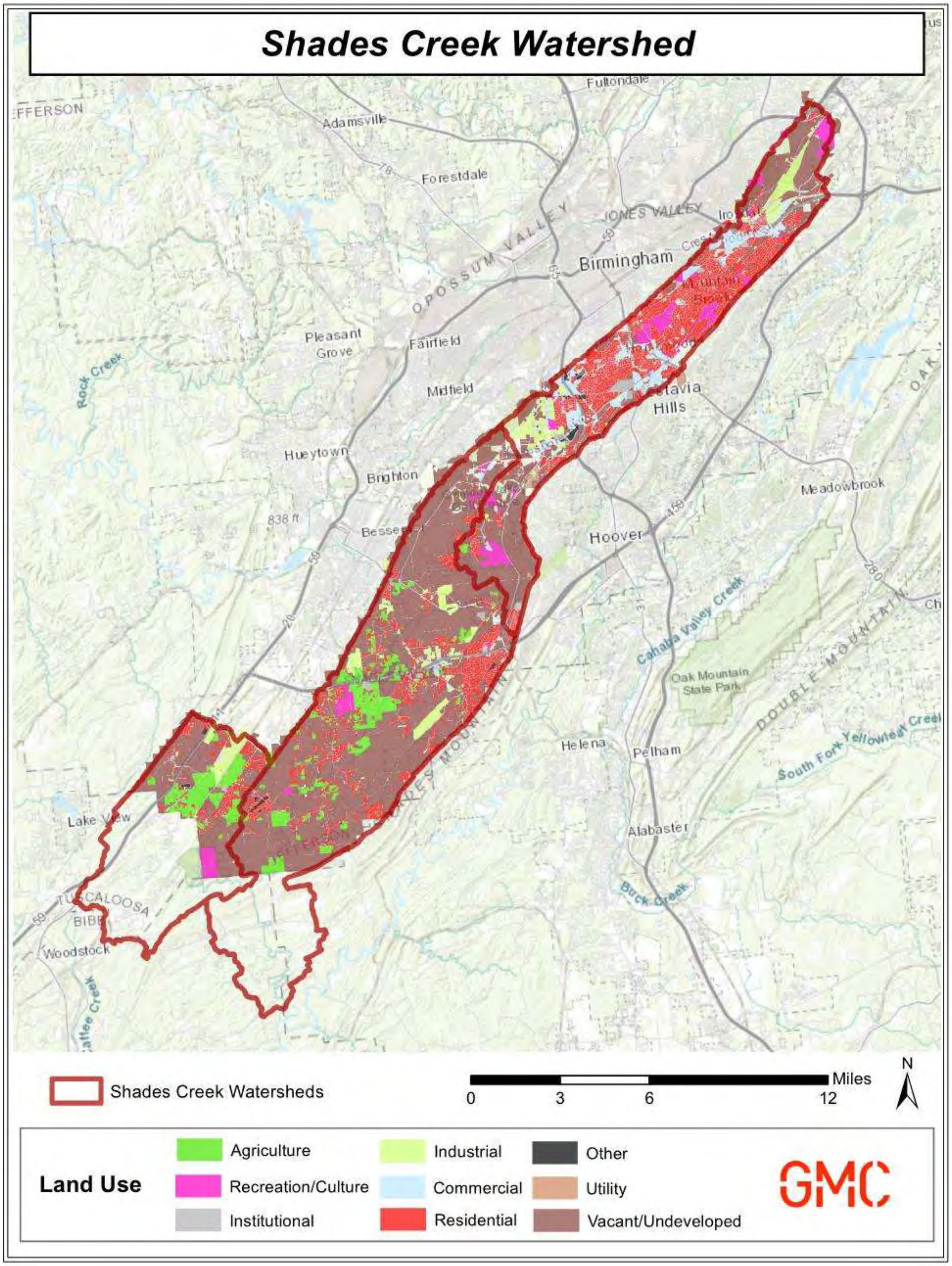


Figure 3.2 Shades Creek Watershed Land Use Map

3.4 SURFACE WATER

There are named tributaries and streams in all three watersheds within the Shades Creek Watershed. The tributaries are as follows:

Table 3.3 Shades Creek Watershed Waterways (USGS National Hydrography Dataset (NHD))

Watershed	Total Length of Waterways (LF)	Total Length of Waterways (miles)
Cooley Creek-Mud Creek • Mud Creek • Cooley Creek • Mill Creek • Unnamed Drainages	302,190.60	57.23
Lower Shades Creek • Black Creek • Clear Branch • Bob George Branch • Rice Creek • Allen Brook • Rocky Brook • Unnamed Drainages	870,892.26	164.94
Upper Shades Creek • Shades Creek • Griffin Branch • Watkins Brook • Unnamed Drainages	383,540.46	72.64

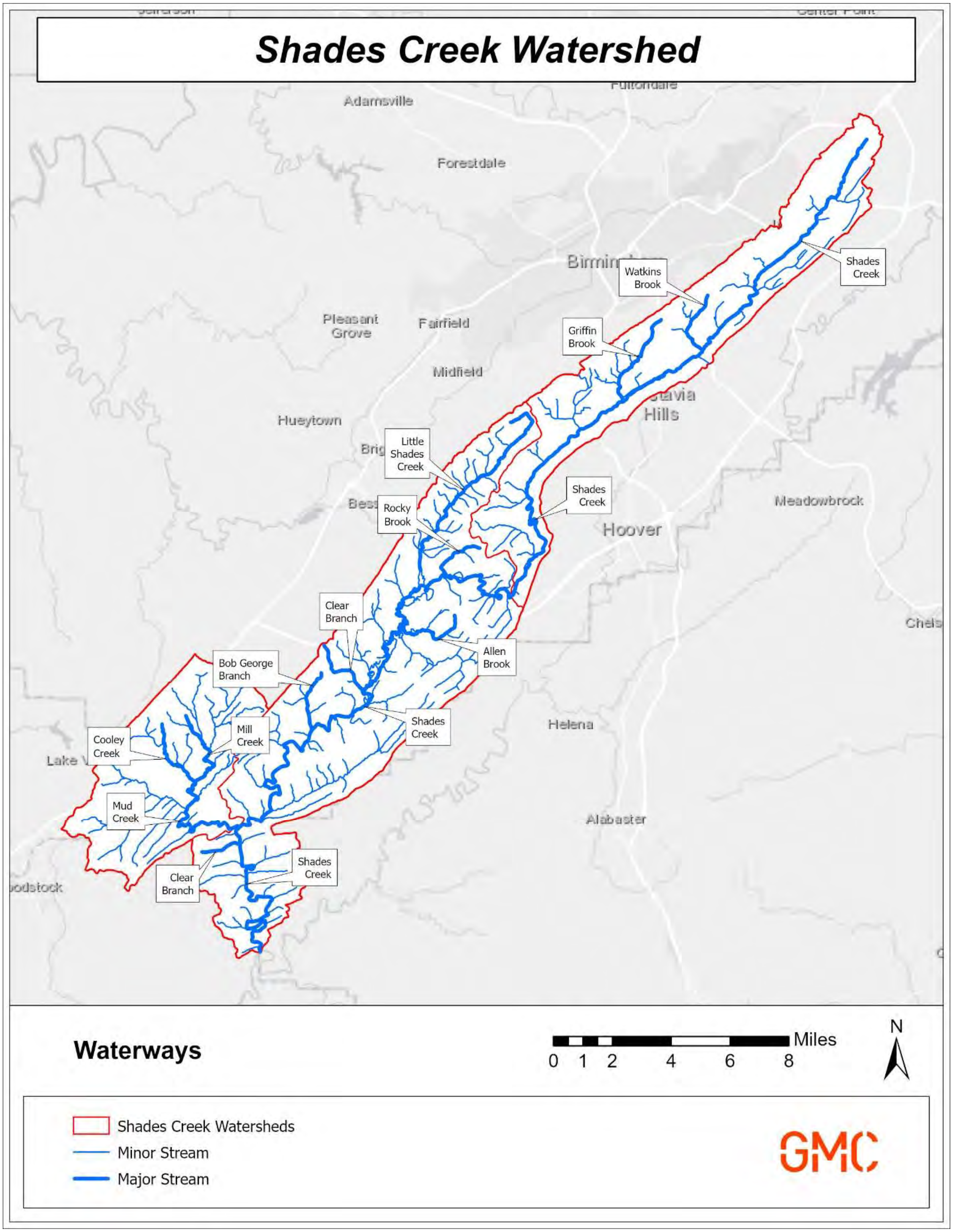


Figure 3.3: Shades Creek Waterways (USGS NHD)

3.0 WATERSHED CHARACTERIZATION

3.5 PHYSICAL SETTING

3.5.1 Ecoregions

Ecoregions are areas having a similar ecosystem and environmental resources. Ecoregions are identified and mapped based on characteristics including geology, physiography, vegetation, climate, soils, land use, wildlife, and hydrology. The SCW lies within the Ridge and Valley (Level III) Ecoregion which extends from Alabama through the Appalachian Mountain chain to Northeast United States (U.S. EPA, 2013). As shown in **Figure 3.4**, the SCW lies within three Level IV subcategories of the Ridge and Valley:

- Southern Sandstone Ridges
- Southern Shale Valleys
- Southern Limestone/Dolomite Valleys and Low Rolling Hills

Most of the SCW is within the Southern Sandstone Ridges which is characterized by steep, forested ridges of Coosa and Cahaba ridges with narrow crests. Deposits consist of stony and sandy soils of younger Pennsylvania-age sandstone and shale. Streams flow down ridges and vary greatly depending on the geologic material. With the most topographic relief, elevations typically range from 300 – 800 feet.

Shades Creek lies within the Southern Shale Valley region characterized by rolling valleys and rounded hills. Soils are weathered from shale, limestone, and clays. Flatter land in this region is used for agriculture like soybeans, corn, and hay, while steeper slopes are majority pastureland. Elevations range from 700 – 450 feet.

The western portion of the watershed where Cooley-Mud Creek sub-watershed originates is located in a portion of the Southern Limestone/Dolomite Valley and Low Rolling Hills ecoregion. This area consists of valleys and rounded hills with oak and pine forests, as well as some caves and springs. Geology includes limestone and cherty dolomite. Agriculture is characteristic of the region within this watershed (Ecoregions of Alabama and Georgia, 2001).

The intersection of three Level IV subcategories with the Shade Creek Watersheds demonstrates the variability and great diversity of habitats within Alabama. Rapidly transitioning stream habitats, separated by rugged stream channels, isolates species populations, causes genetic isolation, and creates new species. As a result, Alabama has the greatest biodiversity of any region in North America (Alabama Water Watch, 2016).

3.0 WATERSHED CHARACTERIZATION

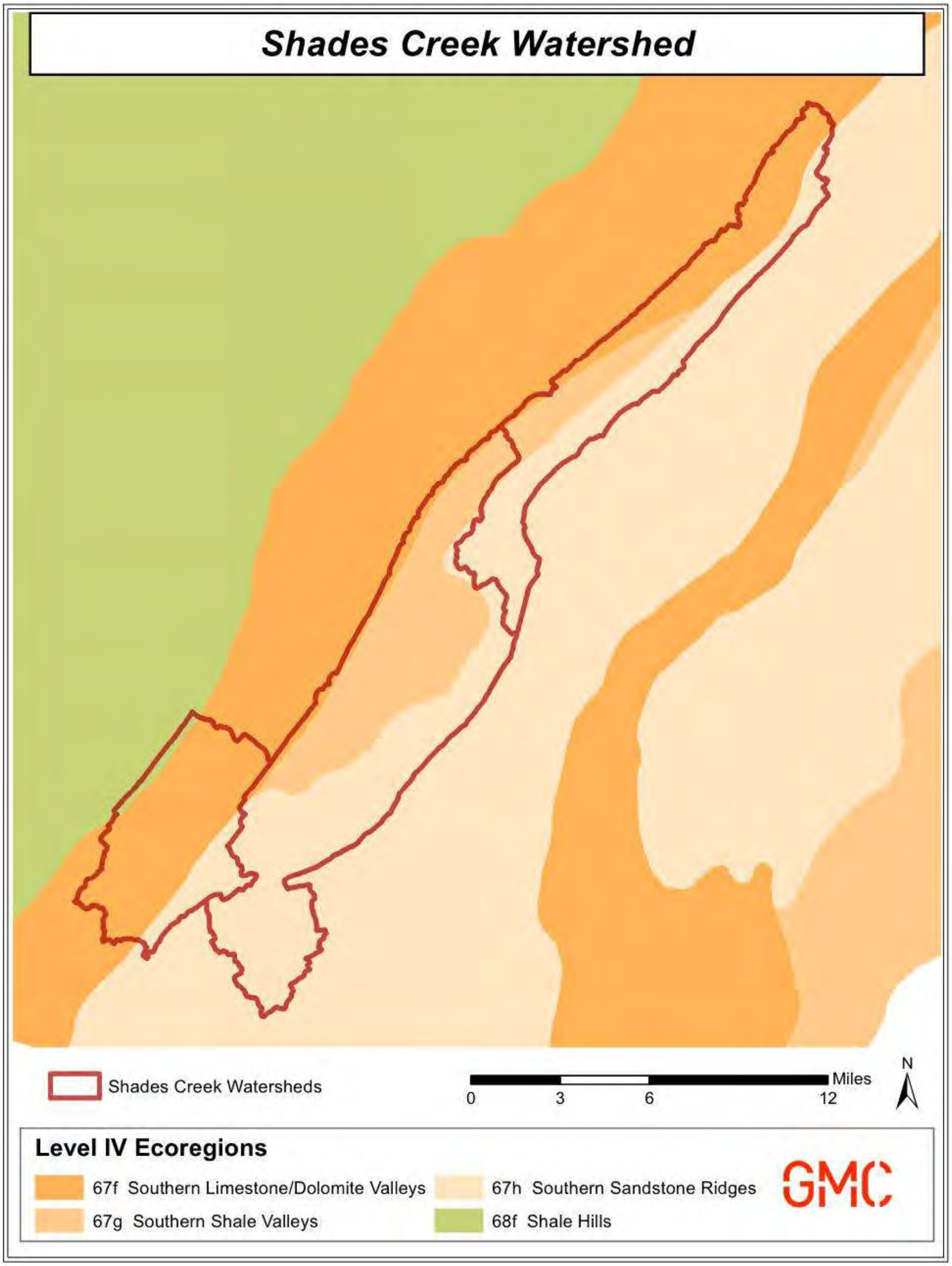


Figure 3.4: Level IV Ecoregions

3.5.2 Geology

The Shades Creek Watershed lies within the Cahaba Ridges District of the Valley and Ridge Physiographic Section (Sapp and Emplaincourt, 1975). The Cahaba Ridges District consist of a series of parallel northeast-striking ridges formed by gently folded sandstone and conglomerate rocks separated by valleys underlain by softer shale. The folded sedimentary rocks strike north-east-southwest. Anticlines and thrust fault structures occur. The structures within the Valley and Ridge Physiographic Section were created by the formation of the supercontinent Pangea. The collision of the proto–North American and Eurasian tectonic plates created the ancestral Appalachian Mountains. The foothills of the Appalachian Mountains extend through the Shades Creek Watersheds and southward to just north of Montgomery, Alabama.

The Shades Creek Watershed is underlain by geologic formations from the Mississippian and Pennsylvanian Systems; the Cooley and Mud Creek Watersheds are underlain by formations of the Cambrian, Ordivician, and Mississippian Systems. Geologic formations in the Shades Creek Watershed include the Hartselle Sandstone, Floyd Shale, Parkwood Formation, and Pottsville Formation. The Cooley and Mud Creek Watersheds are underlain by the Conasauga Formation, the Copper Ridge Dolomite, Chickamauga Limestone, and the Tuscumbia Limestone and Fort Payne Chert. The geologic formations present are summarized in **Table 3.4**.

Table 3.4 Geologic Formations of the Shades Creek Watershed

Watershed	Geologic Formation	Geologic Age	Predominant Lithology	Significant Features
Shades Creek	Hartselle Sandstone	Mississippian	Quartzose sandstone w/ interbeds of dark-gray shale.	Formerly mined for sand near Irondale
	Floyd Shale	Mississippian	Black to dark-gray, marine shale, limestone and chert	Source of natural gas in western
	Parkwood Formation	Mississippian	Shale, sandstone; mudstone, argillaceous limestone, and clayey coal	Not fossil bearing
	Pottsville Formation	Pennsylvanian	Sandstone, siltstone, shale, and coal	Source of coal for the steel industry
Cooley and Mud Creek	Conasauga Formation	Cambrian	Argillaceous limestone and interbedded dark-gray shale	Fossil bearing strata including Trilobites
	Copper Ridge Dolomite	Cambrian	Siliceous dolomite	Noted for distinctive chert
	Chickamauga Limestone	Ordovician	Argillaceous, locally fossiliferous limestone	
	Red Mountain	Silurian	Sandstone, siltstone & shale; fossiliferous partly silty/sandy	Source of Iron ore for the Steel
	Tuscumbia Limestone	Mississippian	Light-gray partly oolitic limestone; very coarse bioclastic crinoidal limestone common; light-gray chert nodules and concretions locally abundant	
	Fort Payne Chert	Mississippian	Bioclastic limestone with nodules, lenses and beds of light to dark-grey chert.	Highly fossiliferous with large crinoid stems

3.5.3 Soils

Soil series and soil types are established by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). Soil series are a level of classification that groups soil types based on similar chemical and physical characteristics. Common soils groupings within the Shades Creek Watershed include: Fullerton-Bodine-Birmingham, Leesburg-Gorgas-Allen, Minvale-Fullerton-Bodine, Nella-Minvale-Fullerton-Dewey-Allen, Smithdale-Maubila-Luverne, Sullivan-State-Ketona-Decatur-Bodine, Townley-Nauvoo-Montevallo, Townley-Nauvoo-Montevallo-Albertville, Urban Land-Nauvoo-Gorgas-Allen, Urban Land-Townley-Holston-Albertville, and Urban Land-Tupelo-Decatur. The various soil groupings within Shades Creek Watershed can be found below in **Figure 3.6**.

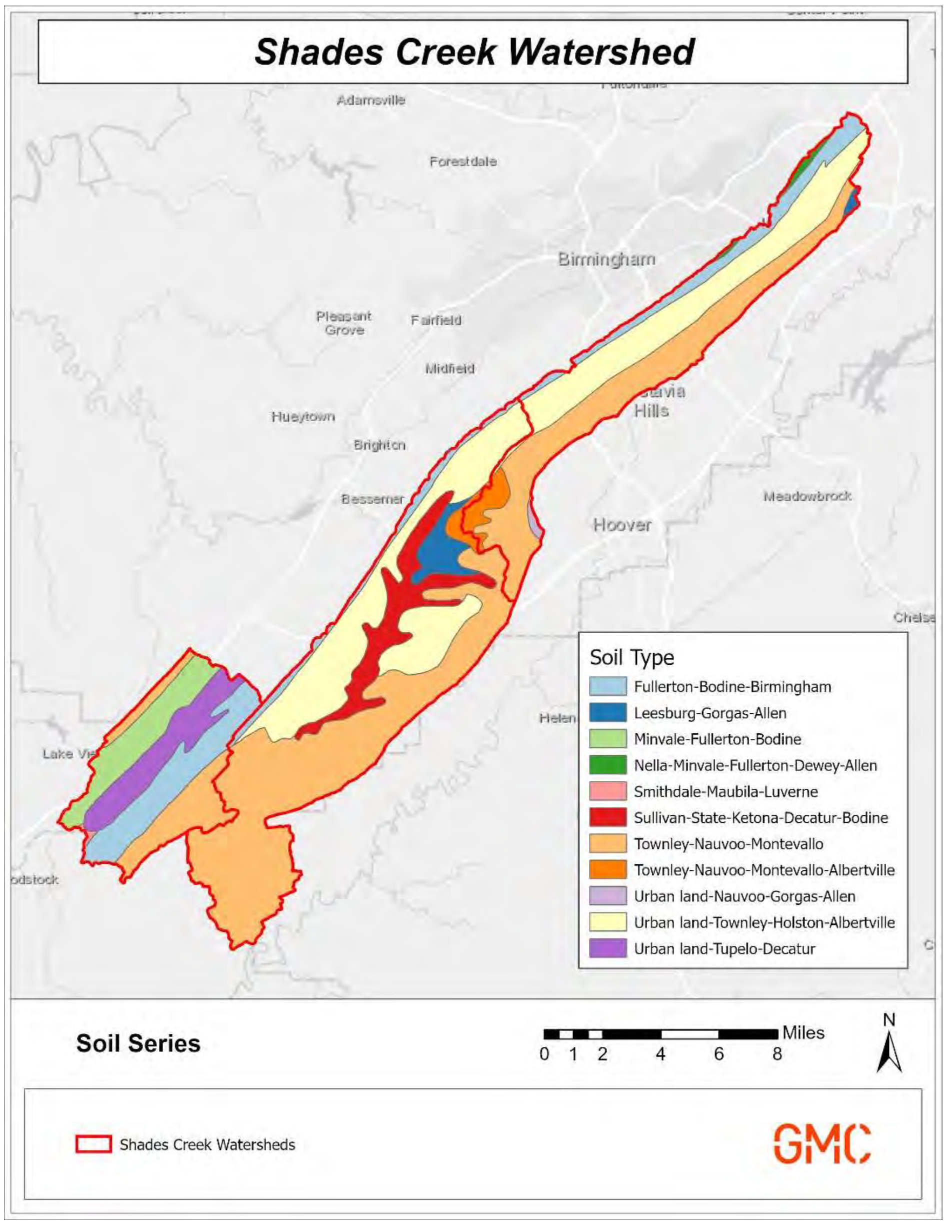


Figure 3.6: Soil Types

The natural drainage class of a soil refers to the frequency and duration of wet periods in natural conditions similar to the conditions when the soil formed (not altered by human activity). The USDA recognizes the following seven classes of natural soil drainage:

1. Excessively drained: Water is removed quickly
2. Somewhat excessively drained
3. Well drained
4. Moderately well drained
5. Somewhat poorly drained
6. Poorly drained
7. Very poorly drained

The USDA defines the classes of natural soil drainage as summarized below.

Excessively drained. Water is removed very rapidly. The occurrence of internal free water commonly is very rare or very deep. The soils are commonly coarse-textured and have very high hydraulic conductivity or are very shallow.

Somewhat excessively drained. Water is removed from the soil rapidly. Internal free water occurrence commonly is very rare or very deep. The soils are commonly coarse-textured and have high saturated hydraulic conductivity or are very shallow.

Well drained. Water is removed from the soil readily but not rapidly. Internal free water occurrence commonly is deep or very deep; annual duration is not specified. Water is available to plants throughout most of the growing season in humid regions. Wetness does not inhibit growth of roots for significant periods during most growing seasons. The soils are mainly free of the deep to redoximorphic features that are related to wetness.

Moderately well drained. Water is removed from the soil somewhat slowly during some periods of the year. Internal free water occurrence commonly is moderately deep and transitory through permanent. The soils are wet for only a short time within the rooting depth during the growing season, but long enough that most mesophytic crops are affected. They commonly have a moderately low or lower saturated hydraulic conductivity in a layer within the upper 1 m, periodically receive high rainfall, or both.

Somewhat poorly drained. Water is removed slowly so that the soil is wet at a shallow depth for significant periods during the growing season. The occurrence of internal free water commonly is shallow to moderately deep and transitory to permanent. Wetness markedly restricts the growth of mesophytic crops, unless artificial drainage is provided. The soils commonly have one or more of the following characteristics: low or very low saturated hydraulic conductivity, a high water table, additional water from seepage, or nearly continuous rainfall.

Poorly drained. Water is removed so slowly that the soil is wet at shallow depths periodically during the growing season or remains wet for long periods. The occurrence of internal free water is shallow or very shallow and common or persistent. Free water is commonly at or near the surface long enough during the growing season so that most mesophytic crops cannot be grown, unless the soil is artificially drained. The soil, however, is not continuously wet directly below plow-depth. Free water at shallow depth is usually present. This water table is commonly the result of low or very low saturated hydraulic conductivity of nearly continuous rainfall, or of a combination of these.

Very poorly drained. Water is removed from the soil so slowly that free water remains at or very near the ground surface during much of the growing season. The occurrence of internal free water is very shallow and persistent or permanent. Unless the soil is artificially drained, most mesophytic crops cannot be grown. The soils are commonly level or depressed and frequently ponded. If rainfall is high or nearly continuous, slope gradients may be greater.

Source: Soils Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture, Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed April 24, 2020

Drainage classes within the SCW are summarized in **Table 3.5** below and are shown in the map in **Figure 3.7**.

Table 3.5 Drainage Classes

Drainage Class	Cooley-Mud Creek (Acres)	% of Watershed	Lower Shades Creek (Acres)	% of Watershed	Upper Shades Creek (Acres)	% of Watershed
Not Classified	369.75	2%	872.61	2%	3,472.20	13%
Moderately well drained	261.07	1%	347.00	1%	-	0%
Poorly drained	3,362.61	19%	2,806.09	6%	731.21	3%
Somewhat excessively drained	3,919.45	22%	1,975.31	4%	2,445.13	9%
Somewhat poorly drained	25.72	0%	2,096.92	5%	-	0%
Well drained	9,967.15	56%	36,368.63	82%	19,747.31	75%
TOTAL	17,905.75		44,466.57		26,395.85	

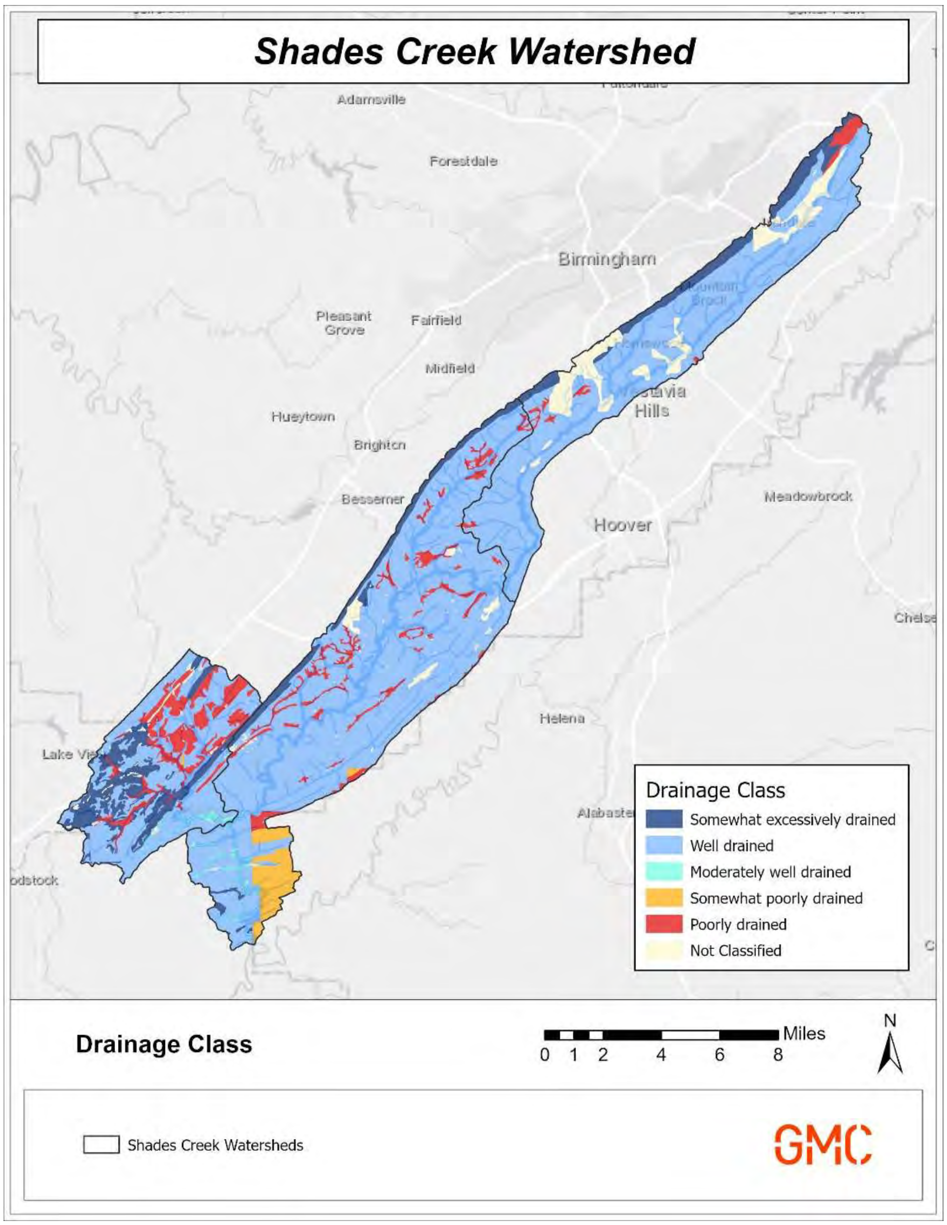


Figure 3.7: Soil Characteristics (NRCS, 2019)

3.5.4 Topography

The Cooley Creek-Mud Creek Watershed begins in Jones Valley at approximately 600 feet and winds through Red Mountain. Rock Mountain forms the border from the southwest to northeast of the Watershed at about 800 feet. After meandering through Red Mountain and Tannehill State Park, Mud Creek converges with Shades Creek at an elevation of 400 feet. Total relief of the stream path is about 200 feet.

The Lower SCW has a highpoint of approximately 700 feet along a ridge in the foothills of Red Mountain before running into Shades Valley at 600 feet. A gradual 100 feet of relief takes Little Shades Creek to meet Shades Creek and cuts through Shades Mountain. Shades Creek eventually encounters the Cahaba River at 300 feet elevation. The 400-foot topographic relief is more gradual in this drainage basin and it contains the longest waterway mileage.

The topography within the Upper SCW is more subdued than either of the other watersheds with the highest elevation approximately 800 feet. Shades Creek in this watershed hugs the foothills of Shades Mountain through a majority urbanized area. At the lowest it is about 540 feet where Shades Creek crosses into Lower SCW.

Topographic maps of each watershed are shown in the map in **Figure 3.8**.

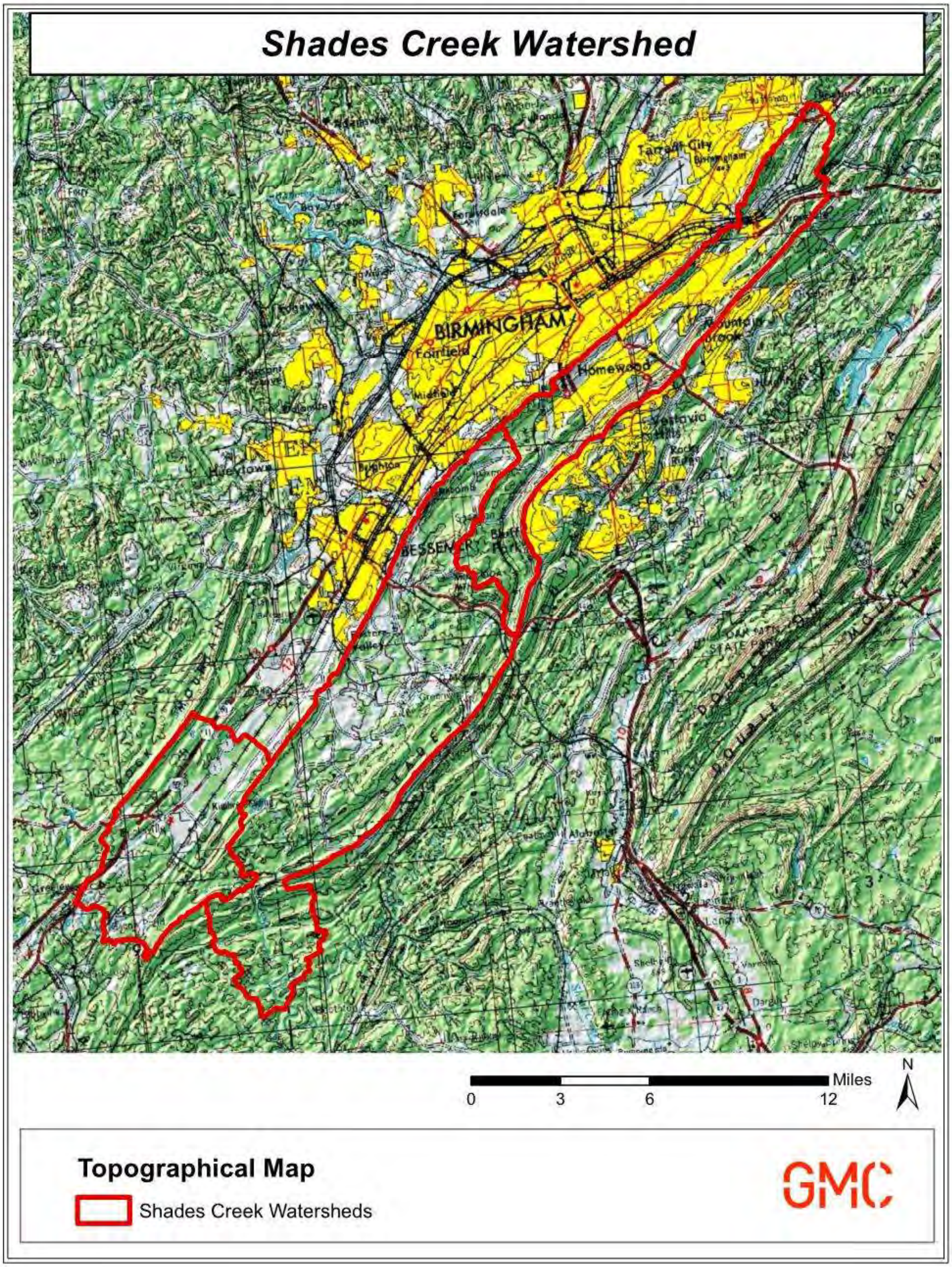


Figure 3.8: Topographic Map

3.0 WATERSHED CHARACTERIZATION

3.6 HYDROLOGY

3.6.1 Rainfall and Climate

Located close to Birmingham, Alabama, Shades Creek Watershed experiences hot summers and mild winters with abundant rainfall. Rainfall and climate data are available from the database for the Weather Forecast Office (WFO) located at the Birmingham International Airport (KBHM). Precipitation is well distributed throughout the year, but most of the rain occurs in the winter months into July. Summertime rain occurs during afternoon thunderstorms, with March and April having the greatest risk of severe weather (Birmingham Area Climatology). Annual rainfall totals for the last five years (2014-2019) are shown in **Table 3.6**.

Average annual precipitation in Birmingham is 53.71 inches. Average monthly precipitation ranges from 3.43 inches in October to 5.24 inches in March. Rainfall is only slightly seasonally distributed. August through October are the only months when rainfall averages less than four inches. The only month that averages greater than five inches of rainfall is March, with May close at 4.99. Monthly maximum average temperatures range from 90.8 degrees F in July to 53.8 degrees F in January. Monthly minimum average temperatures range from 71.4 degrees F in July to 33.8 degrees F in January. The lowest temperature on record, -6 degrees F, occurred on January 21, 1985. The highest temperature, 107 degrees F, was recorded on July 29, 1930.

Table 3.6: Monthly precipitation data from the Birmingham International Airport (from NOAA/NWS, 2014-2019)

Monthly Precipitation													
	Precipitation in inches												
Year	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
2014	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.66	4.46	7.15	***N/A***
2015	4.38	4.32	4.23	10.24	2.56	1.7	7.41	7.23	1.39	2.39	4.54	10.53	***60.92***
2016	3.28	7.46	5.7	3.75	1.42	3.96	7.08	2.52	0.68	0	2.07	2.39	***40.31***
2017	6.71	2.95	5.24	6.09	6.67	10.8	9.49	7.61	2.48	5.55	1.44	4.01	***69.04***
2018	1.35	8.14	4.13	8.25	6.98	5.77	1.81	2.32	4.32	1.04	5.64	11.34	***61.09***
2019	6.02	6.6	2.85	4.37	4.35	4.75	2.75	4.81	0.56	3.87	N/A	N/A	***N/A***
Mean	**4.35**	**5.89**	**4.43**	**6.54**	**4.40**	**5.40**	**5.71**	**4.90**	**1.89**	**2.75**	**3.63**	**7.08**	***57.84***

3.6.2 Groundwater Resources

Shades Creek Watershed lies within the Valley and Ridge aquifer system and contains rocks from the early to late Paleozoic era. They consist of carbonates such as limestone or dolomite and are productive groundwater sources, sometimes yielding 10 to 50 gallons per minute. Wells in these aquifers frequently produce 20 to 30 gallons per minute, and up to 100 gallons a minute in some areas. Carbonate rocks are easily dissolved by groundwater infiltration, therefore forming underground connections between the different systems. There are some sandstone formations in this region that provide smaller amounts of groundwater, around 10 gallons per minute. Some other local formations of chert and quartz that experience fracturing can be productive aquifers as well.

Rocks in this region are eroded with ease and recharge surface water. Most of the recharge occurs when rain falls on outcrops and flows through fractures of sandstone and conglomerates, and eventually meets other groundwater within limestone formations. There is some concern over quality of groundwater in this region, such as increased concentrations of iron and sulfate (USGS, 1990).

3.6.3 FEMA Flood Zones

FEMA flood zone designations within the Shades Creek Watershed are identified in **Figures 3.9, 3.10**, and **3.11**. The flood hazard areas shown are designated by the Federal Emergency Management Agency (FEMA) and include: Zone A (subject to inundation by the 1% annual-chance flood event with no base flood elevation (BFE) determined), Zone AE (subject to inundation by the 1% annual-chance flood event with BFE determined), Zone AE Floodway (channel of river or other watercourse and adjacent land that discharge base flood), and Zone X (minimal risk areas outside the 1% and 0.2% annual-chance floodplains). Zone X includes the “shaded” Zone X (100-yr to 500yr flood zone) and the “non-shaded” zone (>500-yr floodzone) (FEMA, 2018). The flood designations within the SCW include Zone A, Zone AE, Zone AE Floodway, and Zone X. The percentages of each flood zone within the SCW sub basins are summarized in the table below.

Table 3.7 Flood Zones

Flood Zone	Cooley Creek-Mud Creek	Lower Shades Creek	Upper Shades Creek
A	5.04%	2.62%	0.30%
AE	0.27%	4.09%	2.81%
AE, Floodway	0.20%	4.62%	0.92%
Shaded Zone X (100-500 yr.)	0.03%	0.63%	0.80%
Non-Shaded Zone X (>500yr)	94.46%	88.04%	95.17%

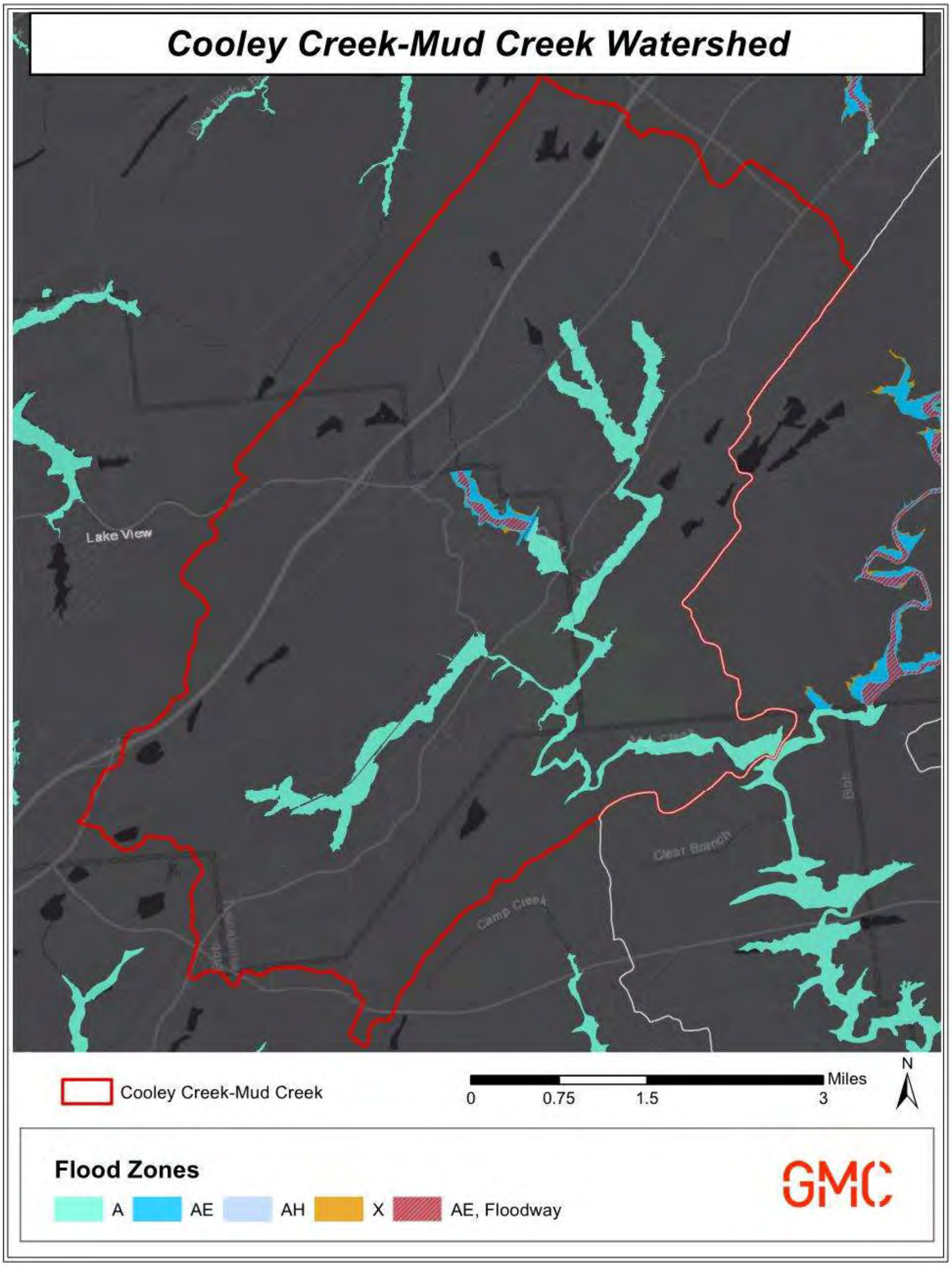


Figure 3.9: FEMA Flood Zones in Cooley Creek-Mud Creek

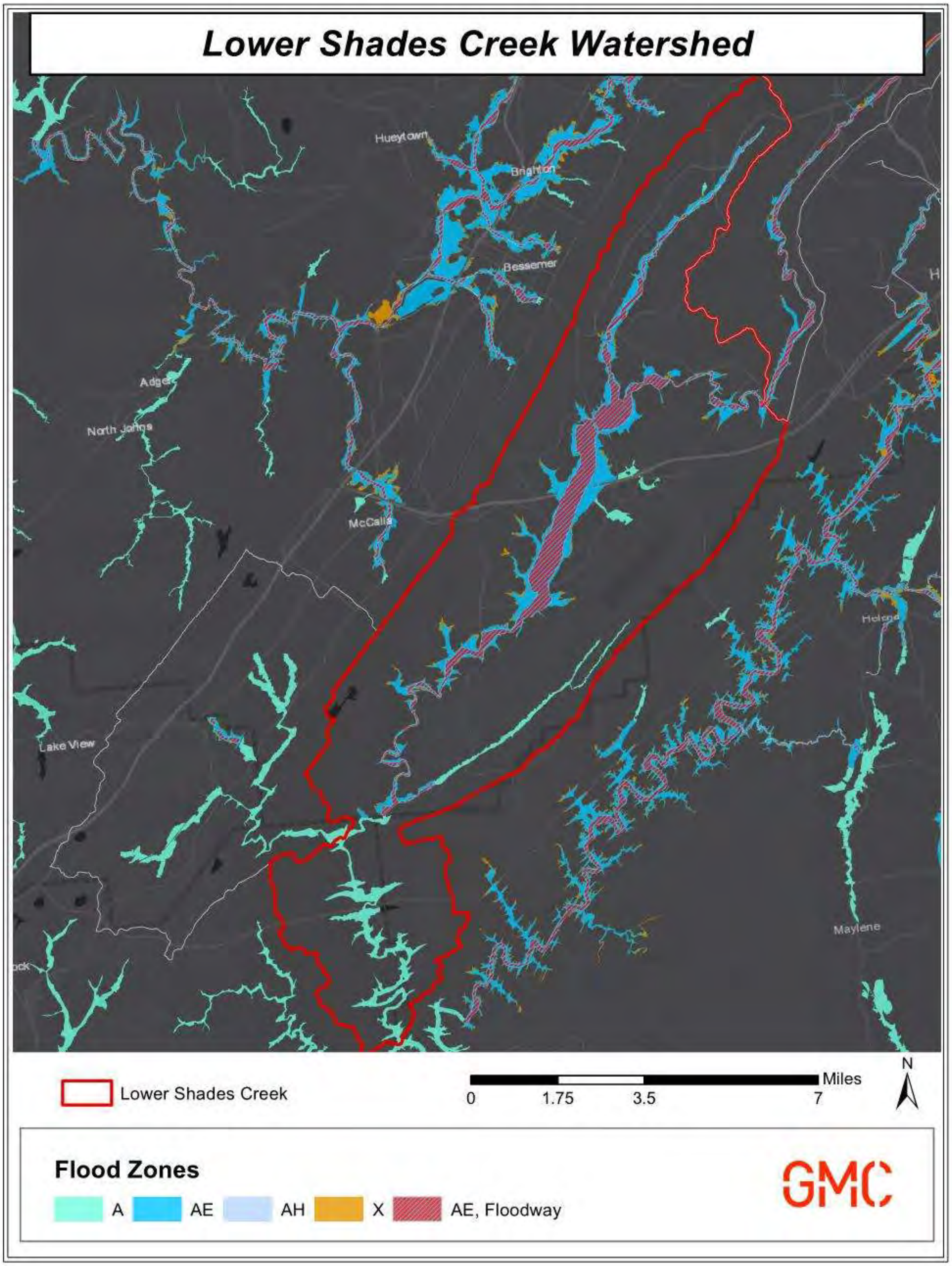


Figure 3.10: FEMA Flood Zones in Lower Shades Creek

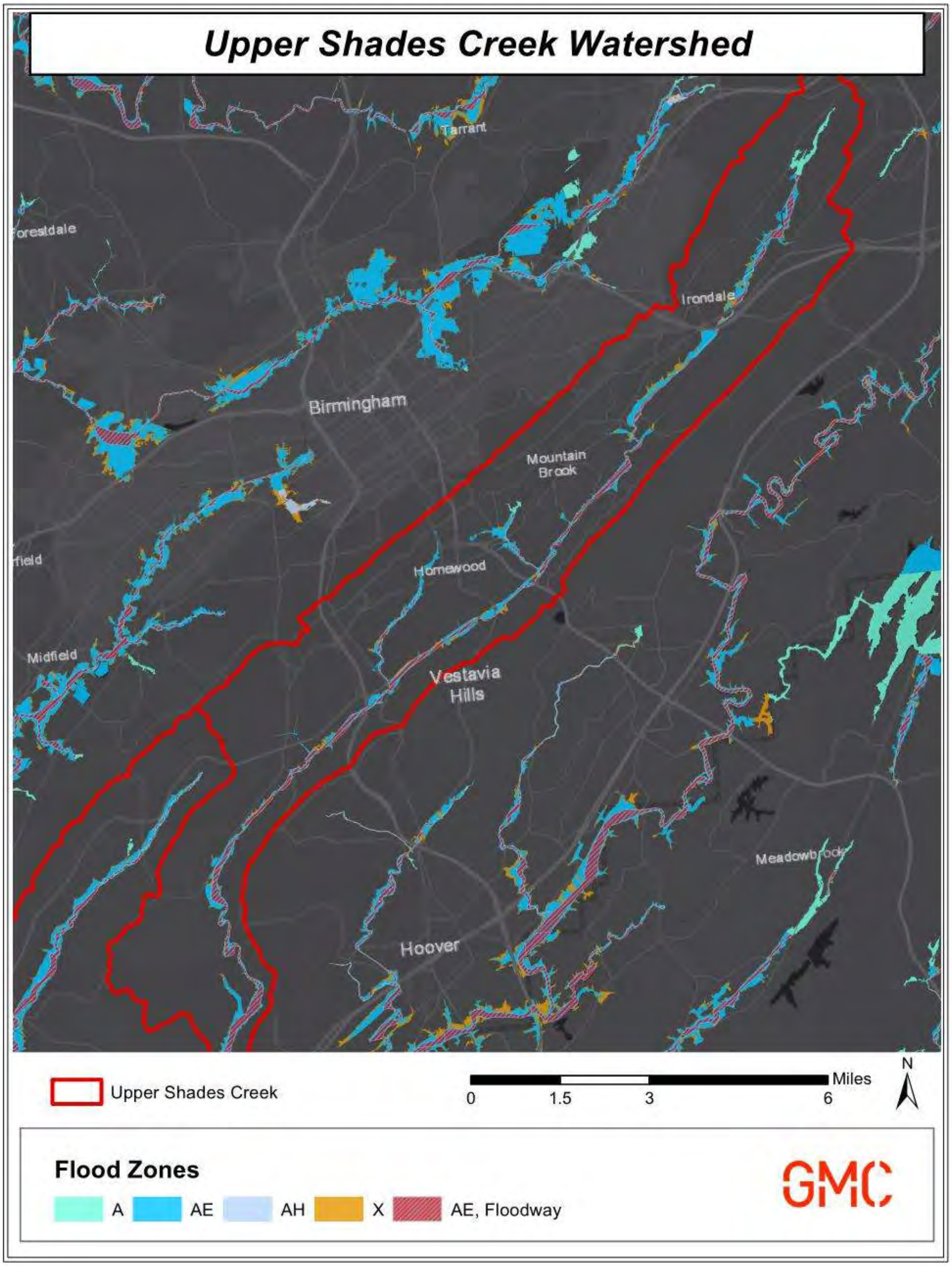


Figure 3.11: FEMA Flood Zones in Upper Shades Creek

3.6.4 Wetlands

A wetland in general is defined as a substrate that is approat the minimum periodically saturated by water. The water creates an environment for specific types of plants and animals. Properly saturated soils that are characteristic of a wetland are generally mineral material, organic material, or rock. National Wetland Inventory (NWI) data were used to classify the wetlands within the Shades Creek Watershed (USFWS, 2017). The SCW contains 4,977.63 acres of wetlands or 5.61% of the watershed's area (**Figures 3.12 – 3.14**). The percentage of wetlands within each sub-watershed is as follows: Cooley Creek-Mud Creek (10.29%), Lower Shades Creek (6.41%), and Upper Shades Creek (1.07%).

The overall health of the Shades Creek Watershed depends upon the existence of its wetlands, which contribute to the vitality of an ecosystem by storing, changing, and transmitting surface water and groundwater. Through these processes, pollution is removed, nutrients are recycled, groundwater is recharged, and biodiversity is enhanced. Wetlands are incredibly diverse and are some of the most productive ecosystems in the world. Wetland composition varies extensively, with five distinct categories for classification: Estuarine, Lacustrine, Marine, Palustrine, and Riverine systems (FGDC, 2013). Wetlands within the Shades Creek Watershed include: Palustrine (Freshwater Emergent, Freshwater Forested/Shrub, Freshwater Pond, and Lake) and Riverine. **Table 3.8** illustrates the percentage of each wetland type within each sub-watershed.

Table 3.8 Wetland Type (USFWS National Wetland Inventory Map)

Wetland Type	Cooley Creek-Mud Creek (Acres)	Cooley Creek-Mud Creek (%)	Lower Shades Creek (Acres)	Lower Shades Creek (%)	Upper Shades Creek (Acres)	Upper Shades Creek (%)
Freshwater Emergent Wetland	137.52	0.77%	182.65	0.41%	10.21	0.04%
Freshwater Forested/ Shrub Wetland	1,342.29	7.50%	2,006.21	4.51%	99.01	0.38%
Freshwater Pond	257.73	1.44%	285.42	0.64%	15.70	0.06%
Lake	22.45	0.13%	65.33	0.15%		
Riverine	82.78	0.46%	312.52	0.70%	157.82	0.60%
TOTAL	***1,842.77***		***2,852.13***		***282.74***	

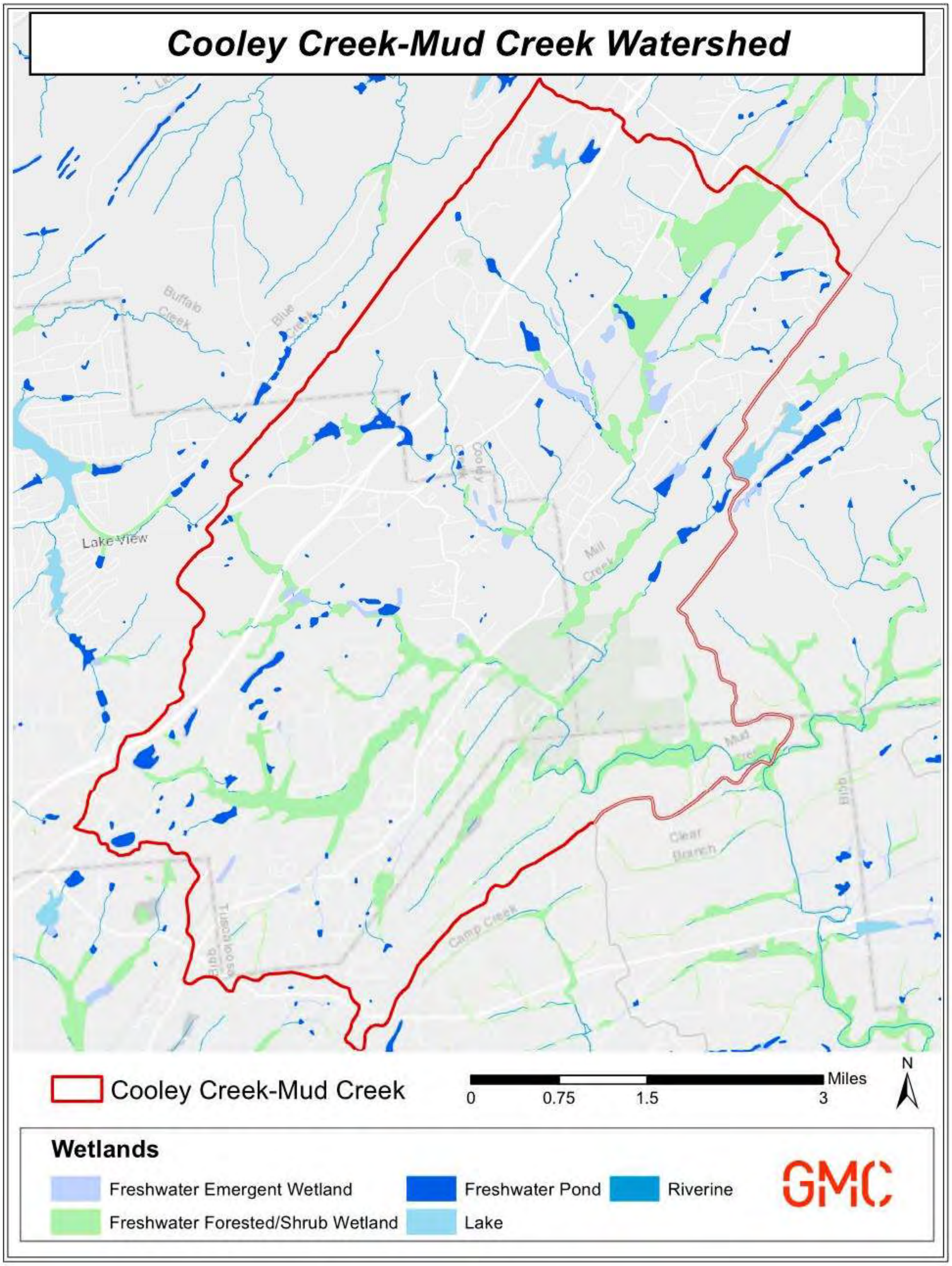


Figure 3.12: Wetland Types in Cooley Creek-Mud Creek

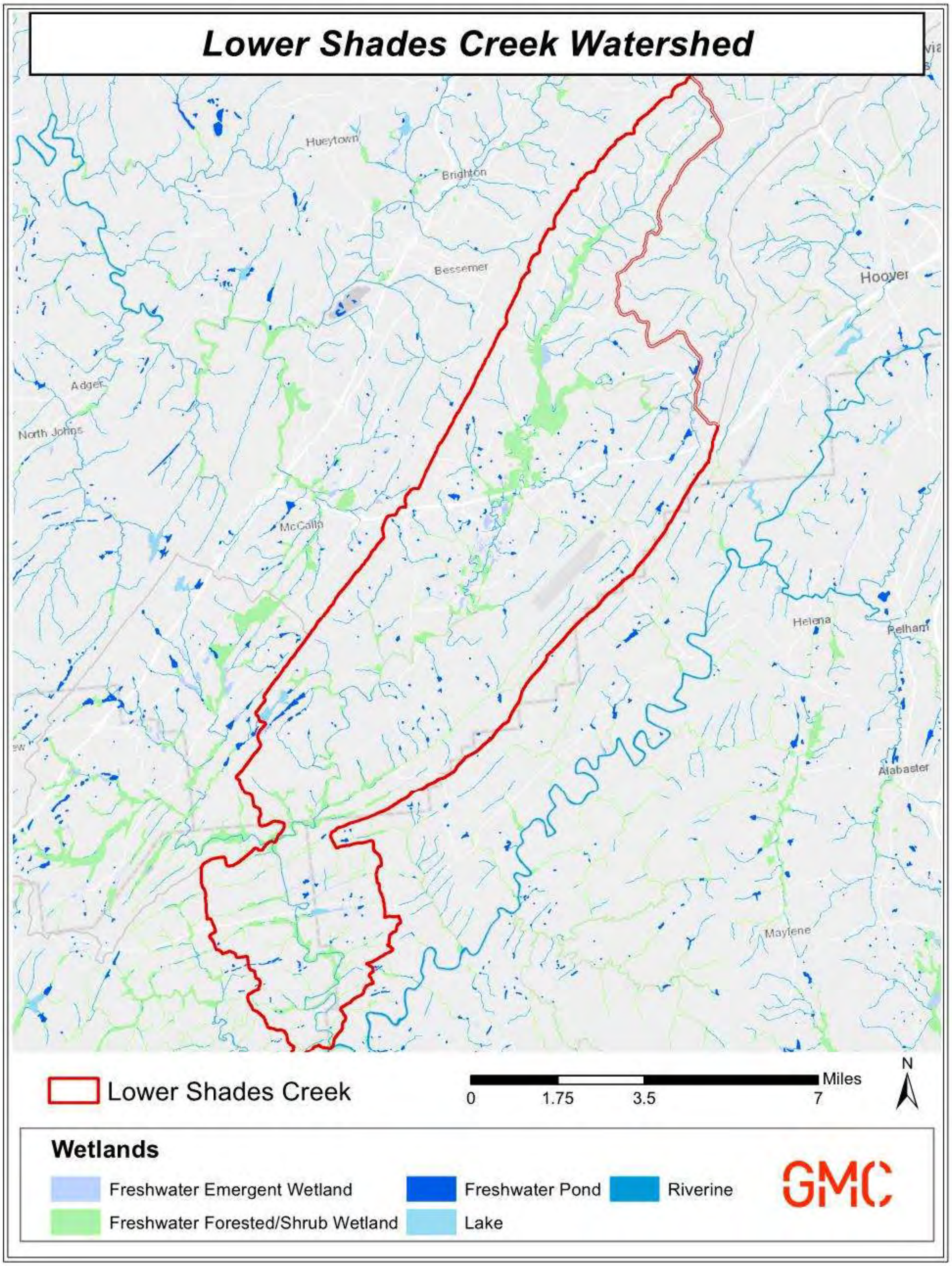


Figure 3.13: Wetland Types in Lower Shades Creek

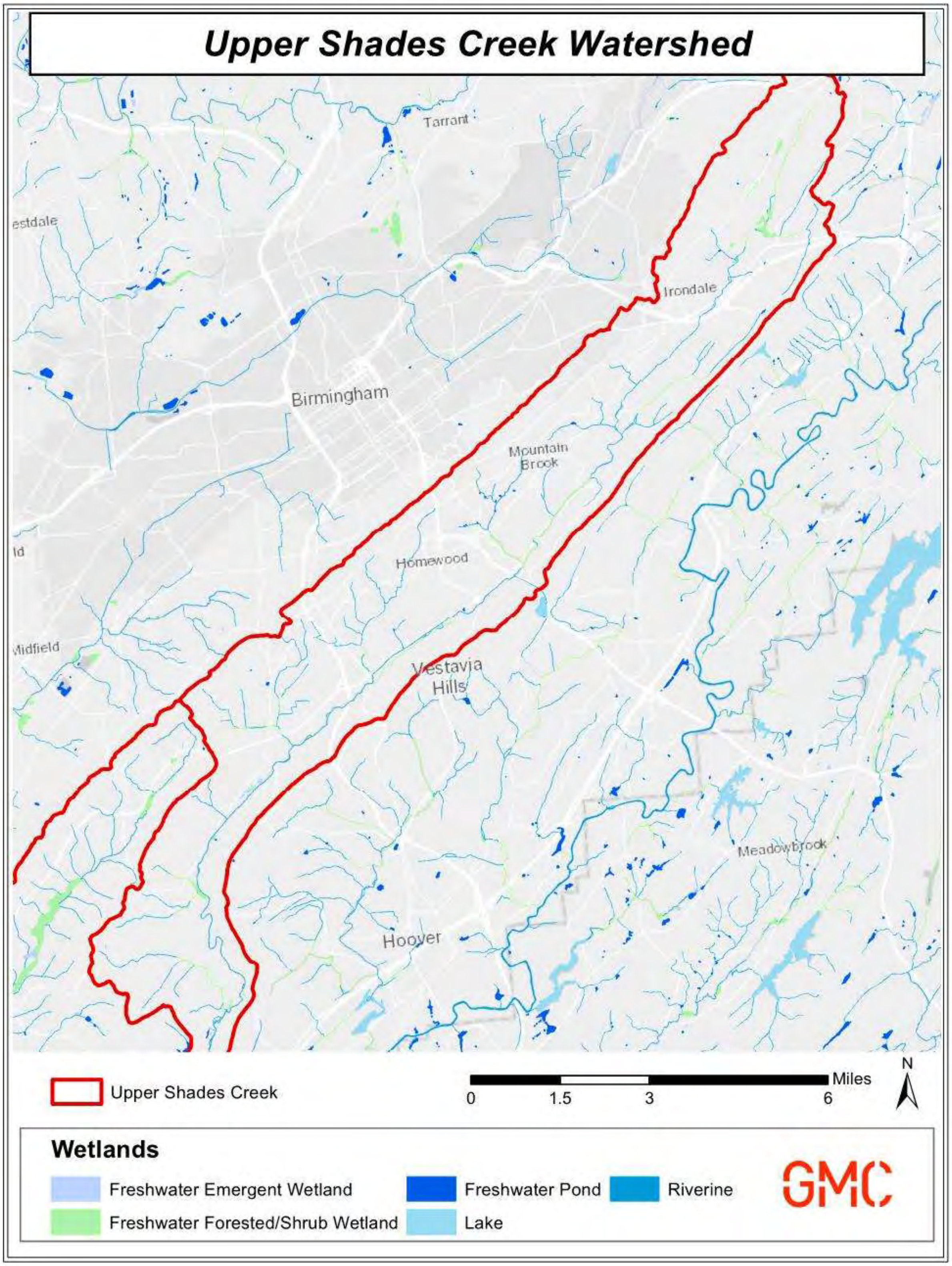


Figure 3.14: Wetland Types in Upper Shades Creek

The Palustrine System

The Palustrine (freshwater) System as shown in **Figure 3.15** includes all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, and all such wetlands that occur in areas where salinity from ocean-derived salts is below 0.5-ppt. The Palustrine System can be bounded by one other wetland System or an upland area. This System contains various vegetated wetlands and periodic or permanent water bodies.

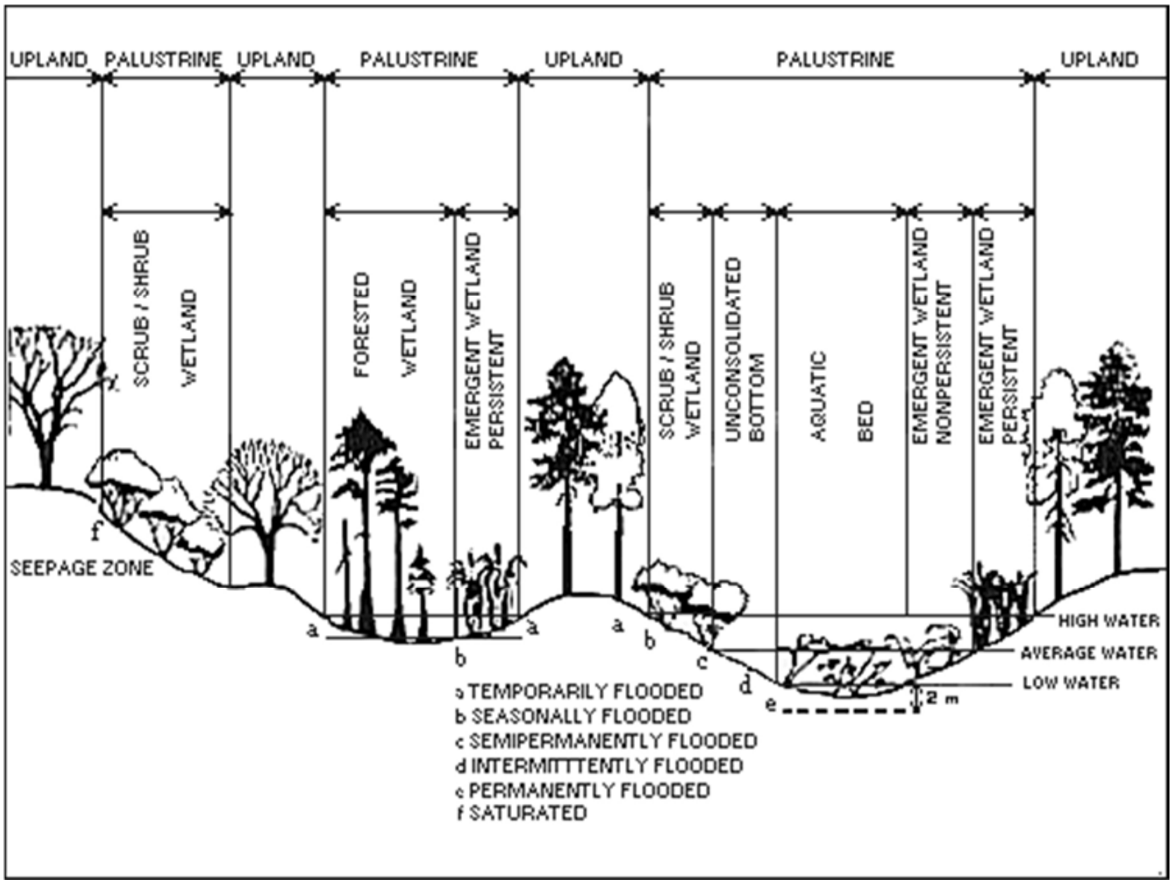


Figure 3.15: The Palustrine wetland system (from FDGC, 2013)

The Riverine System

The Riverine system, shown in **Figure 3.16**, is defined by all wetlands and deep-water habitats that exist within a channel with two exceptions: (1) wetlands dominated by trees, shrubs, emergent vegetation, emergent mosses, or lichens, and (2) habitats with water containing ocean-derived salts in excess of 0.5 ppt. Water can either be occasionally flowing or always flowing through the stream bed.

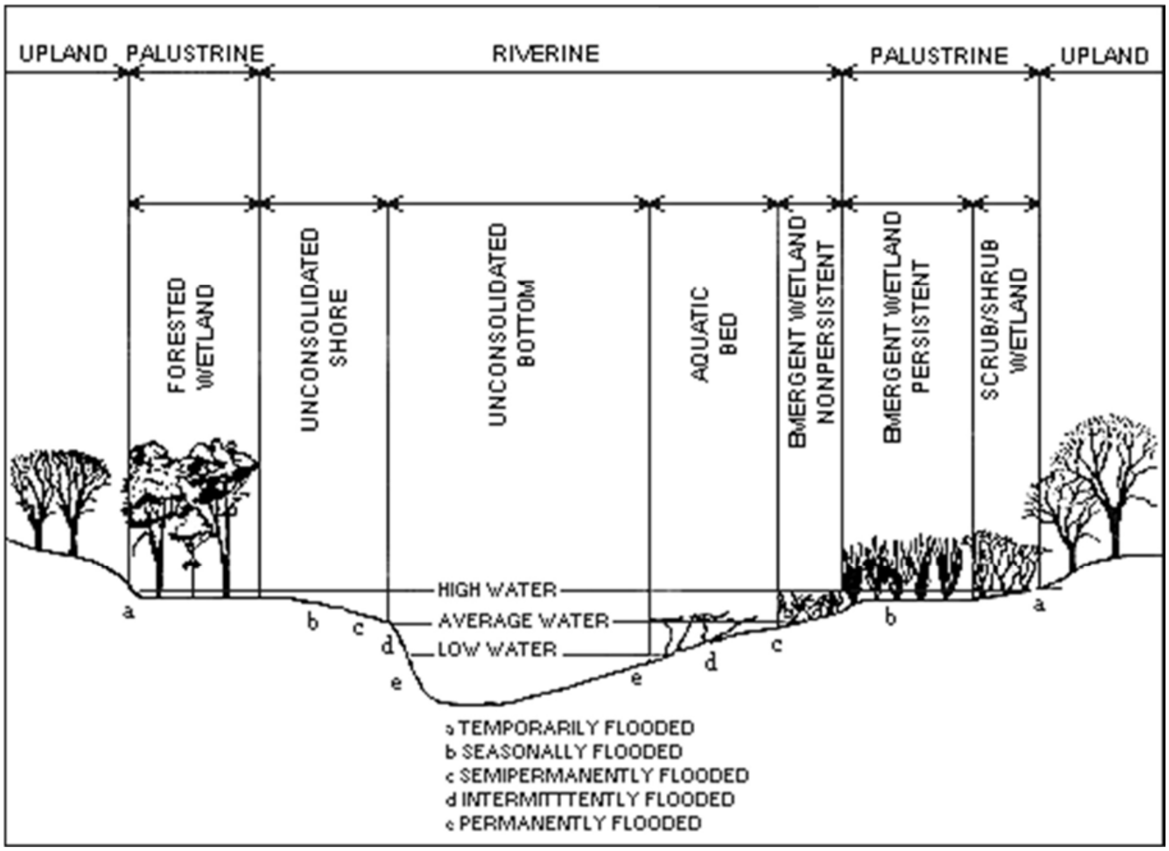


Figure 3.16: The Riverine wetland system (from FDGC, 2013)

3.7 BIOLOGICAL RESOURCES

Shades Creek Watershed is within a very unique ecoregion and has a diversity of plants and animals. The variety of creeks, lakes, and forests provide ample habitat for species.

3.7.1 Flora and Fauna

Jefferson County's environmental inventory includes oak-hickory and oak-pine forests, pastures, and agriculture. Flora data specific to the Shades Creek Watershed was sourced from the Alabama Department of Conservation and Natural Resources which gathers records from a variety of sources (ALDCNR, 2019). There is species occurrence data for 23 amphibians, 188 birds, 15 crustaceans, 61 fish, 69 insects, 13 mammals, 30 mollusks, 18 reptiles, 7 spiders, and 241 vascular plants (ADCNR 2019).

3.7.2 Protected Species

Alabama has the third highest number of endangered or threatened species in the country, with 131 (Al.com, 2019). The unique physical geography of the Appalachian Mountains allows for small ecosystems of distinct species to develop. The U.S. Fish and Wildlife Service (USFWS) has a designation that classified 26 species as federally threatened or endangered in 2019 that may occur in Shades Creek Watershed. This includes 3 mammals, 1 reptile, 1 amphibian, 4 fishes, 9 clams, 3 snails, 5 flowering plants. Some species had a specific "final critical habitat" and the SCW was out of that defined area; however, the species are still known to occur in the Watershed. **Table 3.9** provides a list of these protected species.

Table 3.9: Federally threatened or endangered species that may occur in SCW (from USFWS, 2019)

Group	Common Name	Scientific Name	Status
Mammals	Gray Bat	*Myotis grisescens*	Endangered
Mammals	Indiana Bat*	*Myotis sodalis*	Endangered
Mammals	Northern Long-eared Bat	*Myotis septentrionalis*	Threatened
Amphibians	Black Warrior Waterdog*	*Necturus alabamensis*	Endangered
Fishes	Cahaba Shiner	*Notropis cahabae*	Endangered
Fishes	Rush Darter*	*Etheostoma phytophilum*	Endangered
Fishes	Watercress Darter	*Etheostoma nuchale*	Endangered
Fishes	Goldline Darter	*Percina aurolineata*	Threatened
Freshwater Mussels	Ovate Clubshell*	*Pleurobema perovatum*	Endangered
Freshwater Mussels	Southern Acornshell*	*Epioblasma othcaloogensis*	Endangered
Freshwater Mussels	Southern Clubshell*	*Pleurobema decisum*	Endangered
Freshwater Mussels	Southern Pigtoe*	*Pleurobema georgianum*	Endangered
Freshwater Mussels	Triangular Kidneyshell*	*Ptychobranchus greenii*	Endangered
Freshwater Mussels	Upland Combshell*	*Epioblasma metastriata*	Endangered
Clams	Alabama Moccasinshell*	*Medionidus acutissimus*	Threatened
Clams	Finelined Pocketbook*	*Lampsilis altilis*	Threatened
Clams	Orangenacre Mucket*	*Lampsilis perovalis*	Threatened
Snails	Cylindrical Lioplax	*Lioplax cyclostomaformis*	Endangered
Snails	Flat Pebblesnail	*Lepyrium showalteri*	Endangered
Snails	Round Rocksnail	*Leptoxis ampla*	Threatened
Flowering Plants	Gentian Pinkroot	*Spigelia gentianoides*	Endangered
Flowering Plants	Tennessee Yellow-eyed Grass	*Xyris tennesseensis*	Endangered
Flowering Plants	Georgia Rockcress	*Arabis georgiana*	Threatened
Flowering Plants	Mohr's Barbara's Buttons	*Marshallia mohrii*	Threatened
Flowering Plants	White Fringeless Orchid	*Platanthera integrilabia*	Threatened
Reptiles	Flattened Musk Turtle	*Sternotherus depressus*	Threatened

** denotes species whose critical habitat is outside SCW*

Jefferson County provides habitat for approximately 49 rare, threatened, and endangered species (ANHP, 2019). The Alabama Natural Heritage Program (ANHP) maintains a tracking list of animal species that are protected by the State of Alabama as well as additional species that are of conservation concern. Rankings are referenced from the Heritage ranking system developed by NatureServe as follows: S1: Critically

Imperiled, S2: Imperiled and S3: Vulnerable. The ANHP's tracking list of these species within Jefferson County are listed in **Table 3.10**.

Table 3.10 Animal Species of Conservation Concern in Jefferson County (Alabama Natural Heritage Program)

Group	Common Name	Scientific Name	State Rank
Amphibians	Webster's Salamander	*Plethodon websteri*	S3
Caddisflies	Caddisfly	*Cheumatopsyche cahaba*	S1
Caddisflies	A Caddisfly	*Hydropsyche hageni*	S2
Crayfishes	Painted Devil Crayfish	*Cambarus ludovicianus*	S2
Dragonflies and Damselflies	Springwater Dancer	*Argia plana*	S1
Ferns and relatives	Field Horsetail	*Equisetum arvense*	S2
Flowering Plants	Cypress-knee Sedge	*Carex decomposita*	S1
Flowering Plants	Leafy Prairie Clover	*Dalea foliosa*	S1
Flowering Plants	Ozark Savory	*Clinopodium glabellum*	S1
Flowering Plants	Pasture Glade-cress	*Leavenworthia exigua var. lutea*	S1
Flowering Plants	Yellowleaf Tinker's	*Triosteum angustifolium*	S1
Flowering Plants	Alabama Larkspur	*Delphinium alabamicum*	S2
Flowering Plants	Alabama Skullcap	*Scutellaria alabamensis*	S2
Flowering Plants	Alabama Snow-wreath	*Neviusia alabamensis*	S2
Flowering Plants	Basil Bee-balm	*Monarda clinopodia*	S2
Flowering Plants	Carolina Gentian	*Frasera caroliniensis*	S2
Flowering Plants	Eared Coneflower	*Rudbeckia auriculata*	S2
Flowering Plants	Georgia Oak	*Quercus georgiana*	S2
Flowering Plants	Harper's Dodder	*Cuscuta harperi*	S2
Flowering Plants	Shoals Spider-lily	*Hymenocallis coronaria*	S2
Flowering Plants	Menge's Fame-flower	*Phemeranthus mengesii*	S3
Flowering Plants	Nevius' Stonecrop	*Sedum nevii*	S3
Flowering Plants	Nuttall's Rayless Goldenrod	*Bigelowia nuttallii*	S3
Flowering Plants	Southern Twayblade	*Listera australis*	S3
Flowering Plants	Wahoo	*Euonymus atropurpureus*	S3
Flowering Plants	Yellowwood	*Cladrastis kentukea*	S3
Flowering Plants	Decumbent Trillium	*Trillium decumbens*	S3
Freshwater Fishes	Blue Shiner	*Cyprinella caerulea*	S1
Freshwater Fishes	Rush Darter	*Etheostoma phytophilum*	S1
Freshwater Fishes	Vermilion Darter	*Etheostoma chermocki*	S1
Freshwater Fishes	Watercress Darter	*Etheostoma nuchale*	S1
Freshwater Fishes	Cahaba Shiner	*Notropis cahabae*	S2
Freshwater Fishes	Coal Darter	*Percina brevicauda*	S2
Freshwater Fishes	Tuskaloosa Darter	*Etheostoma douglasi*	S3
Freshwater Mussels	Rayed Kidneyshell	*Ptychobranchus foremanianus*	S1
Freshwater Mussels	Southern Clubshell	*Pleurobema decisum*	S2
Freshwater Mussels	Finelined Pocketbook	*Hamiota altilis*	S2
Freshwater Mussels	Delicate Spike	*Elliptio arctata*	S2
Freshwater Mussels	Black Sandshell	*Ligumia recta*	S2
Freshwater Mussels	Alabama Heelsplitter	*Lasmigona alabamensis*	S3
Freshwater Mussels	Ridged Mapleleaf	*Quadrula rumphiana*	S3
Freshwater Snails	Riffle Elimia	*Elimia clara*	S3
Mammals	Eastern Spotted Skunk	*Spilogale putorius*	S2S3
Natural Community	Swamp Blackgum	*Nyssa biflora / Itea virginica*	S1
Natural Community	Sandstone Glade	*Bigelowia nuttallii*	S2
Reptiles	Northern Pinesnake	*Pituophis melanoleucus*	S3
Spiders and other Chelicerates	Pseudoscorpion	*Aphrastochthonius pecki*	S1
Spiders and other Chelicerates	A Cave Spider	*Appaleptoneta jonesi*	S1
Turtles	Flattened Musk Turtle	*Sternotherus depressus*	S2

3.7.3 Invasive Species

Invasive species are plants or animals that have been introduced to an area outside of their original range. Typically, these species spread incredibly fast due to their quick reproduction rates and ability to outcompete native species for resources. In many cases, the ecological integrity and biodiversity of an area is threatened when homogenous stands of invasive species are established. Managing invasive species can be a significant cost to forestry, fisheries, and agricultural industries. According to the University of Georgia Center for Invasive Species and Ecosystem Health (CISEH) (CISEH, 2016), with 194 species, Jefferson County has reported the 10th most invasive species out of any county in Alabama. The following invasive species exist throughout the state of Alabama: Kudzu Bug, Fire Ants, Southern Pine Beetle; Eastern Poison-Ivy, Eastern Redcedar, Japanese Honeysuckle, Kudzu, Mimosa, Chinese Privet; and Wild Pig.

3.8 DEMOGRAPHIC AND SOCIOECONOMIC ENVIRONMENT

Jefferson County had a population growth rate of -0.54% between 2000 and 2010. This declining population growth rate comes after an increase from 1990 to 2000. Between 1990 and 2000, there was a population increase of 1.6%, (USCB, 2001). From 2010 to 2040, the Center for Business and Economic Research (CBER) at the University of Alabama predicts a total growth rate of 1.4% (CBER, 2018). The 1.4% growth rate is an average that takes into account both areas that are losing and those that are gaining population.

Population and percent change for Jefferson County is summarized in **Table 3.11**. CBER has data estimates on the majority of cities in Alabama which includes those in the Birmingham area. Estimates were made in 2015 that project populations up to 2019 and the percent change compared to the 2010 census (CBER, Quick Facts). This data is detailed in **Table 3.12**. There is a trend of people moving from Birmingham to suburban areas, as shown in the percent growth. The City of Birmingham, Mountain Brook, and Bessemer are decreasing while Homewood, Vestavia Hills, Hoover, and Irondale are increasing. Homewood and Irondale are both located in Upper Shades Creek Watershed.

Table 3.11: ***Population for Jefferson County (1990-2040)*** **and (CBER, 2018), (USCB, 2001)**

Jefferson County				
Year	**1990**	**2000**	**2010**	**Projected 2040**
Population	651,525	662,047	658,466	667,433
Percent Change	--	1.6	-0.54	1.4

Table 3.12 ***Population stats for cities partially or wholly within SCW (2010-2019)*** **(CBER, 2015)**

Cities in SCW			
Year	**2010**	**2019 (est.)**	**% change**
Bessemer	27,667	26,472	-4.3
Birmingham	212,585	209,403	-1.5
Homewood	25,143	25,377	0.9
Hoover	80,823	85,768	6.1
Irondale	12,415	12,893	3.9
Mountain Brook	20,467	20,297	-0.8
Vestavia Hills	33,766	34,413	1.9

3.0 WATERSHED CHARACTERIZATION

The U.S. Census captures data every ten years, and this information is available for a variety of geographic units including counties, cities, tracts, and census blocks. Five-year estimates are also calculated by the Census American Community Survey program for differing geographic units --many at the tract level. Census tracts are defined by the U.S. Census Bureau as “small, relatively permanent statistical subdivisions of a county or equivalent entity that are updated by local participants prior to each decennial census as part of the Census Bureau's Participant Statistical Areas Program” (Census, 2016). The population for the Shades Creek Watershed are illustrated in **Figure 3.17**.

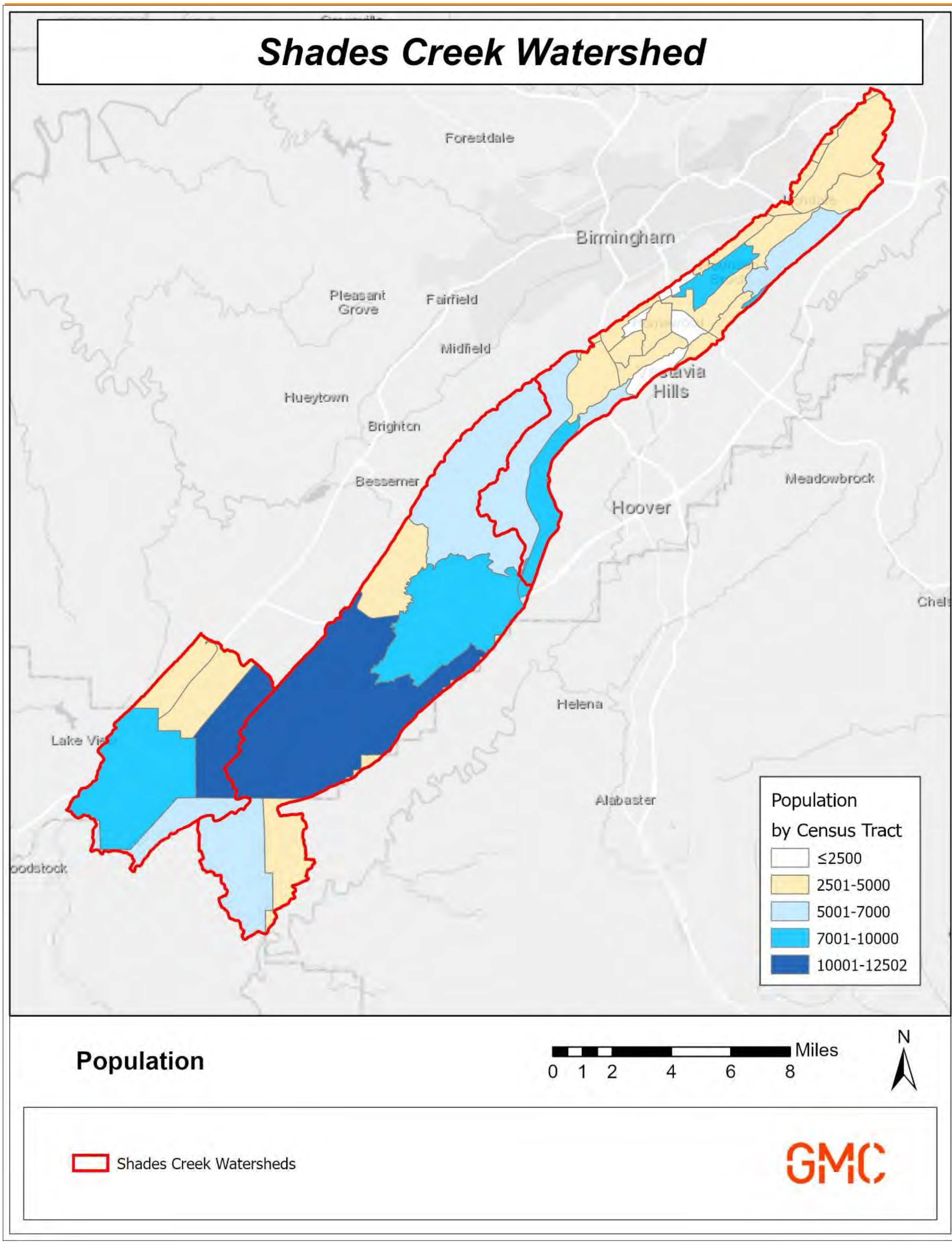


Figure 3.17: Population Distribution by Census Tract

3.0 WATERSHED CHARACTERIZATION

Socioeconomic statistics from 2015 were also acquired from the Census American Community Survey program. The maps that follow illustrate the distribution of median household income on **Figure 3.18** and percent in poverty on **Figure 3.19**.

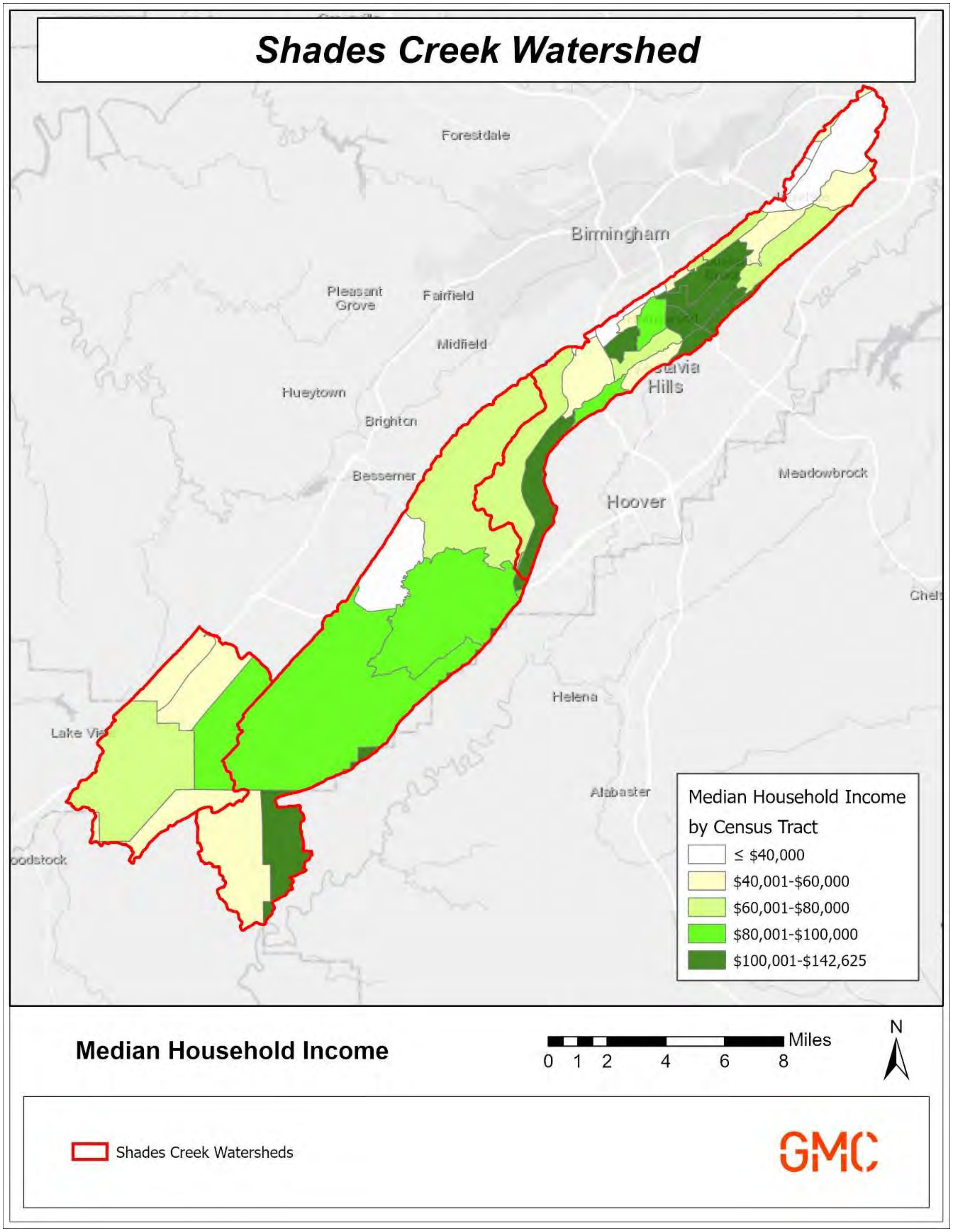


Figure 3.18: Median Household Income

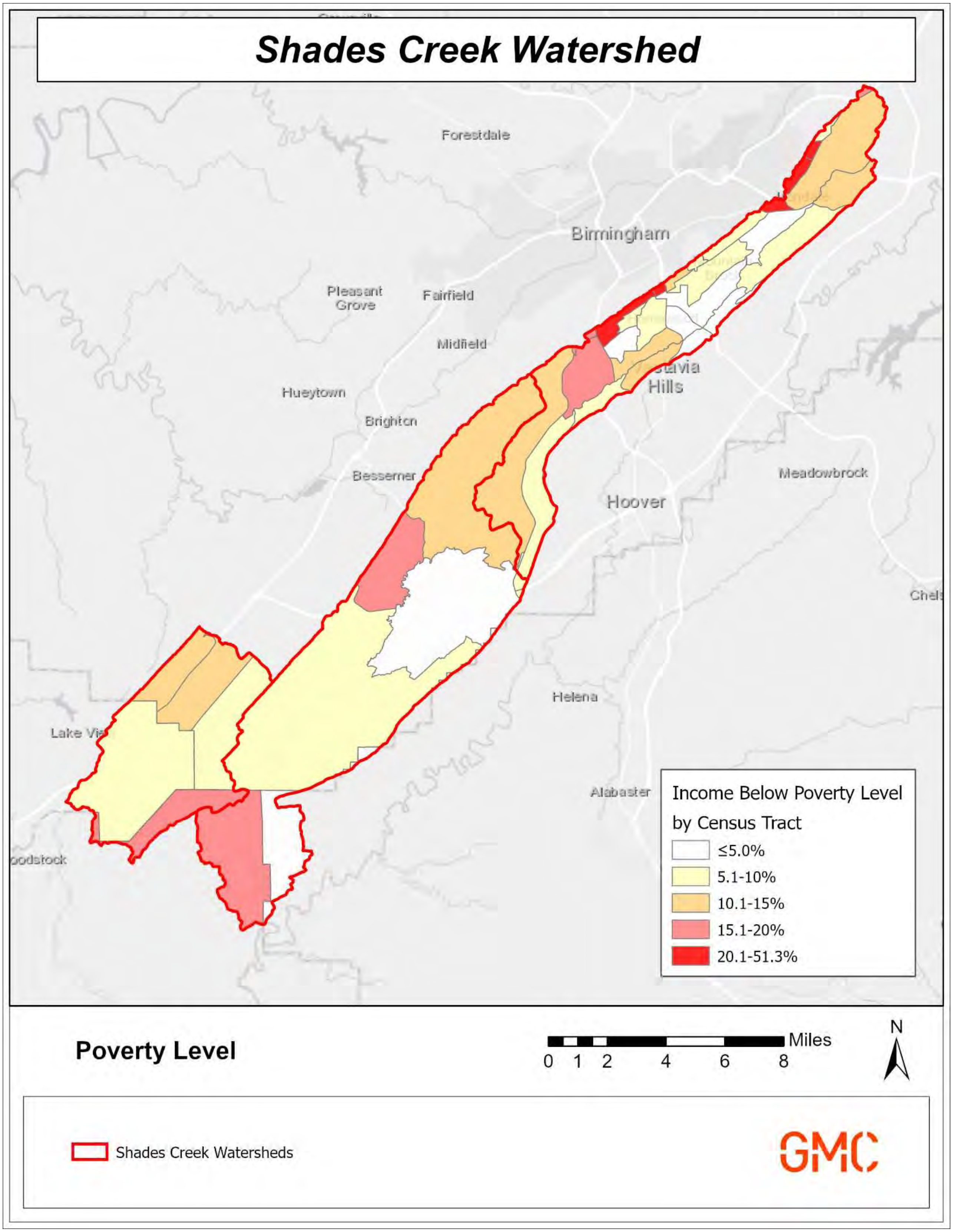


Figure 3.19: Percent in Poverty

4.0 WATERSHED CONDITIONS

4.1 WATER QUALITY OVERVIEW AND PROCESS

The status and trends of the ambient surface water quality of Shades Creek and its tributaries were assessed through the compilation and analysis of available data. Ambient surface water quality has generally been well studied over the past several decades, and sufficient recent and historic data exist to adequately analyze water quality conditions.

4.1.1 Previous Studies and Existing Data

The data sources reviewed and analyzed to characterize ambient surface water quality in this Shades Creek Watershed Management Plan (WMP) included the following:

- Alabama Department of Environmental Management (ADEM) (ADEM, 2017a) – routine programmatic ambient monitoring

- Jefferson County Health Department (JCHD) (JCHD, 2019)

The available numeric data analyzed were obtqined from these sources. **Table 4.1** summarizes the number of stations, sampling period, and general parameters included in these datasets.

Table 4.1: Summary of primary ambient surface water quality data source (ADEM, 2017a; JCHD, 2019)

Source	No. Stations	Sampling Period		General Parametric Coverage
		First	Last	
ADEM	24	07/11/1990	05/01/2019	temperature, DO, pH, specific conductance, turbidity, TSS, TDS, nutrients, bacteria, metals, organics, other
JCHD	12	03/17/2010	05/30/2019	temperature, DO, pH, specific conductance, turbidity, TSS, TDS, nutrients, bacteria, metals, organics, other

It should be noted that the temporal, spatial, and parametric coverage of ADEM monitoring program varies substantially over the period of record, since some stations were only monitored for certain dates or for certain parameters. There are relatively few stations in the Shades Creek Watershed where consistent data have been collected over a long period. Therefore, the characterization of the status and trends in surface water quality presented relies on analyzing what data is provided. Appendix D includes time series plots of data for key parameters at all stations.

4.1.2 Water Quality Standards

<u>Designated and Desired Uses</u>

Code of Alabama Section 335-6-10-.03 establishes the designated use classification system for Alabama surface waters. There are seven basic classifications including:

1. Outstanding Alabama Water
2. Public Water Supply
3. Swimming and Other Whole Body Water-Contact Sports

4. Shellfish Harvesting
5. Fish and Wildlife
6. Limited Warmwater Fishery
7. Agricultural and Industrial Water Supply

In addition to these classifications, there are two additional special designations: Outstanding National Resource Waters and Treasured Alabama Lakes. Designated use classifications essentially define the existing and/or intended use of a particular water body. Code of Alabama Section 335-6-10-.09 defines the water quality criteria that corresponds with specific designated uses (ADEM, 2017b). These criteria establish water quality standards and other measures developed to protect designated uses of each waterbody.

All surface waters in the Shades Creek Watershed have a default water use designation of Fish and Wildlife (F&W), Swimming and Other Whole Body Water-Contact Sports (S&WC), and Agricultural and Industrial Water Supply (A&I). **Table 4.2** lists the specific water quality criteria for water use classifications within the Shades Creek Watershed. A&I standards are not mentioned in the *E.coli* section due to the fact that F&W and S&WC standards are a lower threshold, therefore taking precedent. Dissolved oxygen (DO) standard for A&I also has a lower minimum level than other designated uses so it is not referenced in the DO section.

Table 4.2: ADEM water quality criteria for water use classifications

Swimming and Other Whole Body Contact Water Sports:	
Criteria	**Standard**
pH	6.0 to 8.5 standard unit (s.u.)
Water	< 90°F
Dissolved Oxygen	> 4.0 mg/L
E. coli	< 126 colonies/100mL (geometric mean) / < 235 colonies/100mL (single sample)
Turbidity	< 50 nephelometric turbidity units (NTU) above background
Fish and Wildlife:	
Criteria	**Standard**
pH	6.0 to 8.5 s.u.
Water	< 90°F
Dissolved Oxygen	> 4.0 mg/L
E. coli	< 548 colonies/100mL (geometric mean) / < 2507 colonies/100mL (single sample)
Fecal Coliform Bacteria*	< 1000 colonies/100mL (geometric mean) / < 2000 colonies/100mL (single sample) / < 200 colonies/100mL (geometric mean June –Sept.)
Turbidity	< 50 NTU above background
Agricultural and Industrial Water Supply:	
Criteria	**Standard**
pH	6.0 to 8.5 s.u.
Water	90°F
Dissolved Oxygen	> 3.0 mg/L
E. coli	< 700 colonies/100mL (geometric mean) / < 3200 colonies/100mL (single sample)
Turbidity	< 50 NTU above background

*Pre - 2014 criteria and standards - Source: ADEM Admin. Code R. 335-6-10-.09

4.0 WATERSHED CONDITIONS

Clean Water Act (CWA) Section 303(d) and Total Maximum Daily Loads (TMDLs)

Under Section 303(d) of the Federal Clean Water Act 9 (CWA), waterbodies that are determined to not meet water quality criteria for their respective designated uses are required to be listed as "impaired waters". Section 303(d) of the CWA requires states to submit a list of surface waters that do not meet applicable water quality standards (impaired waters) where implementation of technology-based effluent limitations alone did not ensure attainment of applicable water quality standards. The 303(d) list is submitted to the U.S. Environmental Protection Agency (EPA) for approval after an opportunity for public comment. The list includes the causes and sources of water quality impairment for each waterbody listed and a schedule for development of total maximum daily loads (TMDLs) for each pollutant-causing impairment identified (ADEM, 2017a).

TMDLs determine the amount of each pollutant causing water quality impairments that can be allowed without resulting in exceedances of prescribed water quality standards for the waterbody. A TMDL is the sum of the allowable loads of a single pollutant from every contributing point and nonpoint source, including a margin of safety to account for uncertainty. TMDLs also address reductions needed to meet water quality standards and allocates those reductions among the point and nonpoint sources in a watershed. Therefore, development of TMDLs is an important step in restoring surface waters to their designated uses.

The Shades Creek Watershed is composed of three separate 12-digit hydrologic unit codes (HUCs) and their associated named tributaries and/or canals. The three HUCs and their respective tributaries that comprise the Shades Creek Watershed include the following (EPA, 2017):

Upper Shades Creek (HUC 031502020301)

- Shades Creek
- Griffin Brook
- Watkins Brook
- Unnamed Drainages

Lower Shades Creek (HUC 031502020303)

- Black Creek
- Clear Branch
- Bob George Branch
- Rice Creek
- Allen Brook
- Rocky Brook
- Unnamed Drainages

Cooley Creek/Mud Creek (HUC 031502020302)

- Mud Creek
- Cooley Creek
- Mill Creek
- Unnamed Drainages

ADEM is responsible for the implementation of the Section 303(d) program in Alabama (ADEM, 2017a). To date, four waterbody identification units (WBIDs) in the Shades Creek Watershed have been identified as impaired for different parameter classes, and four have approved TMDLs. **Table 4.3** provides a status summary of the 303(d) listed WBIDs in the Shades Creek Watershed (EPA, 2003a; 2003b).

Table 4.3: Relative water quality summary assessment of the Shades Creek Watershed

Water Body	Impairment	Regulatory Status
Cooley Creek	Pathogens (bacteria)	Approved TMDL (2003)
Mud Creek	Pathogens (bacteria)	Approved TMDL (2003)
Mill Creek	Pathogens (bacteria)	Approved TMDL (2003)
Shades Creek	Pathogens (bacteria); Siltation, Turbidity, and Habitat Alteration	Approved TMDL (2003)

ADEM is initially responsible for implementing waste load allocations (WLAs) for the municipal separate storm sewer system (MS4) area according to specific permit conditions. Responsibility for the incorporation of the approved WLAs within respective NPDES permits then falls on the MS4 permittees in watershed. Responsibility for the implementation of the MS4 requirements falls primarily on the owners of permits for the operation of MS4 permits. In this watershed that includes the counties (Jefferson, Shelby, Tuscaloosa) and municipalities (Bessemer, Birmingham, Homewood, Hoover, Irondale, Mountain Brook, and Vesatvia Hills) located within the watershed.

4.1.3 Stormwater Runoff

The surface water system within the Shades Creek Watershed has been affected by moderate urbanization and agricultural land. Upper Shades Creek and Lower Shades Creek Watersheds experience the most alterations of the watershed due to a greater area of urbanization. There is a more commercial and residential land use in that area, while Cooley-Mud Creek Watershed has some residential. Many have been channelized and concrete-lined, and those with natural channels often are eroded and carry heavy sediment loads. The area surrounding Birmingham has a hot, humid, subtropical climate with abundant rainfall. Average annual rainfall reaches about 50 to 55 inches depending on geographic region and average temperature ranges from 80 to 88 degrees Fahrenheit (°F) in the summer and 38 to 50°F in the winter. Precipitation typically comes in the form of thunderstorms and intense showers (NOAA). All of these conditions create the potential for stormwater runoff to be a major issue within the Shades Creek watershed.

4.0 WATERSHED CONDITIONS

Extensive impervious surfaces create flashy hydrographs with rapid rise and fall of surface water discharge and velocity due to runoff. As documented in Chapter 3, Shades Creek Watershed contains a large percentage of urban developed land use. General land use categories indicate that impervious surfaces are greatest in the Upper Shades Creek sub watershed with the least impervious surfaces in the Cooley-Mud Creek sub watershed. Due to the watershed crossing multiple jurisdictions with varying level of GIS data, impervious surface data is inconsistent. A detailed analysis of the impervious surface data would be beneficial to future watershed planning and identification of critical areas for storwater runoff BMP's.

Stormwater runoff is greatest in developed areas with impervious surfaces. Developed areas are primary sources of trash, nutrients, sediment, and introduced chemicals. Agricultural land contributes pathogens, nutrients, and other pollutants. Maps of land use and land cover (LULC) within the Shades Creek Watershed were created using the GIS database (**Chapter 3**). Urbanized lands with impervious surfaces are critical areas where control and mitigation of runoff should be addressed.

There are over 480 known stormwater outfalls in the Shades Creek Watershed. These outfalls convey stormwater runoff from streets and parking lots to surface water drainages. This runoff can carry petroleum-related substances, trash, metals, and other pollutants to the surface water drainages in the Shades Creek and eventually into the Cahaba River. Illicit discharges are defined as unpermitted and unregulated outflows that place pollutants into the surface water system. Illocit discharges are reported within each communities Municipal Storm Water Permit.

4.2 WATER QUALITY DATA

Characterization of a waterbody's existing water quality is divided into other general classes of water quality parameters including:

1. Physiochemical parameters – measures of the general physical and chemical properties of a waterbody related to water column mixing, density stratification, and light transmittance in estuaries, including:
   - Temperature
   - Salinity

2. Geochemical parameters – measures of geological inputs into a waterbody that affect water clarity and sedimentation, including:
   - Total suspended solids (TSS)
   - Total Dissolved Solids (TDS)
   - Turbidity
   - Specific conductance
   - pH

3. Trophic parameters – measures of primary production (e.g., algal and macrophytic photosynthesis), related processes (e.g., respiration), and drivers (nutrients) in a waterbody, including:
    - Dissolved oxygen (DO)
    - Chlorophyll-a
    - Nitrogen – both total and inorganic
    - Phosphorus - both total and inorganic

4. Pathogens – bacterial constituents that are used as indicators to detect and estimate the level of fecal contamination in water, including:
    - Fecal coliform
    - *E. coli*

5. Contaminants – chemical constituents that are potentially toxic to aquatic organisms and humans, including:
    - Heavy metals
    - Organics

While there is some overlap in the classes of water quality parameters listed above, they are individual measures and/or indicators for different characteristics. The cumulative assessment of these parameters can be used to determine the overall water quality of a particular waterbody with regard to its designated uses.

4.2.1 ADEM Water Qulaity Monitoring Data

COOLEY CREEK-MUD CREEK ADEM WATER QUALITY DATA

The Cooley Creek-Mud Creek Watershed encompasses approximately 72.4 square km with approximately 240,267 feet (or 44.5 miles) of surface water drainages (USGS, 2017). From the western and northern boundaries of the Cooley Creek-Mud Creek Watershed to the confluence with Shades Creek, relief within the study area is approximately 230 feet. The majority of that relief occurs within Tannehill State Park around Red Mountain. Mud Creek runs until elevation of around 400 feet where it merges with Shades Creek (ESRI, 2019).

Water quality sampling stations in the Cooley Creek-Mud Creek Watershed are shown in **Figure 4.1**. In terms of spatial coverage, the Watershed has been consistently sampled by ADEM. The data encompass a period of record from 1996 to 2014.

4.0 WATERSHED CONDITIONS

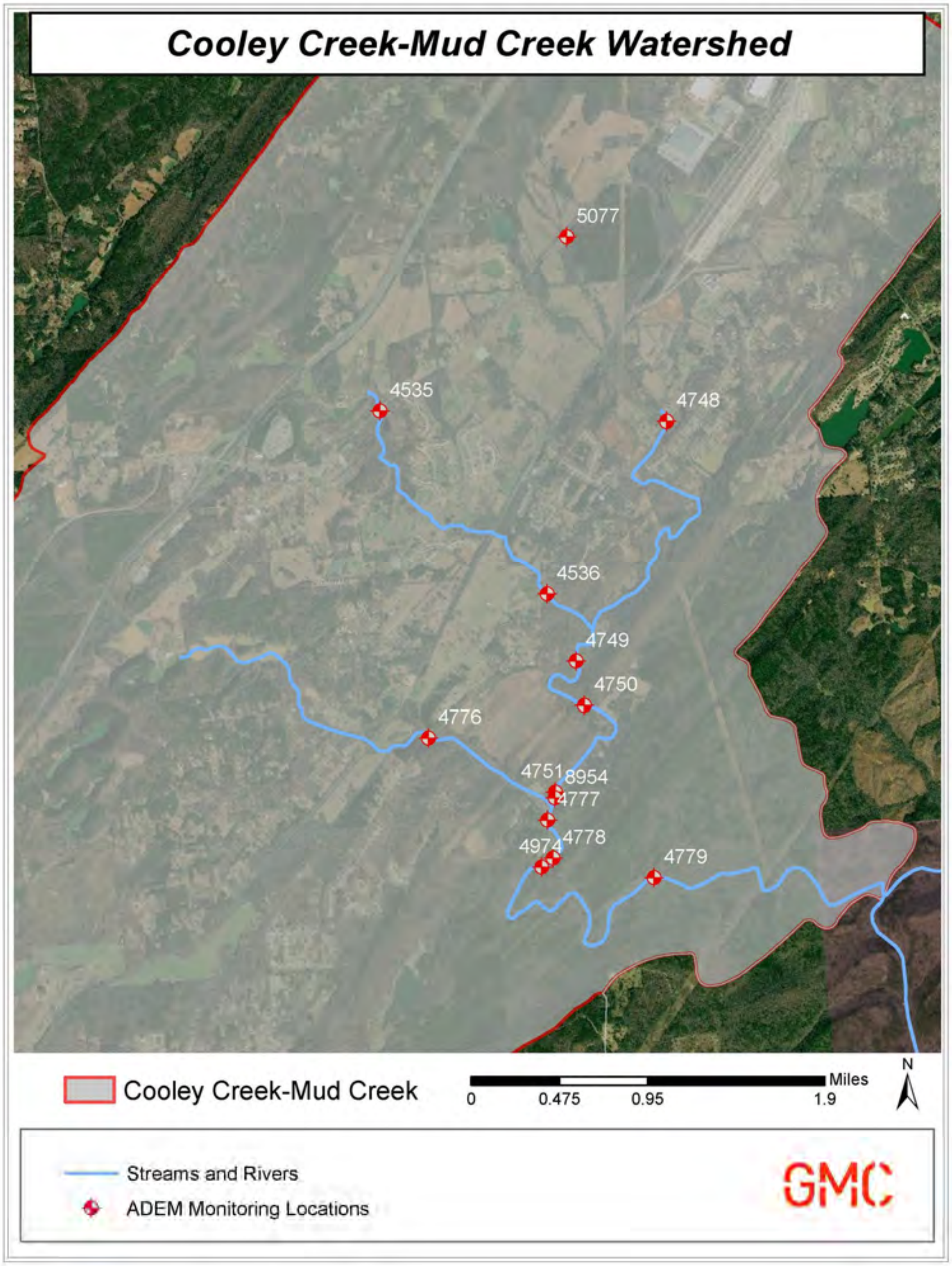


Figure 4.1: Water quality sampling stations in the Cooley Creek-Mud Creek Watershed

<u>Dissolved Oxygen</u> **–** Dissolved oxygen (DO) is necessary for the healthy respiration of all aquatic organisms. DO concentration in streams fluctuates naturally as a result of many factors including water temperature, sunlight intensity and duration, plant growth, and stream flow characteristics such as turbulent versus laminar flow. Unnatural causes such as nutrient runoff can decrease DO concentrations due to algal growth. DO concentrations below regulatory criteria (5mg/L) are considered to be stressful to fish, shellfish and other benthic invertebrates (MPCA, 2019).

4.0 WATERSHED CONDITIONS

Figure 4.2 shows a time series plot of DO data from each creek within the Watershed; Cooley, Mud, and Mill Creek. Minimum DO criteria for freshwater designation is 5mg/L (ADEM, 2017b). This plot shows that dissolved oxygen concentrations have not violated the regulatory criteria, and that the concentration appears to have increased since 1996. These monitoring stations were the only three found within the Cooley Creek-Mud Creek Watershed that had data from both 1996 and 2014. It can be assumed that these provide greater data representation over time.

Station 4751, located on Mill Creek immediately before is converges with Mud Creek, is below the required level of DO for all eight sampling events in August of 1996. The next upstream sampling site at 4750 experienced similar concentrations at the same time. Station 4974 had low concentrations for sampling events June 18th through 20th in 1996.

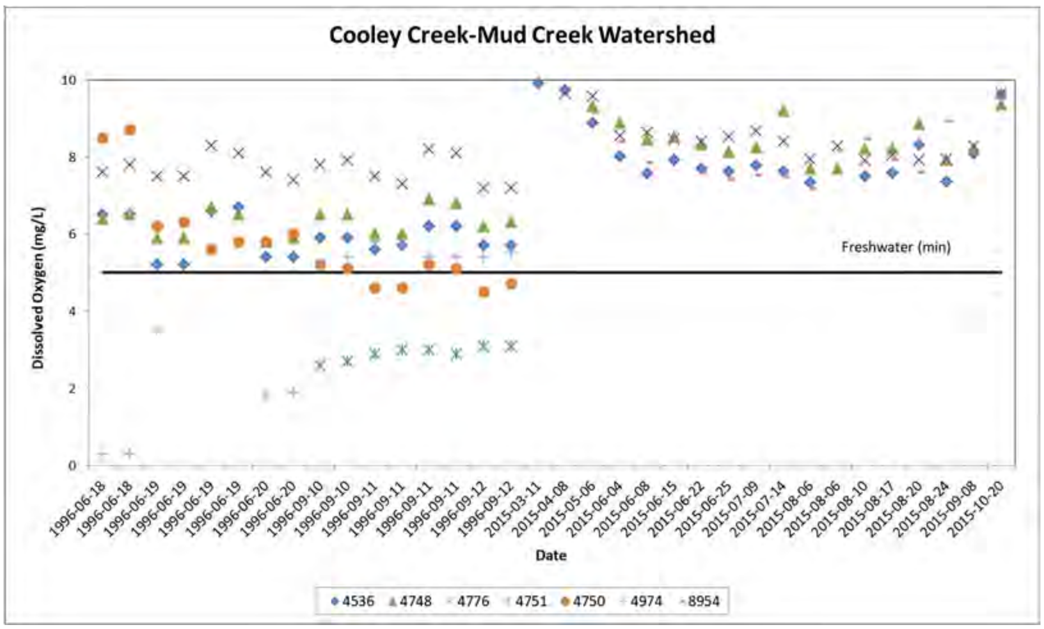


Figure 4.2: Composite time series of DO concentrations at ADEM data stations in Cooley Creek-Mud Creek Watershed

Nutrients **–** Nutrients enter surface waterbodies from a number of sources including: stormwater runoff from fertilized agricultural fertilizers and manure; erosion of soils; septic systems; domestic wastewater discharges; and even pet waste. High concentrations of nitrogen and phosphorus can affect other parameters and make it difficult for aquatic species to survive.

Threshold values (good and poor) for evaluating concentrations of total nitrogen (TN) and total phosphorus (TP) in this WMP were established by referencing EPA standards that are specific to the Alabama subecoregion (EPA, 2000). Alabama does not have state-wide parameters.

Figures 4.3 and **4.4** show time series plots of TN and TP data, respectively, from multiple stations in the Cooley Creek-Mud Creek Watershed that are positioned on each of the three creeks, Cooley, Mud, and Mill. The most downstream station in the Watershed, 4779, after confluence of all creeks, is included on the graphs for comparison. The threshold criteria for TN include good (<0.58 mg/L) and poor (>0.58 mg/L), while the threshold criteria for TP include good (<0.02 mg/L) and poor (>0.02 mg/L).

Figure 4.3 shows TN concentrations at stations 4536, 4748, and 4776 reach far above the recommended levels in several sampling events. This occurs in both years 1996 and 2014. Site 4779 does not experience any elevated levels. **Figure 4.4** shows all TP concentrations measured in 1996 to be far greater than EPA standards. Data in 2015 substantially decrease and are much closer to accepted levels at all stations. In conclusion, these findings show that Cooley Creek-Mud Creek Watershed experienced elevated nitrogen and phosphorus. While nitrogen remains above standards from 1996 to 2015, phosphorus levels are low throughout the 2015 sampling year. Sampling stations with data only from June- September 1996 that are not included on the graphs have elevated levels of both nitrogen and phosphorus. High phosphorus is more common and correlates with high concentrations of bacteria.

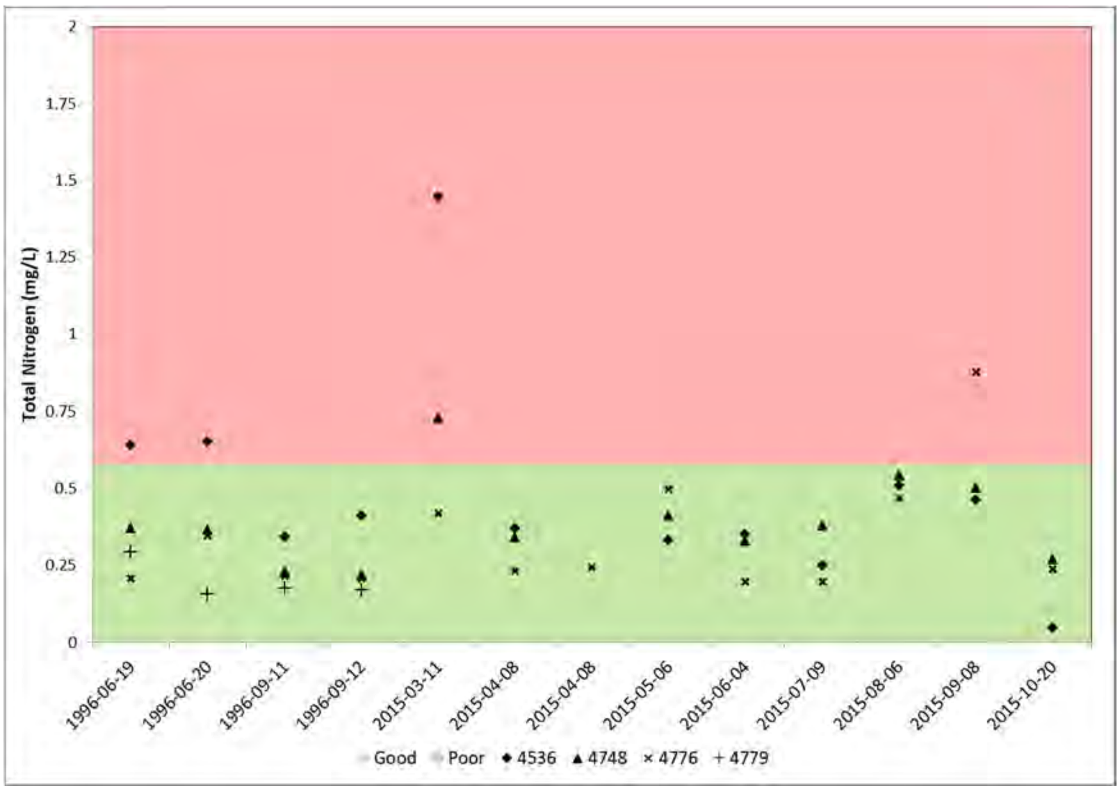


Figure 4.3: Composite time series of TN concentrations in the Cooley Creek-Mud Creek Watershed

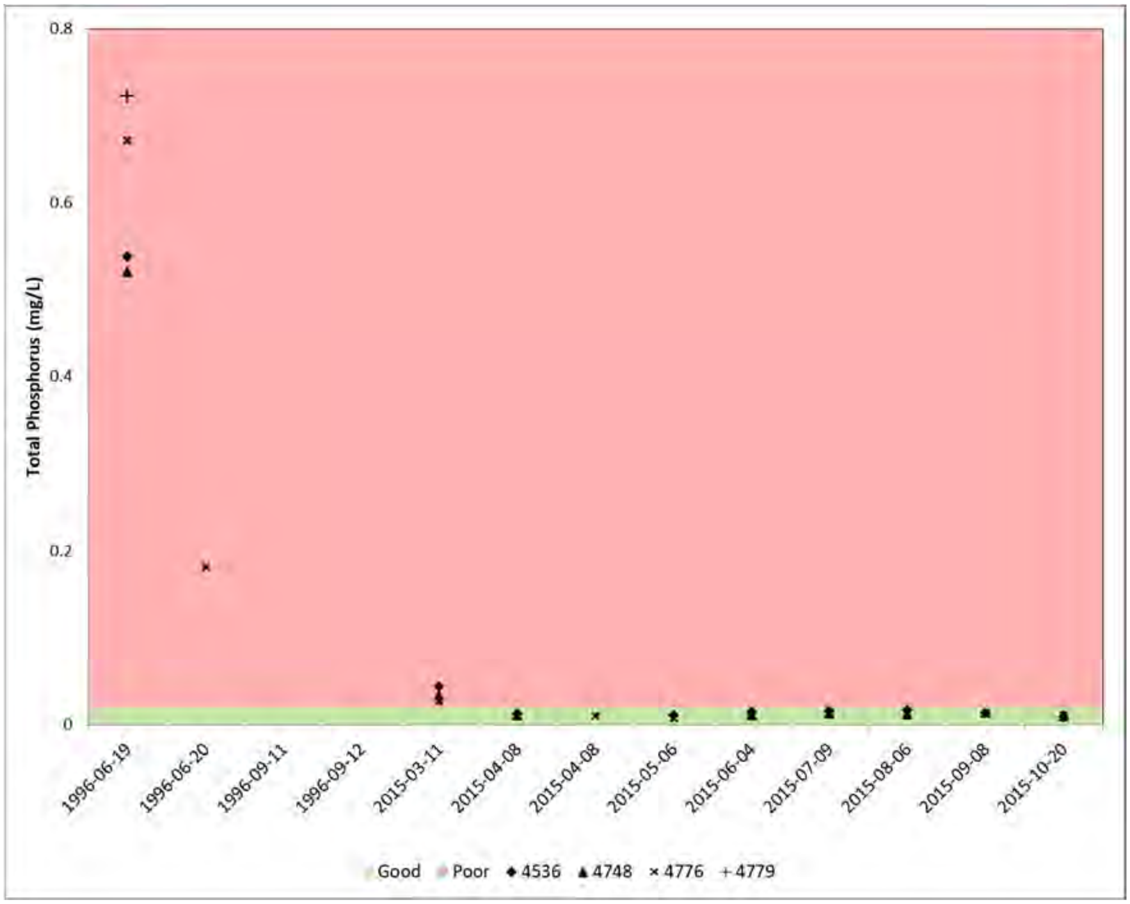


Figure 4.4: Composite time series of TP concentrations in the Cooley Creek- Mud Creek Watershed

Bacteria **–** All healthy surface waters contain a wide range of naturally-occurring bacteria. However, when bacterial concentrations become excessive and are dominated by bacterial indicator species, excessive organic enrichment and the presence of human pathogens, such as disease-causing bacteria and viruses, are possible. Sources of excessive and potentially harmful bacteria in surface waters include untreated domestic wastewater discharges from sanitary sewer overflows (SSOs) or septic tank seepage; animal waste from livestock farms, pets, and bird colonies; and even decaying grass clippings and other organic matter.

The Environmental Protection Agency (EPA) recommends *E.coli* as an indicator for fecal contamination from mammals versus previously monitored fecal coliform bacteria. One genus of fecal coliform, *Klebsiella*, comes from wood pulp and textile wastes (EPA, 2012). There is no known point source potential for any of these industries to discharge into the Shades Creek Watershed. It can be assumed that previously monitored fecal coliform is a good bacterial indicator.

4.0 WATERSHED CONDITIONS

Figure 4.5 shows a time series plot of fecal coliform bacteria concentration measured as a colony-forming unit (cfu) per 100mL of water at ADEM Stations. These stations are used because they are the only three ADEM Stations that have fecal coliform and *E. coli* data recorded from 1996 and 2014. Fecal Coliform limits in Figure 4.1.5 are referenced from a previous Code of Alabama Section 335-6-10-.09(5)(e)7 designated and desired uses categories for Fish and Wildlife that is stated in the TMDL report for fecal coliform in Shades Creek Watershed (EPA, 2003). Fecal coliform standards for Fish & Wildlife are less than 1000colonies/100mL in a geometric mean sample, and less than 200 colonies/100mL in a geometric mean sample in the months June-September when water contact and recreation might occur. There was no stated parameter for the designated use of Swimming and Other Whole Body Water-Contact Sports. Single sample limits were not used due to the fact that no data represented single sampling events.

Figure 4.5 shows that fecal coliform concentrations in 1996 frequently exceed the thresholds for Fish and Wildlife and water contact and recreation during June through September (labeled on the graph as Water Contact). Sampling time periods took place during summer months when water contact is more likely to occur. All but one other station that does not appear on the graph exceeds Water Contact maximum fecal coliform concentration during the June through September 1996 period.

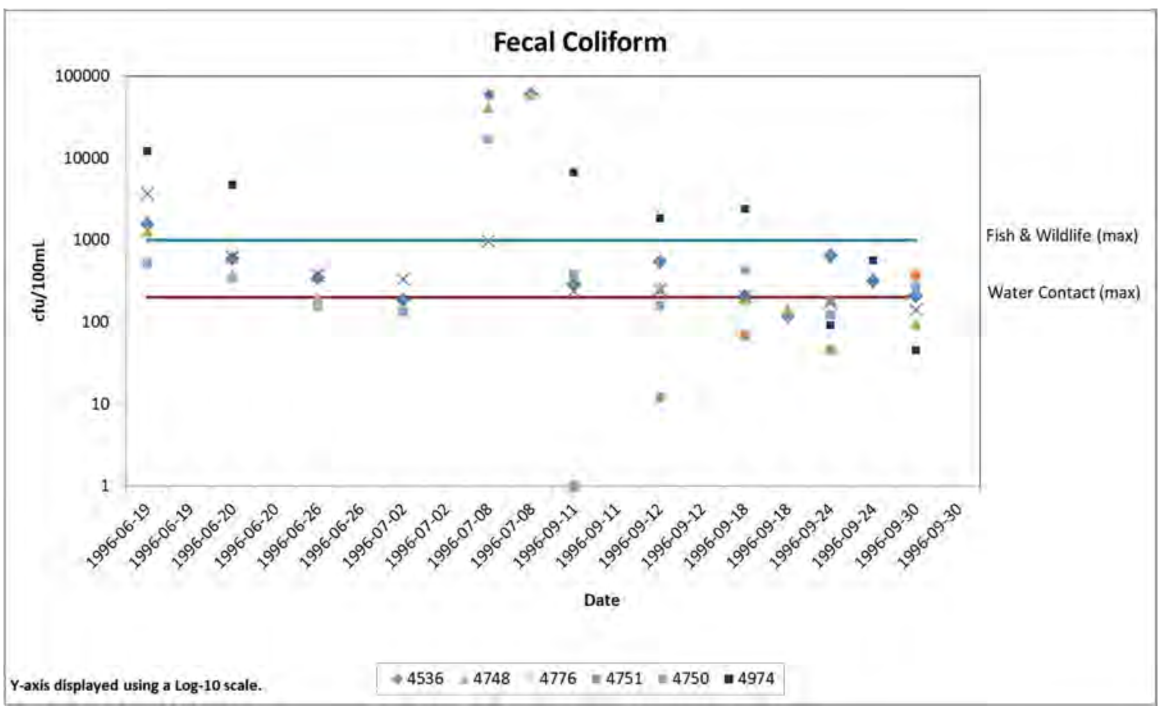


Figure 4.5: Composite time series of fecal coliform bacteria concentration for ADEM Stations in Cooley Creek-Mud Creek Watershed

Bacteria limits for *E. coli* are found in ADEM code 335-6-10 (ADEM, 2017b). The designations of Fish & Wildlife and Swimming & Other Whole Body Water-Contact Sports (S&WC) are displayed as 548 colonies/100mL in geometric mean and 126 colonies/100mL in geometric mean, respectively.

Figure 4.6 shows a time series plot of *E. coli* bacteria concentration measured as most probable number (MPN) at ADEM stations 4536, 4748, 4776, and 8954. The graph only has data from four stations in 2015 as these are the only stations that recorded *E. coli*. **Figure 4.6** displays that *E. coli* concentrations in 2015 are majority below standard levels. Several instances show samples that surpass S&WC levels. There is no clear trend of contamination increasing or decreasing.

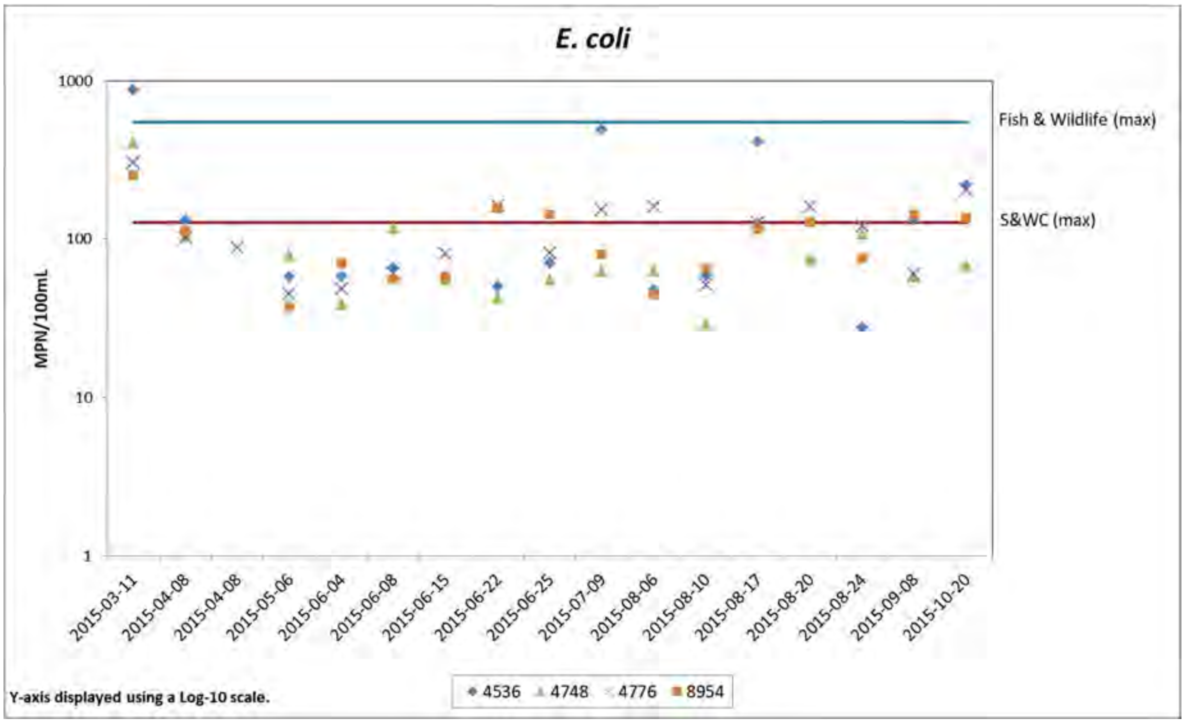


Figure 4.6: Composite time series of *E. coli* bacteria concentration for ADEM Stations 4536, 4748, 4776, and 8954 in Cooley Creek-Mud Creek Watershed

LOWER SHADES CREEK WATERSHED ADEM WATER QUALTY DATA

The Lower Shades Creek Watershed encompasses 69.5 square miles with approximately 602051 feet (or 114 miles) of surface water drainages (USGS, 2017). From the eastern and northern boundaries of the Watershed to the confluence with Cahaba River, the relief is approximately 420 feet. Lower Shades Creek runs through Shades Valley in between Red Mountain and Shades Mountain. Relief throughout the region is gradual from Little Shades Creek at the highest point to confluence with the Cahaba River at the lowest. The northeastern portion of this Watershed, north of Interstate 459, is an upland area that exhibits 240 feet of elevation change. The more gradual topography of the lower half of the Watershed experiences approximately 180 feet of relief as Shades Creek reaches the Cahaba River (ESRI, 2019).

Water quality sampling stations in the Lower Shades Creek Watershed are shown in **Figure 4.7**. ADEM station 828 provides the most long-term data from the upper portion of Shades Creek with a period of record dating from 1991 to 2003. There is more recent data at other sampling locations that offer an idea of how the water quality changes over time.

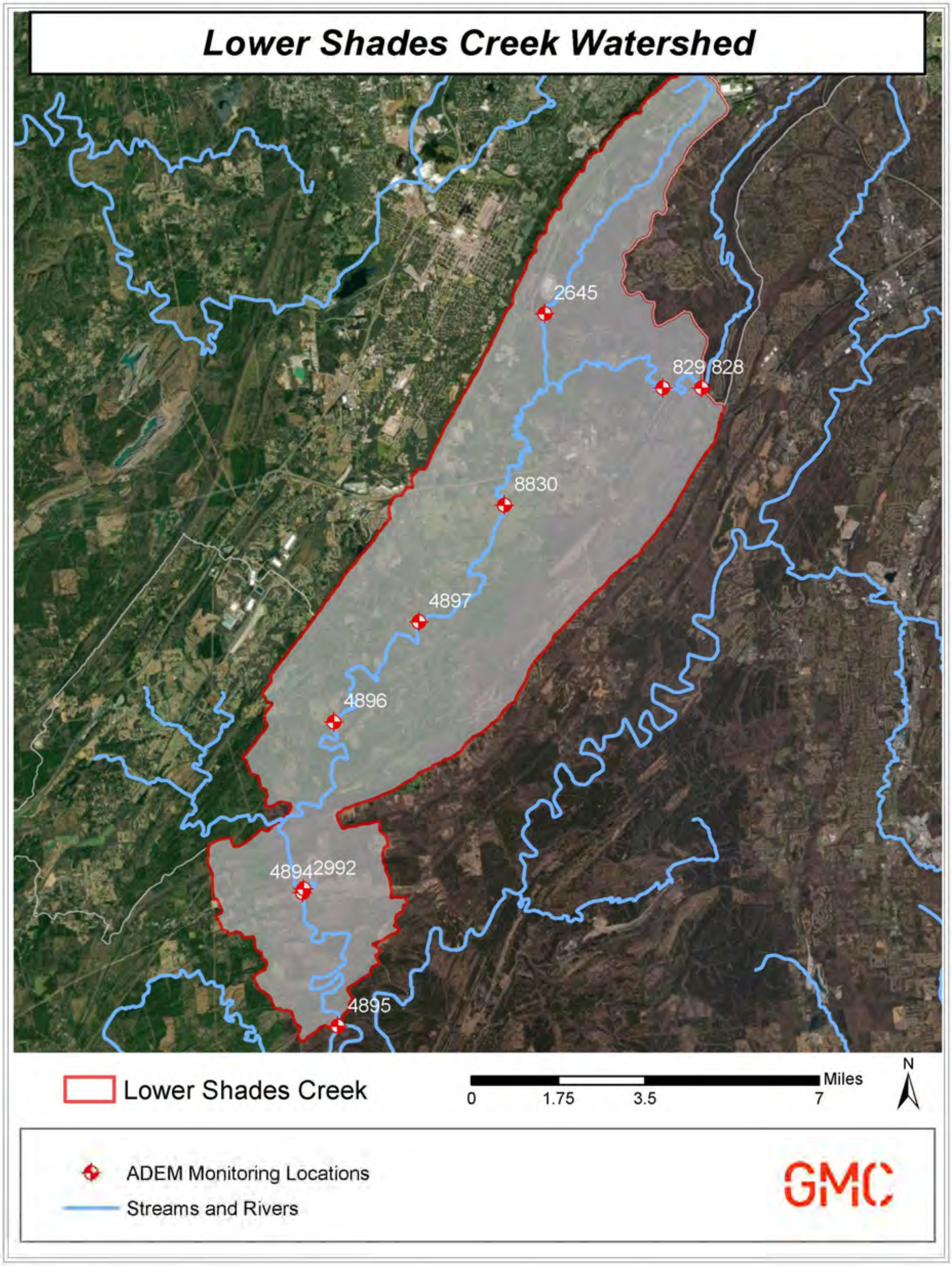


Figure 4.7: Water quality sampling stations in the Lower Shades Creek Watershed

4.0 WATERSHED CONDITIONS

Dissolved Oxygen **– Figure 4.8** gives a time series plot of DO data from multiple water quality stations in the Lower Shades Creek Watershed compared to ADEM's freshwater criteria thresholds for F&W and S&WC designated uses. **Figure 4.8** shows DO concentrations occassionally violating the regulatory criteria for freshwater, and shows violations have become much more frequent in the early 2000s. In 2018, station 2645 drops below recommended levels of DO.

The upper region of Lower Shades Creek Watershed, which includes headwaters of Little Shades Creek a portion of Shades Creek, experiences DO limit violations. The lower portion has no incidence of dipping below the threshold. It is possible that the increased urbanization in the upper region is contributing to the lower DO readings.

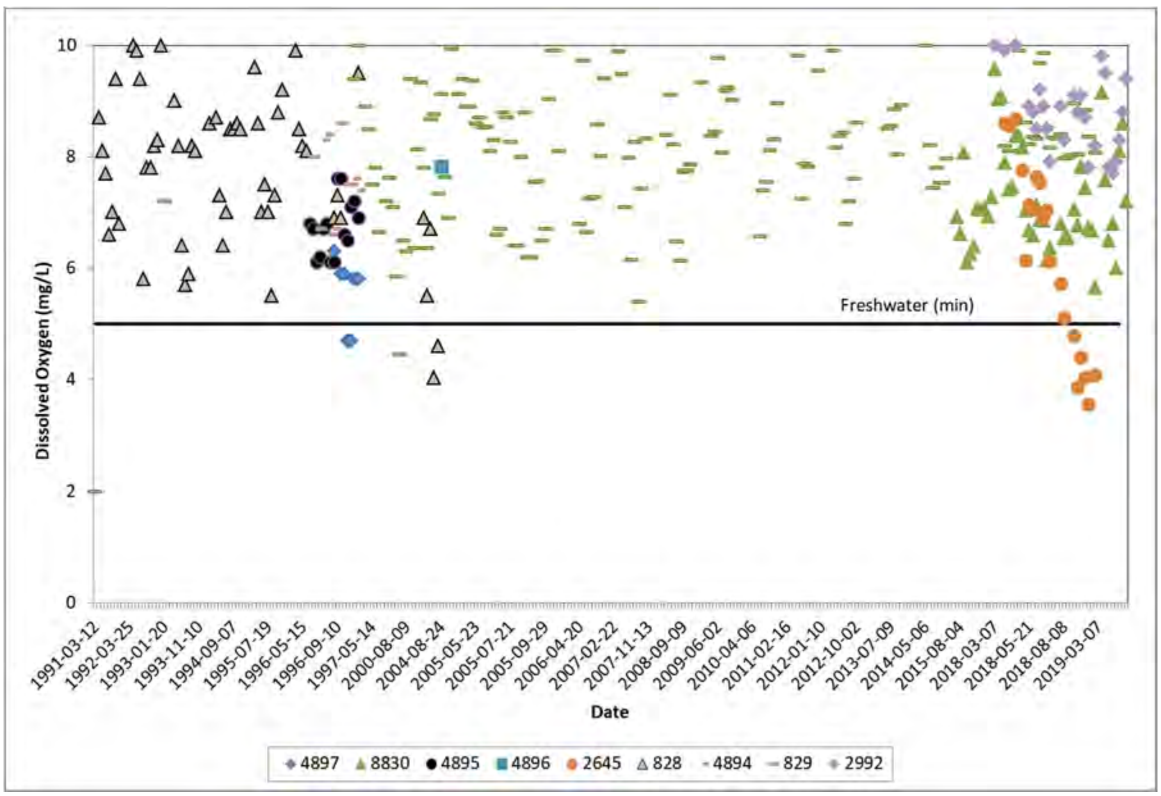


Figure 4.8: Composite time series of DO concentrations from multiple stations in the Lower Shades Creek Watershed

Nutrients **– Figures 4.9** and **4.10** display time series plots of TN and TP data, respectively, from multiple stations in Shades Creek and Little Shades Creek segments of the Lower Shades Creek Watershed. These plots show TN concentrations in Lower Shades Creek Watershed are majority in the poor range, while TP are virtually always in the poor range. These findings show that the lower portion of Shades Creek is nutrient enriched with particularly high phosphorus concentration relative to recommended limit and moderately high nitrogen.

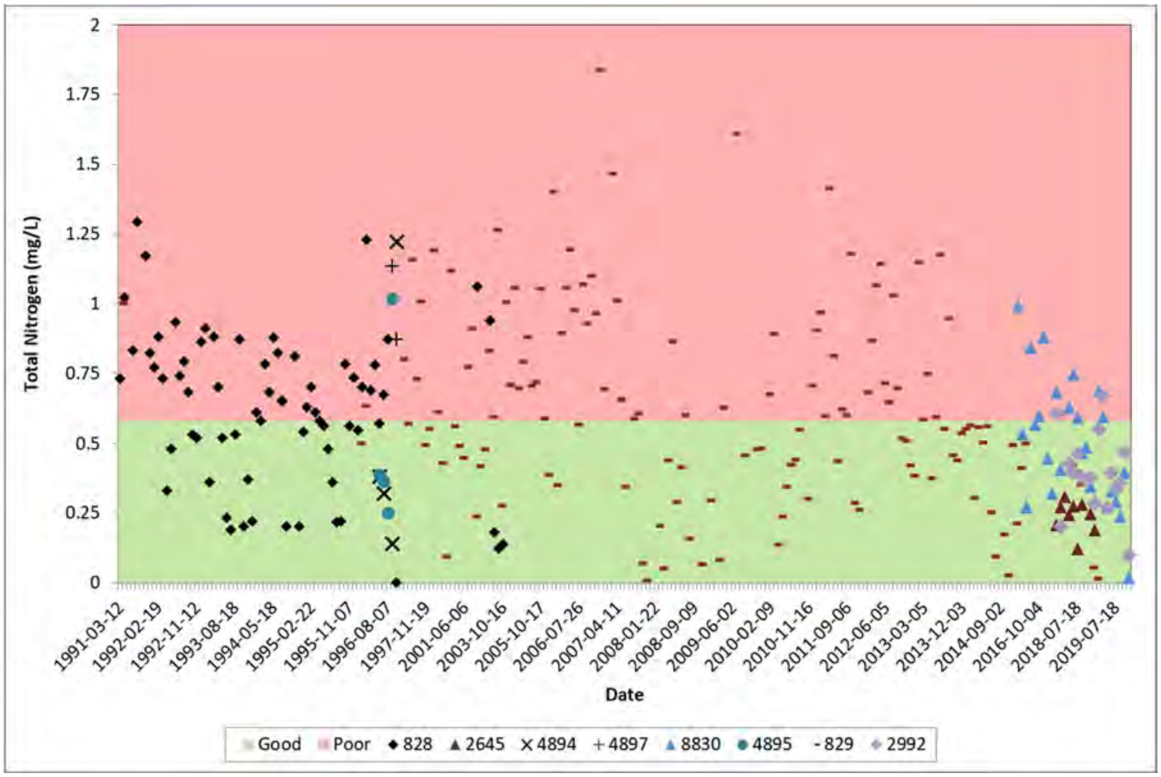


Figure 4.9: Composite time series of TN concentrations from multiple stations on Shades Creek and Little Shades Creek

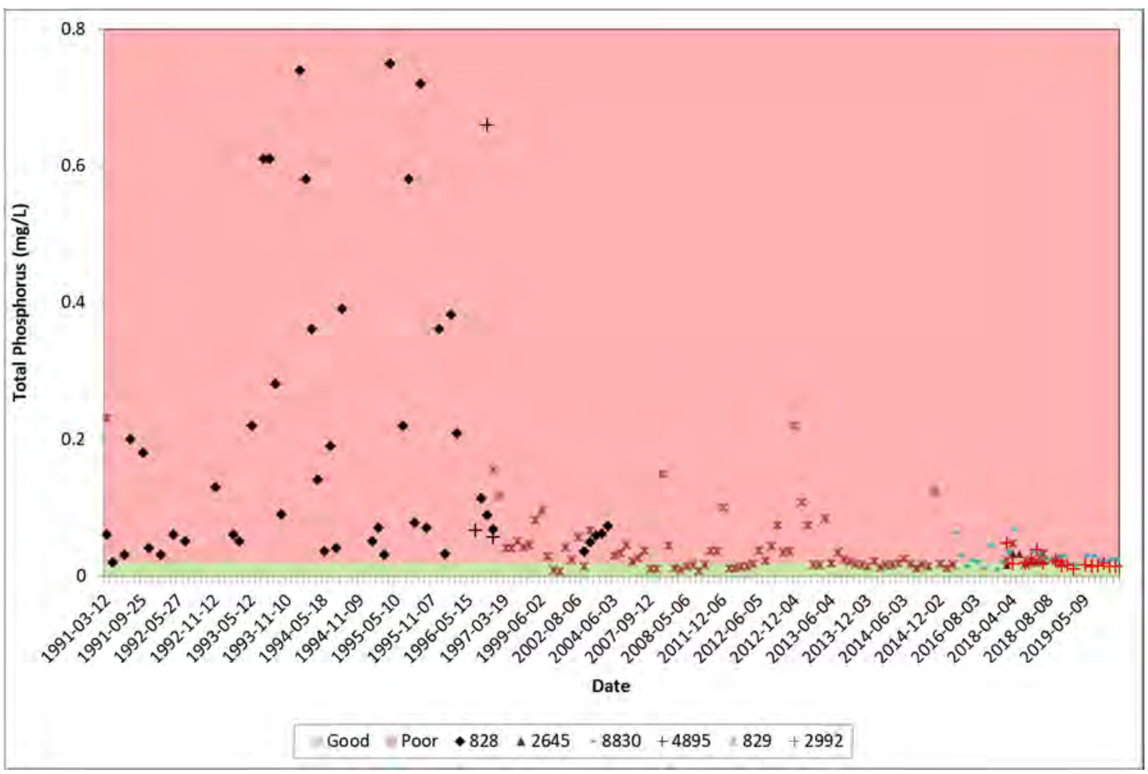


Figure 4.10: Time series of TP concentrations from multiple stations on Shades Creek & Little Shades Creek

Bacteria **– Figure 4.11** shows a time series plot of fecal coliform bacteria concentrations at multiple ADEM stations with applicable regulatory criteria indicated. **Figure 4.11** shows sampled bacteria concentrations at these locations within the Lower Shades Creek Watershed are frequently above both regulatory maximums, indicating generally unsafe swimming conditions and aquatic habitat. Consistent data at Site 828 from 1991 to 2003 shows that fecal coliform concentration in 2003 falls below recommended limits. Station 828 and 829, which are close in proximity on the creek, are the only stations that have fecal coliform data from 2003 to 2010. Station 829 frequently reaches above the maximum limit.

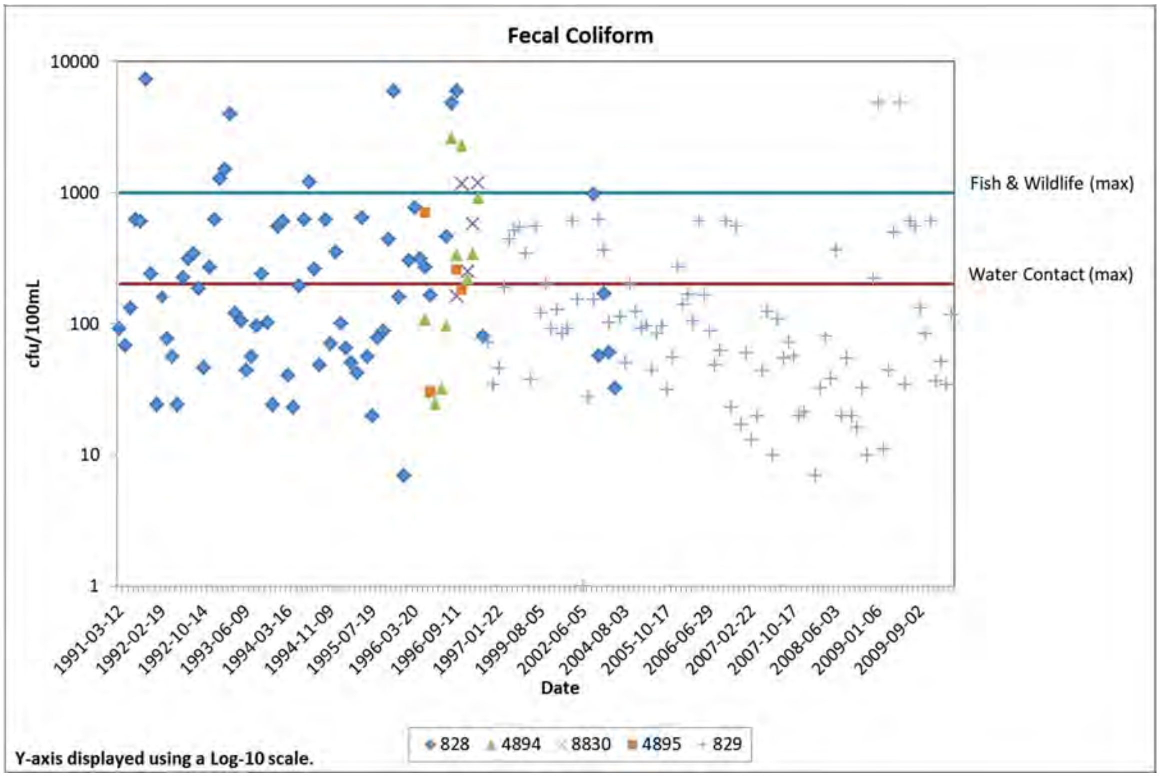


Figure 4.11: Composite time series of bacteria concentrations for multiple ADEM Stations on Shades Creek

A time series plot of bacteria concentrations measured as most probable number (MPN) at ADEM station 2645, located on Little Shades Creek, primary tributary to Shades Creek, stations 8830, 829, and 2992 on Shades Creek, are displayed in **Figure 4.12**. These stations are the only sites that have data on *E. coli*. This plot shows *E. coli* concentrations in the upper region of Lower Shades Creek Watershed frequently exceed regulatory standards. All sites show that E. coli concentrations do not have a specific trend, but they appear to surpass limits less frequently. This could be a result of better practices being implemented around the watershed.

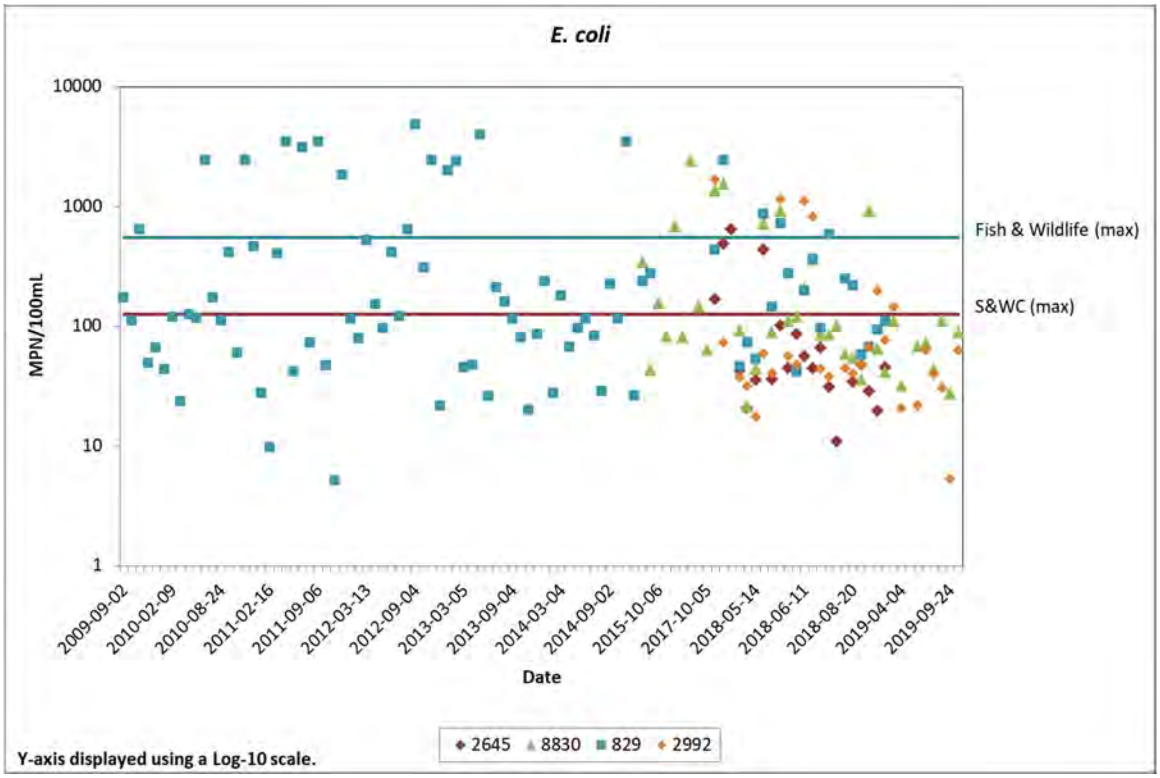


Figure 4.12: Composite time series of bacteria concentrations for ADEM Stations 2645 8830, 829, and 2992 located in Lower Shades Creek Watershed

UPPER SHADES CREEK ADEM WATER QUALITY DATA

The Upper Shades Creek Watershed encompasses approximately 41.2 square miles with approximately 262,765 feet (over 49.8 miles) of surface water drainages (USGS, 2017). The relief within the Watershed is approximately 220 feet. Gradual relief occurs as upper Shades Creek makes it way through the northeastern portion of Shades Valley. The Watershed is in a more densely populated area and runs adjacent to Birmingham (ESRI, 2019).

The Upper Shades Creek Watershed includes Shades Creek to its headwaters at the Birmingham Race Course. Sampling stations in this Watershed are shown in **Figure 4.13**. Only two ADEM stations are within this Watershed, and they both only include data from 2018.

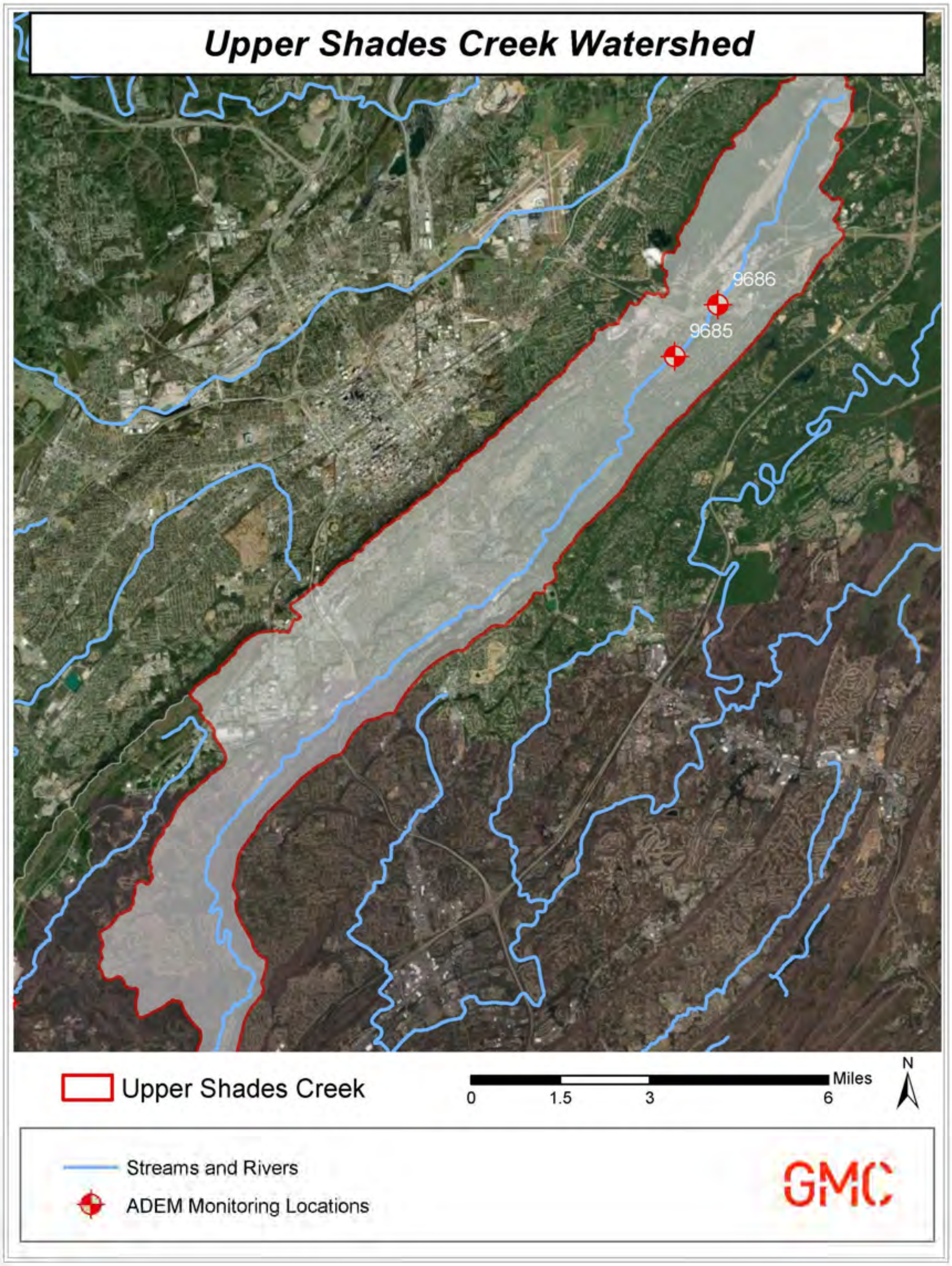


Figure 4.13: Water quality sampling stations in the Upper Shades Creek Watershed

Dissolved Oxygen **–** A plot of DO data from ADEM stations 9685 and 9686 with the freshwater criteria is shown on **Figure 4.14**. This plot reveals DO concentrations are always exceeding the regulatory minimum. The measured maximum DO concentrations have remained steady throughout 2018.

Similar trends in healthy oxygenated waters were observed in several of the tributaries to Shades Creek including Mud Creek, Mill Creek, and Cooley Creek. Three stations have infrequent DO recordings below 5mg/L, and one of those is Little Shades Creek for 2018. The lack of sampling stations in Upper Shades Creek makes it difficult to draw definitive conclusions on the DO. The only two ADEM sites are in the far northeastern region of Upper Shades Creek Watershed.

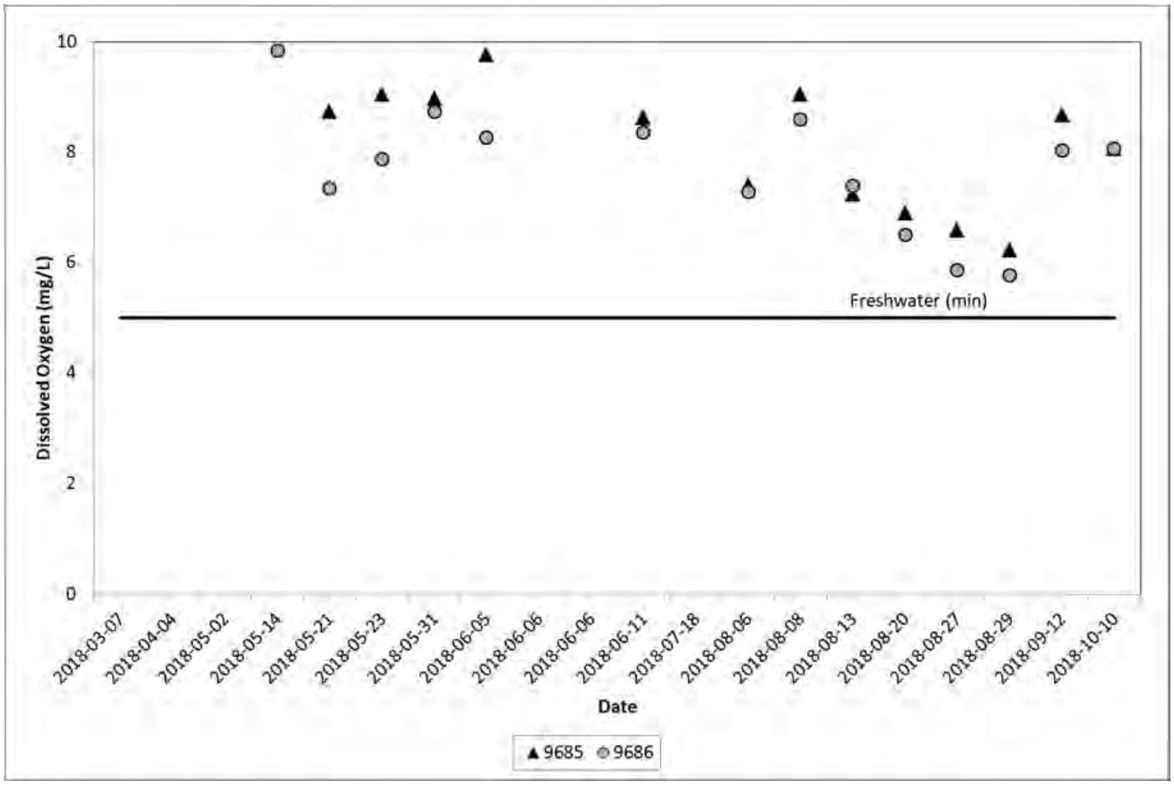


Figure 4.14: Composite time series of DO concentrations at ADEM Stations 9685 and 9686 in upper Shades Creek

Nutrients **– Figures 4.15 and 4.16** display time series plots of TN and TP data, respectively, from multiple stations in the Upper Shades Creek Watershed. These plots show that TN and TP concentrations are majority in the good range. There are no significant trends in either TN or TP. There are just a few incidences where nutrient levels are too high but it is not consistent enough to cause algae blooms.

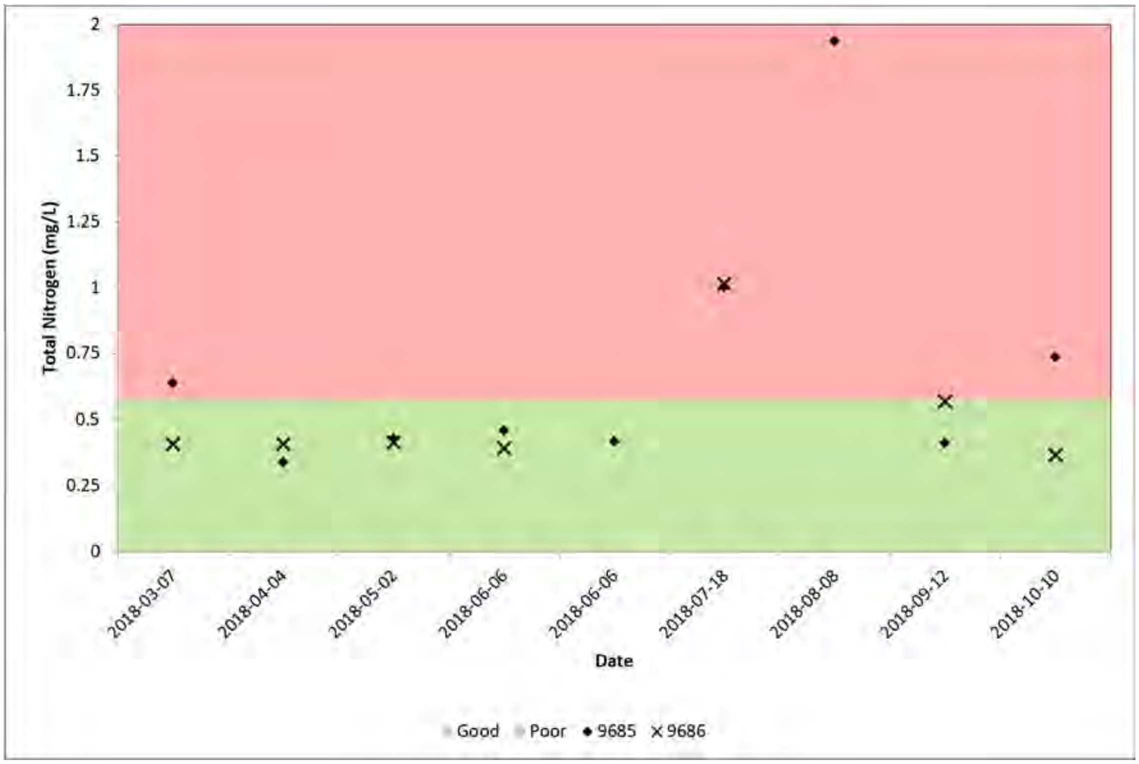


Figure 4.15: Composite time series of TN concentrations from two stations in upper Shades Creek

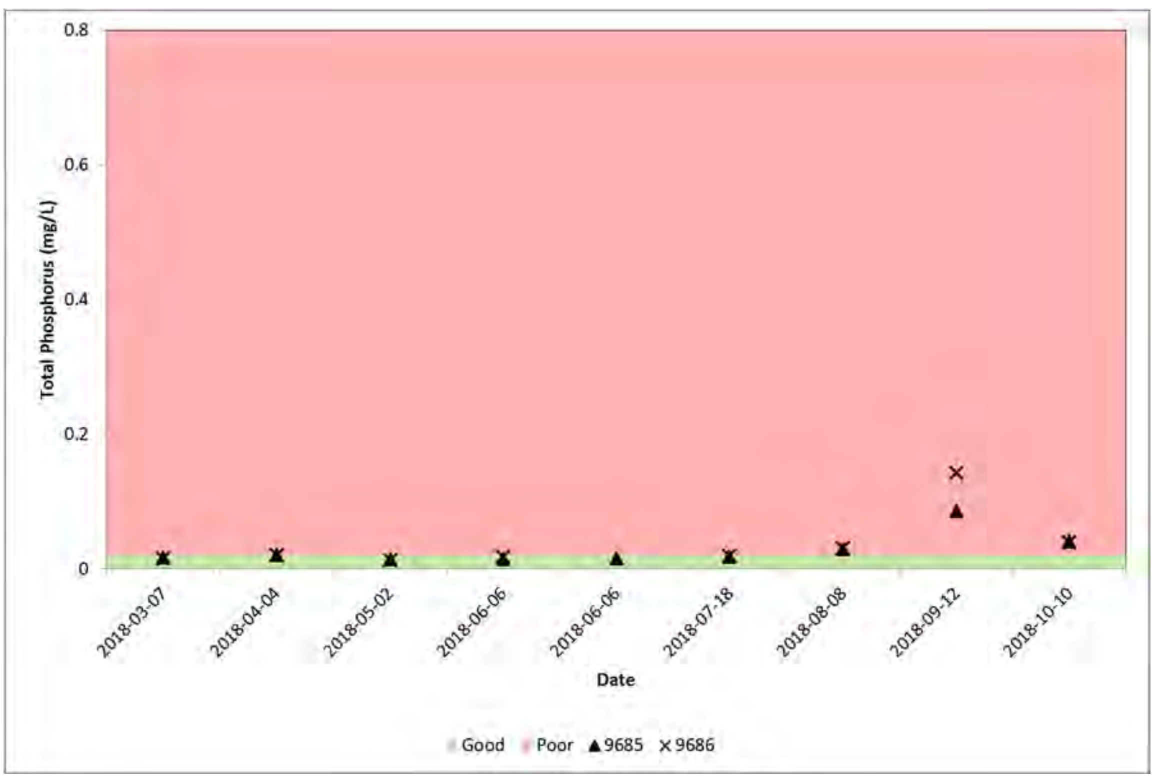


Figure 4.16: Composite time series of TP concentrations from two stations in upper Shades Creek

Bacteria **–** Upper Shades Creek Watershed did not have any data on fecal coliform bacteria at either station. Concentrations of bacteria measured as most probable number (MPN) of *E. coli* cells are shown in **Figure 4.17** for ADEM Stations 9685 and 9686 along with the applicable regulatory criteria. This time series plot reveals that bacteria concentrations are almost always above both maximums. *E. coli* concentrations appear to fluctuate during 2018 with no clear trend.

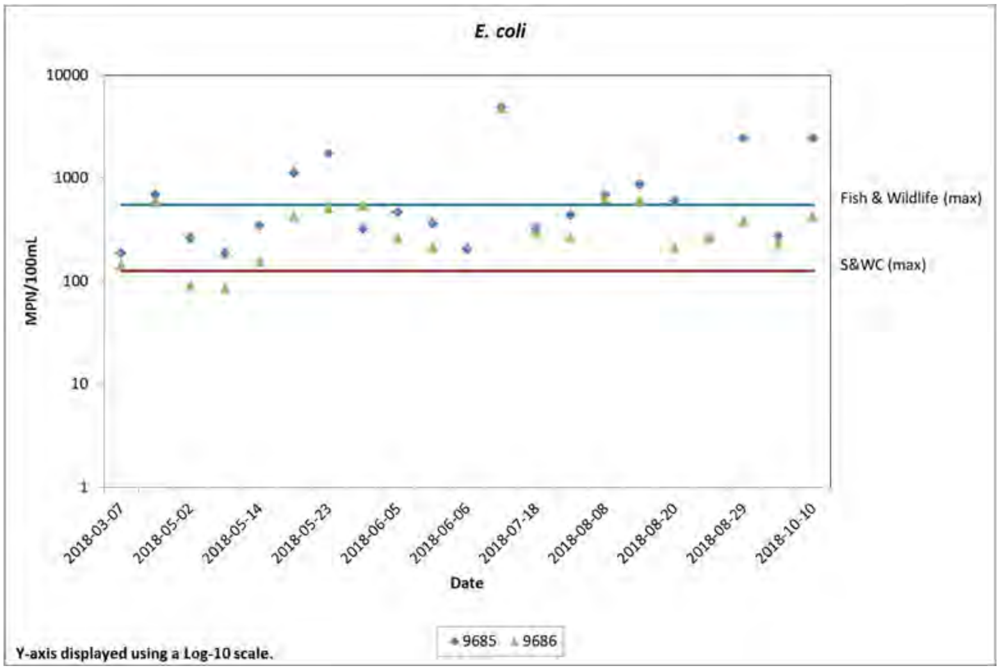


Figure 4.17: Time series of bacteria concentrations for ADEM Stations 9685 and 9686 in upper Shades Creek

A. **METALS AND ORGANICS IN SHADES CREEK WATERSHED** – ADEM has analyzed surface water samples from the Shades Creek Watershed for several common heavy metals including: arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc. However, the data for these parameters are very sparse. The data that are available generally indicate that metals concentrations in Shades Creek surface waters are frequently below detection levels and generally well below established EPA chronic and acute threshold levels. Three stations in the upper portion of Lower Shades Creek Watershed, 8830, 829, and 828, experience multiple heavy metal readings. There are insufficient data in the available ambient surface water datasets to assess organic contaminants in the Shades Creek Watershed.

B. **SEDIMENT IN SHADES CREEK WATERSHED** – Suspended sediment is defined as that portion of a water sample that can be separated from the water by filtering. This solid material may be composed of organic and inorganic particles such as algae; industrial and municipal wastes; urban and agricultural nonpoint source pollutants carried by runoff; and sand, silt, and eroded material from geologic formations. Large amounts or rain and fast flow can pick up sediment and wash it into the surface water. Fine particles suspended in the water deposit as silt and fill up lakes and streams where it can decrease the oxygen levels in water and harms the habitats for aquatic organisms (USGS). Many different things cause this such as unnatural stream bank erosion.

In **Figure 4.18**, the maximum level of NTU for a stream that supports Fish and Wildlife (F & W) is 50 NTU above background, as stated by ADEM (ADEM, 2017b). In 2003, Shades Creek was listed as impaired for support of F & W due to turbidity, siltation, and habitat alteration (EPA, 2003b). All sampling stations along Shades Creek within Lower Shades Creek and Upper Shades Creek Watershed are displayed on the graph to show turbidity levels from 1991 to 2018. There is a gap in data from 1997 to 2015 where only one site has data. There is no clear trend overtime. Since 2010, levels are exceeding the limits on multiple occasions at numerous sites.

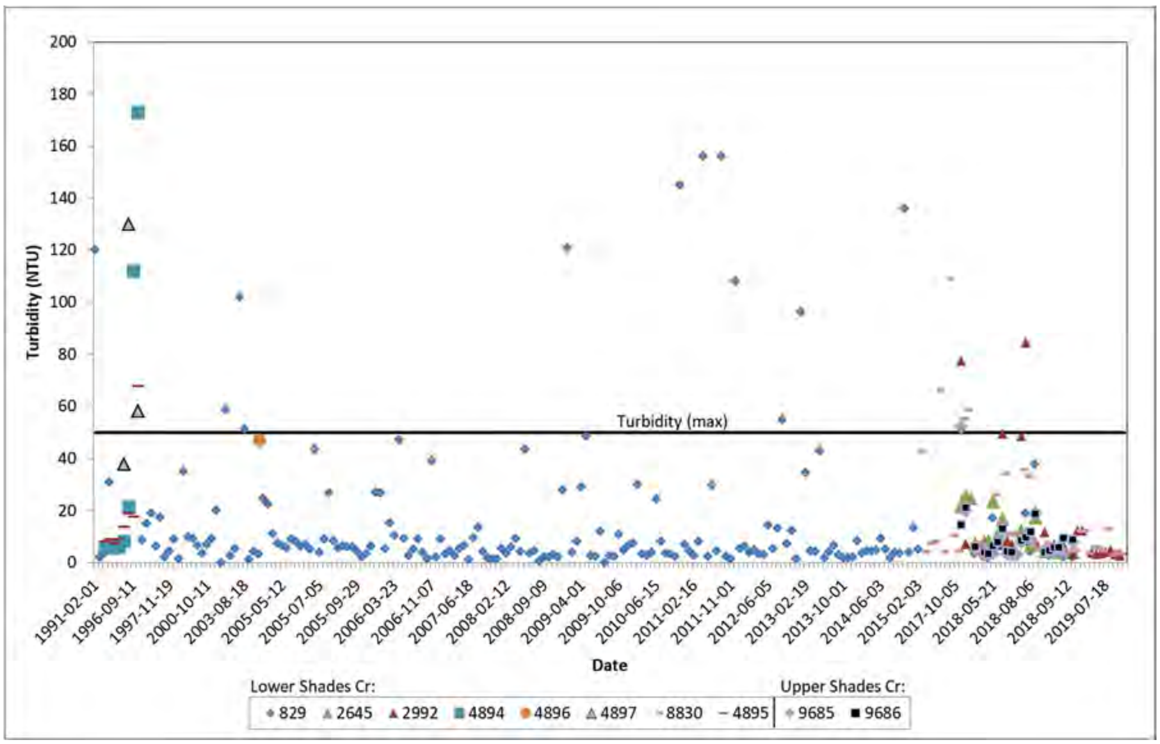


Figure 4.18: ADEM monitoring site locations in Upper and Lower Shades Creek Watersheds

The TMDL report for Shades Creek siltation included a study that found the average annual suspended sediment yield on Shades Creek. Using data from USGS and Stormwater Management Authority, Inc. (SWMA), the annual suspended sediment yield for Shades Creek was calculated as 52.6 T/y/km^2 whereas the "reference" for the Ridge and Valley median annual suspended sediment yield is 24.7 T/y/km^2 (EPA, 2003b). These findings reflect the impacts of intense urbanization on stream dynamics, erosion, and sediment loads. Most of the erosion in developed watersheds is caused by human activities. Upper Shades Creek Watershed is the most impacted within the Shades Creek Watershed by urban development and anthropogenic sources. Lower Shades Creek has also experienced development from agriculture. Different types of BMPs should be established where the siltation impact is higher.

4.2.2 Jefferson County Department of Health Water Quality Data

The Jefferson County Department of Health (JCDH) completed additional water quality sampling in Upper Shades Creek Watershed and sent it to GMC after the first steering committee meeting. Data all began around November 2010 and went into May 2019. This additional sampling data helps to provide a better representation of the condition of the Upper Shades Creek Watershed. **Figure 4.19** displays where monitoring stations occur in the watershed.

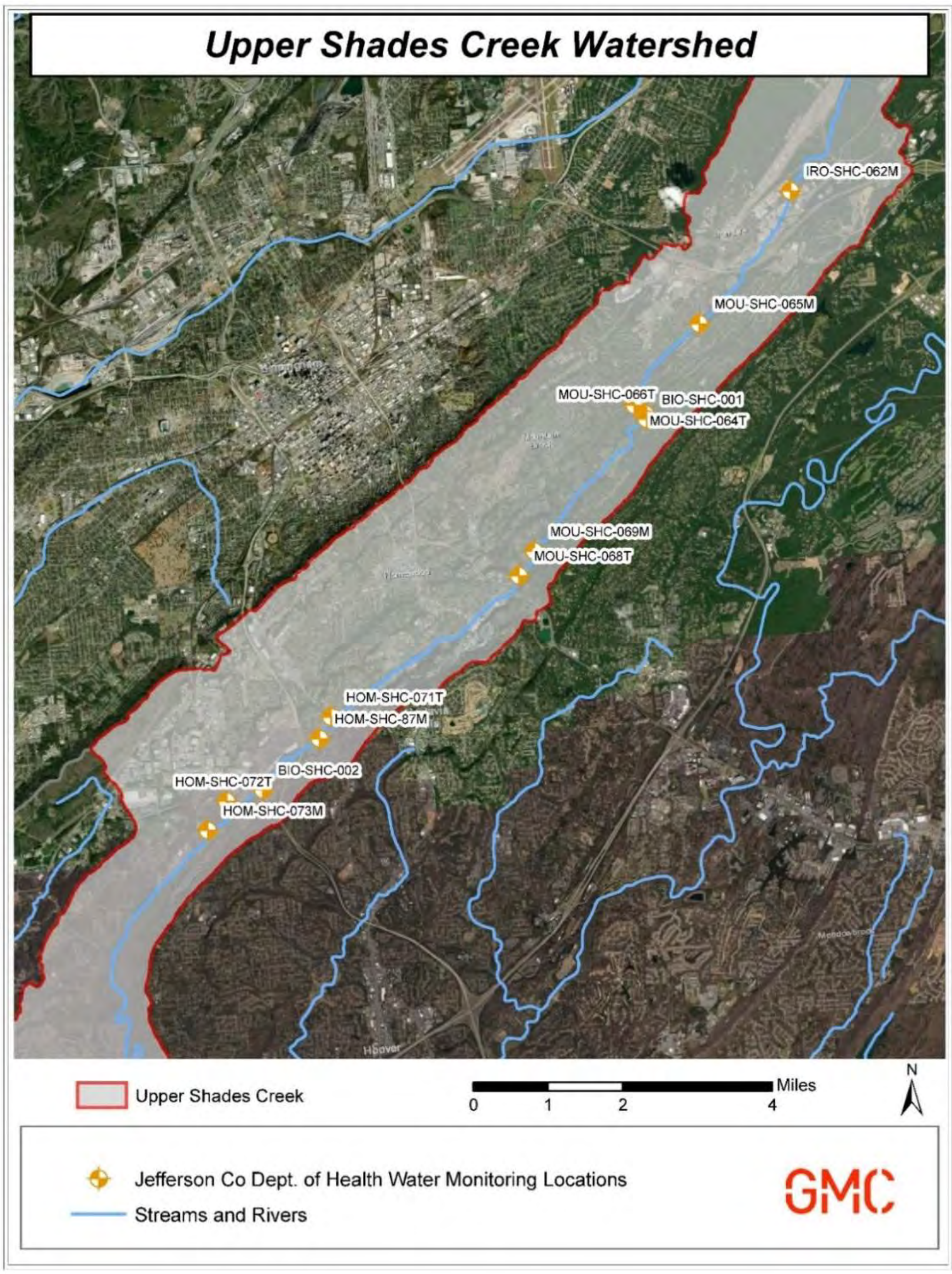


Figure 4.19 Additional water quality sampling stations in the Upper Shades Creek Watershed

Dissolved Oxygen **-** A plot of DO data from JCDH with the freshwater criteria is shown on **Figure 4.20**. This plot reveals DO concentrations are majority above the regulatory minimum of 5 mg/L. The measured maximum DO concentrations have remained steady throughout the sampling period. This data indicates that the DO levels are high enough to sustain aquatic wildlife within the watershed.

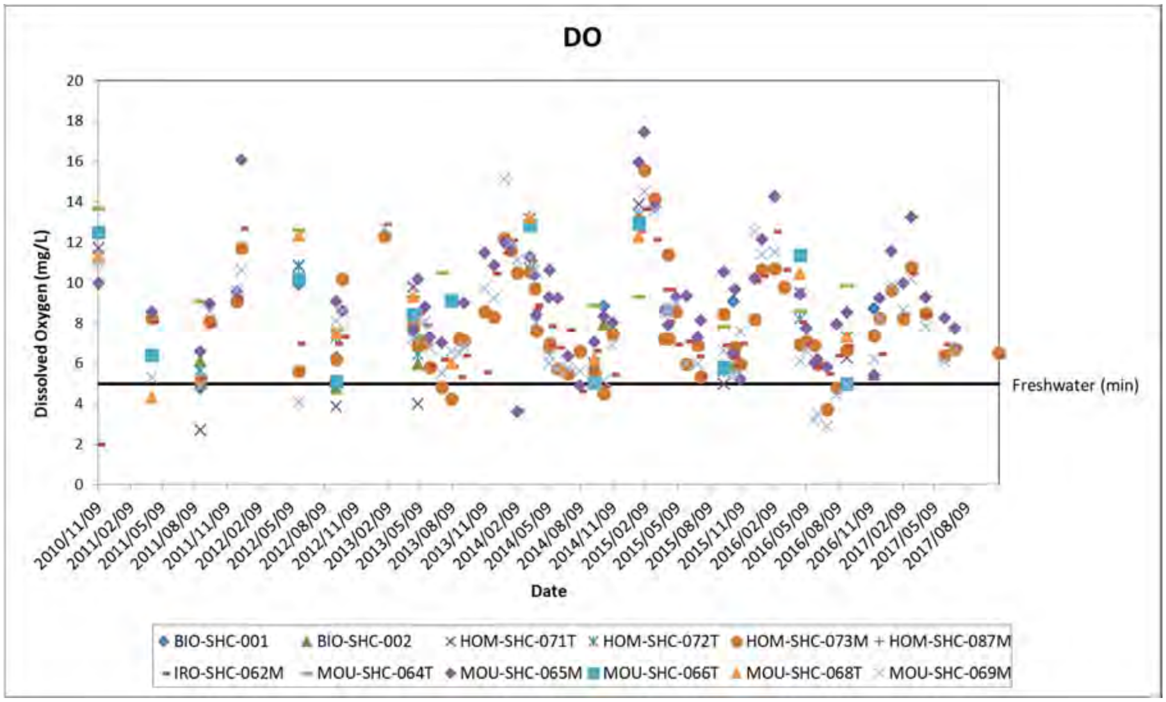


Figure 4.20: Composite time series of DO concentrations at JCDH stations in Upper Shades Creek

Bacteria **– Figure 4.21** shows a time series plot of fecal coliform bacteria concentrations at multiple JCDH stations with applicable regulatory criteria indicated. Both wet and dry samples were collected historically with only wet samples being collected in the last five years. Sampled bacteria concentrations at these locations within the Upper Shades Creek Watershed are frequently below both regulatory maximums, indicating generally safe swimming conditions and aquatic habitat. Occassional data from multiple sites shows that fecal coliform concentration reaches above recommended limits during the summer months of June through September when water contact is more likely to occur.

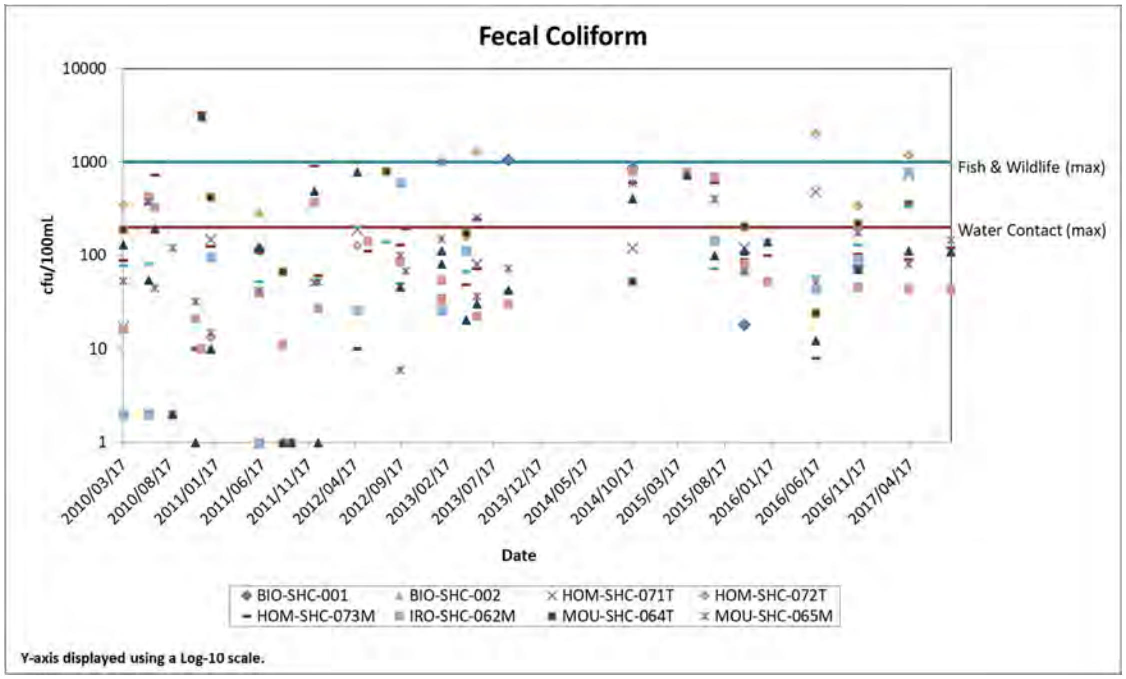


Figure 4.21 Composite time series of fecal concentrations at JCDH stations in Upper Shades Creek

A time series plot of bacteria concentrations measured as most probable number (MPN) at JCHD stations located along Upper Shades Creek are displayed in **Figure 4.22**. This plot shows *E. coli* concentrations in the upper watershed occasionally exceed both regulatory standards. All sites show that *E. coli* concentrations do not have a specific trend over time, but they appear to surpass limits less frequently.

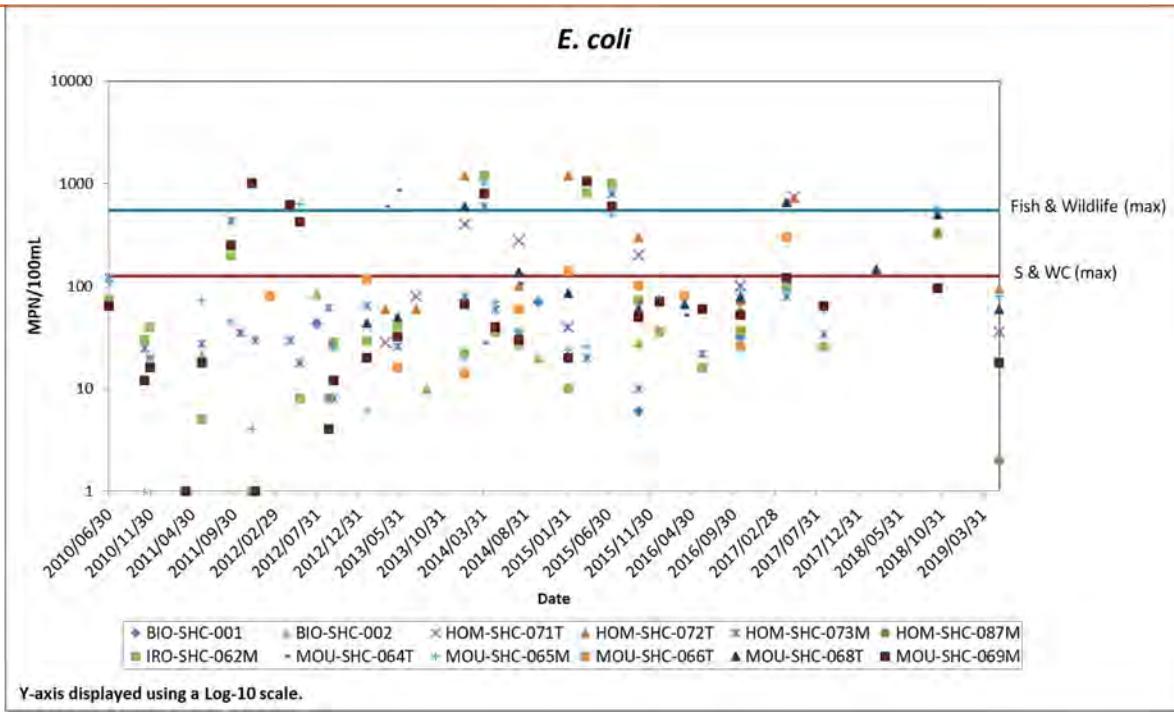


Figure 4.22: Composite time series of *E. coli* concentrations for JCDH Stations in Upper Shades Creek

4.3 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMITS

4.3.1 Municipal Separate Storm Sewer System (MS4)

Under the 1987 Clean Water Act Amendments, the U.S. Environmental Protection Agency (EPA) developed regulations to address stormwater impacts to water quality. These regulations were set up in a phased approach under the National Polluted Discharge Elimination System (NPDES) permitting program commonly termed as a Municipal Separate Storm Sewer System (MS4) permit. In Alabama, the Alabama Department of Environmental Management (ADEM) enforces the NPDES MS4 permitting program. Phase I was issued in 1990 and dealt with MS4 permits for cities with a population of greater than 100,000 people. Phase II was issued in 1999 to include smaller urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges. In addition to Jefferson County, Shelby County, and Tuscaloosa County (unincorporated areas), the cities of Bessemer, Birmingham, Homewood, Hoover, Irondale, Mountain Brook, and Vestavia Hills are all covered under a Phase I or Phase II MS4 permit.

The intent of the MS4I regulations is to reduce the adverse impacts to water quality and aquatic habitat by the development of a stormwater management program, instituting the use of controls and measurable goals. The following stormwater related minimum control measures are generally included in the MS4 permitting requirements:

- Structural Controls
- Public Education and Outreach
- Public Participation / Involvement
- Illicit Discharge Detection and Elimination (IDDE)
- Construction Site Runoff Control
- Post-Construction Stormwater Management
- Spill Prevention and Response
- Pollution Prevention / Good Housekeeping
- Industrial Stormwater Runoff
- Water Quality Monitoring and Reporting
- BMP's for Application of Pesticides, Herbicides, and Fertilizers
- Oils, Toxics, and Household Hazardous Waste Control

4.4 HABITAT CONDITIONS

4.4.1 Invasive Plant Species

The Shades Creek Watershed is host to several invasive plant species. Visual observations and known invasive species of concern in the Watesrhed include:

- Chinese Privet (*Ligustrum sinense*)
- Kudzu (*Pueraria montana var. lobata*)
- Cogongrass (*Imperata cylinrica*)
- Chinese Tallow or Popcorn Tree (*Triadica sebifera*)
- Japanese Climbing Fern (*Lygodium japonicum*)
- Eurasian Watermilfoil (*Myriophyllum spicatum*)
- Hydrilla (*Hydrilla verticillata*)
- Alligatorweed (*Alternanthera philoxeroides*)

Chinese Privet (*Ligustrum sinense*) – A shade tolerant, evergreen shrub, Chinese Privet is known for its ability to propagate in almost all habitat types including urban areas, upland forests, bottomland hardwood wetlands, etc. The distribution is almost the entire southeastern U.S. and it is found throughout the Shades Creek Watershed. This fast-growing species outcompetes native vegetation, and therefore inhibits native forest regeneration. Chinese Privet is dense along stream channels due to seed transport to downstream areas and throughout the Watershed.

Figure 4.23 Example of Chinese Privet (Courtesy of The Nature Conservancy)

Kudzu (*Pueraria montana var. lobata*) – Kudzu is native to China and was planted extensively in South in the 1930s, 40s and 50s for forage and erosion control. "The Vine that ate the South" continues to spread along edges of forests, pastures and right-of-ways and around cities and towns. During Spring, kudzu vines can grow up to a foot a day, covering trees, buildings, fences, road signs and telephone and utility poles. In the late 1980s, a county agent survey estimated about 250,000 acres were infested by kudzu in Alabama. Control treatments have been successful using herbicides, overgrazing and mechanical root removal. Kudzu can be found throughout the Shades Creek watershed.

Figure 4.24. Example of Kudzu (Courtesy of Kudzu © reophax/Flickr Creative Commons)

<u>Cogongrass (*Imperata cylinrica*)</u> – Cogongrass is a perennial grass that forms dense circular infestations that exclude all native species. It is highly flammable and poses a severe fire hazard. This aggressive grass is difficult to eradicate even under strict management practices. It was introduced into the Mobile area in the early 1900's and is steadily spreading northward by windblown seeds, movement of contaminated fill dirt, and probably through horticultural plantings (there is a commercial red variety) as well as sale of hay, pine straw and straw from infested areas. This is a federal and Alabama State listed noxious weed. Successful eradication is achieved with multiple herbicide treatments over several years. Although not prominent in the Shades Creek watershed, there is evidence that this could be a future concern.

Figure 4.25. Example of Cogongrass (courtesy of Alabama Cooperative Extension Service)

<u>Chinese Tallow or Popcorn Tree (*Triadica sebifera*)</u> – Native to Asia, the distribution of Chinese Tallow trees (**Figure 4.26**) is widespread throughout Alabama. Easily recognizable by its diamond-shaped leaves, it exhibits vibrant fall foliage. This fast-growing species, combined with astonishingly high seed yields, allows for rapid expansion. In addition, it easily adapts to various soil types and conditions. Chinese Tallow trees are more prominent in the southern portions of the state, but have been reported in Jefferson County and generally can be found in clear-cut or areas of disturbance such as power-line easements and along stream channels.

Figure 4.26. Example of Chinese Tallow or Popcorn Tree (Courtesy of Alabama Forestry Commission).

Japanese Climbing Fern (*Lygodium japonicum*) – Native to Asia and Australia, Japanese Climbing Fern is a viney perennial fern found throughout the southeastern United States. The Japanese Climbing Fern, shown in **Figure 4.27**, is spread through wind-blown spores and contaminated pine straw. Fronds die back after hard freezes, but dead vines provide a trellis for vigorous new growth in the Spring.

Figure 4.27. Example of Japanese Climbing Fern (Photo credit: Nancy Loewenstein, Auburn University)

Eurasian Watermilfoil (*Myriophyllum spicatum*) – Eurasian Watermilfoil is native to Europe, Asia, and northern Africa, and was thought to be accidentally introduced from Eurasia in the 1940s. Eurasian Watermilfoil forms large mats on the water surface as shown in **Figure 4.28**.

Figure 4.28. Example of Eurasian Watermilfoil

<u>Hydrilla (*Hydrilla verticillata*)</u> – Native to India, Hydrilla was originally introduced as an ornamental aquarium plant trade in Florida. It has been transported throughout the waterways of Alabama via boats, boat trailers, and outboard motors, as Hydrilla can reproduce by fragmentation as well as from tubers produced at the ends of rhizomes. Hydrilla, shown in **Figure 4.29**.

Figure 4.29. Example of Hydrilla (Photo credit: C. Smoot Major, University of South Alabama)

<u>Alligatorweed (*Alternanthera philoxeroides*)</u> – Alligatorweed is a summer perennial herb that grows over water or on land. Alligatorweed, shown in **Figure 4.30**, is native to South America but occurs throughout Alabama. It was first documented in Mobile in 1897. By forming dense, tangled mats on the surface of waterbodies, Alligatorweed outcompetes native aquatic vegetation for sunlight.

Figure 4.30. Example of Alligatorweed (Photo credit: C. Smoot Major, University of South Alabama)

4.4.2 Wetlands

According to the U.S. Fish and Wildlife (USFWS) National Wetland Inventory (NWI), the Shades Creek Watershed contains approximately 4,978 acres of wetlands (4.61% of total area). The types of wetlands included in this data set are Freshwater Emergent, Freshwater Forested/Shrub, Freshwater Pond, Lake, and Riverine wetlands. The Cooley Creek-Mud Creek subwatershed has approximately 1,843 acres of wetlands (10.29% of the total land area), the Lower Shades Creek subwaterhsed has approximately 2,852 acres of wetlands (6.41% of the total area), and the Upper Shades Creek subwatershed has approximately 283 acres of wetlands (1.07% of the total area).

Undoubtedly wetland habitats have been impacted within the watershed due to urbanization and habitat alteration. A total of approximately 9.26 acres of the NWI wetland habitats have been impacted through individual Section 404 permitting since 2010. These totals only include permitted impacts for projects with greater than 0.5 acres of impacts. The historical impact to wetlands is also evident in that the most developed portions of the watershed (Upper Shades Creek) only contain approximately 283 acres of NWI wetlands, accounting for only 5.7% of the total wetlands in the entire watershed. This is an indication that urban development is a heavy contributer to wetland impacts in the Upper Shades Creek Watershed.

4.4.3 Streams

The Shades Creek Watershed contains at a minimum 295 linear miles of perennial streams along with a network of intermittent and ephemeral stream system. The current conditions of stream segments in the Shades Creek Watershed range from those that appear to be stressed, heavily impacted, altered, and unnatural stream systems to those that appear to be thriving, pristine, unaltered, and natural stream systems. The varying degree of stream conditions observed for the watershed is reflective of the cumulative influence urbanization has had on the watershed.

4.4.4 Altered Hydrology

Changes in watershed uses and characteristics, including natural buffer removal and land use conversion to development, have the ability to impact a channel's natural geomorphology –specifically its dimensions, pattern, and profile. Development has the potential to alter specific stormwater runoff and flow regime patterns inherent in a natural, unaltered system. Increases in runoff due to increased impervious surfaces and the associated intensifications in hydrologic peaks and decreases in lag time during storm events potentially translate to increased flow and energy in channels that have evolved over time to convey lower flows in unaltered systems. The increased runoff has the potential to create new or exacerbate existing stream bank erosion, destabilizing streams and leading to headcutting and bank sloughing, augmenting sediment loads in the stream system.

Stream channels may have been physically altered, realigned, or channelized to allow for development or to address perceived concerns, such as flooding and erosion. Physical alterations may include, but are not limited to, concrete lining to create culverts or armoring with rip rap and gabions. In areas where vegetated stream banks may have been replaced by concrete-lined channels, conveyance for stormwater increases while flooding is reduced. However, infiltration is hindered, stormwater runoff volumes and pollutant loads are increased, and the natural habitats from the bed and embankments of the stream are destroyed, thereby hampering the natural ecological services provided by the stream. In some cases, areas with riparian buffer vegetation have been replaced by lawns to the stream bank edge, eliminating these productive ecotones along streams.

4.5 RESILIANCY

The Shades Creek Watershed is routinely affected by high volumes of rainfall associated with either frequent precipitation events in the form of isolated thunderstorms and rain events. When high volumes of rainfall occur over short durations it can cause localized or widespread flooding, particularly in areas where the natural hydrologic system, illustrated in **Figure 4.31**, has been altered. Therefore, it is important to understand a watershed's hydrologic resilience, monitor any resiliency changes, and properly plan for these changes. The term resilience means "the ability of a community to bounce back after hazardous events such as hurricanes, coastal storms, and flooding – rather than simply reacting to impacts" (NOAA, 2018).

4.0 WATERSHED CONDITIONS

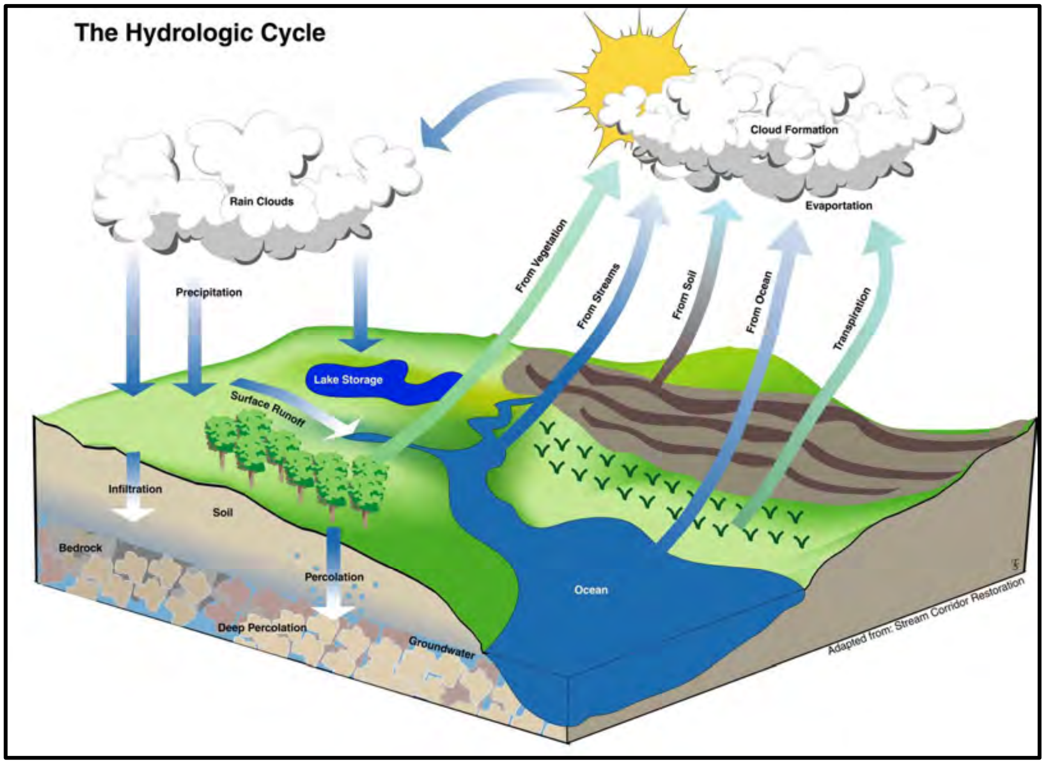


Figure 4.31: General overview of the hydrologic cycle (from Shultz, 2017)

Many naturally occurring features or processes directly influence the hydrologic resilience of the Shades Creek Watershed including its geographic location within the Valley and Ridge region, existing physiography (predominately Appalachian Mountains and valleys), topography, annual rainfall (50 to 55 inches per year). In addition, the hydrologic resilience of the Watershed is affected by the built-environment (i.e. percentage of impervious cover, percentage of urbanization, etc.), which are discussed throughout this WMP.

Suburban cities such as Homewood and Mountain Brook have been increasing since 2010, while Birmingham and Bessemer have actually decreased (Al, 2017). Coupled with the potential impacts of climate change on storm intensity and frequency, communities will be required to plan for events where more citizens and their homes and businesses are in the path of increasingly dangerous and costly storm conditions. The planning and regulatory decisions communities are making today about how and where they develop dictate their ability to recover after tornadoes and flooding events. Understanding where and how our communities are vulnerable to loss from these hazards, and adapting planning and development practices to compensate for these vulnerabilities, will ultimately result in lives, dollars, and habitats saved and stronger communities and economies in the future.

4.6 ACCESS

Large stretches of the shoreline along Shades Creek are privately owned either by individuals or organizations, or have been developed as commercial properties. A limited number of parks and access areas exist along Shades Creek. Table 4.4.1 details the percentages of privately and publicly owned properties.

4.6.1 Land Use and Land Development

The land use among the three sub-watersheds are outlined in the table below. Agriculture, undeveloped land, and residential use all vary considerably between each watershed. Upper Shades Creek Watershed has the least amount of undeveloped land and highest amount of residential and commercial.

Cooley Creek-Mud Creek			Lower Shades Creek			Upper Shades Creek		
Acres	**Percent**	**Use**	**Acres**	**Percent**	**Use**	**Acres**	**Percent**	**Use**
1,620.10	21%	Agriculture	2,810.41	8%	Agriculture	43.71	0%	Agriculture
340.34	4%	Recreation	389.83	1%	Recreation	1,838.05	9%	Recreation
22.97	0%	Commercial	210.45	1%	Commercial	1,764.85	8%	Commercial
493.66	6%	Industrial	1,108.31	3%	Industrial	1,351.92	6%	Industrial
996.74	12%	Residential	4,735.95	14%	Residential	6,947.06	33%	Residential
4,046.17	53%	Undeveloped	25,169.42	72%	Undeveloped	8,244.50	39%	Undeveloped
88.66	1%	Other	334.82	1%	Other	870.56	4%	Other

Table 4.4: Land use by category in each watershed of Shades Creek

4.6.2 Recreational Opportunities

Recreational opportunities within the Shades Creek Watershed are limited and include a handful of trail systems and nature preserves. Cooley Creek-Mud Creek Watershed contains Tannehill State Park where Mud Creek runs through, and it stretches about 1500 acres. Previously the site of a rich iron industry, the Park is now great for hiking, camping, and outdoor recreation. The multi-use park also allows visitors to experience the history of craftsmen through museums and abandoned buildings.

Within Upper Shades Creek Watershed in Homewood, the city constructed a three mile long trail system called The Homewood Shades Creek Greenway and has plans to expand it. Near Samford University there is the 65 acre Homewood Forest Preserve adjacent to Shades Creek. In the 1990s Samford University had plans to develop the area, but the citizen-run group “Friends of Shades Creek” fought to protect the area. The City of Homewood bought the area and turned it into a nature preserve. These parks are tucked into urbanized areas where people can explore the diversity of wildlife and experience nature.

4.7 DATA GAPS

The compilation of information during the development of the Shades Creek WMP has led to the identification of significant gaps in the data acquired, which should guide future research and data collection relevant to the goals of the WMP. In addition, the temporal, spatial, and parametric coverage of ambient surface water quality data from Shades Creek have varied substantially, as very few stations have been monitored consistently since 1991 to present. Although sufficient historic and recent data exist to adequately determine the general status and trends in surface water, it is important to continually monitor in order to capture changes in water quality. The following recommendations are designed to address limitations in data sources as well as limitations in the data from existing sources, along with informational gaps, that makes identification of long term water quality trends difficult:

1. Long Term Trend Water Quality Monitoring program which should address nutrients, fecal bacteria, sediment and flow. Needed activities include:
    - Establishment of additional monitoring locations in the Lower Shades Creek and Cooley/Mud Creek watershed
    - Additional sampling locations and continued consistent parametric coverage at existing stations to support long-term tracking of status and trends and regulatory compliance.
2. Consideration for implementation of sampling locations for anthropogenic sources (pesticides / herbicides / petroleum / oil / grease)
    - Primarily caused due to stormwater runoff from agriculture, lawn and gardens, parking lots, and roads.
    - Monitoring parameters would indicate the success, or lack therof, the management measures in limiting unfiltered urban runoff into surface drainages.
3. Implementation of a pollutant source tracking program to include simultaneous measurements of flow, nutrient, sediment and bacteria at primary tributary inflows.
    - This program should also include microbial source tracking to identify animal sources (e.g., human, dogs, cattle, etc.) of any observed bacterial violations.
    - Assessment of sediment loadings specific to the primary tributary flows in order to identify source of input.
4. Biological and Habitat should be conducted in each sub-watershed and should include:
    - Assessment of the flora, fauna, and protected and invasive species specific to the Watershed.
    - Stream assessment for the main channels and major tributaries.
5. Develop a hydrologic model for the Shades Creek Watershed complex.
    - Detailed impervious surface analysis throughout the watershed.
    - Identify priority sub-watersheds that are experience flows that exceed the capacity of the infrastructure and natural systems.
    - Identify sub watersheds that need to regulate post construction peak flows to LESS than pre-construction post flows in order to address capacity issues.
    - Identify opportunities for the installation of green infrastructure (i.e. infiltration of stormwater runoff

5.0 IDENTIFY CRITICAL ISSUES

Critical issues and areas affecting the health of the Shades Creek Watershed were identified by multiple lines of approach including Steering Committee input, public workshops, open houses, and a community survey regarding the conditions of the Watershed. An estimated 40 people attended the two public workshops. A total of approximately 58 issues were identified in the watershed. Through this outreach, the following list of critical areas and issues were identified.

5.1 WATER QUALITY AND POLLUTION

Water quality and pollution within the watershed was identified as priority issues based on public perception and input. Issues such as erosion and sedimentation, litter, nutrient loading, and pathogens were noted in the public engagement process and all contribute to degraded water quality in the watershed. Contributors to these issues, such as stormwater management, urbanization, stormwater and infrastructure issues are often correlated with each other; thus, they have been grouped together. When high volumes of rainfall occur over short durations it can cause localized or widespread flooding, particularly in areas where the natural hydrologic system has been altered. Urbanization alters the natural hydrologic system of the watershed by increasing the area of impervious surfaces. Trash, nutrients, and chemicals are delivered from these impervious areas to nearby waterways via stormwater runoff. Runoff carrying chemicals and trash, as shown in **Figure 5.1**, affects the entire Watershed in regard to water quality and pollution. Such runoff has led to increased bacteria, nutrient loading, and decreased dissolved oxygen in the nearby waterways. These parameters have failed to meet regulatory standards at ADEM monitoring stations many times in the past 25 years (see **Chapter 4**). This information, combined with results from other data collected during the course of this watershed assessment, can help determine where preservation and restoration activities should occur, and where to prioritize Watershed projects. The greatest reduction of sediment impacts on aquatic habitat will occur when conservation management systems are planned and installed on a whole-watershed basis.

5.1.1 Erosion and Sedimentation

Erosion and sedimentation were identified as high-priority issues in terms of water quality based on public perception and input. In 2003, Shades Creek was listed as impaired for support of F&W due to turbidity, siltation, and habitat alteration (EPA, 2003b). As described in **Chapter 4**, the TMDL report for Shades Creek siltation included a study that found the average annual suspended sediment yield on Shades Creek. Using data from USGS and Stormwater Management Authority, Inc. (SWMA), the annual suspended sediment yield for Shades Creek was found to be over double the “reference” yield for the Ridge and Valley median annual suspended sediment (EPA, 2003b).

5.0 IDENTIFY CRITICAL ISSUES

These findings reflect the impacts of intense urbanization on stream dynamics, erosion, and sediment loads. Most of the erosion in developed watersheds is caused by human activities (see **Figure 5.1**). Upper Shades Creek Watershed is the most impacted within the Shades Creek Watershed by urban development and anthropogenic sources. Lower Shades Creek has also experienced development from agriculture. Different types of BMPs should be established where the siltation impact is higher.

Figure 5.1: Erosion and Sediment Runoff Post Rain Event on Bulldozed site, Shades Creek Watershed

Figure 5.2: Streambank Erosion in Irondale, Shades Creek Watershed

Land use plays a key role in erosion and sediment transport throughout a watershed. As mentioned earlier and in **Chapter 4**, urbanization and agricultural practices can significantly impact and alter a watershed's hydrology. Maps of land use/cover within the Watershed were created utilizing the GIS database of the Watershed (see **Chapter 3**), which help to identify these critical areas. The lands with significant amounts of impervious cover are critical areas where control and mitigation of runoff should be addressed. Sub-watersheds where stormwater best management practices are needed can be prioritized on the basis of where major stream bank erosion and/or known sediment issues are occurring, and based on developed areas with impervious surfaces.

5.1.2 Litter Accumulation

Trash and litter are regularly dumped into Shades Creek and its tributaries, via human transport and stormwater runoff alike. As detailed in **Chapter 2**, 85% of public survey respondents believe litter to be an issue needing to be addressed in the Watershed. When debris—plastic bags, bottles, cigarette butts, etc.—is thrown on the ground, it gets washed into storm drains and directly into local waterways. In addition to potentially choking, suffocating, or disabling aquatic life like ducks, fish, turtles, and birds, litter decreases oxygen levels in the water when it decays. Debris pile-up also causes habitat alteration.

5.0 IDENTIFY CRITICAL ISSUES

Figure 5.3: Trash under bridge in Shades Creek

Plastic and organic litter can change the structure of river habitats and reduce the light level in the waters beneath the debris. All of these factors contribute to a habitat that is ill-suited to support the aquatic plants and animals that rely on it for food and shelter, damaging the ecosystem of the river and, by extension, the surrounding forest or grassland. Too much litter lowers the recreational value of rivers, leaving them both contaminated and unused. Litter is one of the most noticeable forms of pollution in local waterways and can easily be prevented.

5.1.3 Nutrient Loading and Pathogens

In some of the surface waters of the Watershed, ADEM monitoring data indicate nitrate and phosphate concentrations regularly exceed regulatory limits (**Chapter 4**). This could potentially lead to excessive algae growth. Excessive algae growth leads to not only unsightly and odiferous conditions, but also, and more importantly, low dissolved oxygen levels in the water, as shown in **Figure 5.2**. Low dissolved oxygen levels can occur naturally, but negatively impact aquatic life when created artificially. This is especially harmful to benthic biota, which are a critical link in the food chain, and to juvenile fish that cannot easily escape low dissolved oxygen conditions. This could potentially be an issue in the lower portions of the watershed where agriculture is prominent.

Figure 5.2: Example of Algae bloom resulting from excessive nitrate and phosphate concentrations in surface waters

As indicated in the public survey, recreational value (e.g., swimming, hiking, canoeing, etc.) is of significant importance to the stakeholders and citizens in the Shades Creek Watershed (**Chapter 2**). Much of the surface waters in the Shades Creek Watershed have a water use designation of Fish and Wildlife (F&W) and Swimming and Other Whole-Body Water-Contact Sports (S&WC). However, the fecal coliform and *E. coli* data provided by ADEM show that concentrations frequently exceed regulatory standards, indicating generally unsafe swimming conditions and aquatic habitat. In order to address this issue, the source of the bacteria load in Shades Creek needs to be identified (septic failures, animal waste, storm sewer overflows, etc.). The implementation of a pollutant source tracking program for bacteria was identified as a data gap within the watershed in Chapter 4 of this Plan. To ensure safe conditions for aquatic habitat and recreational uses, it is especially important to address the harmful fecal coliform and *E. coli* levels in the watershed.

5.0 IDENTIFY CRITICAL ISSUES

Considering the Watershed is used for aquatic recreation and is home to 26 federally listed threatened or endangered species, the loss of natural areas (urbanization), stormwater runoff, and pollution are serious issues that must be addressed. Upper Shades Creek and Lower Shades Creek sub-watersheds have experienced the most alterations due to a greater area of urbanization. This information, combined with results from other water quality data analyzed over the course of this watershed assessment, can help determine where preservation and restoration activities should occur, and where to prioritize Watershed projects.

5.2 STORMWATER MANAGEMENT AND INFRASTRUCTURE

In addition to the water quality issues discussed above, stormwater management practices and infrastructure within the Shades Creek complex were identified as priority issues based on public perception and input. Stormwater runoff has the potential to carry trash, pollutants, and sediments into surface waters of the complex. Further, during periods of high rainfall and flow events, deficient stormwater management methods may be overburdened and localized flooding and erosion may occur. Flooding was identified as a critical issue in the public participation process. Urbanization has collectively impacted and altered the natural hydrology and hydrologic functions of the Shades Creek Watershed complex resulting in a Watershed with reduced resilience. Consequently, the Watershed is susceptible to reoccurring flood events and is trending towards increased vulnerability to effects from storm events. These seemingly separate critical issues become interconnected when considering appropriate stormwater BMPs and infrastructure for a given watershed.

Litter, pollutants, and high volumes/velocities of runoff may all be delivered from developed areas. Therefore, urbanized lands with large areas of impervious surfaces are focal zones where evaluation, control and mitigation of stormwater runoff, and current stormwater BMPs and systems, should be addressed. Runoff is usually greatest in highly developed areas, such as the majority of the Upper Shades Creek Watershed. Though large portion of the Lower Shades Creek and Cooley/Mud Creek watershed remain undeveloped, future growth within rural or unpopulated areas of these basins should consider progressive stormwater BMPs with systems designed to account for increasingly heavy precipitation events, changing water tables, and climate change.

It was noted during field investigations for this WMP (Chapter 5) that many stream channels within the Shades Creek Watershed complex have been physically altered, realigned, or channelized to allow for development or to address perceived concerns, such as flooding and erosion. The most common alterations to natural streams include stream bank armoring and channelization. These tactics, originally intended to direct and enhance stormwater conveyance, actually result in confinement of flow and increase velocity within the channel, ultimately causing unnatural scouring and erosion. Within the Shades Creek complex, some water resources may be described as stressed, heavily impacted, or otherwise significantly altered from the native condition. This was most commonly observed in the Upper Shades Creek Watershed. Other streams within the complex, most notably the undeveloped areas, appear as thriving and persisting in a relatively natural condition. The contrasting degree of urbanization, acreage of impervious surfaces, and existing conditions of natural surface waters within each of the three sub-watersheds that comprise the Shades Creek Watershed, reflects the need for differing approaches to current and future improved stormwater management practices.

5.3 LOSS OF NATURAL HABITAT

A total of 86.9% of responders to the online survey indicated that habitat conservation is needed in the watershed and 83.6% indicated that preservation of natural areas is needed within the watershed. The protection/enhancement of streams, wetlands, and riparian buffer habitats were specifically noted as a need in the Upper Shades Creek watershed.

Changes in watershed land uses/land cover characteristics, including the removal of buffer vegetation along stream channels or conversion of natural habitats to development affect the behavior of historic overland flows and discharge patterns to natural surface water features and resources (wetlands, rivers, streams, creeks, lakes, ponds, etc.). During severe storm events, runoff volumes and velocities are often amplified. When increased runoff volumes discharge into natural surface water features this may create new, or exacerbate existing, erosion. This can destabilize such natural surface water systems and lead to head cutting and bank sloughing, intensifying sediment loads (Rosgen, 1996). When infiltration is hindered, stormwater runoff volumes and pollutant loads are increased, and the natural habitats from the embankments of waterbodies receiving stormwater discharge are degraded. The ecological services provided by natural surface water features become impaired. In areas where riparian buffer vegetation has been replaced completely by lawn grasses or man-made materials, this eliminates productive habitats essential for infiltration and flow abatements. Naturally vegetated buffers along the limits of water resources reduce erosion and pollutants from adjacent impervious surfaces and lawns. Roots of native vegetation species also provide natural bank stabilization and increase habitat complexity, enhancing species diversity. Enhancement of the riparian buffer by re-planting native grasses, forbs, shrubs and trees is the first step in the recovery of the stream back to a more natural condition.

Wetlands are also important features in the landscape that provide numerous beneficial services for people and for fish and wildlife. Some of these services, or functions, include protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters and maintaining surface water flow during dry periods. Due to the general topography and urbanization of the majority of the Upper Shades Creek Watershed, there are significantly less wetland habitats in the Upper Shades Creek portion of the watershed. The USFWS Wetland Inventory Map indicates only 109.22 acres of emergent and forested wetlands present in the Upper Shades Creek Watershed, versus approximately 2,200 acres in the Lower Shades Creek and 1,500 acres in the Colley Creek/Mud Creek watersheds. Protection of this resource is particularly important in the upper portions of the watershed.

5.4 PUBLIC EDUCATION AND AWARENESS

Public education and awareness were identified by 67.2% of survey respondents (see **Chapter 2**) as significant issues based on public perception and input. For example, many people are unaware that sewers and storm systems are separate, thus, what goes into a storm drain flows directly into the environment, untreated. Likewise, many people in the Watershed are not aware that their household cleaning chemicals, trash, or car wash fluids that are not controlled or disposed of properly will wash into the creek in which they recreate as well.

Furthermore, many people are unaware of the impact their pet's excrement has on a watershed. The need for pet waste receptacles was also identified in the public survey (**Chapter 2**). Pet waste contains bacteria and parasites like ringworm, salmonella, Giardia, and E. coli – to name just a few. Just one gram of dog waste can contain up to 23 million fecal coliform bacteria. These bacteria are known to cause serious health problems in humans, like intestinal illness and kidney disorders. One dog produces an average of 275 lbs. of waste a year. If there are approximately 10,000 dogs living in Homewood, then there is a potential of 1,375 tons of dog waste polluting local waterways each year in Homewood alone. Vestavia Hills and Birmingham are just a few of the many areas in the watershed that have ordinances for public spaces, specifically requiring the removal of pet feces by the pet owner. These ordinances are also enforced with fines ranging from $25-$100.

These are just a few examples of how public education and awareness is lacking and effecting the Shades Creek Watershed.

6.0 MANAGEMENT MEASURES

Management measures are potential opportunities and/or projects that can be implemented to target these critical issues and mitigate their impact to the overall health of the Shades Creek Watershed. These measures consider the collective information provided in the previous chapters of this WMP and integration of the items below:

- Concerns and priorities expressed by watershed stakeholders during community meetings conducted as part of this project, as documented in Chapter 2;
- Current characterization and conditions of the Shades Creek Watershed, as communicated in Chapters 3 and 4 respectively;
- Critical issues affecting the Complex, as identified in Chapter 5.

The subsequent discussions in this chapter address identified items of interest and then provide recommendations to potentially remediate such concerns as part of future studies or projects. Management measures outlined in this Chapter will help achieve the goals of this WMP which include:

- Improving water quality
- Protect natural areas
- Reduce flooding

6 .1 STORM WATER BEST MANAGEMENT PRACTICES

Stormwater runoff is rainwater that collects and flows off streets, roofs, parking lots, driveways, and other impervious surfaces, with ultimate discharge, typically, into natural surface water resources. Data from ADEM and the EPA indicate as much as 55% of rainfall runs off an urban landscape, causing a host of environmental problems. Debris and litter, nutrients, metals, chemicals, sediments, and other nonpoint source pollutants are carried by runoff into receiving water bodies and wetlands, impacting plants, animals, fish, and humans. Improperly managed stormwater may also cause flooding, erosion, and infrastructure damage. Alabama has more than 132,419 miles of diverse water resources (USFS, 2020) that support rich biodiversity and adequate drinking and irrigation water supplies, while providing avenues of transportation and ecotourism. With increasing development across Alabama, stormwater runoff must be managed to properly and innovatively protect waterways. Litter has been a consistent issue facing the Shades Creek Watershed. Combating litter will take a multi-faceted approach that includes the expansion of existing programs, increased regulatory control and enforcement, and a relentless education component in order to treat the problem at its source. In addition to public outreach, active trash collection and removal efforts should be supported and enhanced as much as possible.

6 .2 GREEN INFRASTRUCTURE

Implementing stormwater BMPs reduces runoff and increases infiltration of stormwater into the ground, important to restoring or maintaining adequate water quality. Green infrastructure (GI) uses vegetation, soils, and natural processes to manage stormwater and create healthier built environments with fewer negative impacts on surrounding green spaces and wildlife habitats. At the scale of a large city or region, GI refers to the overall network of natural areas that provide habitat, flood protection, and cleaner air and water. At the scale of a neighborhood or property parcel, GI refers to stormwater management systems that mimic nature by absorbing, storing, and infiltrating stormwater close to its source. Referred to on a site-specific scale as low impact development (LID) techniques, GI includes sustainable stormwater management utilizing natural hydrologic cycles through multiple non-traditional measures. LID practices preserving and re-creating natural landscape features, minimizing impervious surfaces, and incorporating stormwater as an on-site resource rather than a waste product include:

- Green roofs
- Rain barrels and cisterns
- Permeable pavements
- Bioretention areas
- Vegetated swales/dry swales
- Urban forestry/green streets
- Curb and gutter eliminations
- Vegetated filter strips
- Constructed wetlands
- Riparian buffers

These types of practices emphasize improved aesthetics, creation of wildlife habitats, and community involvement and engagement and, as noted by the EPA, typically have lower initial investment with the ability to be maintained similarly to other landscaped areas. Overall, GI disconnects impervious and disturbed pervious surfaces from the storm drain system and reduces post-construction stormwater runoff rates, volumes, and pollutant loads. Though some form of traditional stormwater infrastructure will remain necessary for current and future development within the Shades Creek Watershed, this may be augmented and supplemented by GI practices for improved effectiveness. Specific projects identified as potential locations for GI include the Brookwood Mall Redevelopment, Lakeshore Walmart Parking Lot, Grants Mill Station Parking Lot, Former Sam's Parking Lot (Grants Mill Road), the I-20 ROW Interchange (at Kilgore Memorial Dr.), and Watkins Brook at Lane Park.

GI planning requires the support through federal, state and local policies, programs and regulations encouraging the use of innovative watershed and stormwater management tools. GI planning, design, and intergovernmental coordination can not only help protect valuable terrestrial and aquatic resources from the direct impacts of land development, but also provide ancillary benefits such as reduced sanitary sewer overflow, reduced energy demand, urban heat island mitigation, improved air quality, and improved health for the community. Innovative techniques to consider for the "toolbox" include using:

- Small-scale, GI stormwater management practices to reduce post-construction stormwater runoff rates, volumes, and pollutant loads;
- Better site design techniques to minimize land disturbance;
- Land acquisition and better site planning techniques to protect and conserve valuable natural resources; and
- Comprehensive land use planning and zoning to direct growth away from sensitive aquatic and terrestrial resources.

The USDA-NRCS Web Soil Survey can be utilized as a preliminary tool to explore areas suitable for infiltration-based GI. This type of analysis can help identify depth to water table and hydrologic soil group (HSG) for each soil series and establish ratings for each based on typical GI design guidance. Most GI design manuals recommend a minimum of one or two feet of separation from the bottom of the GI practice and the seasonally high-water table (HWT) because this separation facilitates infiltration and dewatering between rainfall events. HSG is a characteristic that describes runoff potential for a soil, and subsequently infiltration potential. This type of preliminary soil series evaluation help identify areas suitable for GI. Potential specific project locations can then be identified based on the GI soil suitability class and ownership. The “Low Impact Development Handbook for the State of Alabama” (AL LID Handbook) can be utilized to calculate general sizing criteria for bioretention and permeable pavement systems. These two practices were selected because they are the most common GI practices and they provide the greatest benefits in terms of runoff volume reduction through infiltration and water quality treatment. A number of other LID practices that are described in the AL LID Handbook can be used as alternates if site constraints restrict usage for permeable pavement and bioretention. The primary alternates in areas with high water tables are constructed stormwater wetlands, wet enhanced swales, or vegetated/grassed filter strips. This type of GI and Soil Suitability analysis is a very useful for identifying potential GI projects within the watershed. Descriptions and examples of the primary recommended practices are presented below.

- A bioretention cell (BRC) is a shallow basin or landscaped depression designed to store, infiltrate, and treat stormwater runoff. It is excavated and backfilled with well-draining, engineered soil media and planted with native vegetation, grasses, or sod. Bioretention systems can also enhance habitat, mitigate for heat island effects, and improve water quality. They are designed to temporarily hold (24 hours post rain event) and slowly infiltrate stormwater runoff. Bioretention systems use many pollutant removal mechanisms (i.e., infiltration, absorption, adsorption, evapotranspiration, microbial and biological decomposition, plant uptake, sedimentation, and filtration) to improve stormwater quality prior to it leaving the system. Filtered runoff can exfiltrate into surrounding native soils, or these systems can be designed to use an underdrain to collect and return filtered runoff to the conveyance system. **Figure 6.1**. presents a typical BRC profile. For retrofits, large parking areas that are completely impervious can be retrofitted with BRC’s by removing a small number of parking stalls, or landscaped islands can be transformed to bioretention if grading is appropriate or easily adjustable through milling.

Figure 6.1: Typical BRC Profile (ACES 2016)

- Enhanced swales (bioswales) are a type of bioretention system constructed on a slope and also providing stormwater conveyance. They differ from a typical grassed channel or ditch in that they utilize an engineered soil media or soil amendments and incorporate a series of berms or check dams to promote surface ponding, sediment capture, and infiltration. **Figure 6.2** displays four different types of swale design. For retrofits, existing conveyance swales may be suitable for enhancing the underlying soil and adding check dams to promote more infiltration and water quality treatment.

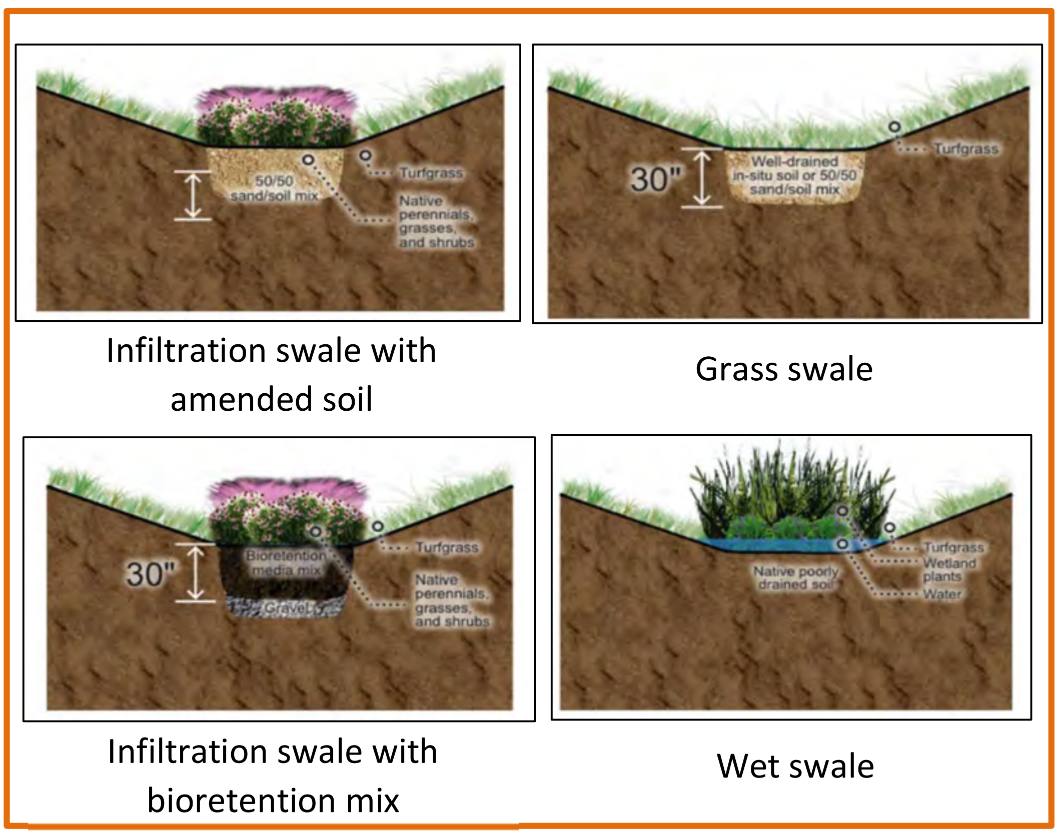


Figure 6.2: Typical Profiles of Enhanced Swales (ACES 2016)

6.0 MANAGEMENT MEASURES

- Permeable pavement systems have structural units that include void (or open) spaces, allowing stormwater to infiltrate and get treated and stored in an underlying gravel base. The stormwater is then filtered through native soils or discharged through an underdrain. Permeable pavement types include, permeable pavers (bricksor blocks), along with pervious concrete and porous asphalt. Permeable pavers use pervious void space located between the pavers that is often filled with small aggregate. **Figure 6.3** shows a typical permeable pavement profile. Permeable pavement systems are advantageous for stormwater management, particularly in areas where land values are high, as vehicles can drive and park on this stormwater BMP.

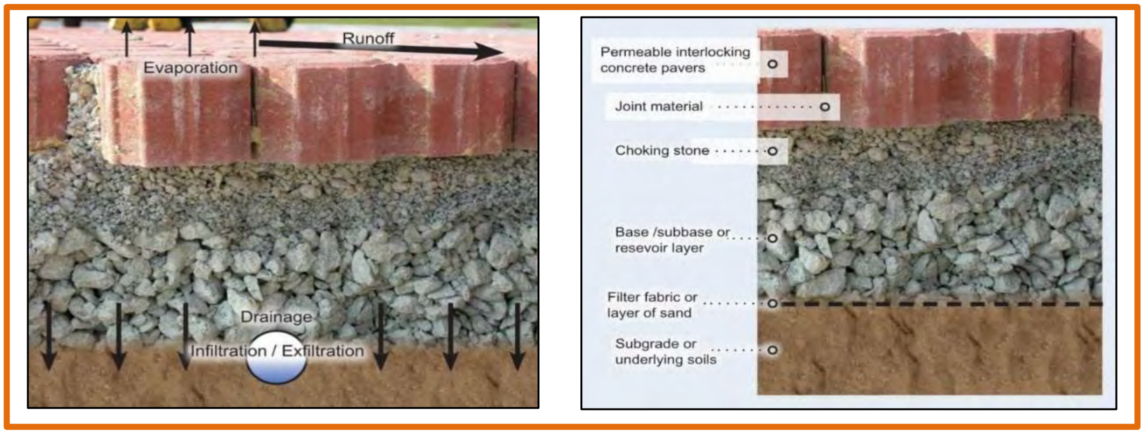


Figure 6.3: Example of Permeable Pavement

- Constructed stormwater wetlands (CSWs) are another GI option; however, they do not promote infiltration as rapidly as bioretention and permeable pavement. CSWs function like natural wetlands to treat stormwater, in that they use biological, chemical, and physical processes to cycle nutrients, promote sedimentation, and filter and decompose pollutants (ACES, 2016). They provide better water quality treatment than retention and detention ponds. **Figure 6.4** shows a typical CSW profile.

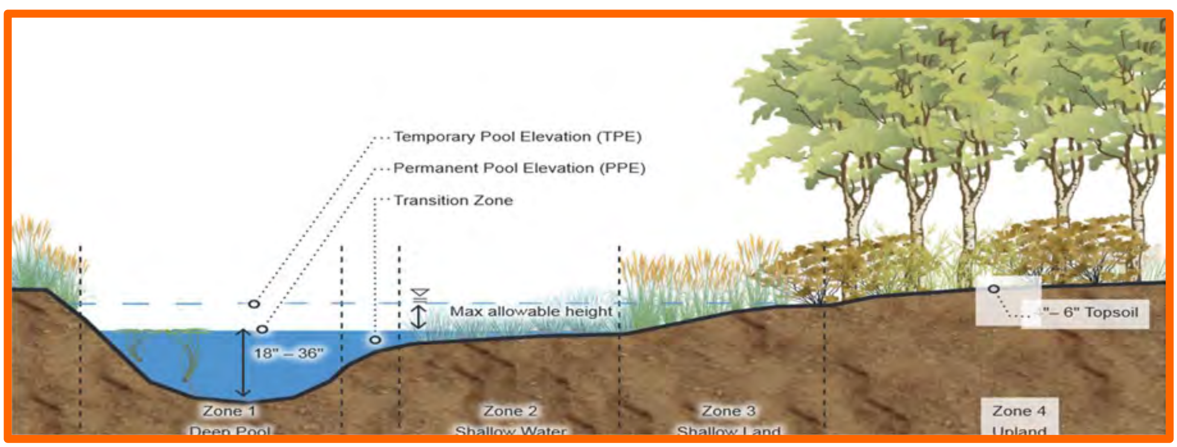


Figure 6.4.: Typical CSW profile

6 .3 STREAM RESTORATION

The process of stream restoration through natural channel design involves a multiple step approach that includes data collection, engineering and scientific assessment, design, construction, monitoring, and maintenance. The success of stream restoration is contingent upon sound design methodology and implementation. The restoration approach follows specific published guidelines and methods endorsed by numerous institutions and regulatory agencies, including the U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), and the North Carolina Stream Restoration Institute. In-stream restoration, stream bank stabilization, and riparian buffer restoration/enhancement all fall under the category of stream restoration.

6.3.1 In-Stream Restoration and Streambank Stabilization

The following is a description of the multi-step process for conducted stream restoration activities:

1. **Identification of Impaired Stream**

The identification and assessment of an impaired stream is the first step in the stream restoration and design process. The stream is classified through the Rosgen Classification of Natural Rivers based on collected data. The data obtained from the project stream also provides details regarding stream channel stability, potential for further degradation, and health of habitat. At this point, certain goals and a preliminary design approach may be identified as the stream design process continues.

2. **Identification of Reference Streams**

Following evaluation of the impacted stream reach, streams in close proximity to and within the same watershed as the impacted stream are identified and assessed with regard to their quality and value to the restoration project. From an engineering standpoint, these reference streams are judged based on apparent channel stability and certain morphological parameters. Similarities in surrounding topography and soil substrate are also compared between the reference streams and the impacted stream. Certain factors help identify reference stream suitability in the design approach. These factors include low-impact watershed use, bankfull at the top of the bank, well-vegetated stream banks, and properly located bed features.

Data collected from the reference streams include, but are not limited to, feature spacing, length and slope, bankfull width and depth, stream sinuosity, and radius of curvature. This data is then processed to develop target dimensions, patterns, and profiles for the design of the impacted stream. Collecting and processing data from streams of varying watershed sizes, or drainage areas, helps to determine “trends” in channel dimensions for the geophysical region. These reference streams can be scaled to match the drainage area of the stream channel being designed. From a biological standpoint, reference streams are assessed based on habitat diversity, biota, and overall ecological quality. Ecologists assess the diversity of available habitat types including riffle/run sequences, woody debris, nutrient availability, and riparian buffer establishment. Baseline data is collected to identify the presence of biota in the reference stream and project reach. This data is used to gauge the long-term ecological success of the restoration project.

3. **Design Development**

Once data describing existing conditions has been collected from the impaired stream and reference data has been collected from reference streams, detailed restoration design of the impacted stream can commence. One crucial parameter of design is bankfull discharge. Bankfull discharge is calculated based on the anticipated one- to two-year rainfall event, drainage area for the project reach, land use within the drainage area, and substrate characteristics. This data is entered into a hydrology model, which provides a bankfull flow rate target. Regional trend data collected from the reference streams should be used to corroborate the hydrology model. Utilizing the calculated flow rate, anticipated channel slope for the restored stream, and projected channel "roughness," the size of the channel can be calculated to ensure overbank flow on an approximate annual frequency. Elevating the stream channel to meet its floodplain is important to make sure the channel is stable. Regional curves generated from recorded data are used in the validation of certain design criteria.

The layout of the stream design is then prepared using available topographical data and data obtained from the reference streams. Taking into account the characteristics of the land and the potential constraints in the surrounding area, the layout design can follow four different approaches. The four priorities for restoration of impaired and incised streams were developed by Dave Rosgen and include the following:

- **Priority 1:** Establish bankfull stage at the historical floodplain elevation.
- **Priority 2:** Create a new floodplain and stream pattern with the streambed remaining at the present elevation.
- **Priority 3:** Widen the floodplain at the existing bankfull elevation.
- **Priority 4:** Stabilize existing stream banks in place.

Priority 1 Restoration: Establish bankfull stage at the historical floodplain elevation. For a Priority 1 restoration, the incised channel is re-established on the historical floodplain using the relic channel or by way of construction of a new morphologically-stable channel. The channel is "lifted" to a higher elevation in order to connect with the historical floodplain, as illustrated in **Figure 6.5**. The new channel has the dimension, pattern and profile characteristic of a stable form, and its floodplain is on the existing ground surface. The existing, incised channel is either completely filled, or partially filled to create discontinuous oxbow lakes and offline wetlands level with new floodplain elevation.

The surrounding land use may be prohibitive of this restoration approach. Priority 1 restorations typically result in higher flood elevations and require sufficient land for meandering, which can be a problem where flooding and land use issues exist. Constraints such as permanent culverts, upstream and downstream of the restoration reach, can also render this approach infeasible.

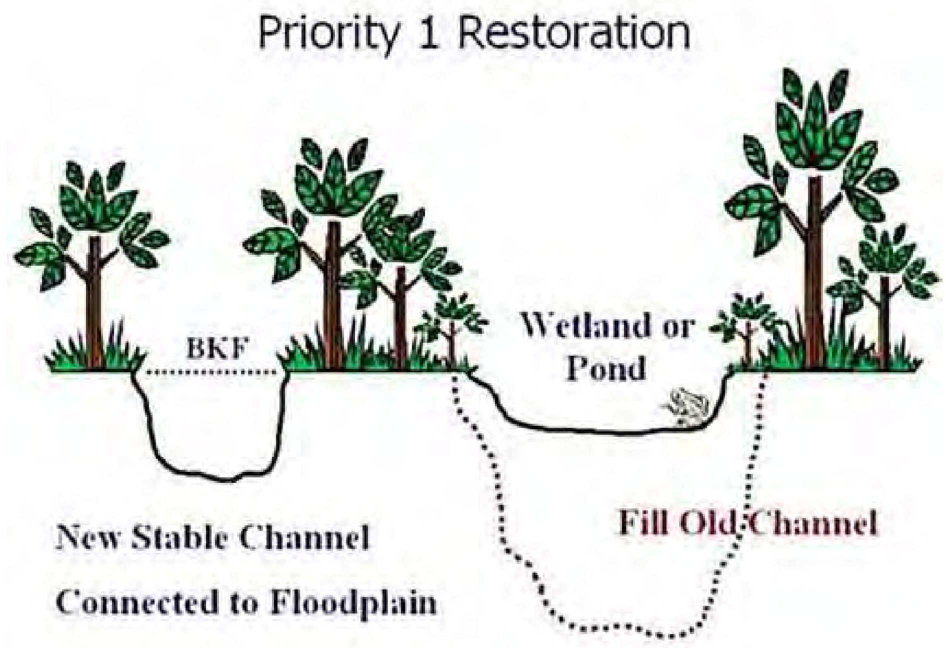


Figure 6.5: Conceptual cross section of Priority 1 restoration (Doll et al, 2003)

Priority 2 Restoration: Create new floodplain and stream pattern with stream bed remaining at the present elevation. In a Priority 2 restoration, a new, stable channel with the appropriate dimension, pattern, and profile is constructed at the elevation of the existing channel. A new floodplain is established, typically at a lower elevation than the historical floodplain, as depicted in **Figure 6.6**. The new channel is typically a meandering channel with bankfull at the elevation of the new floodplain. This type of project can be constructed in dry conditions while streamflow continues in its original channel or is diverted around the construction site.

A major advantage of the Priority 2 approach is that flooding does not increase and may in some cases decrease as the floodplain is excavated at a lower elevation. Riparian wetlands in the stream corridor created by the excavation may be enhanced with this approach. Priority 2 projects typically produce more cut material than is needed to fill the old channel. This means that designers must consider the expense and logistics of managing extra soil material excavated from the floodplain. Surrounding land uses can limit the use of this approach if there are concerns about widening the stream corridor.

Figure 6.6: Conceptual cross section of Priority 2 restoration (Doll et al, 2003)

Priority 3 Restoration: Widen the floodplain at the existing bankfull elevation. Priority 3 restorations entail converting the existing unstable stream to a more stable stream at the existing elevation and with the existing pattern of the channel but without an active floodplain, illustrated in **Figure 6.7**. This approach involves establishing proper dimension and profile by excavating the existing channel to modify the Rosgen stream classification. This restoration concept is implemented where streams are confined (laterally contained) and physical constraints limit the use of Priorities 1 and 2 restorations. A Priority 3 restoration can produce a moderately stable stream system but may require structural measures and maintenance. For these reasons, it may be more expensive and complex to construct, depending on valley conditions and structure requirements.

Figure 6.7: Conceptual cross section of Priority 3 restoration (Doll et al, 2003)

Priority 4 Restoration: Stabilize existing stream banks in place. In a Priority 4 restoration approach, the existing channel is stabilized in place utilizing stabilization materials and methods that have been used to decrease streambed and stream bank erosion, including riprap, gabions, and bio-engineering methods. Because this method does not address existing, excessive shear stress and velocity, which may have caused the impaired channel, it is considered high risk. This approach also limits aquatic habitat and is the least desirable option from a biological and aesthetic standpoint.

Table 6.1 Advantages and Disadvantages of Priority Types

Priority	Advantages	Disadvantages
1	Results in long-term stable stream / Restores optimal habitat values / Enhances wetlands by raising water table / Minimal excavation required	Increases flooding potential / Requires wide stream corridor / Cost associated with excess soil disposal / May disturb existing vegetation
2	Results in long-term stable stream Improves habitat values / Enhances wetlands in stream corridor / May decrease flooding potential	Requires wide stream corridor / Requires extensive excavation / May disturb existing vegetation
3	Results in moderately stable stream / Improves habitat values / May decrease flooding potential / Maintains narrow stream corridor	May disturb existing vegetation / Does not enhance riparian wetlands / Requires structural stabilization measures
4	May stabilize stream banks / Maintains narrow stream corridor / May not disturb existing vegetation	Does not reduce shear stress / May not improve habitat values / May require costly structural measures / May require maintenance

The severity of impairment, land-use constraints, and availability of resources are assessed in the selection of the appropriate priority type for the restoration approach. In-stream structures are also integrated into the design to serve multiple purposes. The structures, which are typically constructed of log and/or rock material, may be used to protect stream banks by directing flow towards the center of the channel, provide grade control where the stream might be prone to head cutting, and enhance stream habitat by creating riffles, plunge pools, and other habitat features. Bioengineering techniques can also be implemented that utilize both woody debris and living vegetation to armor stream banks and provide growing roots for soil stabilization along the bank.

Once the design has been prepared, the functionality of the stream is assessed. The Hydrologic Engineering Centers River Analysis System (HEC-RAS) surface-water hydraulic model is run to predict water levels within the stream during bankfull and other high-flow events, if necessary, based on calculated flow regimes. The model will indicate whether the current design parameters will allow for bank topping during a predicted bankfull flow event. The model can illustrate the impact of the proposed stream design on flood events during periods of greater flow to make sure the design does not adversely affect the surrounding area. It can also demonstrate anticipated stresses and velocities within the stream and on the floodplain to determine if these factors exceed the project's ability to perform. The results are reviewed to examine the effectiveness of the design and any needs for revision. Consequently, additional design iterations may be necessary to ensure the best final stream restoration design.

4. **Construction**

Upon approval of the final stream design by the client and regulatory agencies, the project moves into the construction phase. Any site preparation needed prior to construction, including mobilization, staging, creating temporary access, clearing and grubbing, and stockpiling, is performed. The project site is staked for construction by incorporating Global Positioning System (GPS) and conventional surveying techniques. Project engineers ensure the stream design is constructed in accordance with the design plans, and are available to field engineer any modifications required. Project scientists work with the engineers and construction team to incorporate habitat features that lead to the overall ecological success of the project. Best management practices are incorporated to minimize unnecessary pollution to the stream during the construction phase. Eco-friendly materials are used to stabilize the stream channel until vegetation can be established. This includes coconut fiber coir matting and wooden eco-stakes along the slopes of the stream bank.

Vegetation is vital to the stability of a newly-constructed channel and floodplain. Temporary seeding is critical upon construction completion to provide instant stability to the construction zone and prevent excessive erosion and sedimentation. Permanent vegetation, which includes native herbaceous wetland plants, trees, and shrubs, is installed on the project site to provide long-term stream bank and floodplain stability and streamside habitat.

5. **Monitoring and Maintenance**

The final stage of restoration includes long-term monitoring of the restoration project. The success of a stream restoration is based on several factors, including regulatory requirements, channel stability, ecological diversity, and client satisfaction. Periodic maintenance should be considered a requirement for stream restoration projects. Supplemental seeding, in-stream structure repair, resetting or replacement of erosion control matting, and vegetation replacement are some of the potential maintenance requirements. Providing regular maintenance that addresses stream issues helps prevent or mitigate potential large-scale, long-term failures.

6.3.2 Stream Buffer Restoration

Riparian buffers are vitally important to the overall health of a stream. Buffers are the transition zones that connect uplands (urban, natural, etc.) to floodplain wetlands and, ultimately, creeks, streams, and rivers. As discussed in Chapters 5 and 7 of this Plan, there are streams and other surface waters in the Shades Creek Watershed with little to no riparian buffers.

The establishment of a riparian buffer zone will greatly enhance the environment of the channel and its surrounding areas. Riparian buffers decrease stream velocity, improve diffuse flow, and reduce nonpoint source pollution concentrations through nutrient cycling. They are also vital in the stabilization of streambanks, and provide habitats that attract and improve biodiversity. As identified in **Figure 6.8**, construction of a riparian buffer includes the following zones:

- Zone 1: Closest to the water body and generally 25-30 feet wide. A mix of wetland herbaceous and woody vegetation that has floodplain and/or wetland characteristics.
- Zone 2: The area between Zone 1 and the upland with a primary function of infiltration of runoff and filtration of pollutants. Zone 2 is generally 25-50 feet wide with woody vegetation.
- Zone 3: 25-foot strip of native grasses creating diffuse flow to Zone 2 (optional)

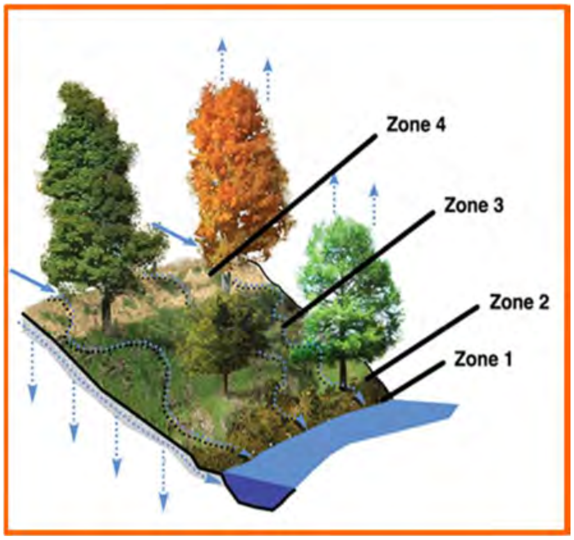


Figure 6.8: Riparian buffer zone diagram (LID Handbook for Alabama, 2014)

Protected or preserved riparian buffers, established for regulatory guidelines, can range from 25-150 feet, depending on state-specific regulations, but are typically 100 feet or greater.

6 .4 ENCOURAGE IMPROVED FORESTRY AND AGRICULTURE BMPs

While forestry practices do not typically contribute as much sediment to surface waters as construction or agriculture, effects can be significant without proper management. Removal of overstory trees combined with operation of logging equipment throughout an area can compact soils, expose them to erosive weather forces, and increase overland flow transporting sediment. Additionally, improper construction of logging roads and loading docks create erosion problems along slopes due to exposed soils. Stream crossings and use of logging equipment within riparian areas can also exacerbate channel erosion by compromising bank integrity if proper techniques are not utilized.

6.0 MANAGEMENT MEASURES

The use of recommended management measures for forest operations can significantly reduce the amount of soil transported into streams and other waterways within the Watershed. Streamside management zones act as vegetated buffers, intercepting stormwater runoff and allowing sediments to fall out before reaching watercourses. Water crossings utilizing culverts or temporary bridges also help to maintain bank stability and prevent erosion directly adjacent to a stream. Forest roads and loading decks should employ a series of broad-based dips, turnout ditches, and water bars to slow runoff and hold sediments in place. More detailed descriptions of forestry management measures can be found in the *Alabama's Best Management Practices for Forestry* handbook. This handbook can be accessed at www.forestry.alabama.gov/Pages/Management/Forms/2007_BMP_Manual.pdf.

Although agriculture makes up a minimal amount of land use within the Shades Creek Watershed, at 0.06%, agricultural activities can significantly impact the amount of sediment entering a stream system if not managed properly. This is especially true in the Lower Shades Creek and the Colley/Mud Creek sub-watersheds where agricultural activities are more prominent. Improper agricultural practices, such as poorly located animal feeding operations, overgrazing, and plowing too frequently or at improper times, can contribute to excessive sediment loads entering surface waters. These adverse impacts can be avoided by using relatively simple management measures. The Natural Resources Conservation Service (NRCS) and Farm Service Agency offer numerous programs for public and private landowners a brief description of each is provided below (Source: www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/).

- Conservation Stewardship Program provides financial and technical assistance to agricultural producers to implement enhanced conservation practices to improve plants for wildlife, grazing management to reduce soil compaction and improve riparian function.
- Environmental Quality Improvement Program (EQIP) is a voluntary program that provides financial and technical assistance to agricultural producers to plan and implement conservation practices that improve soil, water, plant, animal, air and related natural resources on agricultural land and non-industrial forestland. Within EQIP, the Air Quality Initiative provides financial ass stance to implement conservation practices that address air resource issues (greenhouse gas emissions, ozone precursors, volatile organic compounds, airborne particulate matter, and some odor-related volatile compounds) for designated locations.
- Emergency Watershed Protection Program (EWP) provides financial assistance for recovery efforts in response to natural disasters and is designed to help people conserve natural resources by relieving imminent hazards to life and property caused by floods, fires, drought, windstorms and other natural occurrences.
- Regional Conservation Partnership Program (RCPP) provides for public-private partnerships focused on improving water quality, combating drought, enhancing soil health, supporting wildlife and protecting agricultural viability.
- The Watershed and Flood Prevention Operations Program (WFPO) provides technical and financial assistance to state and local governments for planning and installing watershed projects.

6.0 MANAGEMENT MEASURES

The Agricultural Water Enhancement Program (AWEP) and the Wildlife Habitat Incentive Program (WHIP) were repealed on February 7, 2014 and new enrollments are no longer accepted. Conservation practices previously covered under the two programs are usually eligible under EQIP.

6 .5 LITTER CONTROL MEASURES

As detailed in **Chapter 2**, 85% of public survey respondents believe litter to be an issue needing to be addressed in the Watershed. When debris—plastic bags, bottles, cigarette butts, etc.—is thrown on the ground, it gets washed into storm drains and directly into local waterways. In addition to potentially choking, suffocating, or disabling aquatic life like ducks, fish, turtles, and birds, litter decreases oxygen levels in the water when it decays. Debris pile-up also causes habitat alteration. As outlined in Chapter 5, plastic and organic litter can change the structure of river habitats and reduce the light level in the waters beneath the debris. Too much litter lowers the recreational value of rivers, leaving them both contaminated and unused. Litter is one of the most noticeable forms of pollution in local waterways and can easily be prevented.

One management measure for litter control are litter control devices that can be placed in the streams within the watershed to collect litter from being transported downstream. In 2018 as part of the "Osprey Initiative", the first litter control device was installed in the Birmingham metro area in Valley Creek. Currently, there are eleven litter control devices located in the Birmingham area with two (2) located within the Shades Creek Watershed. The two in Shades Creek Watershed include one at Griffin Brook (Homewood, funded by the City of Homewood) and one in Shades Creek (Homewood – Brookwood Mall, funded by the EPA).

Figure 6.9: Litter control device in Griffin Brook (Source: Freshwater Land Trust website)

Continued support and funding of these types of programs and for the implementation/maintenance of these devices will be beneficial to water quality in the watershed.

6 .6 IMPROVE WATERSHED RESILIENCE

Many communities within the Shades Creek Watershed participate in the National Flood Insurance Program (NFIP), which allows property owners to receive federally subsidized flood insurance. Participation in this program requires the enforcement of a Flood Damage Prevention Ordinance. The objective of the ordinance is to minimize the potential for flood damage to future development. This ordinance has been effective in requiring new buildings to be protected from damage from the 100-year base flood. However, flood damage still results from floods that exceed the base flood, from flooding in unmapped areas, and from flooding that affects buildings constructed before the community joined the NFIP.

6.0 MANAGEMENT MEASURES

Under the Community Rating System (CRS), a national program developed by the Federal Emergency Management Agency (FEMA), communities participating in the NFIP can be rewarded for doing more than simply regulating construction of new buildings to the minimum national standards. When a community is approved to join the CRS program, the flood insurance premiums of that community's residents and businesses are discounted to reflect that community's work to reduce flood risk to existing buildings, protect new buildings beyond the minimum NFIP protection level, preserve and/or restore natural functions of floodplains, help insurance agents obtain flood data, and help people obtain flood insurance. This ensures communities are better prepared to withstand and recover from future flooding events.

The CRS program recognizes and awards credits for floodplain management activities in four (4) categories: public information, mapping and regulations, flood damage reduction, and warning and response. The more points a community receives, the better the discount property owners within that community receive on their flood insurance policies. **Table 6.2** shows the points awarded with the corresponding reductions in flood policy premiums that correspond with those scores.

TABLE 6.2: CRS POINTS AND INSURANCE PREMIUM REDUCTION

CRS Classes	Points	Policies inside the Regulatory Floodplain	Policies outside the Regulatory Floodplain
1	4500+	45%	10%
2	4000-4499	40%	10%
3	3500-3999	35%	10%
4	3000-3499	30%	10%
5	2500-2999	25%	10%
6	2000-2499	20%	10%
7	1500-1999	15%	5%
8	1000-1499	10%	5%
9	500-999	5%	5%
10	0-499	0	0

Source: FEMA, 2020

In 2021, FEMA issued an addendum to the 2017 National Flood Insurance Program Community Rating System Coordinator's Manual (CRS Manual). The CRS Manual explains how the program operates, credit criteria, how credits are calculated for community activities and programs that go above and beyond the minimum requirements for participation in FEMA's National Flood Insurance Program. The Coordinator's Manual is available in Adobe pdf format at www.CRSresources.org. Although the CRS Manual is primarily a reference for CRS activities and credits, it can also help guide communities that want to improve their floodplain management programs and make their communities more resilient to future flooding events.

6.0 MANAGEMENT MEASURES

Several, but not all of the communities within the Shades Creek Watershed currently participate in the CRS program. All communities within the watershed should review the CRS program and with the benefits of participating in CRS. Recommended management measures include:

- Plan for Public Information: A Program for Public Information (PPI) is a committee-based localized approach to community outreach and education on flood hazards and flood insurance. The goal of a PPI is to encourage community outreach that is designed to meet local needs and to develop a program that monitored, evaluated, and revised to improve effectiveness. Once implemented a PPI can be a powerful tool to organize community engagement and ensure that activities are effective and streamlined.

- Natural Floodplain Functions Plan: This plan is designed to aid in the understanding of floodplain natural resources and functions and to examine strategies and tools to protect, preserve and/or restore these resources. Natural Floodplain Functions are currently defined by the CRS Glossary as: a) The functions associated with the natural or relatively undisturbed floodplain that moderate flooding, retain flood waters, reduce erosion and sedimentation, and mitigate the effects of waves and storm surges from storms; and b) Other significant beneficial functions, which include maintenance of water quality, recharge of groundwater, and provision of fish and wildlife habitat.

- Flood Hazard Mitigation Plan: This plan is intended to assess current flood hazard conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the local government to consider in reducing or eliminating future flood losses.

7.0 IMPLEMENTATION

A variety of management measures are needed to improve the health of the Shades Creek Watershed. A clear, concise strategic approach will be necessary to successfully implement these measures. This approach should involve all stakeholders within these watersheds, as well as the cities, counties, state, and federal agencies including, but not limited to, those listed in **Table 7.1**. Coordination of so many stakeholders will be greatly enhanced by having a long-term champion and advocate for this WMP. The strategies discussed below will help to successfully implement the management measures recommended in this WMP. Many of these actions can be concurrently implemented.

Table 7.1 Shades Creek Watershed Stakeholders

SHADES CREEK WATERSHED STAKEHOLDERS		
The Nature Conservancy (TNC)	Jefferson County Department of Health (JCDH)	Alabama Department of Environmental Management (ADEM)
Friends of Shades Creek	Jefferson County	Natural Resources Conservation Service (NRCS)
The Cahaba River Society (CRS)	Tuscaloosa County	Alabama Department of Conservation and Natural Resources (ADCNR)
The Cahaba Riverkeepers	Shelby County	Tannehill Ironworks Historical State Park
Freshwater Land Trust (FWLT)	Bibb County	Alabama Forestry Commission (AFC)
Cawaco RC&D Council	City of Irondale	Alabama Department of Transportation (ALDOT)
Samford University	City of Homewood	Alabama Power
Ruffner Mountain Nature Coalition	City of Birmingham	U.S. Army Corps of Engineers (USACE)
Alabama Water Watch (AWW)	City of Mountain Brook	U.S. Fish and Wildlife Service (USFWS)
Local businesses and industries	City of Hoover	Geological Survey of Alabama (GSA)
Local civic organizations	City of Vestavia Hills	Birmingham Business Alliance (BBA)
Local residents	City of Bessemer	Goodwyn Mills Cawood (GMC)

7.1 MANAGEMENT STRATEGIES

The issues and problems threatening the health of the Shades Creek Watershed occur throughout the three (3) sub-watersheds and extend across political boundaries. The Shades Creek Watershed is located partially within the jurisdictions of Jefferson County, Bibb County, Shelby County, Tuscaloosa County, and the Cities of Irondale, Homewood, Birmingham, Mountain Brook, Hoover, Vestavia Hills, and Bessemer. Due to this, site inspections and enforcement of management ordinances cross many jurisdictions. Organizations who monitor water quality should expedite the process of voicing water quality concerns to the appropriate regulatory agencies so these agencies can implement necessary enforcement actions.

7.2 INTERIM MILESTONES

Interim milestones should be established to support detailed scheduling and task tracking. These milestones should identify specific goals, and the time frame within which those milestones should be accomplished. Milestones can be loosely organized into short-term (one to two years), mid-term (two to five years), and long-term (five to ten years or longer) categories.

7.3 IMPLEMENTATION SCHEDULE

Implementation of recommended management measures should begin immediately following approval of the Shades Creek WMP. Initial implementation should focus on the most critical issues and prioritized management measures identified in the WMP. The following steps should be given priority:

- Apply for and solicit funding within the first year.
- Establish the Public Education and Outreach Program within the first year.
- Establish a formal Monitoring Program as soon as funding becomes available.
- Implement priority management measures as funding becomes available.

7.4 INDICATORS TO MEASURE PROGRESS

Criteria for determining the success of management measures in improving watershed conditions must be established. The criteria for success must include specific reduction goals for water-quality impairments. Establishing goals for load reductions also allows an adaptive management approach to reevaluate management measures and implementation plans if they fail to meet goals.

7.5 ESTIMATION OF COSTS AND TECHNICAL ASSISTANCE NEEDED

The costs to implement the proposed management measures and to monitor the results will be substantial, with at least over 20 years being required to fully implement the WMP as presented; estimated costs are listed in the tables below. The implementation of this WMP will require the assistance of numerous government agencies, non-profit entities, and private organizations. In particular, technical guidance from the ADEM, along with the municipalities and county agencies will be required. The following **Table 7.2** is a summary of proposed actions for overall planning and assessment of the watershed. **Table 7.3** is a summary of the proposed educational outreach strategies and connectivity and visibility strategies. **Table 7.4** is a summary of potential site-specific BMP's that were identified during the public involvement process that address the overall planning and assessment actions in order to improve water quality within the Shades Creek watershed.

7 .0 IMPLEMENTATION

Table 7.2 – Proposed Overall Watershed Planning and Assessment Actions

OVERALL WATERSHED PLANNING AND ASSESSMENT					
ACTION	FUNDING SOURCES	NUMBER OF UNITS	ESTIMATED COST PER	ESTIMATED TOTAL COST	BRIEF DESCRIPTION
Develop a Hydrologic Model for the Shades Creek Watershed Complex	General Funds Grants Private Funds	1	$150K	$150K	1) Detailed impervious surface analysis throughout watershed. 2) Identify priority sub-watersheds experiencing flows that exceed the capacity of the infrastructure and natural systems. 3) Identify sub watersheds that need to regulate post construction peak flows to LESS than pre-construction post flows in order to address capacity issues. 4) Identify opportunities for installation of green infrastructure (i.e., infiltration of stormwater runoff).
Implementation of a Pollutant Source Tracking Program	319 Funds General Funds Grants	~25	$50K/year	$1.25M	1) Include simultaneous measurements of flow, nutrient, sediment & bacteria at primary tributaries 2) This program should also include microbial source tracking to identify animal sources (e.g., human, dogs, cattle, etc.) of any observed bacterial violations. 3) Assessment of sediment loadings specific to primary tributary flows to identify source of input.
Long Term Trend Water Quality Monitoring Program	State Funding Grants 319 Funds Private Funding	Cost of existing monitoring programs is set. Cost associated with monitoring for data gaps will vary.			1) Address nutrients, fecal bacteria, sediment and flow 2) Establishment of additional monitoring locations in the Lower Shades Creek and Cooley/Mud Creek watershed 3) Consistent parametric coverage at existing stations to support long-term tracking of status and trends and regulatory compliance.
Implementation of sampling locations for anthropogenic sources (pesticides, herbicides, petroleum, oil, & grease)	General Funds Grants Private Funds	~25	10K/Year	$250K	1) Primarily caused due to stormwater runoff from agriculture, lawn and gardens, parking lots, and roads 2) Monitoring parameters would indicate the success, or lack thereof, the management measures in limiting unfiltered urban runoff into surface drainages.
Biological and Habitat analysis in each sub-watershed	General Funds Grants Private Funds	1	150K	150K	1) Assessment of the flora, fauna, and protected species and invasive species specific to the Watershed. 2) Stream assessment for the main channels and tributaries to determine issues with stream erosion/sedimentation
Septic System GIS Inventory and Visual Inspection	General Funds Grants Private Funds	1	$75K	$75K	1) Identify, inspect and map priority septic systems primarily within the Lower Hades Creek and Cooley-Mud Creek sub-watersheds 2) Information to be maintained and updated by project partners in coordination with the Jefferson County Department of Health.
Implement Septic System Retrofit Program *Locations to be Determined based on Assessments	319 Funds Grants Private Funding	15	$5K/each	$750K	1) Based on Septic system GIS inventory, identify 15 failing septic systems within priority areas of Shades Creek 2) Inspect and retrofit/repair/pump the failing septic systems 3) Following repairs to the system, review monitoring data to investigate the extent that failing septic systems contribute to the fecal coliform levels in Shades Creek 4) Conduct a public outreach campaign to support the septic management strategy.

Table 7.2 (Continued)– Proposed Overall Watershed Planning and Assessment Actions

OVERALL WATERSHED PLANNING AND ASSESSMENT					
ACTION	**FUNDING SOURCES**	**NUMBER OF UNITS**	**ESTIMATED COST PER UNIT**	**ESTIMATED TOTAL COST**	**BRIEF DESCRIPTION**
GIS Inventory of Storm Water Infrastructure in Upper Shades Creek sub watershed	General Funds Grants Private Funding	1	$250K	$250K	1) Collection of existing storm water infrastructure data within the watershed 2) Field collection of storm water infrastructure data within the municipalities located in Upper Shades Creek 3) Host GIS data for use by municipalities within the watershed 4) Engineering analysis to identify issues related to storm water infrastructure (damaged structures, undersized drainage features, etc.) 5) Develop conceptual solutions and estimated costs for repairing identified infrastructure issues
Preparation of Stormwater Master Plan for Communities within Watershed	General Funds Grants Private Funding	N/A	TBD	TBD	1) GIS inventory of infrastructure and condition assessment 2) Conduct training for municipal staff 3) Develop capital improvement plan for SW prioritization 4) Review and update ordinances to support plan
Implement Infrastructure Repair Program ***Locations to be Determined based on Assessments**	319 Funds Grants Private Funding General Funds	10	$25K-100K	$250K-$1M	1) Based on Storm water infrastructure inventory, identify top 10 infrastructure issues contributing to degraded water quality 2) Complete engineering design for retrofit/repair of infrastructure issue. 3) Implement repair of issue/s 4) Update GIS database to reflect repair
Implement Invasive Species Management Program	General Funds Grants 319 Funds Private Funds	1	TBD	TBD	1) Conduct watershed assessment and identify invasive species within stream riparian buffers 2) Prioritize areas that need invasive species removal based on size, location, and density 3) Initiate restoration of the identified areas.
Green Stormwater Infrastructure (GSI) and Soil Suitability Assessment	General Funds Grants Private Funds	1	75K	75K	1) Utilize the preliminary soil series, available GIS information, and exiting mapping services to identify stormwater hotspots and potential GSI projects. 2) Conduct field assessments to further determine feasibility of potential GSI and develop cost estimates for implementation. 3) Produce conceptual plans and cost estimates for implementation of the potential GSI projects. 4) Prioritize potential GSI projects based on water quality impact, property ownership, costs, etc.
Implementation of Green Stormwater Infrastructure (GSI) Projects ***Locations to be Determined based on Assessments**	Grants 319 Funds Private Funding	10	TBD	TBD	1) Conduct final engineering and analysis 2) Secure regulatory approvals and select contractor 3) Implement GSI project

7.0 IMPLEMENTATION

Table 7.3 – Proposed Educational Outreach Strategies and Connectivity and Visibility Strategies

EDUCATIONAL OUTREACH STRATEGIES				
ACTION	TARGET AUDIENCE	DESCRIPTION AND/OR STRATEGIC LOCATIONS	FUNDING	RESPONSIBLE PARTY / ORGANIZER
Promotion of Public Events	General Public	Annual Fall Shades Creek Cleanup	Volunteer	Friends of Shades Creek
		Annual Salamander Festival	Private Fundraising	
Educational Materials and Electronic Resources	General Public	Shades Creek WMP Availability and Annual Updating	Private Fundraising Grants ($5K / Annually)	The Nature Conservancy of Alabama Community Groups
		Public Education and Outreach Program in Coordination with Municipal MS4 Permit Requirements	Private Funding General Funds Grants	Friends of Shades Creek Local Community Groups Municipalities

CONNECTIVITY AND VISIBILTY STRATEGIES				
ACTION	POTENTIAL PROJECT LOCATIONS	POTENTIAL FUNDING SOURCES	ESTIMATED IMPLEMENTATION COST	BRIEF DESCRIPTION
Greenway Connectivity	Brookwood Mall	Private Funding Grants	$250,000	Currently, the Brookwood Mall represents a gap within a Greenway System along Shades Creek. Homewood Greenway is located downstream of the mall and Jemison Trail is located upstream of the mall. Connecting the 2 trail systems by incorporating a trail at Brookwood Mall would increase access and visibility to Shades Creek.
Increase Visibility	Headwaters of Shades Creek	Grants Private Funding General Funds	TBD	Identify potential locations for access and increased visibility for the springs at the headwaters of Shades Creek (i.e., racetrack, New Life Church, etc.). Once potential locations have been identified, conduct assessment and conceptual planning for providing access and increasing visibility. Secure funding and implement design plan.

7.0 IMPLEMENTATION

Table 7.4 – Proposed Site Specific BMPs for Identified Issues

SITE SPECIFIC BMP'S FROM PUBLIC INPUT & POTENTIAL PROJECTS FOR ABOVE ACTIONS					
IDENTIFIED ISSUE	ACTION	RESPONSIBLE ENTITIES	POTENTIAL FUNDING SOURCES	ESTIMATED IMPLEMENTATION COST	BRIEF DESCRIPTION
Flooding	**Active Participation of Governmental Bodies in the National Flood Insurance Program (NFIP) and Community Rating System (CRS)**	- Jefferson County - Homewood - Birmingham - Mountain Brook - Irondale - Hoover - Vestavia Hills - Bessemer	General Funds	-	1) Participation in NFIP allows communities to regulate floodplain development. In return for regulating floodplains, the citizens of the community receive federally subsidized flood insurance. 2) Under CRS, communities participating in the NFIP can be rewarded for exceeding minimum national standards. The CRS program recognizes and awards credits for floodplain management activities in four (4) categories: public information, mapping and regulations, flood damage reduction, and warning and response. The more points a community receives for exceedance of the national flood standards, results in reduced flood insurance premiums of that community's residents and businesses. This ensures communities are better prepared to withstand and recover from future flooding events.
	Plan for Public Information	NFIP and CRS Participants	Grants General Funds	$125K	1) A Program for Public Information (PPI) is a committee-based localized approach to community outreach and education on flood hazards and flood insurance. The goal of a PPI is to encourage community outreach that is designed to meet local needs and to develop a program that is monitored, evaluated, and revised to improve effectiveness. Once implemented a PPI can be a powerful tool to organize community engagement and ensure that activities are effective and streamlined.
	Natural Floodplain Functions Plan	NFIP and CRS Participants	Grants General Funds	$50K –$100K	1) This plan is designed to aid in the understanding of floodplain natural resources and functions and to examine strategies and tools to protect, preserve and/or restore these resources. Natural Floodplain Functions include natural or relatively undisturbed floodplain that moderate flooding, retain flood waters, reduce erosion and sedimentation, maintain water quality, recharge of groundwater, and protection of fish and wildlife habitat.
	Flood Hazard Mitigation Plan	NFIP and CRS Participants	Grants General Funds	$75K - $150K	1) This plan is intended to assess current flood hazard conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the local government to consider in reducing or eliminating future flood losses.

Table 7.4 (Continued) – Proposed Site Specific BMPs for Identified Issues

SITE SPECIFIC BMP'S FROM PUBLIC INPUT & POTENTIAL PROJECTS FOR ABOVE ACTIONS							
IDENTIFIED ISSUE	BMP	EXAMPLE / POTENTIAL PROJECT LOCATIONS	APPROXIMATE LATITUDE/LONGITUDE	POTENTIAL FUNDING SOURCES	ESTIMATED IMPLEMENTATION COST	ESTIMATED MAINTENANCE COSTS	BRIEF DESCRIPTION
Litter Accumulation	**Litter Control Traps**	- Flora Johnston Park (Irondale) - Cross Creek (Irondale) - Homewood Jr. High (Homewood) - Lakeshore Walmart (Homewood) - Watkins Brook (Mountain Brook)	33.524472˚, -86.711545˚ 33.515207˚, -86.715044˚ 33.476737˚, -86.809947˚ 33.442886˚, -86.824535˚ 33.484758˚, -86.771905˚	Grants General Funds 319 Funds Private Fundraising	$125K (5 Traps Year 1)	$120K Annually (5 Traps Years 2+)	1) Identify five (5) strategic locations along tributaries to Shades Creek 2) Install litter traps at strategic locations 3) Long-term cleaning and maintenance of traps
General Erosion and Sedimentation	**Streambank Restoration**	- Flora Johnston Park (Irondale) - Cross Creek (Irondale) - Overbrook Road (Mtn. Brook) - Jemison Park (Mountain Brook) - Brookwood Mall (Homewood) - Brookside Pass (Hoover)	33.524472˚, -86.711545˚ 33.515207˚, -86.715044˚ 33.490235˚, -86.748505˚ 33.482331˚, -86.756892˚ 33.470900˚, -86.770204˚ 33.358751˚, -86.880207˚	Grants General Funds 319 Funds Private Fundraising	TBD	TBD	1) Conduct streambank rest. feasibility study. 2) Develop streambank restoration design plan and acquire appropriate permitting. 3) Implementation of streambank rest. design. 4) Long-term monitoring to determine success of project.
Invasive Species and Lack of Riparian Buffers	**Invasive Species Management Program**	-Dickey Springs Road (Bessemer) -Brookwood Mall (Homewood and Mountain Brook) -Shades Creek at Pocahontas Rd (Bessemer) -Jemison Park (Mountain Brook)	33.323591˚, -86.950231˚ 33.470900˚, -86.770204˚ 33.295052˚, -86.983313˚ 33.482331˚, -86.756892˚	Grants General Funds 319 Funds Private Fundraising	$20K – 100K (Per Site)	TBD	1) Conduct riparian buffer enhancement feasibility study. 2) Develop plan and acquire permitting. 3) Implementation of invasive species control and buffer enhancement. 4) Long-term maintenance
Stormwater Infrastructure	**Green Stormwater Infrastructure Design/Retrofit**	- Brookwood Mall (Homewood/Mtn. Brook) - Lakeshore Walmart (Homewood) - Grants Mill Station Parking Lot (Irondale) - Sam's Parking Lot (Irondale) - ROW Interchange (I-20/Kilgore Memorial Dr.)	33.470900˚, -86.770204˚ 33.448710˚, -86.820505˚ 33.530651˚, -86.694309˚ 33.533105˚, -86.692794˚ 33.534099˚, -86.698090˚	Grants General Funds 319 Funds Private Fundraising	TBD	TBD	1) Conduct suitability assessment (see Table 7.1) 2) Produce conceptual plan 3) Conduct full design and obtain permitting 4) Implementation of Green Stormwater Infrastructure Plan
Septic Leaks and Sewer Overflows	**SW System Repairs and Septic System repair/retrofit**	- Elder Street - Overbrook Road downstream of Mountain Brook Country Club - Homewood Central Park (fecal coliform)	33.520895˚, -86.716890˚ 33.490235˚, -86.748505˚ 33.475848˚, -86.797986˚	Grants General Funds 319 Funds Private Fundraising	TBD	TBD	1) Conduct septic inventory to identify failing systems (see Table 7.1) 2) Inspect and retrofit/repair/pump the failing septic systems. Repair stormwater system failures 3) Following repairs to the system, review monitoring data to investigate the extent that failing septic systems contribute to the fecal coliform levels in Shades Creek Conduct a public outreach campaign to support the septic management strategy.

7.6 EDUCATION PROGRAM

Management of any natural resource is enhanced by understanding, support, and participation of the stakeholders. Successful implementation of the recommended management measures may not be possible without public education and outreach, which is one of the EPA's nine (9) key elements for watershed planning. A consistent and targeted education and outreach program will raise public awareness and support for the recommended management measures necessary to protect and improve the health of the Shades Creek Watershed. The outreach program should include scheduled presentations to schools, civic organizations, municipal leadership, and other organizations as necessary. Informational signage at public access points should encourage the public to help preserve and protect the Shades Creek through good stewardship. Trash containers and dumpsters with appropriate signage should be located and maintained at public access points and other strategic locations as a reminder to keep the Shades Creek Watershed clean and free of trash.

The following goals have been identified for the public education and outreach plan:

- Inform, educate, and engage key stakeholders in an effort to increase the public's awareness of both the benefits provided by the Shades Creek Watershed and the problems impacting its Watershed.
- Engage private property owners to identify needs and interests along with their input on collaboration needs associated with the public for access, erosion, and habitats concerns.
- Explore additional opportunities to engage the public in the restoration and protection of the Shades Creek Watershed.
- Provide ways for the public to contribute to the restoration process, such as offering ideas for improving and preserving the Watershed.
- Educate community members so they increasingly value natural resources and recognize the importance of preserving and protecting the resource.
- Explore opportunities to engage the public in the restoration and protection of the Shades Creek Watershed.

Targeted Audiences

Specific community stakeholders must become leaders in the WMP implementation process. These targeted audiences and the ways the WMP address the values important to each of those stakeholders are identified in this section. The stakeholder groups have the ability to make changes through regulation or policy, participation in restoration activities, management of stormwater runoff, or communication of the Shades Creek WMP goals and objectives.

<u>Local Government Officials</u>

Local elected officials and their staffs are responsible for establishing priorities for local programs, developing policies, and setting annual budgets. These roles can influence the successful implementation of the Shades Creek WMP. This stakeholder group should be informed of the opportunity presented by the WMP to unify the public with the concept of protecting Shades Creek with local engagement. Jefferson County and all of the municipalities within the Shades Creek Watershed currently operate under their respective National Pollutant Discharge Elimination System (NPDES) municipal seprate stormwater system (MS4) permit. Public education and outreach is already a requirement of the permit. Examples of public outreach that meet this permit requirement include the following:

- Posting signage in public parks reminding dog owners to pick up after their pets
- Distributing brochures to the community highlighting stormwater issues in the community
- Providing public schools with stormwater related educational materials or conducting presentations at schools
- Developing display materials to showcase at local events
- Developing public service announcements for mass media outlets
- Purchasing or producing give away materials that educate the public on stormwater issues (magnets, bookmarks, pens, etc.)
- Painting, stenciling, or marking storm drains to alert citizens not to dump materials into the system
- Running a poster or essay contest to encourage citizens to consider clean water issues.

Considering that MS4 permit holders are already required to incorporate a public education and outreach program, it is a perfect opportunity to incorporate elements of this WMP in support of the MS4 permit. Any public outreach and education for the Shades Creek WMP can be utilized as documetation for the MS4 permit. Local government officials also have a role in providing access to the historic and productive waterway. In addition, the WMP provides useful information needed to make decisions about both recreational access and economic development while ensuring protection of environmental resources.

Local government officials can vote to support the Shades Creek WMP, develop and implement WMP recommendations, and encourage stricter enforcement of regulations related to litter and stormwater management. Local officials should be encouraged to work with state and federal agencies to facilitate WMP projects. They can also promote a sense of watershed community through community-wide activities such as trash collection and tree planting events.

Private Industry

Success is closely tied to financial support. Support from an active and diverse group of private stakeholders is needed to attract and match sources of federal, state, and local funding. Major institutions within the Watershed should be motivated to support the WMP, as all businesses within the watershed will benefit from its restoration. Local residents will enjoy improved surroundings, a better living environment, and increased satisfaction and pride in their community. Businesses can enhance their public image by demonstrating their support for preservation and restoration of a local resource. The WMP recommends engagement opportunities for private industry in the implementation of projects to support the surrounding community, local workforce, and economy while promoting their company image and fostering goodwill. Private industry can also seize opportunities to become involved in recommended projects such as installing stormwater retention ponds for their facilities or funding components of other projects and programs throughout the Watershed. Sponsors can be highlighted on signage or plaques.

Academia

Local schools and higher education institutions have an opportunity to inform students about issues in their community. Teachers and instructors can introduce students to the WMP goals and objectives. The extensive scientific and technical data presented in the WMP regarding the current status of the Shades Creek Watershed and measures to improve conditions can be utilized as educational tools for all levels of curriculum. The WMP also identifies research opportunities for academic field work benefiting local resources.

Local Resource Managers

Local resource managers provide services related to water supply and wastewater treatment to the Shades Creek Watershed residents and can assist in guiding water quality management within the Watershed. The actions recommended in this WMP will improve water quality of the Shades Creek Watershed by reducing stormwater pollutants and trash in waterways and increasing public understanding of human impacts on water resources. Local resource managers can help by getting involved in the Shades Creek preservation and restoration efforts, assisting with outreach and communication, and sponsoring community events.

Media

Newspapers, television news programs, on-line news sources, social media (Twitter, Facebook, Instagram, etc.), and radio stations are significant sources of information for the public. The WMP sets the stage for a better future for the Shades Creek Watershed and a vision, supported by the public, to preserve the area and provide community-wide access to a beautiful natural resource. Local media can help by publishing stories highlighting the WMP and its recommendations, creating news stories describing accomplishments of the WMP, advertising cleanup or anti-littering events and campaigns, and sharing stories about the involvement of local leaders in the WMP.

Community Organizations and Leaders

Community leaders have a vital role in implementing the WMP and its goals. They should be advocates of the WMP and encourage elected officials to prioritize the WMP recommendations. They should participate in education and outreach, litter reduction campaigns, and share restoration ideas. Community leaders should understand that the WMP represents a community-wide approach for protecting water quality, habitats, and living resources of the Shades Creek Watershed through the goals of improving recreational opportunities, beautifying the area, and highlighting historical and cultural aspects of the Watershed. Community leaders can host events, promote recreational and outreach activities, create and launch neighborhood anti-littering campaigns, and educate residents on the benefits of preservation and restoration to their properties. Many leaders and stakeholders have been identified through the process of developing the WMP, and some are already involved. While TNC has led the effort to initiate the work, future efforts and project implementation must be rooted within the community of stakeholders.

The mission of TNC is to "conserve the lands and waters on which all life depends" and TNC vision is a "world where the diversity of life thrives, and people act to conserve nature for its own sake and it ability to fulfill our needs and enrich our lives." To support its mission and vision, TNC chooses to promote watershed planning and the development of this WMP. TNC recognizes the critical importance of preserving and improving the health of the Shades Creek system. TNC and the other community organizations listed as stakeholders will continue to work with local governmental officials and regulatory agencies to help advocate for the implementation of the WMP recommendations. These community organizations will continue to provide opportunities for public involvement and membership, organize the training of volunteer coordinators for a wide variety of environmental topics, host meetings with community groups and neighborhood associations to equip them with the knowledge and materials for promoting the WMP goals and objectives, and collaborate with citizen groups to promote stewardship efforts in preserving and restoring the Shades Creek Watershed.

7.7 LOCAL PROGRAMS

Local programs for citizens are an important part of the WMP implementation strategy to create interest and encourage participation by watershed residents. The following are examples of local programs that can be beneficial to the health of the watershed.

Voluntary Monitoring

An important part of the WMP implementation strategy is to create interest and encourage participation by watershed residents. One way to achieve this is to create a local volunteer monitoring program. Community organizations, such as the Cahaba Riverkeepers, are already conducting water quality monitoring and distributing the results through social media. The Alabama Water Watch (AWW) is another outstanding example of this type of program. It is a citizen-volunteer water quality monitoring program that has data collection stations located in all of the major river basins in Alabama. The goals of the Shades Creek volunteer monitoring program are to:

- Educate residents on water quality issues and create interest in the health of the Watershed;
- Train citizens to use standardized equipment and techniques to gather water quality information correctly;
- Enable citizens to maintain and improve the health of the Watershed by using their data for environmental education, restoration, protection, and stewardship; and
- Create a database of water quality data that can be used to help evaluate the effectiveness of management measures.

Volunteer monitoring locations should initially include all the data collection stations listed in Chapter 4. The volunteer monitoring program is primarily intended to collect field parameters as an ongoing reconnaissance to screen water quality for potential problems. Identified issues could then be more thoroughly investigated through in-depth sampling and analyses under the formal monitoring program addressed in **Chapter 4** and monitoring locations for future sampling.

Community Rating System

The National Flood Insurance Program (NFIP) provides federally backed flood insurance within communities that enact and enforce floodplain regulations. To be covered by a flood insurance policy (for the structure and/or its contents), a property must be in a community that participates in the NFIP. To qualify for participation in the NFIP, the governmental entity must adopt and enforce a floodplain management ordinance to regulate development in flood hazard areas. The main objective of the flood ordinance is to minimize the potential for flood damage on future development, thus protecting people and property in the community.

The NFIP established the Community Rating System (CRS) program to provide incentives for communities that exceed minimum requirements with their floodplain management programs. The CRS program aims to achieve three major goals: 1) to reduce damage to insurable property, 2) to strengthen and support the insurance aspects of the NFIP, and 3) to encourage a comprehensive approach to floodplain management. The CRS program recognizes and awards credits for floodplain management activities that go above and beyond the minimum requirements in these four main categories: public information, mapping and regulations, flood damage reduction, and warning / response. The more points a community receives, the better the discount property owners within that community receive on their flood insurance policies. Participation in CRS can reduce insurance premiums for policy holders by as much as 45%. Additionally, implementation of CRS activities can give participating communities a competitive edge with other Federal assistance programs.

Communities within the watershed that are currently in the CRS program are the Cities of Hoover, Homewood, and Birmingham. With flooding being identified as an issues within the watershed, this program could be invaluable for governmental stakeholders within the watershed. Not only does this program contribute to the health of the watershed, but it also provides a financial incentive for businesses and citizens within each community. Communities currently not participating in this program should be encouraged to take the appropraite steps to become eligible. Participating communities should continue to work on implementing floodto receive credit and reduced insurance premiums for its citizens.

Alabama Smart Yards

The Alabama Smart Yards (ASY) program is a cooperative alliance by the Alabama Cooperative Extension System, ADEM, Alabama Nursery and Landscape Association, Alabama Master Gardeners Association, and Auburn University's Department of Horticulture (ACES, 2016a). Its mission is to introduce environmental consciousness to homeowners and neighborhoods. The ASY provides an extensive handbook that contains a host of information including recycling lawn waste, reducing stormwater runoff, managing yard pests responsibly, efficient irrigation practices, etc. The program also includes a "Smart Yards" application for mobile telephones that serves as a pocket guide for environmentally responsible yard maintenance.

7.8 EVALUATION FRAMEWORK

The evaluation framework for this WMP, its implementation, and its success can be divided into three (3) primary areas: inputs, outputs, and outcomes. Inputs include human resources of time and technical expertise, organizational structure, management, and stakeholder participation. Outputs include implementation of management measures, public outreach and education, and the monitoring program. Outcomes include increased public awareness, improved watershed conditions, and improved water quality. An effective evaluation framework allows the WMP and implementation strategy to be modified as necessary to maximize efficiency and achieve stated goals. The evaluation framework for the Shades Creek Watershed should focus on answering these questions during the indicated time frames. If the answer to any of these questions is negative, the implementation strategy should be reevaluated and revised.

Short-Term Milestone Period (0 – 2 years)

- Have necessary funding for implementation been quantified, sources identified, and any received?
- Has the Public Education and Outreach Program been organized and implemented?
- Has the Monitoring Program been updated/implemented and a qualified entity identified to carry out the program?
- Have any planning/assessment actions been completed (hydrologic model, biological assessment, septic inventory, SW infrastructure inventory, GSI inventory, etc.)?
- Has the Pollutant Source Tracking Program been implemented?

Mid-Term Milestone Period (2 – 5 years)

- Has the Monitoring Program been successfully implemented?
- Has the Invasive Species Management Program been initiated?
- Have any management measures been implemented (septic retrofits, SW infrastructure repair, litter traps, streambank restoration, etc.)?
- Have any Green Infrastructure projects been funded and completed?
- Did the level of public interest and participation rise to the level of helping to achieve the WMP goals?
- Has additional funding been identified and secured?

Long-Term Milestone Period (5 – 10 years)

- Have specific projects and management measures proposed in the WMP been fully implemented and completed?
- Have there been reductions in the sediment, nutrient, and fecal loading rates?
- Have water quality conditions improved?
- Have water quality improvements and loading rate reductions met stated goals?

7.9 NEW DATA RECOMMENDATIONS

The compilation of information during the development of this WMP has led to the identification of significant gaps in the data acquired, which should guide future research and data collection relevant to the goals of the WMP. In addition, the temporal, spatial, and parametric coverage of ambient surface water quality data from Shades Creek have varied substantially, as very few stations have been monitored consistently since 1991 to present. Although sufficient historic and recent data exist to adequately determine the general status and rends in surface water, it is important to continually monitor in order to capture changes in water quality.

Recommendations for water quality monitoring are presented in Chapter 4. Informational gaps that are addressed in these recommendations include the following:

- Establishment of long-term trend water quality monitoring program which should address nutrients, fecal bacteria, sediment, and flow. Needed activities include establishment of additional monitoring locations in the Lower Shades Creek and Colley-Mud Creek sub-watersheds, and consistent parametric coverage and existing stations to support long-term tracking of status, trends, and regulatory compliance.
- Consideration for implementation of sampling locations for anthropogenic sources (pesticides / herbicides / petroleum/ oil / grease). These sources are primarily caused due to stormwater runoff from agriculture, lawn and gardens, parking lots, and roads. Monitoring parameters would indicate the success, or lack thereof, the management measures in limiting unfiltered urban runoff into surface drainages.
- Implementation of a pollutant source tracking program to include simultaneous measurements of flow, nutrients, sediment and bacteria at primary tributary inflows. This program should include microbial source tracking to identify animal sources (e.g. human, dogs, cattle, etc.) of any observed bacterial observations. Assessment of sediment loadings specific to the primary tributary flows in order to identify the source of input.

- Biological and habitat evaluations should be conducted in each sub-watershed and include the assessment of flora, fauna, and protected and invasive species specific to the watershed. Stream assessment should also be conducted for the main channel and major tributaries.
- Develop a hydrological model for the Shades Creek watershed including 1) a detailed impervious surface analysis throughout the watershed, 2) identify priority sub-watersheds that are experiencing flows that exceed the capacity of the infrastructure and natural systems, 3) identify sub-watersheds that need to regulate post-construction peak flows to less than pre-construction flows in order to address capacity, and 4) identify opportunities for the installation of green infrastructure (e.g. infiltration of stormwater runoff).

7.10 INITITAL IMPEMENTATION OF MANAGEMENT MEASURES

Implementation of recommended management measures should begin immediately following the approval of the Shades Creek WMP. Initial implementation should focus on the most critical issues and the prioritized management measures identified in this WMP. Below is a summary of priority management measures that are recommended for implementation.

1. **Develop a long-term trend water quality monitoring program**
   A water quality monitoring and sampling plan is necessary to continue to document the overall health of the Shades Creek Watershed, track the success or failure of the implemented management measures, and determine where additional measures are necessary. The monitoring plan should encompass the greatest possible portion of each watershed with the least number of samples necessary, while providing sufficient detail to identify probable sources for impairments of concern. As part of the water quality monitoring and sampling program, it is recommended to implement a pollutant source tracking program to determine the sources of pollutant input. Incorporating collection of data for anthropogenic sources (pesticides, herbicides, petroleum, oil, & grease) should be considered as part of this monitoring plan.

2. **Develop a Hydrologic Model for the Shades Creek Watershed Complex**
   A hydrological model of the watershed will provide a detailed analysis of impervious surfaces and identify sub-watersheds that are experiencing flows that exceed the capacity of the infrastructure and natural systems. This model could also identify sub-watersheds that need to regulate post-construction peak flows and identify opportunities for the installation of green infrastructure (e.g. infiltration of stormwater runoff).

3. **Conduct a biological and habitat analysis in each sub-watershed**
   Initiate potential habitat enhancement projects that are intentionally large and aimed at current federal funding opportunities to restore and protect critical habitats. These projects should target stabilization of stream channels, wetlands, and riaprian buffers to reduce erosion/sedimentaiton and enhance aquatic habitat. Identify projects for restoration and conservation of priority habitats. Prepare a flora inventory plan as well as an invasive species (flora and fauna) control plan specific to the watershed to ensure vital areas are protected and maintained.

4. **Conduct GIS inventory for septic systems and stormwater infrastructure**

   A GIS inventory of existing septic systems (primarily in the Lower Shades Creek and Cooley-Mud Creek sub-watersheds) and existing stormwater infrastructure (primarily in the Upper Shades Creek sub-watershed) would provide the necessary information for making improvements to these systems. System failures could be identified and prioritized for the necessary repairs to enhance water quality in the watershed. In addition, a GIS Green Infrastructure (GI) and soil suitability assessment could be incorporated into this analysis to determine feasibility of potential GSI projects and develop cost estimates for implementation.

5. **Establish a public outreach and education program**

   The outreach program should include scheduled presentations to schools, civic organizations, municipal leadership, and other organizations as necessary. Informational signage at public access points should encourage the public to help preserve and protect the Shades Creek through good stewardship. Trash containers and dumpsters with appropriate signage should be located and maintained at public access points and other strategic locations as a reminder to keep the Shades Creek Watershed clean and free of trash. The watershed outreach program could be incorprated into the existing public outreach requirements for the NPDES MS4 permits held by many of the communities within the Shades Creek watershed.

6. **Implement specific stormwater best management practices**

   Implement litter control measures as necessary, reduce nutrient loads (implement improvements to reduce failing septic tanks and stormwater infrastruture), condcut streambank and wetland restoration, conduct invasive species control and riparian buffer restoration, and encourage low impact development and green stormwater infrastructure (bioretention, constructed wetlands, retrofits, etc.). Specific potential sites for best management practices are listed in **Table 7.1** and additional specific project could be identified through the recommended assessments listed above.

8.0 REGULATORY FRAMEWORK

As part of the development of this Watershed Management Plan (WMP) for the Shades Creek Watershed in Jefferson County, Alabama, a review of existing regulations at the Federal, State, and local levels was conducted. The geopolitical boundaries of the Shades Creek Watershed include overlapping jurisdictions and adjacent portions of Jefferson, Shelby, Bibb, and Tuscaloosa Counties, the Cities of Bessemer, Birmingham, Homewood, and Hoover, Irondale, Mountain Brook, and Vestavia Hills. Past and current status of developments, ordinances, inspections, and compliance issues were discussed with local government officials, as well as with representatives of Alabama Department of Environmental Management (ADEM), U.S. Army Corps of Engineers (USACE), and the WMP Steering Committee.

The laws, regulations, and ordinances reviewed in this WMP focus on water quality, stormwater, erosion and sediment control, wetlands, other “waters of the U.S.,” and land disturbances. The list includes:

- Clean Water Act, 33 USC § 1251, et seq.
- Alabama Water Pollution Control Act, Ala. Code § 22-22-1, et seq.
- ADEM Admin Code Reg. 335-6-6 National Pollutant Discharge Elimination System (NPDES)
- 335-6-6 and 335-6-10 (NPDEA and Water quality criteria)
- City of Bessemer Stormwater Management Ordinance
- Birmingham City Code Chapter 17: Storm Water Management and Flood Control
- City of Birmingham Stormwater Management Program Plan
- City of Homewood Erosion and Sediment Control and Stormwater Management Ordinance
- City of Hoover Erosion and Sediment Control and Illicit Discharge Ordinance
- City of Irondale Stormwater Management Ordinance
- City of Mountain Brook Stormwater Management, Erosion and Sediment Control, and Subdivision Ordinance
- City of Vestavia Erosion and Sedimentation Control Ordinance
- Jefferson County Flood Damage Prevention Ordinance
- Shelby County Stormwater Management Plan and SSO Response and Reporting Program
- Tuscaloosa County Floodplain Management Ordinance

Federal, State, and local regulations are regularly reviewed and updated. Regulation changes are constantly being planned; however, permits typically required for activities within the Watershed are regularly updated (typically every five years) and usually include some changes from the previously issued permits. Below is a summary of the current expiration dates for the federal, state, and local permits required for certain activities within the Watershed:

- USACE Nationwide Permits – March 18, 2022
- ADEM Construction Stormwater General Permit – March 31, 2026
- City of Bessemer Municipal Separate Storm Sewer System (MS4) Individual Permit – November 30, 2022
- City of Birmingham Municipal Separate Storm Sewer System (MS4) Individual Permit – February 28, 2023

- City of Homewood Municipal Separate Storm Sewer System (MS4) Individual Permit – June 30, 2022
- City of Hoover Municipal Separate Storm Sewer System (MS4) Individual Permit – January 31, 2023
- City of Irondale Municipal Separate Storm Sewer System (MS4) Individual Permit – June 30, 2022
- City of Mountain Brook Municipal Separate Storm Sewer System (MS4) Individual Permit – June 30, 2022
- City of Vestavia Hills Municipal Separate Storm Sewer System (MS4) Individual Permit – June 30, 2022
- Jefferson County Phase I MS4 General Permit – September 30, 2023
- Shelby County NPDES Permit – September 30, 2025
- Tuscaloosa County Phase II MS4 General Permit – September 30, 2021

8.1 REGULATORY FRAMEWORK

In May 1991, the State of Alabama Legislature passed a law (Act No. 91-602) that provides for the creation of watershed management authorities in the state, with the expressed purpose of "developing and executing plans and programs relating to any phase of conservation of water, water usage, flood prevention, flood control, water pollution control, wildlife habitat protection, agricultural and timberland protection, erosion prevention, and control of erosion, floodwater and sediment damages" (AL Code§ 9-10A-1, 2013).

This body is non-regulatory; however, the law provides numerous powers and authorities to the Board of Directors of a watershed management authority, including the power to:

- Acquire lands or rights-of-way by purchase, gift, grant, bequest, or through condemnation proceedings;
- Construct, improve, operate, and maintain such structures and projects as may be necessary for the exercise of any authorized function of the Authority;
- Borrow money as is necessary for the performance of its functions;
- Make and execute contracts and other instruments necessary to the exercise of its powers;
- Act as agent for the State of Alabama or any of its agencies, the United States or any of its agencies, or any county or municipality in connection with the acquisition, construction, operation, or administration of any project within the boundaries of the Authority;
- Issue, negotiate, and sell bonds upon approval of the State Finance Director; and
- Accept money, services, or materials from national, state, or local governments.

8.1.1 Federal Authorities

<u>Federal Water Pollution Control Act</u>

The Federal Water Pollution Control Act was enacted in 1948, and was significantly reorganized and expanded in 1977. The Clean Water Act (CWA) became the Act's common name with the amendments in 1972. The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating water quality standards for surface waters. The CWA and its amendments provide the basis for the primary federal regulatory and permitting procedures relating to stormwater management in the Shades Creek

Watershed. The most applicable sections of the CWA related to controlling stormwater runoff and erosion and sedimentation within the Watershed are listed below.

CWA § 404

This section establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. CWA Section 404 requires a permit before dredged or fill material may be discharged into waters of the United States, unless the activity is exempt from Section 404 regulation (e.g., certain farming and forestry activities). The USACE is the primary permitting authority for impacts to waters of the United States, including wetlands. Permit applications are reviewed and evaluated based on the environmental criteria set forth in the CWA Section 404(b)(1) guidelines and regulations promulgated by the U.S. Environmental Protection Agency (EPA). The permits must also meet State water quality standards and coastal area requirements and must be consistent with each program.

CWA § 402

This section authorizes permitting under the NPDES program with EPA having primary permitting authority. The NPDES program requires dischargers to obtain permits prior to discharging pollutants into waters of the United States. The NPDES program covers point source discharges from industrial facilities; MS4s; concentrated animal feeding operations (CAFO); publicly-owned treatment works (POTW); combined sewer overflows (CSO) and sanitary sewer overflows (SSO); and construction, non-coal/non-metallic mining and dry processing less than five acres, other land disturbance activities, and areas associated with these activities.

Through delegation from the EPA, ADEM has the authority to administer the NPDES program. Through ADEM Admin. Code Reg. 335-6-6 the Department regulates and permits certain point source discharges. Through ADEM Admin Code Reg. 335-6-6, ADEM regulates discharges from construction, non-coal/non-metallic mining and dry processing less than five acres, other land disturbance activities, and areas associated with these activities. This regulation also imposes requirements for controlling erosion, sedimentation, and other potential sources of pollution from these activities through the use of best management practices. This regulation also outlines requirements for inspections, reporting, and enforcement actions.

The EPA promulgated the Effluent Limitations Guidelines and Standards for the Construction and Development Point Source Category in December 2009. The rule requires owners and operators of permitted construction activities to adopt certain requirements including the implementation of erosion and sediment controls, stabilization of soils, management of dewatering activities, implementation of pollution prevention measures, provision and maintenance of a buffer around surface waters, prohibition of certain discharges, and utilization of surface outlets for discharges from basins and impoundments. The 2009 rule also included the establishment of numeric limitations on the allowable level of turbidity in discharges from certain construction sites. In 2014, the EPA made several revisions to the 2009 rule requirements including defining “infeasible” and removing the numeric turbidity effluent limitation and monitoring requirements.

In addition to the activities listed above, ADEM is also the delegated authority from the EPA to regulate discharges from MS4s. ADEM requires municipalities and other large operators of MS4s, such as the Alabama Department of Transportation (ALDOT), to obtain and comply with terms of an NPDES permit to control the discharges from such systems.

CWA § 303(D)

Under Section 303(d) of the 1972 CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop total maximum daily loads (TMDLs) for these waters. The TMDLs are used to establish limits for the amount and type of pollutant discharges that the receiving streams can handle without experiencing further degradation.

Within the Shades Creek Watershed, Cooley Creek, Mill Creek, and Mud Creek are listed on the Alabama § 303(d) list for pathogens (E. coli), and Shades Creek is listed for pathogens, siltation, turbidity, and habitat alteration. All of these drainages have approved TMDL's (2003). Once a TMDL is established, additional research may be warranted to determine additional measures that can be implemented to meet the required TMDL. Mud Creek and Mill Creek are on the current (2020) ADEM 303(d) list. Mud Creek and Mill creek are proposed for pathogens (E. coli).

CWA § 319

Under Section 319 of the 1972 CWA, the Alabama Non-Point Source (NPS) Management Program protects and restores water quality by; strategically focusing programmatic goals and objectives to achieve and sustain water quality standards, clearly articulate programmatic goals so that project workplan planning and implementation reflect actions to advance those goals, reflect a balance between watershed-based planning and implementation that best utilizes resources to deliver measurable nonpoint source pollutant load reductions and water quality improvement results, leverage and integrate a mix of public and private sector programs to align priorities and make the best use of available resources to control nonpoint sources of pollution, and the tracking and reporting of results to demonstrate progress and ensure accountability.

CWA § 401

Under Section 401 of the 1972 CWA, permit applications must be submitted, and reviewed by ADEM for consistencies within the State's active water quality program. It is noted that a federal agency may not issue a license or permit without state or authorized tribe consent that warrants a Section 401 water quality certification verifying compliance with existing water quality requirements, or that waves the certification requirement to conduct any activity that may result in any discharge into waters of the U.S.

8.1.2 State Authorities

A comprehensive program of environmental management for the state was established in 1982 when the Alabama Legislature passed the Alabama Environmental Management Act. The law created the Alabama Environmental Management Commission and established ADEM, which absorbed several commissions, agencies, programs, and staffs that had been responsible for implementing environmental laws. ADEM administers all major federal environmental laws, including the CWA. The ADEM assumed these responsibilities only after demonstration that State laws and regulations are at least equivalent to federal standards and that the State has matching funds and personnel available to administer the programs. In addition, the Alabama Department of Conservation and Natural Resources (ADCNR) and the Alabama Department of Economic and Community Affairs (ADECA) Office of Water Resources (OWR) may also have jurisdiction over certain actions that affect state waters and natural resources.

Alabama Water Pollution Control Act

The Alabama Water Pollution Control Act (AWPCA), Alabama Code § 22-22-1, is the state's version of the CWA. The Act provides the framework for the adoption of rules establishing water quality standards, the adoption of effluent limitation guidelines, a system for issuance of permits, which shall include effluent limitations for each discharge for which a permit is issued, and such other rules as necessary to enforce water quality standards adopted by ADEM.

Water Quality Criteria

As outlined in CWA § 401(a), CWA § 404 permit applications must be reviewed by the ADEM to ensure that the proposed permitted action is consistent with the State's water quality program. This review is to ensure that any discharge of dredged or fill material will not cause or contribute to a violation of the State's water quality standards. State water quality standards are outlined in ADEM Admin. Code Reg. 335-6-10.

Construction Site Stormwater

The CWA and federal regulations require construction site operators to obtain NPDES permit coverage for regulated land disturbances and associated discharges of stormwater runoff to state waters. Effective April 1, 2021, ADEM established the General NPDES Permit No. ALR100000 for discharges associated with regulated construction activity that will result in land disturbance equal to or greater than one acre, or from construction activities involving less than one acre, and which are part of a common plan of development or sale equal to or greater than one acre. This permit replaced the previous General NPDES Permit No. ALR100000 which expired on March 31, 2021. The General Permit falls under the authority of ADEM Admin. Code Reg. 335-6-6, along with the other actions regulated by the NPDES program.

Construction site operators and/or owners seeking coverage under this general permit must submit a Notice of Intent (NOI) in accordance with the permit requirements. Operators and/or owners of all regulated construction sites must implement and maintain effective erosion and sediment controls in accordance with a Construction Best Management Practices Plan (CBMPP) prepared and certified by a Qualified Credentialed

Professional (QCP). For priority construction sites, which include any sites that discharge to (1) a waterbody listed on the most recently EPA approved 303(d) list of impaired waters for turbidity, siltation, or sedimentation; (2) any waterbody for which a TMDL has been finalized or approved by EPA for turbidity, siltation, or sedimentation; (3) any waterbody assigned the Outstanding Alabama Water use classification in accordance with ADEM Admin. Code Reg. 335-6-10-.09; and (4) any waterbody assigned a special designation in accordance with ADEM Admin. Code Reg. 335-6-10-.10, the CBMPP must be submitted to ADEM for review along with the NOI. A Qualified Credentialed Inspector (QCI) or QCP must conduct regular inspections of regulated construction activities to ensure effective erosion and sediment controls are being maintained.

State MS4 NPDES Program

The MS4 NPDES Program, administered by ADEM, requires certain designated municipalities and other entities to obtain an MS4 permit (either Phase I or Phase II). Portions of Jefferson, Shelby, and Tuscaloosa Counties are located within either a Phase I or Phase II MS4 permitted area and the corporate boundaries of the Cities of Bessemer, Birmingham, Homewood, Hoover, Irondale, Mountain Brook, and Vestavia Hills are covered under a Phase I or Phase II MS4 permit.

CWA § 303(D)

ADEM is required by the EPA to designate waters for which technology-based limits alone do not ensure attainment of applicable water quality standards. This list is to be submitted to the EPA on April 1st of each even-numbered year. Impairments include things such as nutrients, pesticides, pathogens, metals, organic enrichment, and siltation, among other things, and can be caused by point sources or non-point sources. The impaired waters must then be sampled and a TMDL amount or limit must be calculated. The Shades Creek Watershed is proposed to have one impaired stream, and an approved TMDL (2003) is listed. Any activity within the Shades Creek Watershed should take into consideration the cause of the listing and determine if the proposed action is contributing to the impairment. If a proposed activity is contributing to the impairment, the best available technology should be considered to minimize the potential of contributing to the impairment of the watershed.

8.1.3 County Authorities

The applicable ordinances for Bibb, Jefferson, Shelby, Tuscaloosa Counties are summarized in **Table 8.1**.

8.1.4 City Authorities

The applicable City ordinances for Bessemer, Birmingham, Homewood, Hoover, Irondale, Mountain Brook, and Vestavia Hills are summarized in **Table 8.2**.

8.2 REGULATORY OVERLAP

Federal, state, and local regulations overlap within the Shades Creek Watershed. Federal and state water quality regulations apply to all areas within the Watershed. The various City MS4 permits apply to the Watershed, and the Jefferson Tuscaloosa, and Shelby County MS4 permits apply to the portions of the Watershed located outside of City limits. Land disturbance activities within the Watershed must have:

- A CWA §404 permit with review by all agencies and the public, if not authorized by a NWP (if disturbance activity proposes to fill jurisdictional waters of the U.S.);
- ADEM water quality certification (if disturbance activity proposes to fill jurisdictional waters of the U.S.);
- ADEM General NPDES Permit No. ALR100000 (if disturbances are equal to or greater than 1 acre);
- County Land Disturbance Permit;
- and City Land Disturbance Permit (if located within the boundaries of a City MS4 Permit).

Some Cities have extraterritorial jurisdictions that extend up to five miles beyond their boundaries for planning purposes, and overlap into the county, but not adjacent municipalities. This extraterritorial boundary is for planning purposes only; therefore, only the federal, state, and county water quality regulations apply to these areas. All regulations state that where there is an overlap in jurisdiction within the Watershed, the more stringent requirements apply.

8.3 REGULATORY DEFICIENCIES

Observation 1
The QCI training programing only includes training on inspections during construction and does not include training of post-construction BMPs. In addition, not all individuals covered by the definition of a QCP are qualified to inspect post-construction BMPs.

Observation 2
Except as it relates to flood control, there are currently no federal or state post-construction stormwater management controls, which leaves these regulations to fall under local government jurisdiction. While a large portion of the Watershed is regulated by local ordinances and regulations, the remainder of the Watershed has no post-construction stormwater control regulations.

Observation 3
The State of Alabama has established a 25-foot buffer requirement related to wetlands and riparian buffers for all new construction sites greater than one acre. Federal and state permits are regularly issued, allowing wetlands, streams, and riparian buffers to be impacted. Although mitigation for these impacts are typically required, mitigation measures often occur outside of an impacted watershed, creating a net loss of these valuable resources within the watershed.

8.0 REGULATORY FRAMEWORK

Observation 4

The inspection and enforcement power for water quality concerns falls primarily to County and municipal public works and development departments. These departments have a multitude of other responsibilities and may not be trained to recognize storm water issues.

Observation 5

Bibb County has no local stormwater management plan, floodplain ordinances, or erosion and sediment control ordinances.

8.4 ENFORCEMENT

The inspection and enforcement power for water quality concerns falls primarily to County and municipal public works and development departments. These departments have a multitude of other responsibilities and may not be trained to recognize storm water issues.

Table 8.1 – County Level Regulatory Table

County	MS4 Program NPDES Permit	SW Program	SSO/Illicit Discharge Program	Floodplain Management Program	Ordinances	Responsible Authority
Bibb	None	None	None	None	2019 Code of Alabama, Title 45 - Local Laws, Chapter 4 - Bibb County	N/A
Jefferson	MS 4 Phase I Permit # AL000001	Yes 2013	Yes 2018	Yes 2019	Article 10, 11, 13, Subdivision and Construction Ordinance	Development Services Environmental Services
Shelby	NPDES Permit # ALS000008	Yes 2019	Yes 2019	Yes 2013	Subdivision Regulations Resolutions 13-01-28-03, 19-8-26-04, 09-02-09-06, 07-02-12-07 Stormwater ordinance 98-09-28-8	County Engineer, Department of Development Services
Tuscaloosa	MS 4 Phase II Permit # ALR040001	Yes 2019	Yes 2018	Yes 1995, 2008	Title 11, chapter 52, sections 1 through 84; and title 41, chapter 9, section 166 of the Code of Alabama, 1975 Flood Damage Prevention Ordinance 2008	Public Works Department

Table 8.2 – Local Level Regulatory Table

Municipality	MS4 Program NPDES Permit	SW Program	SSO/Illicit Discharge Program	Floodplain Management Program	Ordinances	Responsible Authority
Bessemer	MS 4 Phase I Permit # ALS000022	Yes 2018	Yes 2018	Yes 1995	Bessemer, AL Code of Ordinances, Chapters 50 and 58	Build and Inspections Department Storm Water Management program
Birmingham	MS 4 Phase I Permit # ALS000032	Yes 2018	Yes 2018	Yes 1995	Birmingham City Code Stormwater Management plan Floodplain Ordinances Zoning Ordinances	City Stormwater Management Program, Planning and Engineering, Public Works
Homewood	MS 4 Phase I Permit # ALS000016	Yes 2018	Yes 2018	No	1995, 1422, 2704, 2705, 2706 2005 Subdivision Regulations,	Department Public Works and Inspections, SWMA Program
Hoover	MS 4 Phase I Permit # ALS000027	Yes 2010	Yes 2018	Yes 2013	Ordinance 10, Articles IV and V 13-2226	City Engineer Public Safety Center
Irondale	MS 4 Phase I Permit # ALS000019	Yes 2018	Yes 2018	Yes 2019	Ordinance 464-83, 00-12, 2006-36, 2017-57, 4-0794, 758, 2018-12, 2018-13	Public Works Department
Mountain Brook	MS 4 Phase I Permit # ALS000018	Yes 2013, 2018	Yes 2018	Yes 2013	Ordinances 1496, 2019, 2023, 2024, Subdivision Regulation adopted 2013	Department of Planning, Building, and Sustainability
Vestavia Hills	MS 4 Phase I Permit # ALS000017	Yes 2018	Yes 2019	Yes 2019	2769, 2770, 2771, 2331, 2429, 2262,	Departments of Engineering, Public Works

9.0 FUNDING SOURCES

9.1 INTRODUCTION

Funding projects and activities throughout an entire watershed is not a simple undertaking. Successful implementation of the management measures recommended in this WMP will require the long-term commitment of significant financial resources and community support. The design, construction, and maintenance of stormwater improvements, purchase of land for offline storage, modification/protection of streams to reduce erosion, and/or the purchase and preservation of tracts of land to create greenspace buffers, wetlands, or floodplains to protect stream quality will require significant and reliable funding. The jurisdictional areas of political entities that might provide funding do not necessarily follow or encompass watershed boundaries; therefore, a public-private partnership may be the most effective way to accomplish management goals.

To acquire the funding necessary to undertake significant restoration, preservation, and/or management projects, public and private entities should consider and compare all available funding options. Many financial assistance opportunities, primarily in the form of federal grants and cooperative agreements, are available to help restore, enhance, and preserve watersheds. However, increases in watershed recovery efforts by communities around the nation have substantially increased the competition for these resources.

Financial structures and sources that could provide funding for the management issues and projects identified in this WMP are discussed below. Some financial structures could be helpful across the entire Watershed and some within limited areas. Many would require public-private partnerships and cooperation among landowners, organizations, and governments, rather than imposition by governmental entities.

The following alternatives for funding and financing projects in the Shades Creek Watershed are discussed (with the sections in which they are discussed indicated parenthetically):

- Stormwater utility fees (9.2)
- Property, sales, or other taxes (general funds) (9.3)
- Federal grants, loans, and revenue sharing (9.4)
- Non-governmental organization and other private funding (9.5)
- Impact fees (9.6)
- Special assessments (9.7)
- System development charges (9.8)
- Environmental tax shifting (9.9)
- Capital improvement cooperative districts (9.10)
- Alabama improvement districts (9.11)
- Regional collaboration opportunities (9.12)

9.2 STORMWATER USER FEES

The U.S. Environmental Protection Agency (EPA) indicates the most stable source of funding for stormwater management is a stormwater utility fee (EPA, 2008). Stormwater utility fees provide equitable and transparent sources of funding for stormwater management. A stormwater utility fee would provide a stable, predictable, long-term funding mechanism dedicated to stormwater management improvements. A stormwater utility could undertake planning and construction programs to enable resolution of chronic problems. Sustainable revenues would be generated based on consumption and user fee-based services (Spitzer, 2010).

Stormwater utility authorities are used extensively in many areas of the country. In the State of Alabama, the authority to create a local stormwater utility typically must be granted to a county by legislative statute. However, municipalities that have approved municipal separate storm sewer systems (MS4) ordinances may levee stormwater utility fees. The stormwater user fee typically appears as a separate line item on residential or commercial water and sewer bills, as a special assessment on property tax bills, or as a stand-alone bill making these fees highly visible to the general public. The concept of stormwater management is difficult for the average citizen to grasp and can result in skepticism about the need for stormwater user fees. The user fee is often seen as a tax and can be subject to legal challenges. Therefore, local stormwater ordinances must be carefully crafted to prevent such challenges.

Stormwater user fees can be based on parcel size or the impervious areas within the parcel. Fees for residential and commercial properties may be calculated differently (e.g., a fixed fee for each residential parcel versus a fee based on the amount of impervious area for commercial parcels). Credits may be allowed for on-site attenuation, treatment of stormwater, or for watershed stewardship activities. Surcharges may be added for the type of land use or industrial activity present on the site. Stormwater fee collection is commonly enforced by utility shut-off or by tax liens placed on the owner's property. Most stormwater utilities allow exemptions for certain categories of property. Streets and highways, undeveloped land, and railroad rights-of-way are typically exempt from paying stormwater user fees (Spitzer, 2010 and Leo and Tillery, 2010).

In 2014, the Alabama Legislature approved Act #2014-439, which provides the enabling legislation for all local governments subject to EPA NPDES MS4 permits to implement a SW User Fee system to fund their stormwater management programs. There are over 300 communities with a stormwater user fee system in the southeast. In Alabama, there are only a few communities that have currently implemented a SW user fee system, including but not limited to the City of Anniston, City of Hoover, City of Birmingham, Jefferson County, Madison County, City of Mobile, and City of Montgomery (Campbell, Warren C. 2019). As an example, the City of Anniston generates approximately $400,000 annually that is utilized for implementing the requirements of their MS4 permit (public education/involvement, illicit discharge detection, erosion and sedimentation, post construction runoff, good housekeeping, etc.). Excluding Florida-based stormwater authorities, a 2013 survey of stormwater utilities in the Southeast (2013 Southeast Stormwater Utility Survey) found that of those who responded:

- 97% operate based on user fees;
- 79% use impervious surfaces as the basis for the fee;
- The average stormwater utility rate was $3.59 per month;
- The average revenue was $3,964,000 per year;
- 75% reported that a public information effort was essential or helpful to their mission;
- 47% are combined with a Department of Public Works;
- 13% operated as a separate Authority distinct from local government;
- 77% served only a municipality;
- 10% served a watershed or some other defined area; and
- The average population served was 97,500.

9.3 PROPERTY, SALES, OR OTHER TAXES (GENERAL FUND)

The use of public “general funds” to finance projects is considered undesirable because no dedicated source of continuing and consistent funding would be created. This limits the success of funding watershed management plans (WMP), as these programs would have to compete with maintenance and construction projects for funding. Environmental projects are often considered less essential than priorities such as police, fire, and emergency medical personnel. Environmental projects are also vulnerable to budget cuts (Spitzer, 2010). Finally, there is no single or central authority to administer greater Shades Creek Watershed projects as the Watershed falls under many jurisdictions.

9.4 FEDERAL GRANTS, LOANS, AND REVENUE SHARING

The United States Federal Government offers numerous grants, loans, and revenue-sharing opportunities that may be used by municipalities and non-profit groups to conduct studies and construct projects related to watershed protection, stream restoration, and stormwater management. A composite list of federal funding opportunities follows. The Clearinghouse for Federal Grant Opportunities (also known as Grants.gov) is a central storehouse for information about more than 1,000 grant programs providing approximately $500 billion in annual awards. The EPA Catalog of Federal Funding Sources for Watershed Protection is a searchable database of financial assistance sources available to fund a variety of watershed protection projects. Also, 53 specific funding programs offered by nine different federal agencies are summarized in **Table 9.1**.

Table 9.1 Federal agencies offering funding programs

Acronym	Agency	Number of Programs
EPA	Environmental Protection Agency	12
FEMA	Federal Emergency Management Agency	2
NOAA	National Oceanic and Atmospheric Administration	2
USACE	U.S. Army Corps of Engineers	2

USDA	U.S. Department of Agriculture	12
NFWF	National Fish and Wildlife Foundation	12
USDOI	U.S. Department of the Interior	4
USFWS	U.S. Fish and Wildlife Service	6
USGS	U.S. Geological Survey	1

Several of the potential funding sources are appropriate for projects, studies, or issues relevant to the Shades Creek Watershed and should be considered. Grants are popular because the funds received do not have to be repaid. However, grants discourage consideration of long-term costs such as maintenance, adaptive management, and operation. Additionally, grants are very competitive and awarded on merit; the considerable effort required to produce a grant application may not be rewarded with funding. Grants may also require matching funds and contributions that are difficult to obtain. Several of the more pertinent grant opportunities are discussed below.

9.4.1 State of Alabama Revolving Loan Fund

The EPA State Revolving Fund (SRF) loan program offers a reliable source of funding (Berahzer, 2010). There are separate SRF programs for “Clean Water” and “Drinking Water”. Funds are provided annually to each state by the federal government with the states providing a 20% matching amount. In order to receive funding, a project must be on the state’s annual “Intended Use Plan” (IUP) list. The IUP contains a “comprehensive” list and a shorter “fundable” or “priority” list. A public comment process is required for the IUP. Since 2007, the SRF has moved beyond the traditional “water treatment works” projects and has begun to emphasize nonpoint sources as funding priorities.

The following information regarding the State of Alabama Revolving Fund was accessed on March 29, 2021 on the Alabama Department of Environmental Management (ADEM) website (http://www. adem.state.al.us/programs/water/ srf.cnt):“The Clean Water State Revolving Fund (CWSRF) and the Drinking Water State Revolving Fund (DWSRF) are low interest loan programs intended to finance public infrastructure improvements in Alabama. The programs are funded with a blend of state and federal capitalization funds. ADEM administers the CWSRF and DWSRF, performs the required technical/environmental reviews of projects, and disburses funds to recipients.”

Benefits of an SRF Loan

- The SRF offers a loan interest rate substantially lower than the prevailing municipal bond rate available to "AAA" rated municipalities
- The interest rate is fixed with a 20-year payback (extended term may be available)
- Loan repayment does not begin until construction completion date (capitalized interest accrues)
- The loan recipient is not required to pay any ongoing trustee expenses or rebate expenses normally associated with a local bond issue.

Projects Eligible for Funding

Any public body, including counties, state agencies, incorporated cities and towns, boards, and authorities, may apply for SRF financing. An ability to repay must be substantiated along with meeting other specified standards. Projects that strengthen compliance with Federal and State regulations and/or enhance protection of public health are eligible for consideration to receive an SRF loan. If a project qualifies, the engineering, inspection, and construction costs are eligible for reimbursement. Among the projects which qualify for funding are:

- Publicly owned water or wastewater treatment works
- Sewer rehabilitation
- Interceptors, collectors, and pumping stations
- Decentralized wastewater treatment
- Drinking water storage facilities
- New/rehabilitated water source wells
- Water transmission/distribution mains
- Consolidation/water system interconnection
- Water conservation and reuse projects
- Green infrastructure
- Streambank restoration
- Green roofs
- Permeable pavements
- Rain gardens and biofiltration products
- Brownfield remediation
- Watershed and estuary protection projects.

9.4.2 “Green” Stimulus Funding

Under the 2009 American Recovery and Reinvestment Act (i.e., Stimulus Act), the EPA introduced, as a part of its SRF Loan Program, a Green Project Reserve, and has maintained this funding mechanism. The Green Project Reserve is intended for SRF funds to be used by states for projects that address green infrastructure, water/energy improvements, or other environmentally innovative activities (Berahzer, 2010). Some green infrastructure projects may fit into either the “Clean Water” or “Drinking Water” divisions of the SRF program. In general, the combination of the Green Project Reserve and additional subsidization could lead to better financing terms for these projects.

ADEM’s stated goal in its 2020 annual reports for the clean water and drinking water funds, that not less than 10% of the Capitalization Grant for projects will address green infrastructure, water or energy efficiency improvements, or other environmentally innovative activities. Many stormwater projects and Low Impact Development (LID) strategies may be considered “green” under this funding category. Examples include porous pavement, bioretention facilities, rain gardens, green roofs/walls/streets, wetlands restoration, constructed wetlands, urban retrofit programs, infiltration basins, landscaped swales, downspout disconnection, and tree planting. Land acquisition services and the actual cost for the purchase of land or easements may also be included in the scope of this definition.

9.4.3 Five Star Restoration Program

The EPA supports the Five-Star Restoration Program by providing funds to the NFWF, the National Association of Counties, NOAA's Community-based Restoration Program, and the Wildlife Habitat Council. These groups are then able to make subgrants to support community-based wetland and riparian restoration projects. Competitive projects must have a strong on-the-ground habitat restoration component with long-term ecological, educational, and/or socioeconomic benefits to the people and their community. Preference is given to projects that are part of a larger watershed or community stewardship effort and include a description of long-term management activities. "Projects must involve contributions from multiple and diverse partners, including citizen volunteer organizations, corporations, private landowners, local conservation organizations, youth groups, charitable foundations, and other federal, state, and tribal agencies and local governments" (Private Landowner Network, 2015). It is desirable that each project involve at least five partners who are expected to contribute funding, land, technical assistance, workforce support, or other in-kind services that are equivalent to the federal contribution. The 2020 funding for this program is $1.5 million.

9.4.4 Clean Water Section 319(h)

Section 319(h) of the Federal Clean Water Act funds projects or programs that aim to reduce nonpoint sources (NPS) of pollution and lead to measurable improvements in water quality. Minimum requirements for funding include: 1) Implementation of watershed-based plan that address EPA's Nine Elements for Watershed Planning; and 2) a minimum of 40% non-federal match through local funds, in-kind services, or other non-federal sources. Grant proposals should focus on implementation of NPS components of TMDL causes and sources in approved TMDLs or section 303(d)-listed streams.

Eligible elements for projects may include:

- Projects of State-wide Importance
- Education/Information Programs
- Technical Assistance/Planning
- Best Management Practices (BMP)
- Implementation of Local Regulatory Programs
- Groundwater Protection
- Assessment
- Training
- Watershed Projects/Watershed Resource Restoration
- Development and/or Implementation of Total Maximum Daily Loads (TMDLs).

9.4.5 Wetlands Program Development Grants

The EPA funds Wetland Program Development Grants to encourage comprehensive wetlands program development by promoting the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution.

Projects should build the capacity of states, tribes, and local governments to effectively protect wetland and riparian resources. Projects funded under this program support building or refining a wetlands program through four core elements: regulation, monitoring/assessment, voluntary restoration/protection, and water quality standards for wetlands. Estimated 2020-2021 funding for this program is $660,000.

9.5 NON-GOVERNMENTAL ORGANIZATIONS AND OTHER PRIVATE FUNDING

Private foundations and corporations may be another source of funding for improvements. Several funding sources are available from non-governmental organizations (NGOs) and other private entities. Three of the listings are searchable electronic databases of foundation and corporate grants in various fields: (1) the Chronicle of Philanthropy Guide to Grants; (2) the Community of Science Database; and (3) the Foundation Center. Local governmental entities and non-profit agencies involved with the Watershed should investigate these databases with specific project objectives in mind. The Kodak American Greenways Program, RBC Bank Blue Water Project Grants, and Surdna Foundation Sustainable Environmental Grants offer specific funding opportunities for environmental improvement projects related to watershed protection and Green Infrastructure (GI). These programs are included here because of their direct applicability to ongoing efforts in the Watershed.

9.6 IMPACT FEES

Impact fees are paid by developers (usually at the time of development) to obtain a building permit. The fee is designed to reimburse the government for the additional impact a development may have on the community. Impact fees may be for transportation (i.e., increased impact on roads and bridges as a result of constructing a development), water and sewer (i.e., the impact on the system capacity as a result of increased volume and demand), as well as other public infrastructure impacts. Typically, a direct relationship between the development and the impact fee must exist. Impact fees, which often must be authorized by statute, are used for capital improvements, not for maintenance. They are a one-time, up-front fee for new construction (Mustian, 2010). Because impact fees are an unreliable and unstable long-term funding source for maintenance and improvements, they are not the most viable option for implementation of the WMP and associated projects. Developers resent impact fees, and timely expenditure of funds can also be an issue. As previously noted, the Shades Creek Watershed falls within many jurisdictions, and there is not a central authority to administer impact fees.

9.7 SPECIAL ASSESSMENTS

A special assessment is a charge levied for the benefit a particular property receives for a specific public improvement. The cost and benefit must be related to the property itself. Special assessments may be based on property area or frontage. Special assessments are distinguishable from taxes, but they have been challenged in court. They may be used to fund capital and operating costs. In some states, special assessments may be placed on the tax rolls that achieve the same status as ad valorem taxes. However, assessing governmental property and property owned by non-profits that are not on the tax rolls may pose a challenge. Collection of special assessments can be spread over time.

Special assessment fees for the maintenance of public sewers and septic tanks have been assessed in some communities. In the Chesapeake Bay area of Maryland, the Bay Restoration Fund (BRF) has a $2.50 per month wastewater fee that provides over $65 million per year for upgrades to wastewater treatment plants and $12.6 million per year for septic tank

9.8 SYSTEM DEVELOPMENT CHARGES

System development charges (also known as connection fees or tie-in charges) are one-time fees commonly charged to new customers to cover the costs for additional maintenance or for service extensions. The amount of the new customer's system development charge is typically calculated based on the potential demand the new customer will place on the system. Stormwater system development charges can also be used. The amount of a customer's stormwater system development charge is typically determined by the area of the customer's property (EPA, 2008).

9.9 ENVIRONMENTAL TAX SHIFTING

Environmental tax shifting is a creative concept proposed by environmental groups to redirect tax code incentives to support energy conservation and to sustain the environment. Examples include: (1) a pay-to-pave tax could be levied on newly paved surfaces on a per-square-foot basis; and (2) the discontinuance of the state tax exemptions for fertilizer and pesticide sales. The income from these measures could then be directed toward environmental projects (EPA, 2008). One limitation to an environmental tax shifting approach is the lack of routine public or political support necessary for acceptance and implementation.

9.10 CAPITAL IMPROVEMENT COOPERATIVE DISTRICTS

Authorized under Chapter 99B of Title 11, Code of Alabama, capital improvement cooperative districts can be formed by one or more governmental entities, including counties, municipalities, public utilities and public corporations such as industrial or commercial development authorities. Once formed, the districts can finance and construct various capital improvements and can then enter arrangements such as leases or contracts to make the improvements available to users. The members of the district (i.e., the public bodies) can also contribute funding to finance the projects. The counties and municipalities within the watershed could create a vehicle to collectively finance and make improvements on a watershed basis by forming a cooperative district to facilitate that effort. Each entity could contribute to the costs incurred, either directly or through the payment of shares of the debt service on bonds issued by the district.

The advantages of a cooperative district is that they offer great flexibility. They can comprise various public bodies with an interest in the project. They support projects that can be financed by any of its members, and therefore, they may be able to acquire, construct, and improve a larger number of capital items for both public and private use. Cooperative districts can protect a governmental body from the potential liability of ownership of an improvement. The disadvantages include the lack the authority to assess private users. They can charge for services or facilities only on a bilateral basis in which the benefiting parties agree on the charges upfront contractually. Thus, they are most effective when providing a service or facility (i.e., utilities or even buildings for private use) needed by potential users who agree to be assessed a fee for the service or facilities. It is difficult to obtain public support as property owners do not generally want to voluntarily pay for improvement projects on public property.

9.11 ALABAMA IMPROVEMENT DISTRICTS

Authorized under Chapter 99A of Title 11, Code of Alabama, improvement districts are formed by a county or municipality upon application by all the affected landowners. Once formed, they can acquire, construct, and install a wide range of public infrastructure and can assess the landowners for their pro rata shares of the cost of the improvements. The assessments constitute liens against the land. Depending on the range of projects undertaken, the improvement districts can effectively become subunits of government for providing services beyond those typically provided. For instance, they have been widely used for residential or multi-use developments to provide for the initial and maintenance costs of infrastructure not provided by local government.

The authority to assess and to create liens on property provides a powerful financing alternative. Improvement districts are also ideally suited to construct and own public infrastructure. However, landowners' consent may be impossible to achieve in an area as large as the Shades Creek Watershed. If a project is proposed that affects a single significant property, or especially a project required for the development or redevelopment of the property, an improvement district could be used to finance the project. It would be the responsibility of the property owner to pay the improvement district. For instance, if a large portion of a watershed, or a large shopping center, was being developed that required drainage or retention facilities beyond the normal requirements, an improvement district could be a good vehicle.

9.12 REGIONAL COLLABORATION OPPORTUNITIES

There are regional collaboration opportunities applicable to watershed projects. The EPA Region 4 sponsors three: 1) the Green Infrastructure Partnership, 2) Smart Growth Implementation Assistance, and 3) Watershed Protection and Restoration Assistance collaboration opportunities.

The primary goal of the Green Infrastructure Partnership is to reduce runoff volumes and sewer overflow events through the widespread use of green infrastructure management practices that help maintain natural hydrologic functions by absorbing and infiltrating precipitation where it falls. The Smart Growth Implementation Assistance program is an annual, competitive solicitation open to state, local, regional, and tribal governments (and non-profit organizations that have partnered with a governmental entity) to incorporate smart growth techniques into their future developments. Through the Watershed Protection and Restoration Assistance Partnership, the staff of EPA Region 4 works with state and local governments and watershed organizations to facilitate protection and restoration efforts in targeted watersheds.

9.13 SUMMARY

There are considerable financial support opportunities to supply funds for the management measures recommended in this WMP. However, because the Shades Creek Watershed falls within several governmental jurisdictions, it lacks a central authority to administer many of the potential funding sources. Establishment of a public-private partnership may provide additional funding options for watershed management. Additionally, a partnership clearly illustrates to the grants market the communities' active resolve to serve as vested and committed partners in the watershed management process. This endeavor would significantly enhance the viability, competitiveness, and position of this WMP as it pursues federal, state, local, and private grant assistance needed for implementation.

10.0 MONITORING AND SAMPLING PLAN

A monitoring plan is necessary to document the overall health of the Shades Creek Watershed, provide long-term water quality trend data, track the success or failure of the implemented management measures, and determine where additional management measures are necessary. The monitoring plan should encompass the greatest possible portion of the Watershed, with the least number of sampling stations, while providing sufficient detail to identify probable source areas for elements of concern.

Based on the identified issues and/or data gaps in the WMP, the following sections provide a description of the recommendations for a water quality monitoring program for the Shades Creek Watershed.

10.1 LONG-TERM TREND WATER QUALITY MONITORING

The WMP identifies sedimentation, nutrient loading, pathogens (fecal bacteria), and habitat alteration (urbanization) as critical issues affecting the health of the watershed. Data collection and analysis prior to this WMP was thorough and established baseline conditions for many water quality parameters. Although some existing monitoring stations provide consistent data over a long period of time, the temporal, spatial, and parametric coverage of the ADEM, Alabama Water Watch (AWW), Jefferson County, and the City of Birmingham (MS4 program) monitoring programs vary substantially over the period of record. This has been identified as potential data gaps in terms of long-term trend water quality monitoring. In addition, the extensive urbanization of portions of the watershed indicate that water quality samples should also be analyzed for pesticides/herbicides, and petroleum/oil/grease. In order to address these noted issues, the following sections are a description of recommended sampling parameters and other monitoring / modeling that should be implemented as part of the monitoring program:

These following parameters should be collected consistently at existing monitoring stations to support long-term tracking of status and trends and regulatory compliance. In addition, establishment of additional monitoring locations should be established in the Lower Shades Creek, Cooley/Mud Creek, and southern section of the Upper Shades Creek watershed.

1. <u>Standard Field Parameters</u> - Standard procedures during the collection of water quality samples should include recording of temperature, pH, specific conductance, and dissolved oxygen.

2. <u>Total Suspended Solids and Turbidity</u> – Total suspended solids, bed sediment, and turbidity measurements should be measured at sampling locations. Turbidity measurements should be collected under a variety of flow conditions. All data collection and analyses should utilize Geological Society of America (GSA) data collection protocols. The success of management measures will be assessed, in part, by the degree to which sediment loading rates are reduced or remain stable as the percentage of developed land in the watershed increases.

3. Nutrients (Total Nitrogen and Total Phosphorus) – Total nitrogen and phosphorus concentrations in water is a combined measure of inorganic and organic compounds. Elevated levels of nitrogen and phosphorus are an indication of sewage runoff, animal manure, and fertilizers. Nitrogen and phosphorus concentrations in some areas of the Shades Creek Watershed exceed the levels at which excessive algae growth may occur. The success of management measures will be assessed, in part, by the degree to which the concentration of nitrogen and phosphorus in the surface water system is reduced or stabilized.

4. Bacteria – Tributaries within the Shades Creek Watershed are utilized for recreation, swimming, and fishing. The introduction of pathogens into the surface water because of sanitary sewer overflows and stormwater runoff is a critical issue within the Watershed. Monitoring for fecal coliform and enterococcus bacteria should be part of the monitoring plan for the watershed. Reductions in bacteria counts would indicate the effectiveness of management measures in limiting and reducing pathogen inputs into the Watershed.

5. Pesticides and Herbicides – Unlike many other contaminants, pesticides and herbicides derive solely from anthropogenic sources. The presence of pesticides and herbicides is primarily due to stormwater runoff from agriculture and lawn and garden application. Monitoring for selected pesticide and herbicide concentration would indicate the success, or lack thereof, of the management measures in limiting unfiltered urban runoff into surface water drainages.

6. Petroleum, Oil, and Grease – Petroleum in the waters of Shades Creek most likely derive solely from anthropogenic sources. The presence of petroleum is primarily due stormwater runoff from parking lots and roads, with minor contributions from leaking storage facilities. Monitoring for selected petroleum, oil, and grease parameters would indicate the success, or lack thereof, of the management measures in limiting unfiltered urban runoff into surface water drainages.

10.2 POLLUTANT SOURCE TRACKING PROGRAM

The presence of pathogens in the Shades Creek Watershed and the hazards they pose to freshwater resources and human health has been identified as an issue in the watershed. Bacteria pathogens can originate from a variety of point and non-point sources. Point source discharges and stormwater runoff are not the only contributors of pathogens to the watershed. It is suspected that a significant source of pathogens in the watershed comes from sewer system overflows and septic systems.

Identification of these sources can often be a complex task to determine. Standard measurements of pathogens as described above, allow for the identification and prioritization of areas that may be impaired for pathogens. However, in order to effectively improve water quality and meet the TMDL goals, both the host source and geographical origin of pathogenic bacteria needs to be understood. Microbial Source Tracking (MST) is a tool that can be used to better classify and allocate the contributions of fecal contamination, particularly from nonpoint sources, once a problem is identified. MST protocols followed by the U.S. Geological Survey (USGS) typically include several microbiological targets or source identifiers, detection methods, and analytical approaches to link data from water samples to the fecal sources (Stoeckel, D.M., 2005). This methodology of source tracing can help identify animal sources (e.g., human, dogs, cattle, etc.) of any observed bacterial violations. In addition to the MST sampling, an assessment of sediment loadings specific to the primary tributary flows will need to be conducted in order to identify source of input.

10.3 BIOLOGICAL AND HABITAT ASSESSMENT

The purpose of the biological and habitat assessment (recommended in Chapter 7 – Implementation) will be to characterize and grade the overall health of the ecosystem along specific tributaries within the Shades Creek Watershed. Biological assessments should utilize a standard protocol established by a state or federal agency, such as the U.S. Environmental Protection Agency's (EPA's) Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Biological assessments should be performed at selected water quality monitoring stations representing each of the sub-watersheds and should include population surveys of fish communities, benthic invertebrate species, characterization of stream habitat, and assessment of the streams main channels and tributaries. In addition, an assessment of the flora, fauna, and protected and invasive species specific to the watershed should be conducted.

10.4 HYDROLOGICAL MODEL

Considering that urbanization and overdevelopment have been identified as an issue in the WMP, it would be beneficial to develop a hydrologic model for the Shades Creek Watershed. This model should include at a minimum 1) updated impervious surface information, 2) identify priority sub-watersheds that experience flows exceeding the capacity of the infrastructure and natural systems, 3) identify sub-watersheds that need to regulate post construction peak flows to less than pre-construction post flows in order to address capacity issues, and 4) Identify opportunities for the installation of green infrastructure (i.e., infiltration of stormwater runoff)

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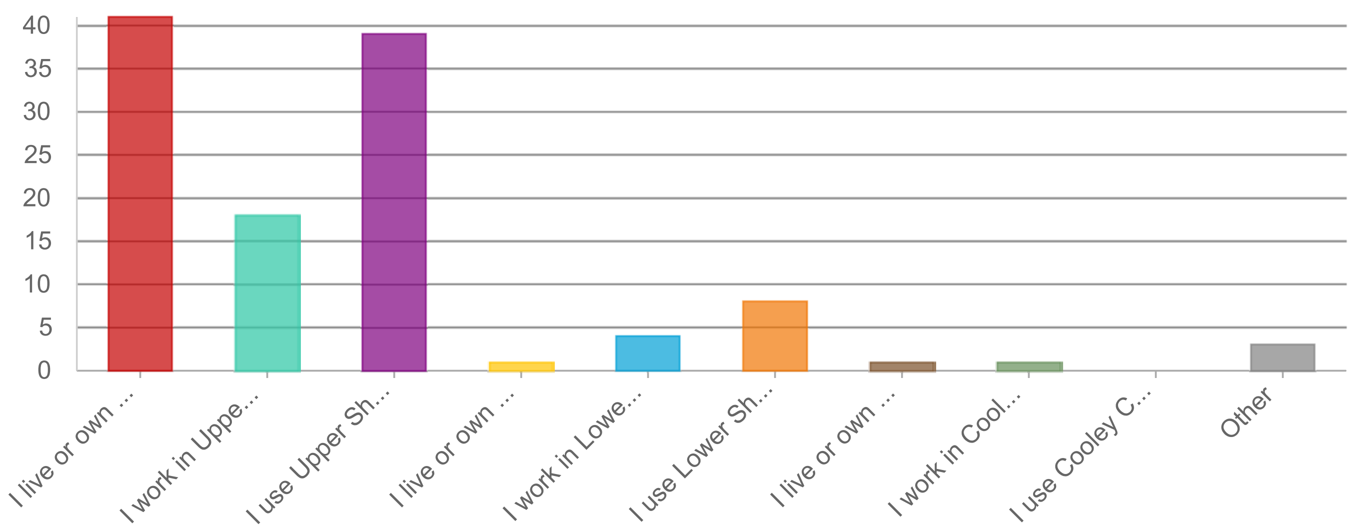
APPENDICES

APPENDIX A

ShadesCreek - PublicOpinionSurvey

Using the map above as a guide, which of the three Shades Creek Watersheds applies to your interests (check all t…



Answers	Count	Percentage
I live or own property in Upper Shades Creek	41	67.21%
I work in Upper Shades Creek	18	29.51%
I use Upper Shades Creek for recreation	39	63.93%
I live or own property in Lower Shades Creek	1	1.64%
I work in Lower Shades Creek	4	6.56%
I use Lower Shades Creek for recreation	8	13.11%
I live or own property in Cooley Creek/Mud Creek	1	1.64%
I work in Cooley Creek/Mud Creek	1	1.64%
I use Cooley Creek/Mud Creek for recreation	0	0%
Other	3	4.92%

Answered: 59 Skipped: 2

In a few words, what does Shades Creek mean to you?

Word	Count
creek	8
water	7
recreation	7
wildlife	5
beauty	5
habitat	4
source	4
life	4
Shades	4
important	4
natural	4
watershed	4
Asset	3
community	3
quality	3
opportunity	3
part	3

catching	3
playing	3
history	3
great	3
helps	2
me.	2
vital	2
area	2
blue	2
Home	2
resource	2
outdoor	2
love	2
wonderful	2
potential	2
Beautiful	2
recreational	2
environmental	2
creek.	2
ecosystem	2
grew	2
upper	2
trails	2
experiences	2
Fun	2
biodiversity	2

enjoy.	2
drainage	2
education	2
Cahaba	2
River	2
contribution	1
life.	1
Recreating	1
relax	1
connect	1
nature	1
distress.	1
respite	1
city	1
sustainability	1
Tremendous	1
BIRMINGHAM	1
metro	1
preserved	1
headwaters	1
green	1
backbone	1
flows	1
Jemison	1
Park	1
family	1

enjoys	1
walking.	1
stream	1
clean	1
possible.	1
Refreshing	1
undeveloped	1
space	1
historically	1
interesting	1
beautiful!	1
leisure	1
preserve	1
world	1
cultural	1
historic	1
areas;	1
preservation	1
wetlands	1
(lower	1
part)	1
public	1
Meaningful	1
Greenspace	1
protects	1
providing	1

cooling	1
temps	1
climate	1
change	1
sense	1
being.	1
moving	1
gallery	1
greenery	1
childhood	1
adulthood	1
son's	1
childhood.	1
place	1
escape	1
to.	1
sounds	1
good	1
soul	1
abused	1
asset.	1
It’s	1
local	1
flora	1
animals	1
represents	1

unique	1
biodiverse	1
perspectives.	1
means	1
children	1
tadpoles.	1
walk	1
birdwatching	1
valuable	1
preserved.	1
crawfish	1
treasure	1
picking	1
balckberries	1
banks	1
tributaries.	1
adult	1
enjoy	1
spending	1
time	1
walking	1
parallel	1
it.	1
creeks	1
feed	1
crayfish	1

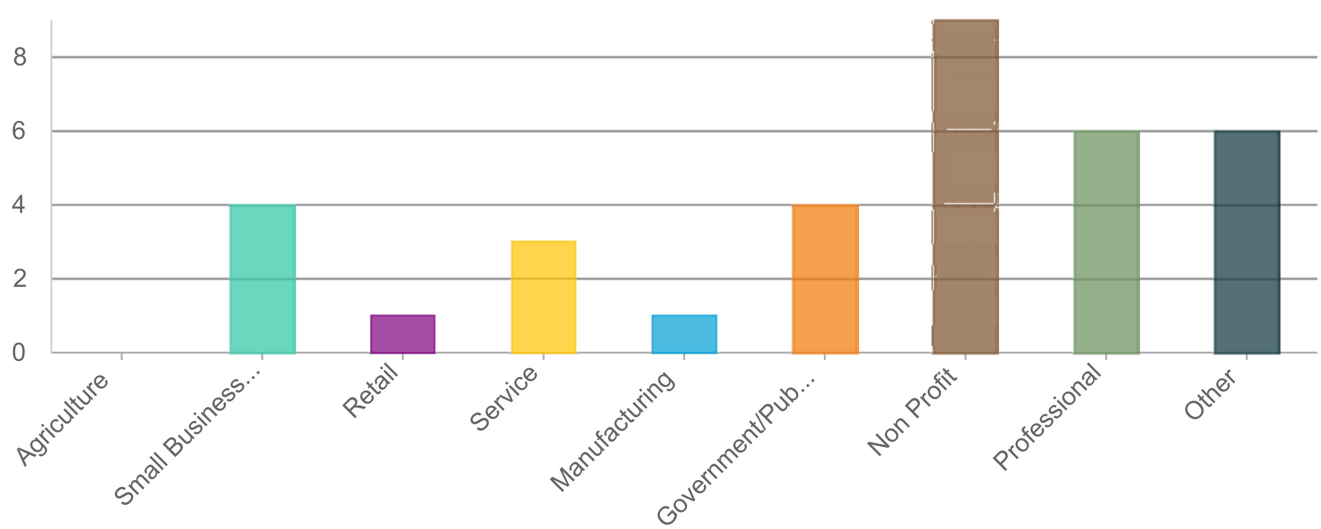
formative	1
greatly	1
cherish	1
fishing	1
impaired	1
lost	1
resource.	1
activities	1
Enhances	1
fostering	1
house	1
hundred	1
feet	1
Emotional	1
well-being	1
creating	1
memories	1
family.	1
Defines	1
landscape	1
Daily	1
aesthetic	1
benefit	1
safe	1
obligation	1
Cahaba’s	1

largest	1
trib	1
herons	1
small	1
treated	1
ditch.	1
tributary	1
recover	1
urban	1
impact.	1
Amenity	1
drinking	1
primary	1
indicator	1
&	1
civic	1
awareness.	1
microcosm	1
greater	1
environment	1
barometer	1
health	1
tool	1
recreation.	1
shows	1
issues	1

unfettered	1
development.	1
lovely	1
support	1
full	1
suite	1
aquatic	1
species	1
fishes	1
missing	1
due	1
destruction.	1
accessible	1
areas	1

Answered: 48 Skipped: 13

If you work in the watershed, what type of work do you do?

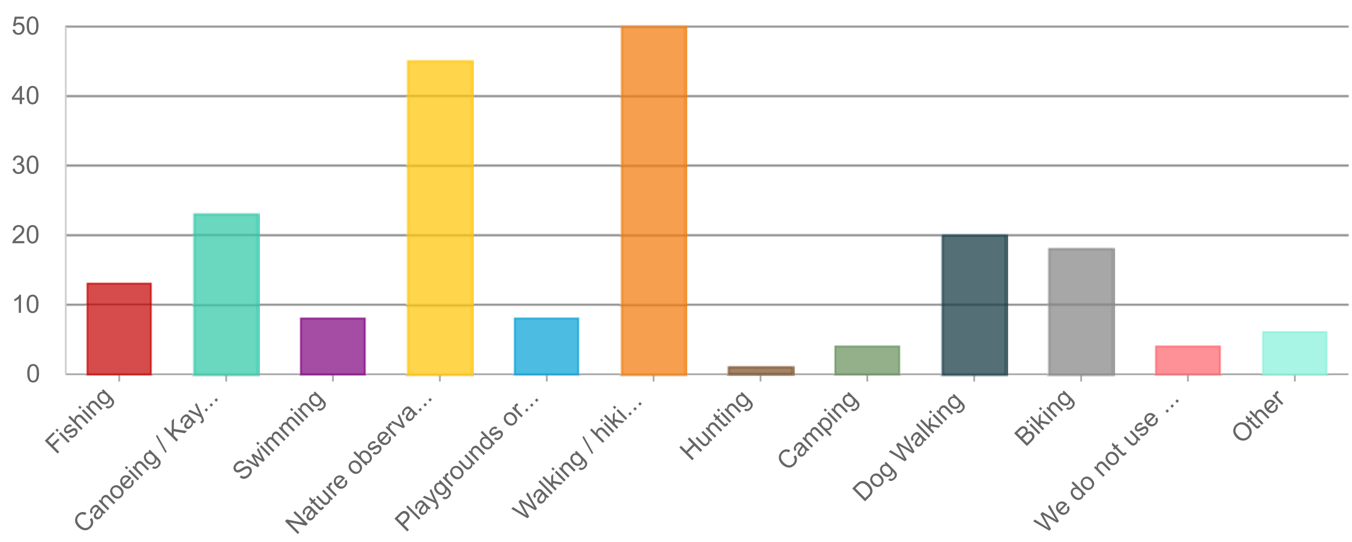


Answers **Count** **Percentage**

Agriculture	0	0%
Small Business Owner	4	6.56%
Retail	1	1.64%
Service	3	4.92%
Manufacturing	1	1.64%
Government/Public Sector	4	6.56%
Non Profit	9	14.75%
Professional	6	9.84%
Other	6	9.84%

Answered: 29 Skipped: 32

How do you, or your family, use the Shades Creek watersheds for recreation?

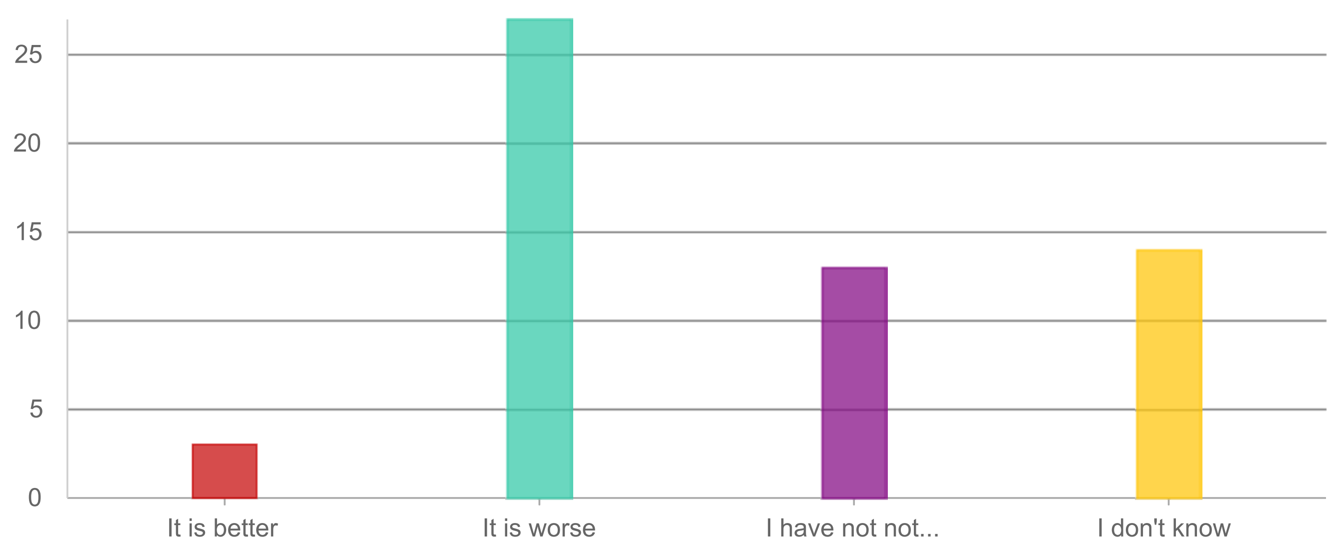


Answers	Count	Percentage
Fishing	13	21.31%
Canoeing / Kayaking	23	37.7%
Swimming	8	13.11%
Nature observation	45	73.77%

Playgrounds or ball fields	8	13.11%
Walking / hiking	50	81.97%
Hunting	1	1.64%
Camping	4	6.56%
Dog Walking	20	32.79%
Biking	18	29.51%
We do not use the watershed for recreational use	4	6.56%
Other	6	9.84%

Answered: 59 Skipped: 2

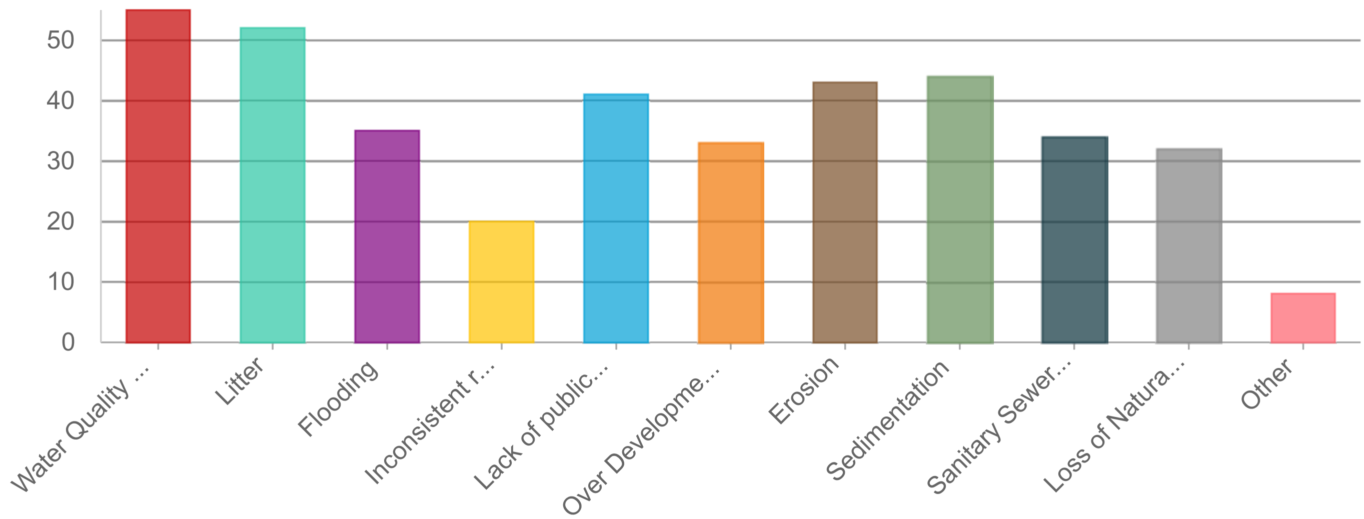
What do you think of the environmental conditions of the watershed Today versus 5 years ago?



Answers	Count	Percentage
It is better	3	4.92%
It is worse	27	44.26%
I have not noticed any change	13	21.31%
I don't know	14	22.95%

Answered: 57 Skipped: 4

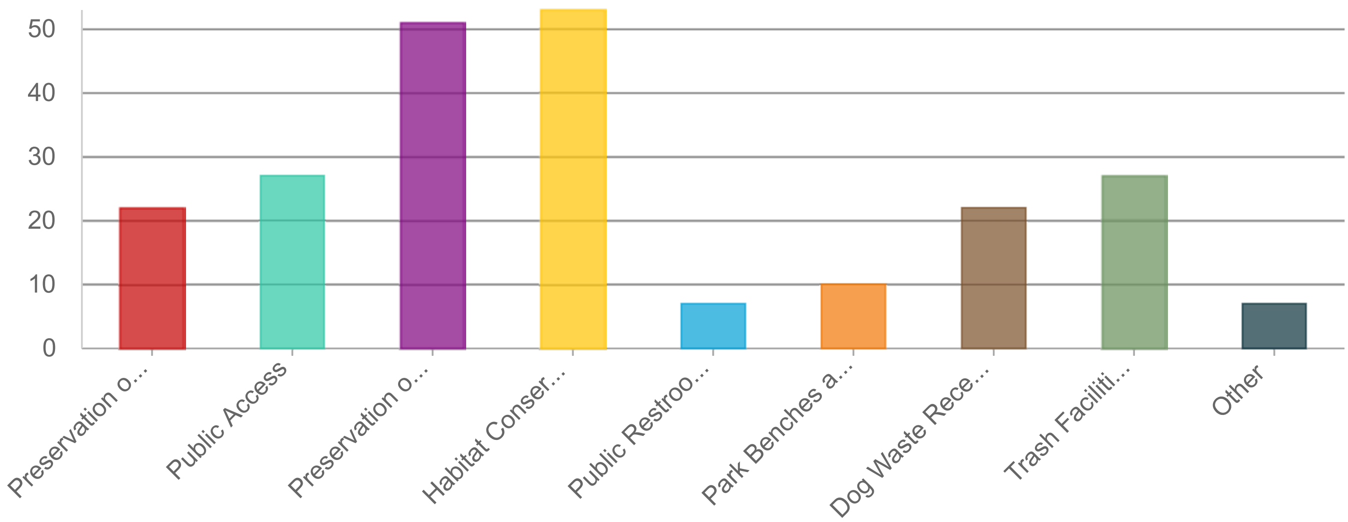
What issues do you think need to be addressed within the watershed? (check all that apply)



Answers	Count	Percentage
Water Quality / Pollution	55	90.16%
Litter	52	85.25%
Flooding	35	57.38%
Inconsistent regulations	20	32.79%
Lack of public education / awareness	41	67.21%
Over Development / Urbanization	33	54.1%
Erosion	43	70.49%
Sedimentation	44	72.13%
Sanitary Sewer Overflows	34	55.74%
Loss of Natural Areas	32	52.46%
Other	8	13.11%

Answered: 59 Skipped: 2

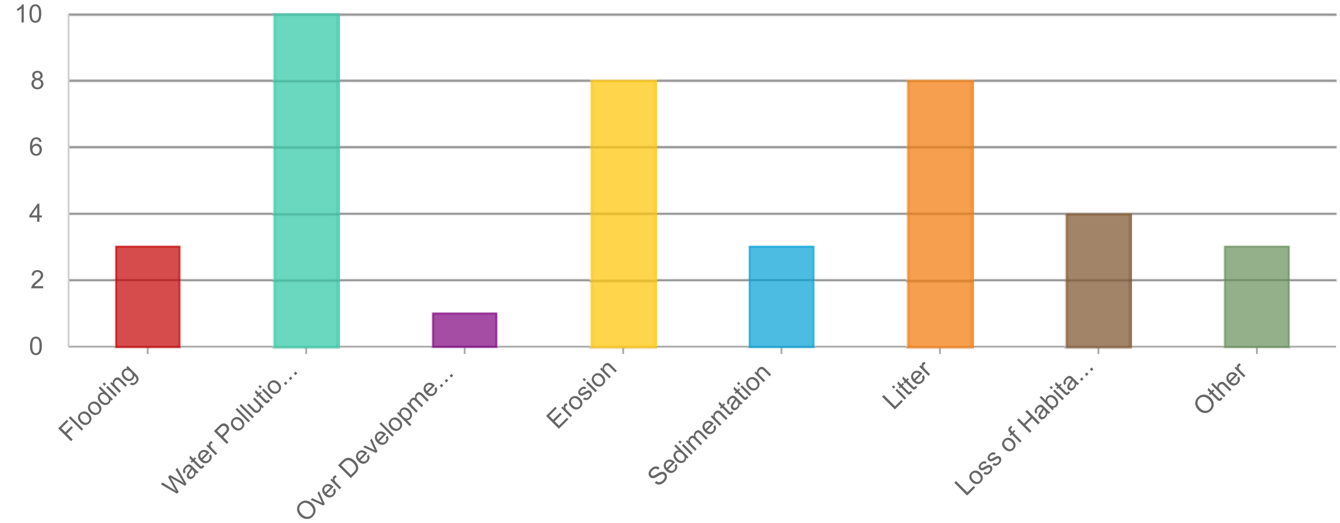
What do you think is needed in the Shades Creek Watershed?



Answers	Count	Percentage
Preservation of Historic Sites	22	36.07%
Public Access	27	44.26%
Preservation of Natural Areas	51	83.61%
Habitat Conservation	53	86.89%
Public Restrooms	7	11.48%
Park Benches and Picnic Tables	10	16.39%
Dog Waste Receptacles	22	36.07%
Trash Facilities	27	44.26%
Other	7	11.48%

Answered: 59 Skipped: 2

Select the issue the word below that best matches the issue noted on the map.



Answers	Count	Percentage
Flooding	3	4.92%
Water Pollution	10	16.39%
Over Development	1	1.64%
Erosion	8	13.11%
Sedimentation	3	4.92%
Litter	8	13.11%
Loss of Habitat	4	6.56%
Other	3	4.92%

Answered: 40 Skipped: 21

Other comments.

The word cloud requires at least 20 answers to show.

Word	Count
Shades	4
creek	4
erosion	4

litter	4
Flooding	2
creek.	2
dismayed	1
over-zealous	1
"weeding"	1
happy	1
improvements	1
experienced	1
1980s.	1
West	1
Homewood	1
Park	1
tributary	1
Unable	1
definition	1
map	1
pinpoint	1
areas	1
part	1
original	1
channel.	1
preserved	1
-	1
filled	1
invasive	1

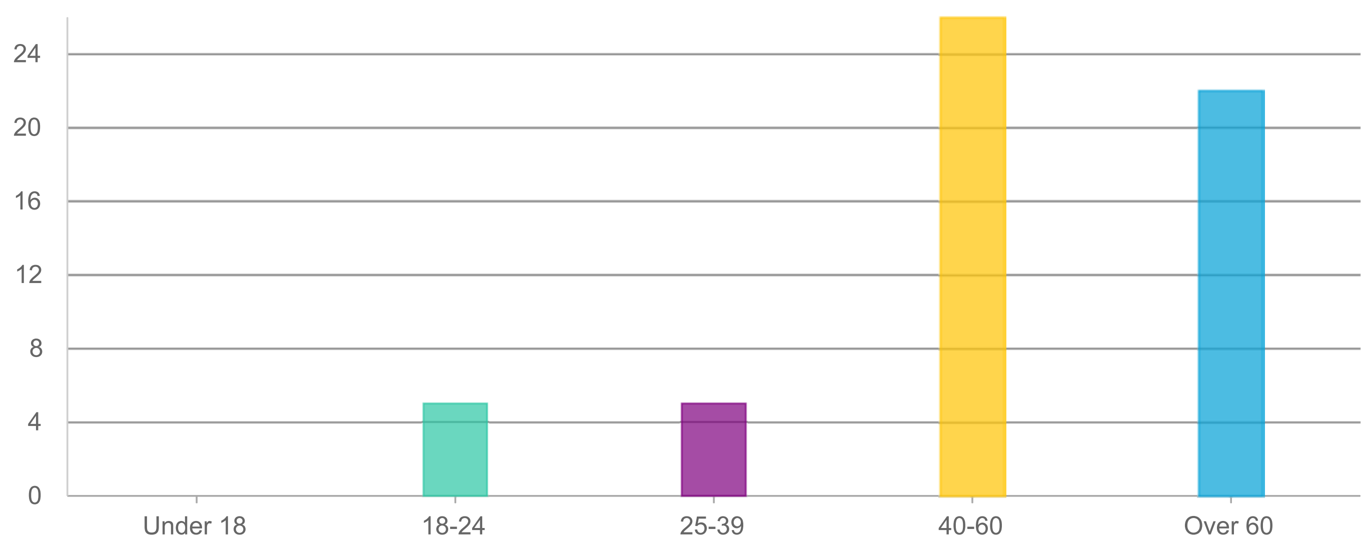
plant	1
species.	1
Spotted	1
Salamanders	1
breed	1
here.	1
Smell	1
trash	1
pollution	1
dumping	1
book	1
Samford	1
installed	1
rock	1
vanes	1
address	1
appears	1
moved	1
downstream	1
site	1
map.	1
sewer	1
leak	1
upstream	1
collects	1
branches	1

bushes	1
alongside	1
sewage.	1
Kids	1
play	1
re-engagng	1
280/cahaba	1
intersection	1
pain	1
point	1
reasons	1
stretch	1
too.	1
disappointing.	1
terrible	1
watershed	1
Target	1
Columbiana	1
Homewood.	1
Channel	1
opportunity	1
GI	1
&	1
storage.	1
Surrounding	1
area	1

flood	1
development	1
upstream.	1
Potential	1
green	1
gateway	1
Irondale.	1

Answered: 14 Skipped: 47

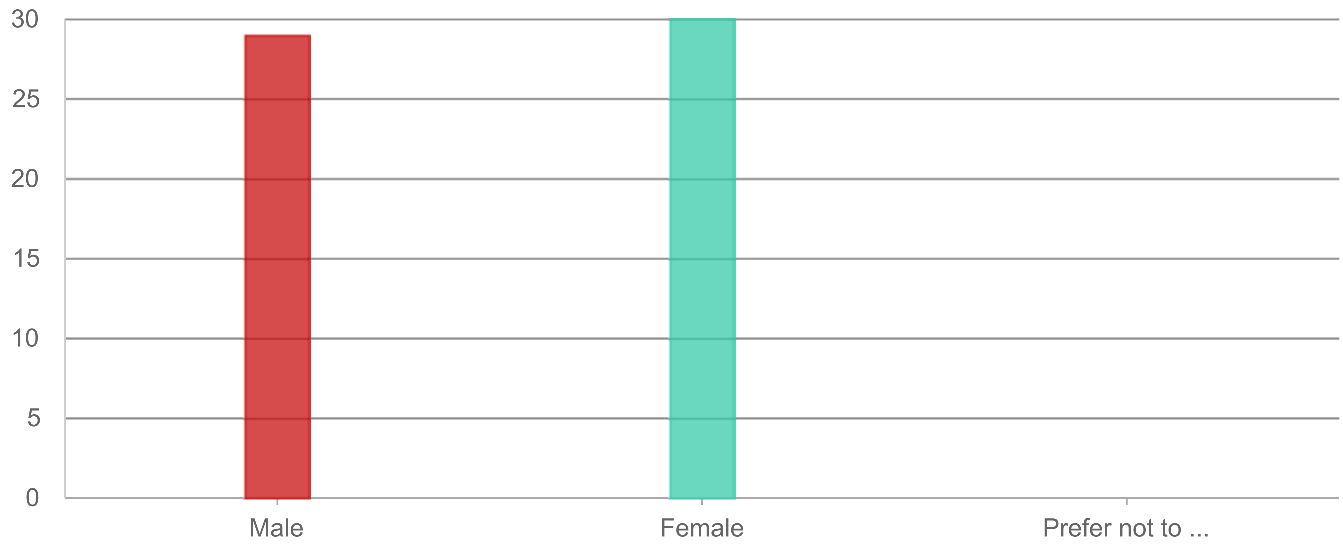
What's your age? (optional)



Answers	Count	Percentage
Under 18	0	0%
18-24	5	8.2%
25-39	5	8.2%
40-60	26	42.62%
Over 60	22	36.07%

Answered: 58 Skipped: 3

What's your gender? (optional)



Answers	Count	Percentage
Male	29	47.54%
Female	30	49.18%
Prefer not to answer	0	0%

Answered: 59 Skipped: 2

APPENDIX B

Alabama Inventory List

The Rare, Threatened, & Endangered Plants & Animals of Alabama

August 2019

Alabama Natural Heritage Program®

TABLE OF CONTENTS

ALABAMA NATURAL HERITAGE PROGRAM® 1

CHANGES FROM ALNHP TRACKING LIST OF AUGUST 2017 3

DEFINITION OF HERITAGE RANKS 9

DEFINITIONS OF FEDERAL & STATE LISTED SPECIES STATUS 11

***VERTEBRATES* 15**

- Birds 15
- Mammals 19
- Amphibians 23
- Reptiles 25
  - *Lizards, Snakes, and Amphisbaenas* 25
  - *Turtles and Tortoises* 26
- Fishes 29
  - *Ray-finned Fishes* 29
  - *Lampreys* 38

***INVERTEBRATES* 39**

- Bivalves (Clams & Mussels) 39
- Gastropods (Slugs and Snails) 48
  - Freshwater Snails 48
  - Terrestrial Snails 54
- Crustaceans 58
- Spiders, Scorpions, Pseudoscorpions, Harvestmen, Mites 63
- Hexapods - Diplurans, Springtails, and Proturans 67
- True Insects 69
  - Beetles 69
  - True Flies 72
  - Mayflies 72
  - Butterflies and Moths 73
  - Dragonflies and Damselflies 73
  - Grasshoppers, Locusts, and Crickets 75
  - Stoneflies 75
- Millipedes 76
- Terrestrial and Freshwater Worms 76

***VASCULAR PLANTS* 77**

- Ferns & Relatives 77
  - *Ferns* 77
  - *Succulent Ferns* 78
  - *Whiskferns* 78
  - *Quillworts & Spike-moss* 78
  - *Clubmosses* 79
  - *Horsetails* 79
- Monocots 79
- Dicots 87
- Conifers 105

***NON-VASCULAR PLANTS* 106**

- Mosses 106
- Liverworts 106

EXTINCT SPECIES THAT ONCE OCCURRED IN ALABAMA 108

- Birds 108
- Ray-finned Fishes 108
- Bivalves (Clams & Mussels) 108
- Gastropods (Snails & Slugs) 109

Alabama Natural Heritage Program®

Keeping Track of Alabama's Natural Heritage

The purpose of the Alabama Natural Heritage Program® (ALNHP) is to provide the best available scientific information on the biological diversity of Alabama to guide conservation action and promote sound stewardship practices. Established by The Nature Conservancy in 1989, it is one of a network of such programs collectively known as the Natural Heritage Network, which is represented by its membership organization NatureServe. NatureServe works to aggregate data from individual Network Programs and is dedicated to the furtherance of the Network and the application of Heritage data to biodiversity conservation.. The mission of Natural Heritage Programs is to collect and manage data about the status and distribution of species and ecosystems of conservation concern. Natural heritage programs have become the recognized source for the most complete and detailed information on rare and endangered species and threatened ecosystems, relied upon by government agencies, corporations, and the conservation community alike. Today the NatureServe network includes 74 independent natural heritage programs and conservation data centers throughout the United States, Canada, Latin America, and the Caribbean. Most heritage programs (or conservation data centers) are housed within state or provincial government agencies, while some reside within universities or non-governmental organizations. ALNHP is administered through the Auburn University Museum of Natural History, Department of Biological Sicences. ALNHP provides the following services: biodiversity data management, inventory, biological surveys, biological monitoring, site prioritization, conservation planning, Geographic Information System services, spatial modeling, and land management expertise.

Natural Heritage Programs have three broad functions: to collect information on the status and distribution of species and natural communities, to manage this information in a standardized way, and to disseminate this information to a wide array of users. Natural Heritage Programs use a standardized information management system to track biodiversity data including taxonomy, distribution, population trends, habitat requirements, relative abundance, quality, condition, and viability. Programs also track non-biological information including land ownership type, land-use and management, distribution of protected areas, and threats to species or their habitat.

One of the important tasks each heritage program performs is the regular compilation of a "Rare Species Inventory List" for the state that ranks by priority each element based on the number and quality of occurrences. In general, species are listed in alphabetical order (by Order, Family, Genus) within the taxonomic groups. The only exception is birds where the order in which the species are presented follows the American Ornithologists' Union's checklist of North American birds. Although the inventory list is compiled using the best scientific information available at the time, there is always more current information available on a particular species, distribution and/or status. We would appreciate any new information on the location, abundance, or rarity of any of the species on the following list. Please send your comments to the appropriate staff member.

Scientific classification, common names, and order in which species are presented follow AOU (1998) and Chesser et al. (2015) for birds, Best and Dusi (2014) for mammals, Boschung and Mayden (2004) and Mettee et al (1996) for fish, and Williams et al. (2008) for mussels. Scientific and common names for reptiles and amphibians follow that of Crother (2012), but the order in which species are presented follow that used by Mirachi (2004). Other taxon are presented alphabetically.

Citation: Alabama Natural Heritage Program®. 2019. *Alabama Inventory List: the Rare, Threatened and Endangered Plants & Animals of Alabama.* Alabama Natural Heritage Program®, Auburn University, Alabama.

Staff Directory, Resources, & Partners

Auburn University Museum of Natural History

The mission of the Auburn University Museum of Natural History is to conduct biodiversity research, preserve and document our region and planet's biodiversity, and to lead and promote activities related to natural history education and outreach for Auburn University and all citizens of the state of Alabama. Our vision is to emerge as the primary repository for all natural history collections currently maintained at Auburn University and to function as a center of excellence for biodiversity research, education, and outreach. We will capitalize on strengths of the biodiversity heritage collections in our care and the vast organismal knowledgebase of the curators and staff to establish a gateway through which all segments of society can come discover the natural sciences and appreciate the relevance of biodiversity to human health and quality of life. We will preserve and document the rich natural heritage of Alabama while concurrently creating opportunities for students and teachers from regional schools, the general public, students at Auburn University, and researchers to explore our planet's biodiversity. We seek to inspire an appreciation of nature and the environment so that we might better conserve it for future generations.

NatureServe

NatureServe is a non-profit conservation organization whose mission is to provide the scientific basis for effective conservation action. NatureServe represents an international network of biological inventories—known as natural heritage programs or conservation data centers—operating in all 50 U.S. states, Canada, Latin America and the Caribbean. NatureServe's three organizational goals are:

(1) Help make biodiversity a mainstream consideration in all significant conservation and natural resource management decisions by making it simple for conservationists, government agencies, corporations, and landowners to access and use high-quality biodiversity information.
(2) Advance our scientific resources and information technology systems in order to meet the needs of our clients and partners.
(3) Strengthen our organizational effectiveness and capacity and better leverage the power of the NatureServe network to inform conservation action at local, regional, national, and international scales.

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NatureServe:
http://www.natureserve.org

Auburn University Museum of Natural History:
http://aumnh.org/

Changes From ALNHP Tracking List Of August 2017

I. Taxa Removed From ALNHP Tracking List

Scientific Name	Reason
Flowering Plants	
Coreopsis gladiata	Too common to be on tracking list
Croomia pauciflora	Too common to be on tracking list
Frasera caroliniensis	Too common to be on tracking list
Graptemys nigrinoda delticola	Merged subspecies and is now too common to be on list
Graptemys nigrinoda nigrinoda	Merged subspecies and is now too common to be on list
Isoetes melanopoda	Too common to be on tracking list
Minuartia godfreyi	Incorrectly identified
Ophioglossum engelmannii	Too common to be on tracking list
Palhinhaea cernua	Too common to be on tracking list
Scutellaria saxatilis	Incorrectly identified
Spiranthes floridana	No record of this species occurring in Alabama.
Symphyotrichum drummondii var. *texanum*	No record of this variety occurring in Alabama.
Thelypteris quadrangularis	Too common to be on tracking list
Vitis rotundifolia var. *munsoniana*	Too common to be on tracking list
Zephyranthes atamasca var. *treatiae*	No record of this variety occurring in Alabama.

II. Taxa Added to ALNHP Tracking List

Scientific Name	Common Name
Birds	
Calidris canutus	Red Knot
Fishes	
Acantharchus pomotis	mud sunfish
Noturus crypticus	chucky madtom
Freshwater Mussels	
Pleurobema beadleianum	Mississippi pigtoe
Strophitus williamsi	flatwoods creekshell
Freshwater Snails	
Fontigens nickliniana	watercress snail
Crayfishes	
Cambarellus rotatus	twisted dwarf crayfish
Flowering Plants	
Ampelaster carolinianus	Carolina aster
Arnica acaulis	Leopardsbane
Callirhoe papaver	woods poppy-mallow

Ceanothus microphyllus	little-leaf buckbrush
Coelorachis tessellate	lattion jointgrass
Erythronium umbilicatum ssp. *monostolum*	dimpled trout-lily
Geum vernum	spring avens
Hymenocallis choctawensis	panhandle spider lily
Hypericum microsepalum	Flatwoods St. John's-wort
Lygodesmia aphylla	rose rush
Lysimachia lewisii	Lewis's yellow loosestrife
Paronychia argyrocoma	silvery nailwort
Penstemon kralii	Kral's beardtongue
Pterocaulon virgatum	wand blackroot
Pycnanthemum nudum	Coastal Plain mountain mint
Ranunculus longirostris	eastern white water crowfoot
Rhododendron colemanii	Red Hills azalea
Spiraea tomentosa	hardhack
Symphyotrichum simmondsii	Simmonds' aster
Viburnum ashei	Ashe's arrowwood
Mosses	
Fontinalis welchiana	difficult moss

III. Taxa with Taxonomic or Nomenclatural Changes

Old Name	New Name
Freshwater Mussels	
Anodontoides radiatus	*Strophitus radiatus*
Fusconaia rotulata	*Reginaia rotulata*
Obovaria jacksoniana	*Obovaria arkansasensis*
Freshwater Snails	
Rhodacme elatior (domed ancylid)	*Rhodacmea cahawbensis (Cahaba ancylid)*
Rhodacme filosa	*Rhodacmea filosa*
Rhodacme hinkleyi	*Rhodacmea hinkleyi*
Crayfishes	
Fallicambarus burrisi	*Creaserinus burrisi*
Fallicambarus byersi	*Creaserinus byersi*
Fallicambarus danielae	*Creaserinus danielae*
Fallicambarus fodiens	*Creaserinus fodiens*
Fallicambarus oryktes	*Creaserinus oryktes*
Flowering Plants	
Amphianthus pusillus	*Gratiola pusilla*

Andropogon gyrans var. *stenophyllus*	*Andropogon perangustatus*
Dicerandra linearifolia	*Dicerandra fumella*
Graptemys nigrinoda delticola	*Graptemys nigrinoda*
Graptemys nigrinoda nigrinoda	*Graptemys nigrinoda*
Leptopus phyllanthoides	*Phyllanthopsis phyllanthoides*
Lesquerella lyrate	*Paysonia lyrate*
Physalis carpenteri	*Calliphysalis carpenteri*
Spigelia gentianoides var. *alabamensis*	*Spigelia alabamensis*
Spigelia gentianoides var. *gentianoides*	*Spigelia gentianoides*
Thelypteris burksiorum	*Stegnogramma burksiorum*
Creamflower Tick-trefoil	Cream Tick-trefoil

IV. Taxa with Heritage Conservation Status Changes

Global Rank Changes

Animals

Taxa	Old Rank	New Rank
Reptiles		
Graptemys nigrinoda	G3T2Q	G4
Amphibians		
Necturus alabamensis	G2	G1

Plants

Taxa	Old Rank	New Rank
Delphinium alabamicum	G2	G3
Desmodium ochroleucum	G2	G2G3
Helianthus verticillatus	G1Q	G1
Phlox pulchra	G2	G1
Spigelia alabamensis	G1T1	G1
Spigelia gentianoides	G1T1	G1

State Rank Changes

Animals

Taxa	Old Rank	New Rank
Reptiles		
Graptemys nigrinoda	S2S3	S4
Amphibians		
Necturus alabamensis	S2	S1
Fishes		
Cyprinella callitaenia	S3	S1

Sander sp. cf. *vitreus*	S3	S1
Freshwater Mussels		
Dromus dromas	S1	SX
Lemiox rimosus	S1	SX
Freshwater Snails		
Elimia boykiniana	SNR	S2
Rhodacmea hinkleyi	S2	SX
Plants		
Actaea rubifolia	SH	S1
Arnoglossum sulcatum	S2S3	S3
Bulbostylis warei	SH	S1
Celastrus scandens	S2	S1
Desmodium ochroleucum	S1S2	S2
Dryopteris celsa	S1	S2
Epidendrum magnoliae	S2	S3
Eurybia eryngiifolia	S2	S1
Galactia floridana	SH	S1
Lilium superbum	S2	S3
Lobelia boykinii	S1S2	S1
Mikania cordifolia	S1	S2
Nestronia umbellula	S2	S3
Oenothera heterophylla	SH	S2
Phlox pulchra	S2	S1
Pityopsis oligantha	S1	S2
Quercus arkansana	S2	S3
Stylisma aquatica	S1	S2
Tephrosia mohrii	S1S2	S1?

IV. Taxa with Federal Status Changes

Taxa	Old Status	New Status	Reason
Mammals			
Perimyotis subflavus	PET	UR	USFWS issued a 90-day finding on 27 December 2017 that listing may be warranted and initiated a status review to determine if listing is warranted.
Amphibians			
Necturus alabamensis	C	LE	USFWS designated as endangered effective 2 February 2018.
Turtles			

Taxa	Old Status	New Status	Reason
Graptemys barbouri	UR		USFWS determined that listing is not warranted (5 October 2017).
Fishes			
Etheostoma brevirostrum	UR		USFWS determined that listing is not warranted (4 October 2017).
Etheostoma trisella	UR	LT	USFWS listing as threatened on 28 December 2018.
Freshwater Snails			
Leptoxis compacta	PET	UR	USFWS issued a 90-day finding on 27 December 2017 that listing may be warranted and initiated a status review to determine if listing is warranted.

VI. Taxa with Counties of Occurrence Added

Taxa	Counties Added
Mammals	
Spilogale putorius	Baldwin, Butler, Clay, Chambers, Cleburne, Coosa, Covington, Crenshaw, Dale, DeKalb, Fayette, Jefferson, Lauderdale, Lawrence, Macon, Tallapoosa, Winston
Amphibians	
Amphiuma means	Washington
Cryptobranchus alleganiensis	Jackson
Fishes	
Sander sp. cf. *vitreus*	Clay, Coosa
Flowering Plants	
Agalinis heterophylla	Bullock, Elmore, Montgomery
Agastache nepetoides	Madison
Agrimonia incisa	Bullock, Covington, Geneva, Pike
Arnoglossum sulcatum	Conecuh, Dale, Monroe, Pike
Canna flaccida	Geneva, Houston
Carex acidicola	Bibb, Lee
Coreopsis nudata	Baldwin
Crataegus ashei	Montgomery
Crataegus triflora	Montgomery
Cypripedium candidum	Lowndes
Desmodium ochroleucum	Madison
Dicerandra fumella	Barbour Butler, Conecuh, Crenshaw, Dale, Escambia, Geneva
Dryopteris celsa	Cherokee, Crenshaw, Jefferson, Lawrence, Limestone, Marion Montgomery, Walker

Taxa	Counties Added
Dyschoriste oblongifola	Houston
Enemion biternatum	Conecuh
Epidendrum magnoliae	Barbour, Butler, Coffee, Geneva, Henry
Hedeoma drummondii	Lowndes
Hypericum nudiflorum	Butler, Crenshaw, Wilcox
Isoetes appalachiana	Butler, Conecuh, Tallapoosa
Kalmia hirsuta	Houston
Lilium iridollae	Geneva
Lilium michiganense	Colbert, Dekalb, Franklin, Lawrence, Lowndes, Madison, Pickens
Lilium superbum	Baldwin, Bullock, Chilton, Choctaw, Crenshaw, Escambia, Macon, Marengo, Randolph, Russell, Shelby, Sumter, Tallapoosa
Macranthera flammea	Crenshaw
Mikania cordifolia	Clarke, Houston, Mobile
Nestronia umbellula	Pike
Oenothera heterophylls	Dallas, Greene
Orobanche uniflora	Bullock
Pachysandra procumbens	Bullock, Lowndes
Penstemon multiflorus	Covington, Escambia
Pieris phillyreifolia	Houston
Pinus serotina	Pike
Platanthera nivea	Conecuh
Rhamnus lanceolata	Butler
Rhododendron austrinum	Baldwin, Butler, Conecuh, Crenshaw, Dale, Escambia, Mobile, Monroe
Rudbeckia mollis	Houston
Schoenolirion croceum	Madison
Selaginella arenicola ssp. *riddellii*	Geneva, Wilcox
Stylisma aquatica	Geneva
Symphyotrichum pratense	Russell
Symphyotrichum sericeum	Colbert
Thelypteris ovata	Conecuh, Houston, Washington
Utricularia floridana	Houston
Veratrum woodii	Dale
Viola canadensis	Butler, Lowndes
Warea sessilifolia	Coffee, Dale, Henry, Mobile
Zanthoxylum americanum	Montgomery

VII. Taxa with Counties of Occurrence Deleted

Taxa	Counties Deleted
Flowering Plants	
Astragalus canadensis	Geneva
Isoetes appalachiana	Covington
Pachysandra procumbens	Butler
Rhexia aristosa	Choctaw
Rudbeckia mollis	Bibb, Tuscaloosa

Definition of Heritage Ranks

The Alabama Natural Heritage Program uses the Heritage ranking system developed by NatureServe. Each species is assigned two ranks; one representing its range-wide or global status (G rank), and one representing its status in Alabama (S rank). Species with a rank of 1 are most critically imperiled; those with a rank of 5 are most secure. Rank numbers may be combined when there is uncertainty over the status, but ranges cannot skip more than one rank (e.g., an element may be given a G-rank of G2G3, indicating global status is somewhere between imperiled and vulnerable).

Global Ranking System

G1 Critically Imperiled – At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 Imperiled – At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3 Vulnerable – At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 Apparently Secure – Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 Secure – Common; widespread and abundant.

GX Presumed Extinct (species) – Not located despite intensive searches and virtually no likelihood of rediscovery.
Eliminated (ecological communities) – Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.

GH Possibly Extinct (species)/ Eliminated (ecological communities and systems) – Known from only historical occurrences but still some hope of rediscovery There is evidence that the species may be extinct or the ecosystem may be eliminated throughout its range, but not enough to state this with certainty.

GU Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

GNR Not ranked to date.

G#T# Infraspecific Taxon (trinomial) – The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. At this time, the T rank is not used for ecological communities.

State Ranking System

S1 Critically Imperiled - Critically imperiled in Alabama because of extreme rarity (5 or fewer occurrences of very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation from Alabama.

S2 Imperiled - At high risk of extirpation because of rarity - very restricted range, very few populations, steep declines, or other factors making it very vulnerable to extirpation from Alabama.

S3 Vulnerable - Rare or uncommon in Alabama – at moderate risk of extirpation due to a restricted range, relatively few populations, recent and widespread declines, or other factors.

S4 Apparently Secure - Apparently secure in Alabama, may be uncommon, but not rare. May have some cause for long-term concern due to declines or other factors.

S5 Secure - Demonstrably secure in Alabama; common, widespread, and abundant in the state

SX Presumed Extirpated – Species or community is believed to be extirpated from Alabama. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

SH Historical (Possibly Extirpated) – Species or community occurred historically in Alabama, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in Alabama were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.

SNR Unranked – State conservation status not yet assessed.

SNA A conservation status rank is not applicable because the species is not a suitable target for conservation activities in the state.[1]

SU Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

Variant Ranks and Rank Modifiers

G#G# Range Rank – A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community (e.g., an element may be given a G-rank of G2G3, indicating global status is somewhere between imperiled and vulnerable). Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4). Also applies to state ranks (e.g., S2S3)

HYB Hybrid

Q Questionable taxonomy – Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority.

? Inexact Numeric Rank – Denotes inexact numeric rank (e.g., G2?)

Breeding Status Qualifiers[2]

B Breeding - Conservation status refers to the breeding population of the species in the state. Regularly occurring, usually migratory and may be present only during the breeding season.

N Nonbreeding - Conservation status refers to the non-breeding population of the species in the state. Regularly occurring, usually migratory and may not breed in Alabama; this category includes migratory birds, bats, sea turtles, and cetaceans.

M Migrant - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the nation or state/province.

[1] A conservation status rank may be not applicable for some species, including long distance aerial and aquatic migrants, hybrids without conservation value, and non-native species or ecosystems, for several reason

[2] A breeding status is only used for species that have distinct breeding and/or non-breeding populations in the state. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the state. In addition, a breeding-status S-rank can also be coupled with a migrant-status S-rank if, on migration, the species occurs regularly at particular staging areas or concentration spots where it might warrant conservation attention. Multiple conservation status ranks (typically two, or rarely three) are separated by commas (e.g., S2B,S3N or SHN,S4B,S1M).

For more information regarding Conservation Status Ranks, see
http://www.natureserve.org/explorer/ranking.htm#globalstatus

Definitions of Federal & State Listed Species Status

Federal - U.S. Fish and Wildlife Service

The U.S. Endangered Species Act (U.S. ESA) is the primary legislation that affords federal legal protections to threatened and endangered species in the United States, and is administered by the U.S. Fish and Wildlife Service (USFWS) (http://endangered.fws.gov/) and U.S. National Marine Fisheries Service (NMFS) (http://www.nmfs.noaa.gov/prot_res/overview/es.html). As defined by the Act, endangered refers to species that are "in danger of extinction within the foreseeable future throughout all or a significant portion of its range," while threatened refers to "those animals and plants likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges." Plant species and varieties (including fungi and lichens), animal species and subspecies, and vertebrate animal populations are eligible for listing under the Act. Status under the U.S. Endangered Species Act in data provided by ALNHP is based on formal notices published by USFWS or NMFS in the Federal Register. Where names used by the USFWS differ from those used by ALNHP, ALNHP records include notes indicating under what name the USFWS lists the species and how that relates to the name used by ALNHP.

ESA Status Definitions

LE – Listed Endangered: A species in danger of extinction throughout all or a significant portion of their range.

LT – Listed Threatened: A species likely to become endangered within the foreseeable future throughout all or a significant portion of their range.

PE – Proposed Endangered: A species proposed to be listed as endangered.

PT – Proposed Threatened: A species proposed to be listed as threatened.

C – Candidate: A species under consideration for official listing for which there is sufficient information to support listing. The USFWS encourages other agencies to give consideration to such taxa in environmental planning.

XN – Experimental Population, Nonessential: Experimental reintroduced population.

SC – Species of Concern: Species that have not been petitioned or been given Endangered, Threatened, or Candidate status, but have been identified as important to monitor. (An unofficial status with no regulatory rquirements)

UR – Under Review in the Candidate or Petition Process: A species under review in the candidate or petition process. A 90-day finding indicated that listing may be warranted, and a full status review has been initiated to determine if listing is warranted. (An unofficial status with no regulatory requirements)

PET – Petitioned for listing – A species that has been petitioned to be listed as endangered or threatened under the Endangered Species Act. Petition findings by USFWS have not yet been made.

SAT – Similarity of Appearance: A species listed as threatened due to a similarity of appearance to a listed species. Species listed as SAT are not biologically endangered or threatened and are not subject to Section 7 consultation.

State - Alabama Department of Conservation and Natural Resources (ADCNR)

Wildlife & Freshwater Fisheries Division

Alabama does not have a state law equivalent to the federal endangered species act so species do not have regulatory protection as state endangered or threatened species. However, some species do receive regulatory protection through the *Alabama Regulations on Game Fish and Fur Bearing Animals* published annually. These are the primary regulations affording state protection for some species in Alabama, and are administered by the Alabama Department of Conservation and Natural Resources. Copies of these regulations may be obtained from the Division of Wildlife & Freshwater Fisheries, Alabama Department of Conservation & Natural Resources, 64 North Union Street, Montgomery, AL 36104. A digital version of these regulations is available online at http://www.outdooralabama.com/season-and-bag-limits.

State Status Code Definitions

SP – State Protected: Species protected by Regulation 220-2-.92 (Nongame Species Regulation), 220-2-.98 (Invertebrate Species Regulation), 220-2-.26(4) (Protection of Sturgeon), 220-2-.94 (Prohibition of Taking or Possessing Paddlefish), or 220-2-.97 (Alligator Protection Regulation).

PSM – Partial Status Mussels: All mussel species not listed as a protected species under the Invertebrate Species Regulation are partially protected by other regulations of the Alabama Game, Fish, and Fur Bearing Animals Regulations. Regulation 220-2-.104 prohibits the commercial harvest of all but the 11 mussel species for which commercial harvest is legal. Regulation 220-2-.52 prohibits the take, capture, kill, or attempt to take, capture, or kill of any freshwater mussel from Wheeler Lake from Guntersville Dam downstream to the mouth of Shoal Creek and from the upstream end or head of Hobbs Island downstream to Whitesburg Bridge, Pickwick Lake from Wilson Dam downstream to the upper end or head of Seven Mile Island, Wilson Lake from Wheeler Dam downstream to the mouth of Town Creek on the south bank and the mouth of Bluewater Creek on the north bank, and the Cahaba River.

RT – Regulated Turtle: Species for which the Turtle Catcher/Dealer/Farmer Regulation (Regulation 220-2-.142) imposes a limit on the number which can be possessed or size limits.

GA – Game Animal (Managed hunting regulations).

GANOS – Game Animal - No Open Season: Species designated a game animal by Regulation 220-2-.07, but for which there is no open season.

GB – Game Bird (Managed hunting regulations).

GBNOS – Game Bird - No Open Season: Species designated a game bird by Regulation 220-2-.04, but for which there is no open season.

GF – Game Fish (Managed fishing regulations).

GF-HP – Game Fish – Harvest Prohibited: Species designated a game fish by Regulation 220-2-.34, but harvest of the species in the state is prohibited.

CNGF – Commercial or Non-Game Fish (Managed fishing regulations).

State Wildlife Action Plan (SWAP) Status Definitions

In order to receive funds through the Wildlife Conservation and Restoration Program and the State Wildlife Grants Program, Congress charged each state and territory with developing a wildlife action plan. These proactive plans, known technically as "comprehensive wildlife conservation strategies," assess the health of each state's wildlife and habitats, identify the problems they face, and outline the actions that are needed to conserve them over the long term. The wildlife action plans identify a variety of actions aimed at preventing wildlife from declining to the point of becoming endangered, and outline the steps that are needed to conserve wildlife and habitat before they become rarer and more costly to protect. One component of the plan was identifying Species of Greatest Conservation Need (GCN). Species were assigned a status based on the expert opinion of taxa committees. The taxa evaluated for inclusion on the SGCN list were birds, mammals, amphibians, reptiles, fishes, mussels, aquatic snails, and crayfishes.

SWAP Status Code Definitions

P1	Priority 1/Highest Conservation Concern: taxa critically imperiled and at risk of extinction/extirpation because of extreme rarity, restricted distribution, decreasing population trend/population viability problems, and specialized habitat needs/habitat vulnerability due to natural/human-caused factors. Immediate research and/or conservation action required.
P2	Priority 2/High Conservation Concern: taxa imperiled because of three of four of the following: rarity; very limited, disjunct, or peripheral distribution; decreasing population trend/population viability problems; specialized habitat needs/habitat vulnerability due to natural/human-caused factors. Timely research and/or conservation action needed.
EX	Extirpated: taxa that historically occurred in Alabama, but are now absent; may be rediscovered in the state, or be reintroduced from populations existing outside the state.
EXCAU	Extirpated/Conservation Action Underway: taxa that historically occurred in Alabama, were absent for a period of time, and currently are being reintroduced, or have a plan for being reintroduced, into the state from populations outside the state.
Extinct	Extinct: taxa that historically occurred in Alabama, but are no longer alive anywhere within their former distribution.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Vertebrates

CLASS AVES – *Birds*

ORDER CICONIIFORMES - Storks
Family Ciconiidae - Storks

Mycteria americana	Wood Stork	G4	S2N	LT[1]	SP	P2

Counties of occurrence: Autauga, Baldwin, Barbour, Bibb, Bullock, Butler, Chilton, Choctaw, Clarke, Coffee, Colbert, Conecuh, Covington, Crenshaw, Dallas, Elmore, Escambia, Geneva, Greene, Hale, Houston, Lee, Lowndes, Macon, Madison, Marengo, Mobile, Monroe, Montgomery, Perry, Russell, Shelby, Sumter, Tuscaloosa, Washington, Wilcox

ORDER PELICANIFORMES - Pelicans, Herons, Ibises, and Allies
Family Ardeidae - Herons and Bitterns

Botaurus lentiginosus	American Bittern	G4	S3N		SP	

Counties of occurrence: Baldwin, Mobile

Ixobrychus exilis	Least Bittern	G5	S2N,S4B		SP	P2

Counties of occurrence: Autauga, Baldwin, Barbour, Butler, Clarke, Dallas, Elmore, Houston, Jackson, Lamar, Lawrence, Lowndes, Macon, Mobile, Pike, Washington

Egretta rufescens	Reddish Egret	G4	S1B,S3N		SP	P2

Counties of occurrence: Baldwin, Mobile

Family Threskiornithidae - Ibises and Spoonbills

Eudocimus albus	White Ibis	G5	S2B,S3N		SP	

Counties of occurrence – breeding: Baldwin, Clarke, Covington, Geneva, Houston, Mobile
Counties of occurrence – foraging or transient: Barbour, Butler, Chilton, Cleburne, Coffee, Conecuh, Crenshaw, Dale, Escambia, Henry, Lowndes, Marshall, Monroe, Montgomery, Russell, Shelby, Sumter, Wilcox, Washington

Plegadis falcinellus	Glossy Ibis	G5	S1B,S3N		SP	

Counties of occurrence: Mobile

ORDER ANSERIFORMES - Screamers, Swans, Geese, and Ducks
Family Anatidae Swans, Geese, and Ducks

Anas fulvigula	Mottled Duck	G4	S2N,S3B		SP	P2

Counties of occurrence: Baldwin, Mobile

Anas rubripes	American Black Duck	G5	S2B,S5N		SP	P2

Counties of occurrence: Limestone, Marshall, Morgan

ORDER ACCIPITRIFORMES - Hawks, Kites, Eagles, and Allies
Family Accipitridae - Kites, Eagles, and Hawks

Elanoides forficatus	Swallow-tailed Kite	G5	S2		SP	P2

Counties of occurrence: Autauga, Baldwin, Butler, Choctaw, Clarke, Conecuh, Covington, Dallas, Escambia, Geneva, Hale, Marengo, Mobile, Monroe, Sumter, Washington, Wilcox

Circus cyaneus	Northern Harrier	G5	S3N		SP	

Counties of occurrence: Autauga, Baldwin, Calhoun, Cherokee, Greene, Hale, Jefferson, Lee, Lowndes, Macon, Mobile, Wilcox

[1] *Mycteria americana*, Listed by USFWS as Endangered in Alabama, Florida, Georgia, Mississippi, North Carolina, and South Carolina; not listed elsewhere.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

ORDER FALCONIFORMES - Caracaras and Falcons
Family Falconidae - Falcons

Falco sparverius	American Kestrel	G5	S3B,S5N		SP	P2[2]
Counties of occurrence:	Bibb, Blount, Butler, Cherokee, Chilton, Choctaw, Clarke, Clay, Colbert, Coosa, Covington, Cullman, DeKalb, Etowah, Franklin, Hale, Houston, Jackson, Jefferson, Lauderdale, Lawrence, Lee, Limestone, Madison, Marengo, Marion, Marshall, Monroe, Montgomery, Morgan, Shelby, St. Clair, Tuscaloosa, Walker, Washington, Wilcox, Winston					
Falco peregrinus	Peregrine Falcon	G4	SHB,S3N		SP	
Counties of occurrence:[3]	Colbert, Lauderdale, Lawrence, Limestone, Madison, Marshall					

ORDER GALLIFORMES - Gallinaceous Birds
Family Phasianidae - Grouse and Turkeys

Bonasa umbellus	Ruffed Grouse	G5	S1		GBNOS	
Counties of occurrence:	Jackson					

ORDER GRUIFORMES - Cranes, Rails, and Allies
Family Rallidae - Rails

Coturnicops noveboracensis	Yellow Rail	G4	S2N		GB	P2
Counties of occurrence:	Baldwin, Mobile					
Laterallus jamaicensis	Black Rail	G4	S2N	SC	GB	P2
Counties of occurrence:	Baldwin, Mobile					
Rallus longirostris	Clapper Rail	G5	S2	SC	GB	
Counties of occurrence:	Baldwin, Mobile					
Rallus elegans	King Rail	G3G4	S2S3B, S4N	SC	GB	P2
Counties of occurrence:	Baldwin, Barbour, Bullock, Crenshaw, Cullman, Lamar, Lauderdale, Lowndes, Macon, Marshall, Mobile, Montgomery, Morgan, Perry, Tuscaloosa, Wilcox					
Porphyrio martinicus	Purple Gallinule	G5	S2B		GB	
Counties of occurrence:	Baldwin, Barbour, Choctaw, Clarke, Coffee, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Mobile, Washington					

Family Gruidae - Cranes

Grus americana	Whooping Crane	G1	S1N	LT,XN	SP	
Counties of occurrence:	Limestone, Madison, Morgan					
Grus canadensis pulla	Mississippi Sandhill Crane	G5T1	SH	LE	SP	
Counties of occurrence:	Baldwin[4]					

ORDER CHARADRIIFORMES - Shorebirds, Gulls, Auks, and Allies
Family Charadriidae - Plovers and Lapwings

Charadrius melodus	Piping Plover	G3	S1N	LT[5]	SP	P1
Counties of occurrence:	Baldwin, Mobile					
Charadrius nivosus	Snowy Plover	G3	S1B,S2N		SP	P1
Counties of occurrence:	Baldwin, Mobile					
Charadrius wilsonia	Wilson's Plover	G5	S1		SP	P1
Counties of occurrence:	Baldwin, Mobile					

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2 The southern form, *Falco sparverius paulus*, is included on the species of greatest conservation need list but the northern form, *F. sparverius sparverius*, is not. The northern form is considered to be a species of moderate conservation concern (Priority 3).

3 Species may occur in any county if suitable habitat exists.

4 Historic occurrence.

5 *Charadrius melodus*, LE, LT; Listed by USFWS as Endangered in Great Lakes watersheds of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin; Listed as Threatened elsewhere, including Alabama.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Haematopodidae - Oystercatchers						
Haematopus palliatus	American Oystercatcher	G5	S1		SP	P1
Counties of occurrence: Mobile						
Family Scolopacidae - Snipe, Woodcock, and Sandpipers						
Tringa semipalmata	Willet	G5	S2B,S5N		SP	
Counties of occurrence: Baldwin, Mobile						
Numenius americanus	Long-Billed Curlew	G5	S2N		SP	
Counties of occurrence: Mobile						
Calidris canutus	Red Knot	G4	S2N	LT[6]	SP	P2
Counties of occurrence: Baldwin, Mobile						
Scolopax minor	American Woodcock	G5	S3B,S5N		GB	
Counties of occurrence: Baldwin, Barbour, Blount, Butler, Chambers, Cherokee, Cleburne, Colbert, Conecuh, Covington, Crenshaw, Cullman, DeKalb, Escambia, Etowah, Franklin, Geneva, Jackson, Jefferson, Lauderdale, Lawrence, Lee, Limestone, Lowndes, Macon, Madison, Marion, Mobile, Montgomery, Morgan, Perry, Shelby, St. Clair, Tallapoosa, Wilcox, Winston						
Family Laridae - Jagers, Skuas, Gulls, and Terns						
Sternula antillarum	Least Tern	G4	S2B,S4N		SP	
Counties of occurrence: Baldwin, Mobile						
Gelochelidon nilotica	Gull-Billed Tern	G5	S2B,S4N		SP	P2
Counties of occurrence: Baldwin, Mobile						
Hydroprogne caspia	Caspian Tern	G5	S2B,S4N		SP	
Counties of occurrence: Baldwin, Mobile						
Sterna hirundo	Common Tern	G5	S1B,S4N		SP	
Counties of occurrence: Mobile						
Sterna forsteri	Forster's Tern	G5	S1B,S5N		SP	
Counties of occurrence: Mobile						
Thalasseus maximus	Royal Tern	G5	S2B,S5N		SP	
Counties of occurrence: Baldwin, Mobile						
Thalasseus sandvicensis	Sandwich Tern	G5	S1B,S5N		SP	
Counties of occurrence: Baldwin, Mobile						
Rynchops niger	Black Skimmer	G5	S2B,S4N		SP	
Counties of occurrence: Baldwin, Mobile						
ORDER COLUMBIFORMES - Pigeons and Doves						
Family Columbidae - Doves and Pigeons						
Zenaisa asiatica	White-winged Dove	G5	S2B,S3N		GB	
Counties of occurrence: Baldwin, Mobile						
Columbina passerine	Common Ground-dove	G5	S3		SP	
Counties of occurrence: Autauga, Baldwin, Barbour, Bullock, Butler, Chambers, Chilton, Choctaw, Clarke, Clay, Cleburne, Coffee, Conecuh, Coosa, Covington, Crenshaw, Dale, Dallas, Elmore, Escambia, Geneva, Henry, Houston, Lee, Lowndes, Macon, Marengo, Mobile, Monroe, Montgomery, Perry, Pike, Randolph, Russell, Shelby, Sumter, Talladega, Tallapoosa, Washington, Wilcox						
ORDER CUCULIFORMES - Cuckoos and Allies						
Family Cuculidae - Cuckoos, Roadrunners, and Anis						
Coccyzus erythropthalmus	Black-billed Cuckoo	G5	S1B		SP	
Counties of occurrence: Cullman, Jackson, Marshall, Morgan						

[6] Subspecies *Canidis canutus rufa* listed as threatened.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Crotophaga sulcirostris	Groove-billed Ani	G5	S2N		SP	

Counties of occurrence: Mobile

ORDER STRIGIFORMES - Owls

Family Strigidae - Typical Owls

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Athene cunicularia	Burrowing Owl	G4	S2N		SP	

Counties of occurrence: Mobile

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Asio flammeus	Short-Eared Owl	G5	S2N		SP	P2

Counties of occurrence: Autauga, Baldwin, Bibb, Dallas, Etowah, Henry, Jefferson, Lauderdale, Limestone, Marshall, Mobile, Montgomery

ORDER PICIFORMES - Puffbirds, Jacamars, Toucans, Woodpeckers, and Allies

Family Picidae - Woodpeckers and Allies

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Picoides borealis	Red-cockaded Woodpecker	G3	S2	LE	SP	P1

Counties of occurrence[3]: Baldwin[4], Barbour, Bibb, Bullock, Butler, Calhoun, Chilton, Clay, Cleburne, Colbert[4], Conecuh, Coosa, Covington, Dallas, Escambia, Hale, Jefferson[4], Lawrence[4], Macon, Marengo[4], Marshall[4], Perry, St. Clair[4], Talladega, Tallapoosa, Tuscaloosa, Washington[4], Winston[4]

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Campephilus pricipalis	Ivory-Billed Woodpecker	GH	SX	LE	SP	EX

Counties of occurrence[4]: Dallas, Hale, Lamar, Marengo, Pike, Wilcox

ORDER PASSERIFORMES - Passerine Birds

Family Tyrannidae - Tyrant Flycatchers

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Empidonax traillii	Willow Flycatcher	G5	S1B	SC	SP	

Counties of occurrence: Cherokee, Lawrence, Limestone

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Tyrannus dominicensis	Gray Kingbird	G5	S1B		SP	

Counties of occurrence: Baldwin, Mobile

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Tyrannus forficatus	Scissor-tailed Flycatcher	G5	S2		SP	

Counties of occurrence: Autauga, Baldwin, Blount, Colbert, Cullman, Dallas, Franklin, Hale, Jackson, Jefferson, Lauderdale, Lowndes, Madison, Marengo, Mobile, Morgan, Perry, Pike, Shelby, Sumter, Talladega, Wilcox

Family Vireonidae - Vireos

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Vireo solitarius	Blue-Headed Vireo	G5	S3B,S4N		SP	

Counties of occurrence: Blount, Calhoun, Cherokee, Clay, Cleburne, Cullman, DeKalb, Etowah, Jackson, Lawrence, Marshall, Morgan, Randolph, St. Clair, Talladega, Tallapoosa, Winston

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Vireo gilvus	Warbling Vireo	G5	S1B		SP	

Counties of occurrence: Colbert, Crenshaw, Jackson, Lauderdale

Family Corvidae - Crows and Jays

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Corvus corax	Common Raven	G5	SX		SP	EX

Counties of occurrence[4]: Cullman, DeKalb, Jackson, Walker, Winston

Family Troglodytidae - Wrens

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Thryomanes bewickii	Bewick's Wren	G5	SHB, S1N		SP	P1

Counties of occurrence: Autauga[4], Butler, Clay[4], Colbert[4], Coosa[4], Cullman[4], DeKalb[4], Elmore[4], Etowah[4], Franklin[4], Jackson[4], Jefferson, Lauderdale, Lawrence[4], Limestone[4], Madison, Marshall[4], Mobile, Morgan[4], Randolph[4], Shelby[4], St. Clair[4], Sumter[4], Talladega[4], Tuscaloosa[4], Walker[4]

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cistothorus palustris	Marsh Wren	G5	S2B, S4N		SP	

Counties of occurrence: Baldwin, Mobile

[3] Species may occur in any county if suitable habitat exists.
[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Parulidae - Wood-warblers						
Vermivora bachmani	Bachman's Warbler	GH	SX	LE	SP	
Counties of occurrence[4]: Autatuga, Baldwin, Clarke, Coosa, Cullman, Mobile, Tuscaloosa, Washington						
Setophaga petechia	Yellow Warbler	G5	S2B		SP	
Counties of occurrence: Autatuga, Cherokee, Colbert, DeKalb, Fayette, Franklin, Jackson, Jefferson, Lamar, Lauderdale, Lee, Limestone, Madison, Marshall, Montgomery, Morgan, Walker						
Setophaga cerulea	Cerulean Warbler	G4	S1B		SP	P1
Counties of occurrence: Colbert, Cullman[4], DeKalb[4], Fayette, Franklin, Jackson, Jefferson[4], Lauderdale[4], Lawrence, Limestone[4], Madison[4], Marshall[4], Morgan[4], Tuscaloosa[4], Winston						
Family Emberizidae - Emberizids						
Peucaea aestivalis	Bachman's Sparrow	G3	S3		SP	P2
Counties of occurrence: Baldwin, Barbour, Bibb, Bullock, Butler, Calhoun, Chambers, Clarke, Cleburne, Conecuh, Coosa, Covington, Dallas, DeKalb, Escambia, Fayette, Franklin, Greene, Henry, Houston, Jackson[4], Limestone, Lowndes, Macon, Madison, Marion, Mobile, Monroe, MontgomeryMorgan, Pike, Russell, Tuscaloosa, Washington, Wilcox, Winston						
Chondestes grammacus	Lark Sparrow	G5	S3B		SP	
Counties of occurrence: Autauga, Chilton, Colbert, Dallas, Elmore, Franklin, Greene, Hale, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marion, Morgan, Perry, Pickens, Shelby, Sumter						
Ammodramus henslowii	Henslow's Sparrow	G4	S2N		SP	P1
Counties of occurrence: Baldwin, Covington, Escambia, Mobile						
Ammodramus leconteii	Le Conte's Sparrow	G4	S3N		SP	
Counties of occurrence: Baldwin, Mobile						
Ammodramus nelsoni	Nelson's Sparrow	G5	S3N		SP	P2
Counties of occurrence: Baldwin, Mobile						
Ammodramus maritimus	Seaside Sparrow	G4	S2		SP	P2
Counties of occurrence: Baldwin, Mobile						
Family Cardinalidae - Cardinals and Allies						
Passerina ciris	Painted Bunting	G5	S2B		SP	
Counties of occurrence: Baldwin, Barbour, Butler, Covington, Crenshaw, Dallas, Greene, Hale, Lamar, Marengo, Mobile, Monroe, Montgomery, Pike, Sumter, Washington, Wilcox						
Family Fringillidae - Fringilline and Cardueline Finches and Allies						
Loxia curvirostra	Red Crossbill	G5	S1B		SP	
Counties of occurrence: Cleburne						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

CLASS MAMMALIA – *Mammals*

ORDER SIRENIA - Sirenians
Family Trichechidae - Manatees

Trichechus manatus	West Indian manatee	G2	S1	LT	SP	P1
Counties of occurrence: Baldwin, Mobile						

ORDER RODENTIA - Rodents
Family Geomyidae - Pocket Gophers

Geomys pinetis	southeastern pocket gopher	G5	S3		SP	P2
Counties of occurrence: Autauga, Baldwin, Barbour, Bullock, Clarke[3], Coffee, Conecuh[3], Covington, Crenshaw, Dale, Dallas[3], Escambia, Geneva, Henry[3], Houston, Macon,Monroe[3], Montgomery, Russell, Tuscaloosa[3]						

Family Dipodidae - Birch Mice, Jerboas, and Jumping Mice

Zapus hudsonius	meadow jumping mouse	G5	S1		SP	P2
Counties of occurrence[7]: Chambers, Chilton, Lee						

Family Cricetidae - New World Rats and Mice, Voles, Hamsters, and Relatives

Microtus ochrogaster	prairie vole	G5	S2			
Counties of occurrence: Limestone, Madison						
Neotoma magister	Allegheny woodrat	G3G4	S3			P2
Counties of occurrence: Colbert, Lauderdale, Limestone, Jackson, Madison, Marshall						
Peromyscus polionotus ammobates	Alabama beach mouse[8]	G5T1	S1	LE	SP	P1
Counties of occurrence: Baldwin						
Peromyscus polionotus trissyllepsis	Perdido key beach mouse	G5T1	S1	LE	SP	P1
Counties of occurrence: Baldwin						

ORDER LAGOMORPHA - Rabbits, Hares, and Picas
Family Leporidae - Rabbits and Hares

Sylvilagus obscurus	Appalachian cottontail	G4	S1		GA	P2
Counties of occurrence: Clay, Cullman, Lawrence, Winston						
Sylvilagus palustris	marsh rabbit	G5	S3		GA	P2
Counties of occurrence: Baldwin, Escambia[9], Coffee[8], Covington[8], Dale[8], Geneva[8], Henry[8], Houston[8]						

ORDER SORICOMORPHA - Shrews, Moles, and Solenodons
Family Soricidae - Shrews

Sorex fumeus	smoky shrew	G5	S1		SP	P2
Counties of occurrence: Jackson						
Sorex hoyi	American pygmy shrew	G5	S1		SP	P2
Counties of occurrence: Jackson						

ORDER CHIROPTERA - Bats
Family Molossidae - Free-tailed Bats

Tadarida brasiliensis	Brazilian free-tailed bat	G5	S3			P2
Counties of occurrence: Bullock, Lee						

Family Vespertilionidae - Vespertilionid Bats

Lasiurus intermedius	northern yellow bat	G4G5	S1		SP	P2
Counties of occurrence: Mobile						

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[7] Historic occurrence, no reported collections from Alabama since the mid- to late 1970s.
[8] Alabama endemic.
[9] Historic occurrence, no recent information although it still likely occurs in the county.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Perimyotis subflavus	tri-colored bat	G3	S3	UR		P2
Counties of occurrence:	virtually statewide					
Corynorhinus rafinesquii	Rafinesque's big-eared bat	G3G4	S2		SP	P1
Counties of occurrence:	Blount, Clarke, Jackson, Marshall					
Myotis austroriparius	southeastern myotis	G3G4	S2		SP	P1
Counties of occurrence:	Conecuh, Covington, Monroe					
Myotis grisescens	gray myotis	G3	S2	LE	SP	P1
Counties of occurrence:	Bibb[10], Blount[9], Calhoun[9], Cherokee[9], Chilton[9], Clay[9], Cleburne[9], Colbert, Conecuh, Coosa[9], Cullman[9], DeKalb, Escambia[9], Etowah[9], Franklin, Hale[9], Jackson, Jefferson[9], Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan, Shelby, St. Clair[9], Talladega[9], Tuscaloosa[9]					
Myotis leibii	eastern small-footed myotis	G1G3	SNA [11]			P1
Myotis lucifugus	little brown myotis	G3	S3		SP	P1
Counties of occurrence:	Conecuh, Madison					
Myotis septentrionalis	northern myotis	G2G3	S2	LT	SP	P1
Counties of occurrence:	Franklin, Lawrence					
Myotis sodalis	Indiana bat	G2	S2	LE	SP	P1
Counties of occurrence:	Bibb[9], Blount[4], Calhoun[9], Cherokee[9], Chilton[9], Clay, Cleburne[9], Colbert[9], Coosa[9], Cullman[9], DeKalb[9], Etowah[9], Franklin[9], Hale[9], Jackson, Jefferson[9], Lauderdale[9], Lawrence, Limestone[9], Madison[9], Marshall, Morgan, Shelby, St. Clair[9], Talladega[9], Tuscaloosa[9]					
ORDER CARNIVORA - Carnivores						
Family Felidae - Cats						
Puma concolor	cougar	G5	SX	LE[12]	GANOS	EX
Family Canidae - Wolves, Dogs, Foxes, and Jackals						
Canis rufus	red wolf	G1Q	SX	LE[13]	GANOS	EX
Family Ursidae - Bears						
Ursus americanus	black bear	G5	S2		SP[14]	P1
Counties of occurrence:	Baldwin, Barbour[15], Bibb[14], Butler[14], Chambers[14], Cherokee, Chilton[14], Choctaw[14], Clark, Cleburne[14], Coffe[14], Conecuh, Coosa[14], Covington[14], Cullman[14], Dale[14], Dallas[14], DeKalb, Elmore[14], Escambia[14], Etowah, Fayette[14], Geneva[14], Jefferson[14], Lee[14], Limestone[14], Lowndes[14], Macon[14], Madison[14], Marengo[14], Marion[14], Marshall[14], Mobile, Monroe, Montgomery[14], Randolph[14], St. Clair[14], Talladega[14], Tallapoosa[14], Tuscaloosa[14], Walker[14], Washington					

[4] Historic occurrence.

[10] No occurrence record in ALNHP database but the US Fish & Wildlife Service lists this species as occurring or believed to occur in the county (http://www.fws.gov/daphne/es/specieslst.html).

[11] The species is known from adjacent areas of Tennessee and Georgia so it probably occurs in northeastern Alabama. Distribution maps often depict it occurring in Alabama, but no specimens are known from the state.

[12] Both subspecies that occurred in the eastern United states (*Puma concolor cougari*, presumed extinct in wild, and *P. concolor coryi*) are listed as endangered.

[13] *Canis rufus*, LE - listed endangered range wide, except where listed as experimental populations; presumed extinct in wild except experimental populations in North Carolina and Tennessee.

[14] *Ursus americanus* is not included in the list of protected species in Nongame Species Regulation 220-2-.92, but is protected under Alabama Game, Fish and Wildlife Laws, Section 9-11-480-481 which makes it illegal to hunt, wound, injure, kill, trap, collect, or capture a black bear, or to attempt to engage in that conduct during the closed season for black bear. It is designated a game animal by Regulation 220-2-.06 of the Alabama Regulations on Game, Fish, and Fur Bearing Animals, but there is no open season for the species.

[15] Black bear sightings have been reported from the county, but there likely is not an established, self-sustaining population in the county.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Mustelidae - Weasels, Badgers, and Otters						
Mustela frenata	long-tailed weasel	G5	S3		SP	P2
Counties of occurrence[16]: Baldwin, Bibb, Butler, Clarke, Geneva, Greene, Jackson, Walker						
Family Mephitidae - Skunks						
Spilogale putorius	eastern spotted skunk	G4	S2S3		SP	P2
Counties of occurrence[16]: Baldwin, Butler, Chambers, Clarke, Clay, Cleburne, Coosa, Covington, Crenshaw, Dale, DeKalb, Fayette, Jefferson, Lauderdale, Lawrence, Macon, Pickens, Tallapoosa, Winston						
ORDER ARTIODACTYLA - Even-toed Hoofed Mammals						
Family Cervidae - Deer, Elk, Caribou, and Moose						
Cervus elaphus	elk	G5	SX			EX
Family Bovidae - Antelopes, Bison, Cattle, Goats, and Sheep						
Bos bison	American bison	G4	SX			EX

[16] Species potentially occurs in every county, but little is known about its current status.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

CLASS AMPHIBIA – *Amphibians*

ORDER ANURA - Frogs and Toads

Family Hylidae - Treefrogs and Allies

Hyla andersonii	Pine Barrens Treefrog	G4	S2		SP	P1
Counties of occurrence: Covington, Escambia, Geneva						
Pseudacris ocularis	Little Grass Frog	G5	S1			P2
Counties of occurrence: Houston						

Family Ranidae - "True" Frogs

Lithobates areolatus	Crawfish Frog	G4	S1		SP	P1
Counties of occurrence: Sumter						
Lithobates capito	Gopher Frog	G3	S2	UR	SP	P1
Counties of occurrence: Baldwin[4], Barbour[4], Coffee[4], Covington, Escambia, Shelby[4]						
Lithobates heckscheri	River Frog	G5	S1		SP	P1
Counties of occurrence[4]: Baldwin, Escambia, Henry, Mobile						
Lithobates sevosus	Dusky Gopher Frog	G1	SH	LE	SP	P1
Counties of occurrence[4]: Mobile, Washington						
Lithobates sylvaticus	Wood Frog	G5	S2			P1
Counties of occurrence: Clay, Cleburne, Randolph, Talladega, Tallapoosa						

ORDER CAUDATA - Salamanders

Family Ambystomatidae - Mole Salamanders

Ambystoma bishopi	Reticulated Flatwoods Salamander	G2	S1	LE	SP	P1
Counties of occurrence[17]: Baldwin, Covington, Houston, Mobile						
Ambystoma texanum	Small-mouthed Salamander	G5	S3			P2
Counties of occurrence: Choctaw, Madison, Marion, Montgomery, Morgan, Perry, Sumter, Tuscaloosa, Washington, Wilcox						
Ambystoma tigrinum	Eastern Tiger Salamander	G5	S3			P2
Counties of occurrence: Bibb, Bullock, Calhoun, Chilton, Cleburne, Colbert, Covington, Crenshaw, Cullman, Dale, Escambia, Geneva, Henry, Houston, Jefferson, Macon, Marshall, Mobile, Montgomery, Shelby, Talladega						

Family Amphiumidae - Amphiumas

Amphiuma means	Two-toed Amphiuma	G5	S3			
Counties of occurrence: Baldwin, Covington, Henry, Houston, Macon, Mobile, Monroe, Montgomery, Pike, Washington						
Amphiuma pholeter	One-toed Amphiuma	G3	S1		SP	P2
Counties of occurrence: Baldwin, Mobile						
Amphiuma tridactylum	Three-toed Amphiuma	G5	S3			
Counties of occurrence: Dallas, Hale, Sumter, Tuscaloosa, Washington						

Family Cryptobranchidae - Giant Salamanders

Cryptobranchus alleganiensis	Hellbender	G3G4	S2	UR	SP	P1
Counties of occurrence: Colbert, Franklin, Jackson, Lauderdale, Limestone, Madison, Marion, Marshall, Morgan[4]						

Family Plethodontidae - Lungless Salamanders

Aneides aeneus	Green Salamander	G3G4	S3	UR	SP	P2
Counties of occurrence: Cherokee, Colbert, DeKalb, Franklin, Jackson, Lauderdale, Lawrence, Madison, Marion, Marshall, St. Clair, Tuscaloosa[4], Walker, Winston						

[4] Historic occurrence.

[17] Historic occurrence: species has not been observed in Alabama since 1981.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Desmognathus aeneus	Seepage Salamander	G3G4	S2	UR	SP	P2
Counties of occurrence:	Bibb, Calhoun, Cherokee, Chilton, Clay, Cleburne, Greene, Hale, Marion, Randolph, St. Clair, Talladega, Tuscaloosa					
Desmognathus apalachicolae	Apalachicola Dusky Salamander	G4	S3			
Counties of occurrence:	Barbour, Dale, Henry, Houston, Russell					
Desmognathus auriculatus	Southern Dusky Salamander	G5	S2		SP	P1
Counties of occurrence:	Baldwin, Covington, Geneva, Houston, Mobile					
Desmognathus monticola	Seal Salamander	G5	S5		SP[18]	
Counties of occurrence:	Bibb, Blount, Butler, Calhoun, Chambers, Chilton, Choctaw, Clarke, Clay, Cleburne, Conecuh, Coosa, Elmore, Jackson, Jefferson, Lee, Macon, Monroe, Randolph, Russell, Shelby, St. Clair, Talladega, Tallapoosa					
Desmognathus ocoee	Ocoee Salamander	G5	S2			
Counties of occurrence:	Blount, Cullman, DeKalb, Etowah, Jackson, Madison, Marshall, Morgan					
Gyrinophilus palleucus palleucus	Pale Salamander	G2G3T2	S2	UR	SP	P2
Counties of occurrence:	Colbert, DeKalb, Jackson, Limestone, Madison, Marshall					
Phaeognathus hubrichti	Red Hills Salamander[7]	G2	S2	LT	SP	P1
Counties of occurrence:	Butler, Conecuh, Covington, Crenshaw, Monroe, Wilcox					
Plethodon serratus	Southern Red-backed Salamander	G5	S2S3			P2
Counties of occurrence:	Calhoun					
Family Proteidae - Waterdogs and Mudpuppies						
Necturus alabamensis	Black Warrior Waterdog[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Blount, Cullman[19], Fayette[18], Jefferson[18], Lawrence[18], Marshall, Tuscaloosa, Walker, Winston					
Necturus maculosus	Mudpuppy	G5	S1			
Counties of occurrence:	Colbert, Franklin, Lauderdale, Madison, Marshall					
Family Sirenidae - Sirens						
Siren lacertian	Greater Siren	G5	S3			
Counties of occurrence:	Baldwin, Covington, Henry					

[7] Alabama endemic.
[18] Only populations of Coastal Plain origin are protected by the Nongame Species Regulation.
[19] Potentially occurs in the county.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Reptiles

Class Reptilia – *Lizards, Snakes, and Amphisbaenas*

ORDER SQUAMATA, SUBORDER LACERTILIA - Lizards

Family Anguidae - Glass Lizard

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Ophisaurus attenuatus	Slender Glass Lizard	G5	S3		SP	P2
Counties of occurrence:	Barbour, Butler, Calhoun, Chambers, Cleburne, Coosa, Covington, Etowah, Jefferson, Lamar, Lauderdale, Lee, Macon, Morgan, Russell, Shelby, St. Clair, Tallapoosa					
Ophisaurus mimicus	Mimic Glass Lizard	G3	S1		SP	P1
Counties of occurrence:	Baldwin[4], Conecuh, Covington[4], Mobile[4]					

Family Scincidae - Skinks

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Plestiodon anthracinus	Coal Skink	G5	S3		SP	P2
Counties of occurrence:	Bibb, Blount, Chilton, Choctaw, Colbert, Coosa, Elmore, Lawrence, Marion, Mobile[4], Monroe, Russell, Shelby, St. Clair, Tuscaloosa					
Plestiodon inexpectatus	Southeastern Five-Lined Skink	G5	S3		SP	P2
Counties of occurrence:	Autauga, Bibb, Calhoun, Chambers, Cherokee, Chilton, Choctaw, Clarke, Clay, Cleburne, Colbert, Conecuh, Coosa, Covongton, Cullman, Elmore, Etowah, Fayette, Franklin, Greene, Houston, Lamar, Lee, Macon, Marengo, Marion, Mobile, Pickens, Randolph, Russell, Shelby, Talladega, Tallapoosa, Washington					

ORDER SQUAMATA, SUBORDER SERPENTES - Snakes

Family Colubridae - Colubrid Snakes

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Coluber flagellum	Coachwhip	G5	S3		SP	
Counties of occurrence:	Autauga, Baldwin, Barbour, Bibb, Butler, Calhoun, Chambers, Coffee, Conecuh, Coosa, Covington, Crenshaw, Cullman, Dale, Dallas, DeKalb, Escambia, Franklin, Jefferson, Lauderdale, Lee, Macon, Mobile, Monroe, Pickens, Pike, Russell, Shelby, Sumter, Talladega, Tallapoosa, Tuscaloosa, Walker, Wilcox					
Drymarchon couperi	Eastern Indigo Snake	G3	S1	LT	SP	P1
Counties of occurrence:	Baldwin[4], Coffee, Conecuh, Covington[4], Escambia[4], Mobile, Washington[4]					
Farancia erytrogramma	Rainbow Snake	G4	S3		SP	P1
Counties of occurrence:	Baldwin, Chilton, Covington, Dale, Escambia, Henry, Mobile, Shelby, Tuscaloosa					
Heterodon simus	Southern Hog-nosed Snake	G2	SH	UR	SP	P1
Counties of occurrence[20]:	Autauga, Baldwin, Calhoun, Choctaw, Clarke, Covington, Dale, Escambia, Shelby					
Lampropeltis calligaster calligaster	Prairie Kingsnake	G5T5	S1S2		SP	
Counties of occurrence:	Madison					
Lampropeltis calligaster rhombomaculata	Mole Kingsnake	G5T5	S3			
Counties of occurrence:	Baldwin, Bibb, Calhoun, Coosa, Etowah, Jefferson, Lee, Madison, Marshall, Mobile, Randolph, Russell, Shelby, St. Clair, Tuscaloosa					
Lampropeltis getula	eastern kingsnake	G5	S4		SP	P2
Counties of occurrence:	Baldwin, Barbour, Bullock, Butler, Chambers, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Elmore, Geneva, Henry, Houston, Lee, Macon, Mobile, Pike, Russell					
Lampropeltis nigra holbrooki	eastern speckled kingsnake	G5T5	S3		SP	P2
Counties of occurrence:	Autauga, Bullock, Choctaw, Clarke, Dallas, Elmore, Greene, Hale, Lowndes, Macon, Marengo, Mobile, Monroe, Montgomery, Perry, Pickens, Sumter, Tuscaloosa, Washington, Wilcox					

[4] Historic occurrence.
[20] Historic occurrence, may be extirpated in Alabama.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Lampropeltis triangulum syspila[21]	Red Milksnake	G5T5	S2			
Counties of occurrence: Lawrence, Madison, Morgan, Winston						
Lampropeltis triangulum triangulum[20]	Eastern Milksnake	G5T5	S2			
Counties of occurrence: DeKalb, Jackson						
Liodytes pygaea	Black Swampsnake	G5	S1			P2
Counties of occurrence: Covington, Escambia						
Nerodia clarkii clarkii	Gulf Saltmarsh Watersnake	G4T4	S2		SP	P2
Counties of occurrence: Baldwin, Mobile						
Nerodia cyclopion	Mississippi Green Watersnake	G5	S1S2			
Counties of occurrence: Baldwin, Mobile						
Nerodia floridana	Florida Green Watersnake	G5	S1S2			
Counties of occurrence: Baldwin						
Nerodia taxispilota	Brown Watersnake	G5	S3			
Counties of occurrence: Baldwin, Barbour, Coffee, Covington, Dale, Escambia, Geneva, Henry, Houston, Lee, Russell						
Pituophis melanoleucus lodingi	Black Pinesnake	G4T2T3	S2	LT	SP	P1
Counties of occurrence: Clarke, Mobile, Washington						
Pituophis melanoleucus melanoleucus	Northern Pinesnake	G4T4	S3		SP	P2
Counties of occurrence: Autauga, Calhoun, Cherokee, Chilton, Colbert, Crenshaw[22], DeKalb, Elmore[21], Jackson, Jefferson, Lauderdale, Shelby, St. Clair, Tuscaloosa, Winston						
Pituophis melanoleucus mugitus	Florida Pinesnake	G4T3	S2	UR	SP	P2
Counties of occurrence: Baldwin[23], Covington, Crenshaw, Escambia[22], Russell						
Rhadinaea flavilata	Pine Woods Littersnake	G4	S2			
Counties of occurrence: Baldwin, Clarke, Mobile, Russell, Washington						
Family Elapidae - Coral Snakes						
Micrurus fulvius	Harlequin Coralsnake	G5	S3		SP	P1
Counties of occurrence: Autauga[4], Baldwin, Barbour, Bibb, Clarke, Coffee, Coosa, Covington, Dale, Geneva, Greene[4], Henry, Houston, Mobile, St. Clair, Talladega, Washington						
Family Viperidae - Pit Vipers						
Crotalus adamanteus	Eastern Diamond-Backed Rattlesnake	G4	S3	UR		P2
Counties of occurrence: Baldwin, Barbour, Choctaw, Clarke, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Mobile, Monroe, Washington						

Class Chelonia – *Turtles and Tortoises*

ORDER CRYPTODEIRA - Straightneck Turtles
Family Cheloniidae - Sea Turtles

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Caretta caretta	Loggerhead Sea Turtle	G3	S1	LT	SP	P1
Counties of occurrence: Baldwin, Mobile						
Chelonia mydas	Green Sea Turtle	G3	S1	LT[24]	SP	P1
Counties of occurrence: Baldwin, Mobile						

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[4] Historic occurrence.
[21] Ruane et al. (2014) proposed snakes previously considered to be *Lampropeltis triangulum* consist of seven distinct species. They synonymized *L. triangulum syspila* and *L. triangulum triangulum* as a single species, *L. triangulum*. ALNHP has retained the subspecies designations.
[22] Intergradient between northern and Florida pine snakes.
[23] Individuals from the county are intergradient with black pine snake.
[24] *Chelonia mydas*, LT throughout most of its range, including Alabama; LE in Florida, Mexico.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Lepidochelys kempii	Kemp's Ridley Sea Turtle	G1	S1	LE	SP	P1
Counties of occurrence: Baldwin, Mobile						
Family Chelydridae - Snapping Turtles						
Macrochelys temminckii	Alligator Snapping Turtle	G3G4	S3	UR	SP	
Counties of occurrence: Autauga[4], Baldwin, Bullock, Calhoun, Chilton, Choctaw, Clarke, Colbert, Coosa, Covington, Elmore, Escambia, Franklin, Houston, Lauderdale, Lee, Lowndes, Macon, Marshall, Mobile, Monroe, Montgomery, Perry, Russell, Shelby, St. Clair, Sumter, Talladega, Tuscaloosa, Walker, Washington, Wilcox						
Family Dermochelyidae - Leatherback Sea Turtles						
Dermochelys coriacea	Leatherback Sea Turtle	G2	SNA	LE	SP	P1
Counties of occurrence[25]: Baldwin, Mobile						
Family Emydidae - Emydid Turtles						
Deirochelys reticularia	Chicken Turtle	G5	S3			
Counties of occurrence: Baldwin, Calhoun, Covington, Crenshaw, Dallas, Escambia, Geneva, Greene, Henry, Houston, Lee, Macon, Mobile, Pickens, Russell, Shelby, St. Clair						
Graptemys barbouri	Barbour's Map Turtle	G2	S2		SP	P2
Counties of occurrence: Barbour, Coffee, Dale, Geneva, Houston, Russell						
Graptemys ernsti	Escambia Map Turtle	G2	S2	UR	SP	P2
Counties of occurrence: Coffee, Covington, Escambia, Geneva						
Graptemys geographica	Northern Map Turtle	G5	S3			
Counties of occurrence: Bibb, Blount, Colbert, Coosa, Cullman, Jefferson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan, Shelby						
Graptemys ouachitensis	Southern Map Turtle	G5	S3			
Counties of occurrence: Colbert, Jackson, Lauderdale, Lawrence, Madison, Marshall, Morgan						
Graptemys pulchra	Alabama Map Turtle	G4	S3	UR	SP	
Counties of occurrence: Autauga, Baldwin, Bibb, Cherokee, Chilton, Choctaw, Clarke, Coosa, Dallas, Elmore, Etowah, Greene, Hale, Jefferson, Lowndes, Marengo, Mobile, Monroe, Montgomery, Perry, Shelby, Sumter, Talladega, Tallapoosa, Washington, Wilcox						
Malaclemys terrapin pileata	Mississippi Diamond-backed Terrapin	G4T3Q	S2		SP	P1
Counties of occurrence: Baldwin, Mobile						
Pseudemys alabamensis	Alabama Red-bellied Cooter	G1	S1	LE	SP	P1
Counties of occurrence: Baldwin, Mobile, Monroe[3]						
Family Kinosternidae - Mud and Musk Turtles						
Sternotherus carinatus	Razor-backed Musk Turtle	G5	S1			P2
Counties of occurrence: Mobile, Washington[26]						
Sternotherus depressus	Flattened Musk Turtle[7]	G2	S2	LT	SP[27]	P2
Counties of occurrence: Blount, Cullman, Etowah[4], Fayette, Jefferson, Marshall[4], Tuscaloosa, Walker, Winston						
Family Testudinidae - Tortoises						

[4] Historic occurrence.
[7] Alabama endemic.
[25] An occasional visitor to Alabama waters, but not known to nest in the state.
[26] Possibly occurs in the county.
[27] *Sternotherus depressus* is protected under Alabama Game, Fish and Wildlife Laws, Section 9-11-269 as well as the Nongame Regulation.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Gopherus polyphemus	Gopher Tortoise	G3	S3	LT, C[28]	SP	P2
Counties of occurrence:	Baldwin, Barbour, Bullock, Butler, Choctaw, Clarke, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Mobile, Monroe, Pike, Russell, Washington					
Family Trionychidae - Softshell Turtles						
Apalone ferox	Florida Softshell	G5	S2		RT	
Counties of occurrence:	Baldwin, Covington, Escambia, Geneva, Mobile					

[28] *Gopherus polyphemus*, Listed by USFWS as Threatened west of the Mobile and Tombigbee rivers in Alabama (Choctaw, Mobile, and Washington counties), Mississippi, and Louisiana. Eastern populations are a candidate species.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Fishes

CLASS ACTINOPTERYGII – *Ray-finned Fishes*

ORDER ACIPENSERIFORMES - Sturgeons and Paddlefishes
Family Acipenseridae - Sturgeons

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Acipenser fulvescens	lake sturgeon	G3G4	S1		SP	EXCAU

Counties of occurrence: Cherokee, Limestone[4], Madison[4], Morgan[4], Shelby[4], St. Clair[4], Talladega[4]

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Acipenser oxyrinchus desotoi	Gulf sturgeon	G3T2	S1	LT	SP	P2

Counties of occurrence: Baldwin, Bibb[4], Chilton[4], Choctaw, Clarke, Coffee, Covington, Dale, Escambia, Elmore[4], Geneva, Houston, Macon[4], Marengo[4], Mobile, Monroe, Sumter[4], Washington, Wilcox

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Scaphirhynchus platorynchus	shovelnose sturgeon	G4	SX	SAT [29]	SP[30]	EX

Counties of occurrence[4]: Colbert, Lauderdale, Lawrence, Limestone, Morgan

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Scaphirhynchus suttkusi	Alabama sturgeon	G1	S1	LE	SP	P1

Counties of occurrence: Autauga, Baldwin, Clarke, Dallas, Elmore[4], Greene[4], Monroe, Montgomery[4], Perry[4], Sumter[4], Wilcox

Family Polyodontidae - Paddlefishes

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Polyodon spathula	paddlefish	G4	S3		CNGF, SP[31]	

Counties of occurrence: Autauga, Baldwin, Choctaw, Clarke, Dallas, Elmore, Greene, Hale, Lauderdale, Limestone, Lowndes, Macon, Marengo, Mobile, Monroe, Montgomery, Perry, Sumter, Tallapoosa, Tuscaloosa, Walker, Washington, Wilcox

ORDER LEPISOSTEIFORMES - Gars
Family Lepisosteidae - Gars

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Atractosteus spatula	alligator gar	G3G4	S2		CNGF	

Counties of occurrence: Baldwin, Clarke, Escambia, Mobile, Monroe

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Lepisosteus platostomus	shortnose gar	G5	SX		CNGF	EX

Counties of occurrence[4]: Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan

ORDER HIODONTIFORMES - Mooneyes
Family Hiodontidae - Mooneyes

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Hiodon alosoides	goldeye	G5	SX			EX

Counties of occurrence[4]: Lawrence, Limestone, Madison, Morgan

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Hiodon tergisus	mooneye	G5	S3S4			

Counties of occurrence: Baldwin, Bibb, Chilton, Choctaw, Clarke, Colbert, Coosa, Dallas, Elmore, Greene, Hale, Lamar, Lauderdale, Lawrence, Limestone, Lowndes, Macon, Madison, Marengo, Marshall, Mobile, Monroe, Montgomery, Morgan, Perry, Pickens, Shelby, Sumter, Talladega, Tallapoosa, Washington, Wilcox

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[4] Historic occurrence.

[29] *Scaphirhynchus platorynchus* is treated as threatened due to its similarity of appearance to the endangered pallid sturgeon (*Scaphirhynchus albus*).

[30] *Scaphirhynchus platorynchus* is not included in Nongame Species Regulation (Regulation 220-2-.92) but all species of sturgeon are protected by Regulation 220-2-.26(4) Restrictions on Possession, Sale, Importation and/or Release of Certain Animals and Fish.

[31] *Polyodon spathula* is not included in the list of protected species in the Nongame Species Regulation 220-2-.92, but is protected by Regulations 220-2-.94 Prohibition of Taking or Possessing Paddlefish (Spoonbill) and 220-2-.43 Unlawful to Willfully Waste Paddlefish.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

ORDER CLUPEIFORMES - Anchovies and Herrings
Family Clupeidae – Herrings

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Alosa alabamae	Alabama shad	G2G3	S2	SC[32]	SP	P1
Counties of occurrence:	Baldwin[4], Bibb[4], Choctaw, Clarke[4], Covington, Dale, Dallas, Elmore[4], Escambia, Geneva, Greene, Hale, Houston, Marengo[4], Mobile[4], Monroe, Perry[4], Shelby[4], Sumter, Tuscaloosa, Wilcox					

ORDER CYPRINIFORMES - Carps, Minnows, and Suckers
Family Cyprinidae - Carps and Minnows

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Campostoma pauciradii	bluefin stoneroller	G4	S3			
Counties of occurrence:	Barbour, Chambers, Houston, Lee, Randolph, Russell					
Chrosomus erythrogaster	southern redbelly dace	G5	S3			
Counties of occurrence:	Colbert, Franklin, Lauderdale, Lawrence, Limestone, Morgan					
Cyprinella caerulea	blue shiner	G2	S1	LT	SP	P1
Counties of occurrence:	Bibb[4], Calhoun, Cherokee, Coosa, Cleburne[4], DeKalb, Etowah[4], Jefferson[4], Shelby[4], Talladega[4]					
Cyprinella callitaenia	bluestripe shiner	G2G3	S1			P1
Counties of occurrence:	Barbour, Clay, Henry, Houston, Lee, Randolph, Russell					
Cyprinella gibbsi	Tallapoosa shiner	G4	S3			
Counties of occurrence:	Chambers, Clay, Cleburne, Coosa, Elmore, Lee, Macon, Randolph, Tallapoosa					
Erimonax Monachus	spotfin chub	G2	SX	LT, XN[33]	SP	EXCAU
Counties of occurrence[4]:	Colbert, Lauderdale					
Erimystax dissimilis	streamline chub	G4	S1S2			P2
Counties of occurrence:	Jackson, Marshall, Lauderdale					
Erimystax insignis	blotched chub	G4	S2			
Counties of occurrence:	Jackson, Lauderdale, Madison, Marshall					
Hemitremia flammea	flame chub	G3	S3			
Counties of occurrence:	Blount, Calhoun, Colbert, DeKalb, Lauderdale, Lawrence, Limestone, Madison, Morgan, Talladega					
Hybognathus hayi	cypress minnow	G5	S3			
Counties of occurrence:	Dallas, Perry					
Hybognathus nuchalis	Mississippi silvery minnow	G5	S4			
Counties of occurrence:	Autauga, Baldwin, Bibb, Dallas, Elmore, Fayette, Franklin, Greene, Marion, Perry, Pickens, Sumter, Tuscaloosa, Washington, Wilcox					
Hybopsis amblops	bigeye chub	G5	S3			
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marion, Marshall					
Hybopsis lineapunctata	lined chub	G3G4	S3			
Counties of occurrence:	Calhoun, Chambers, Clay, Cleburne, Coosa, Elmore, Etowah, Lee, Macon, Randolph, Talladega, Tallapoosa					

[4] Historic occurrence.
[32] Listed as a species of concern by the National Marine Fisheries Service (Federal Register 69(73):19975-19979, available at <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr64-19975.pdf>).
[33] LT – Listed Threatened range wide except where listed as Experimental Population, Non-essential; There are three locations where it is designated Experimental but only one (Shoal Creek) includes portions of Alabama. XN – Experimental Population, Nonessential: TN-AL - Nonessential experimental population that would extend from the mouth of Long Branch, Lawrence County, Tennessee (Shoal Creek mile (CM) 41.7 (66.7 kilometers (km)), downstream to the backwaters of the Wilson Reservoir at Goose Shoals, Lauderdale County, Alabama (approximately CM 14 (22 km)), and would include the lower 5 CM (8 km) of all tributaries that enter this reach.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Luxilus coccogenis	warpaint shiner	G5	S1			
Counties of occurrence: DeKalb, Lauderdale						
Luxilus zonistius	bandfin shiner	G4	S3			
Counties of occurrence: Barbour, Chambers, Clay, Henry, Houston, Lee, Randolph, Russell						
Lythrurus fumeus	ribbon shiner	G5	S2			
Counties of occurrence: Colbert, Franklin, Lauderdale						
Lythrurus lirus	mountain shiner	G4	S3			
Counties of occurrence: Lauderdale						
Lythrurus roseipinnis	cherryfin shiner	G5	S2			
Counties of occurrence: Baldwin, Clarke, Escambia, Mobile, Monroe, Washington						
Macrhybopsis hyostoma	shoal chub	G5	S2			P1
Counties of occurrence: Limestone						
Macrhybopsis sp 2	Florida chub	G3	S3			
Nocomis micropogon	river chub	G5	S2			
Counties of occurrence: DeKalb, Franklin, Jackson, Lauderdale, Madison, Winston						
Notropis albizonatus	palezone shiner	G1	S1	LE	SP	P1
Counties of occurrence: Lawrence[4], Jackson						
Notropis ariommus	popeye shiner	G3	SX	UR		EX
Counties of occurrence: Lauderdale[4]						
Notropis boops	bigeye shiner	G5	S2			
Counties of occurrence: Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall						
Notropis buchanani	ghost shiner	G5	S2			P2
Counties of occurrence: Colbert[4], Lauderdale, Lawrence[4], Limestone, Madiosn[4], Marshall, Morgan[4]						
Notropis cahabae	Cahaba shiner[7]	G2	S2	LE	SP	P1
Counties of occurrence: Bibb, Blount, Jefferson, Perry, Shelby						
Notropis chalybaeus	ironcolor shiner	G4	SH		SP	P1
Counties of occurrence[4]: Baldwin, Clarke, Covington, Escambia, Henry, Houston, Mobile, Washington						
Notropis cummingsae	dusky shiner	G5	S2			P1
Counties of occurrence: Houston, Lee, Russell						
Notropis harperi	redeye chub	G4	S3			
Counties of occurrence: Barbour, Butler, Coffee, Covington, Crenshaw, Escambia, Geneva, Henry, Houston, Pike						
Notropis hypsilepis	highscale shiner	G3	S2			P2
Counties of occurrence: Chambers, Lee, Randolph, Russell						
Notropis leuciodus	Tennessee shiner	G5	S1			
Counties of occurrence: Jackson, Lauderdale, Madison, Marshall						
Notropis maculatus	taillight shiner	G5	S3			
Counties of occurrence: Baldwin, Clarke, Dale, Dallas, Escambia, Geneva, Greene, Houston, Lamar, Mobile, Monroe, Pickens, Russell, Sumter, Tuscaloosa, Washington, Wilcox						
Notropis melanostomus	blackmouth shiner	G2	S1		SP	P2
Counties of occurrence: Baldwin						
Notropis micropteryx	highland shiner	G5	S2			
Counties of occurrence: Colbert, Franklin, Lauderdale, Lawrence, Limestone						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Notropis photogenis	silver shiner	G5	S1			
Counties of occurrence:	Lauderdale, Limestone					
Notropis sp. cf. *spectrunculus*	sawfin shiner	G4	S2			
Counties of occurrence:	Jackson, Lauderdale, Limestone					
Notropis telescopus	telescope shiner	G5	S3			
Counties of occurrence:	Colbert, Jackson, Lauderdale, Limestone, Madison					
Notropis uranoscopus	skygazer shiner	G3	S2			
Counties of occurrence:	Bibb, Dallas, Elmore, Macon, Monroe, Montgomery, Perry, Tallapoosa, Wilcox					
Notropis wickliffi	channel shiner	G5	S1			
Counties of occurrence:	Franklin, Lauderdale, Madison, Marshall					
Phenacobius mirabilis	suckermouth minnow	G5	S1			P1
Counties of occurrence:	Franklin					
Phenacobius uranops	stargazing minnow	G4	S1S2			P2
Counties of occurrence:	Lauderdale, Lawrence[4], Limestone					
Pteronotropis euryzonus	broadstripe shiner	G3	S2			P1
Counties of occurrence:	Barbour, Henry, Houston, Lee, Russell					
Pteronotropis grandipinnis	Apalachee shiner	GNR	S2			
Counties of occurrence:	Houston					
Pteronotropis merlini	orangetail shiner	GNR	S3			
Counties of occurrence:	Barbour, Bullock, Coffee, Dale, Geneva, Henry, Houston, Pike					
Pteronotropis signipinnis	flagfin shiner	G5	S3			
Counties of occurrence:	Baldwin, Barbour, Choctaw, Clarke, Coffee, Conecuh, Covington, Dale, Escambia, Mobile, Monroe, Washington					
Pteronotropis welaka	bluenose shiner	G3G4	S2			P2
Counties of occurrence:	Bibb, Clarke, Conecuh, Covington, Dallas, Geneva, Henry, Houston, Pickens, Tuscaloosa, Washington					
Family Catostomidae - Suckers						
Carpiodes carpio	river carpsucker	G5	S2		CNGF	
Counties of occurrence:	Colbert, Lauderdale, Limestone, Madison, Marshall					
Cycleptus elongatus	blue sucker	G3	S1		CNGF	
Counties of occurrence:	Colbert, Lauderdale					
Cycleptus meridionalis	southeastern blue sucker	G3G4	S3		CNGF	
Counties of occurrence:	Autauga, Baldwin, Bibb[34], Choctaw, Clarke, Dallas, Elmore, Greene, Lowndes, Macon, Marengo, Mobile, Monroe, Montgomery, Perry[33], Pickens, Shelby[33], St. Clair[4], Sumter, Talladega[4], Wilcox,					
Ictiobus cyprinellus	bigmouth buffalo	G5	S2S3		CNGF	
Counties of occurrence:	Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan					
Ictiobus niger	black buffalo	G5	S2S3		CNGF	
Counties of occurrence:	Franklin, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan					
Moxostoma anisurum	silver redhorse	G5	S2		CNGF	
Counties of occurrence:	Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan					
Moxostoma breviceps	shorthead redhorse	G5	S3		CNGF	
Counties of occurrence:	Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan					

[4] Historic occurrence.
[34] Historic occurrence; evidence suggests it has been extirpated in the Cahaba River system.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Moxostoma lachneri	greater jumprock	G4	S3		CNGF	
Counties of occurrence: Barbour, Chambers, Henry, Houston, Lee, Randolph, Russell						
Moxostoma sp. cf. *poecilurum*	Apalachicola redhorse	G3	S2		CNGF	
Counties of occurrence: Barbour, Chambers, Henry, Houston, Lee, Russell						
ORDER SILURIFORMES - Catfishes						
Family Ictaluridae - North American Catfishes						
Ameiurus brunneus	snail bullhead	G4	S3		CNGF	
Counties of occurrence: Barbour, Chambers, Houston, Lee, Randolph, Russell						
Ameiurus catus	white catfish	G5	S3		CNGF	
Counties of occurrence: Barbour, Geneva, Henry, Houston, Lee, Russell						
Ameiurus serracanthus	spotted bullhead	G3	S2		CNGF	
Counties of occurrence: Barbour, Chambers, Henry, Houston, Lee, Russell						
Noturus crypticus	chucky madtom	G1	SX	LE	CNGF	EX
Counties of occurrence[4]: Jackson						
Noturus elegans	elegant madtom	G4	SX		CNGF	
Counties of occurrence[4]: Jackson, Limestone, Madison						
Noturus eleutherus	mountain madtom	G4	S1		CNGF	P1
Counties of occurrence: Limestone						
Noturus exilis	slender madtom	G5	S3		CNGF	
Counties of occurrence: Colbert, Franklin, Lauderdale, Lawrence, Limestone, Marion						
Noturus sp. cf. *flavus*	highlands stonecat	G5T4Q	S1		CNGF	P2
Counties of occurrence: Lauderdale, Limestone						
Noturus miurus	brindled madtom	G5	S1		CNGF	P2
Counties of occurrence: Colbert, Franklin, Lauderdale[4]						
Noturus munitus	frecklebelly madtom	G3	S2	UR	SP, CNGF	P1
Counties of occurrence: Bibb, Dallas, Greene, Lamar, Marion, Monroe, Perry, Pickens, Sumter, Tuscaloosa, Wilcox						
Noturus nocturnus	freckled madtom	G5	S3		CNGF	
Counties of occurrence: Baldwin, Bibb, Choctaw, Clarke, Dallas, Franklin, Greene, Hale, Lamar, Lauderdale, Lowndes, Macon, Marengo, Marion, Mobile, Morgan, Pickens, Sumter, Tuscaloosa, Washington, Wilcox, Winston						
ORDER PERCOPSIFORMES - Trout-perch and Allies						
Family Amblyopsidae - Cavefishes						
Speoplatyrhinus poulsoni	Alabama cavefish[7]	G1	S1	LE	SP	P1
Counties of occurrence: Lauderdale						
Typhlichthys subterraneus	southern cavefish	G4	S3		SP	
Counties of occurrence: Colbert, DeKalb, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan						
ORDER CYPRINODONTIFORMES - Topminnows, Livebearers, and Allies						
Family Fundulidae - Topminnows						
Fundulus bifax	stippled studfish	G2G3	S2			
Counties of occurrence: Chambers, Coosa, Elmore, Randolph, Tallapoosa						
Fundulus blaire	western starhead topminnow	G4	S3			
Counties of occurrence: Autauga, Baldwin, Bibb, Choctaw, Clarke, Escambia, Mobile, Monroe, Perry, Wilcox						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Fundulus catenatus	northern studfish	G5	S3S4			
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Limestone					
Fundulus chrysotus	golden topminnow	G5	S3			
Counties of occurrence:	Baldwin, Mobile					
Fundulus cingulatus	banded topminnow	G4	S2			
Counties of occurrence:	Baldwin, Covington, Escambia, Mobile					
Fundulus confluentus	marsh killifish	G5	S2			
Counties of occurrence:	Baldwin					
Fundulus dispar	starhead topminnow	G4	S2			
Counties of occurrence:	Choctaw, Clarke, Greene, Mobile, Sumter, Tuscaloosa					
Fundulus escambiae	russetfin topminnow	G4	S3			
Counties of occurrence:	Baldwin, Barbour, Bullock, Covington, Dale, Escambia, Geneva, Houston					
Fundulus jenkinsi	saltmarsh topminnow	G2	S1	SC[35]		
Counties of occurrence:	Baldwin, Mobile					
Fundulus pulvereus	Bayou killifish	G5	S2			
Counties of occurrence:	Baldwin, Mobile					
Leptolucania ommata	pygmy killifish	G5	S1			
Counties of occurrence:	Baldwin					
Lucania goodei	bluefin killifish	G5	S1			P2
Counties of occurrence:	Houston					
Lucania parva	rainwater killifish	G5	S3			
Counties of occurrence:	Baldwin, Clarke, Mobile, Washington					
Family Poeciliidae - Livebearers						
Heterandria formosa	least killifish	G5	S3			
Counties of occurrence:	Baldwin, Clarke, Geneva, Houston, Mobile, Washington, Wilcox					
Poecilia latipinna	sailfin molly	G5	S2			
Counties of occurrence:	Baldwin, Mobile					
ORDER SCORPAENIFORMES - Sculpins and Allies						
Family Cottidae - Sculpins						
Cottus bairdii	mottled sculpin	G5	S2			
Counties of occurrence:	Jackson, Lauderdale, Madison					
Cottus paulus	pygmy sculpin[7]	G1	S1	LT	SP	P1
Counties of occurrence:	Calhoun					
Cottus tallapoosae	Tallapoosa sculpin	G4	S3			
Counties of occurrence:	Chambers, Clay, Cleburne, Elmore, Randolph, Tallapoosa					
ORDER PERCIFORMES - Sunfishes, Perches, and Allies						
Family Centrarchidae - Sunfishes						
Acantharchus pomotis	mud sunfish	G4G5	S1			
Counties of occurrence:	Washington					
Enneacanthus gloriosus	bluespotted sunfish	G5	S3		GF	
Counties of occurrence:	Baldwin, Clarke, Covington, Mobile, Washington					

[7] Alabama endemic.
[35] Listed as a species of concern by the National Marine Fisheries Service (Federal Register 69(73):19975-19979, available at <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr64-19975.pdf>).

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Enneacanthus obesus	banded sunfish	G5	S1		GF	
Counties of occurrence: Baldwin						
Micropterus cataractae	shoal bass	G3	S2		GF-HP	P1
Counties of occurrence: Barbour, Chambers, Lee, Randolph, Russell						
Family Percidae - Perches						
Ammocrypta bifascia	Florida sand darter	G4	S3			
Counties of occurrence: Baldwin, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Houston, Pike						
Ammocrypta vivax	scaly sand darter	G5	S1			P1
Counties of occurrence: Mobile						
Crystallaria asprella	crystal darter	G3	S3		SP	
Counties of occurrence: Baldwin, Bibb, Choctaw, Clarke, Dallas, Elmore, Escambia, Greene, Macon, Monroe, Perry, Pickens, Sumter, Tallapoosa, Wilcox						
Etheostoma bellator	warrior darter[7]	G2	S2			P2
Counties of occurrence: Blount, Cullman, Jefferson						
Etheostoma sp. cf. *bellator "A"*	Sipsey darter[7]	G2	S2			P2
Counties of occurrence: Lawrence, Winston						
Etheostoma sp. cf . *bellator "B"*	Locust Fork Darter[7]	GNR	S1			P2
Counties of occurrence: Blount, Etowah						
Etheostoma blennioides	greenside darter	G5	S3			
Counties of occurrence: Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marion, Morgan, Winston						
Etheostoma blennius	blenny darter	G4	S2			
Counties of occurrence: Lauderdale						
Etheostoma boschungi	slackwater darter	G1	S1	LT	SP	P1
Counties of occurrence: Lauderdale, Limestone, Madison						
Etheostoma brevirostrum	holiday darter	G2	S1		SP	P1
Counties of occurrence: Calhoun, Cleburne						
Etheostoma camurum	bluebreast darter	G4	S1			P1
Counties of occurrence: Limestone						
Etheostoma chermocki	vermilion darter[7]	G1	S1	LE	SP	P1
Counties of occurrence: Jefferson						
Etheostoma chuckwachatte	lipstick darter	G3	S2		SP	
Counties of occurrence: Chambers, Clay, Cleburne, Randolph, Tallapoosa						
Etheostoma cinereum	ashy darter	G2G3	SX	UR		EX
Counties of occurrence[4]: Lauderdale						
Etheostoma corona	crown darter	G3	S2			
Counties of occurrence: Lauderdale						
Etheostoma crossopterum	fringed darter	G4	S1			
Counties of occurrence: Lauderdale						
Etheostoma davisoni	Choctawhatchee darter	G4	S3			
Counties of occurrence: Barbour, Bullock, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Pike						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Etheostoma ditrema	coldwater darter	G2	S2		SP	P2
Counties of occurrence:	Calhoun, Cherokee, Chilton, Coosa, Etowah, Shelby, Talladega					
Etheostoma douglasi	Tuskaloosa darter[7]	G3	S3			
Counties of occurrence:	Blount, Cullman, Jefferson, Lawrence, Walker, Winston					
Etheostoma flabellare	fantail darter	G5	S3			
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Morgan					
Etheostoma fusiforme	swamp darter	G5	S3			
Counties of occurrence:	Autauga, Baldwin, Chambers, Clarke, Conecuh, Covington, Escambia, Geneva, Houston, Lamar, Mobile, Monroe, Pickens, Sumter, Tuscaloosa, Washington					
Etheostoma histrio	harlequin darter	G5	S3			
Counties of occurrence:	Bibb, Choctaw, Clarke, Colbert, Coosa, Covington, Dallas, Elmore, Escambia, Fayette, Franklin, Hale, Lamar, Lauderdale, Marion, Monroe, Montgomery, Pickens, Sumter, Tuscaloosa, Wilcox					
Etheostoma jessiae	blueside darter	G4	S3			
Counties of occurrence:	DeKalb, Franklin, Jackson, Lauderdale, Lawrence[4], Limestone, Madison					
Etheostoma kennicotti	stripetail darter	G4G5	S3			
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Morgan					
Etheostoma lynceum	brighteye darter	G5	S1		SP	P1
Counties of occurrence:	Mobile, Washington					
Etheostoma neopterum	lollypop darter	G3	S1		SP	P1
Counties of occurrence:	Lauderdale					
Etheostoma nuchale	watercress darter[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Jefferson					
Etheostoma phytophilum	rush darter[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Etowah, Jefferson, Winston					
Etheostoma rufilineatum	redline darter	G5	S3			
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Limestone, Marion					
Etheostoma tallapoosae	Tallapoosa darter	G4	S3			
Counties of occurrence:	Chambers, Clay, Cleburne, Coosa, Lee, Randolph, Tallapoosa					
Etheostoma tennesseense	Tennessee darter	G5	S3			
Counties of occurrence:	Colbert, DeKalb, Franklin, Jackson, Lauderdale, Limestone, Madison, Morgan					
Etheostoma trisella	trispot darter	G1	S1	PT	SP	P2
Counties of occurrence:	Cherokee, Etowah, St. Clair					
Etheostoma tuscumbia	Tuscumbia darter	G2	S2	UR	SP	P2
Counties of occurrence:	Colbert, Lauderdale, Lawrence, Limestone, Madison, Morgan					
Etheostoma wapiti	boulder darter	G1	S1	LE, XN[36]	SP	P1
Counties of occurrence:	Lauderdale[4], Limestone					
Etheostoma zonale	banded darter	G5	S2			
Counties of occurrence:	Colbert, Jackson, Lauderdale, Lawrence, Limestone					

[4] Historic occurrence.

[7] Alabama endemic.

[36] LE – Listed Endangered range wide (Alabama and Tennessee) except where listed as Experimental Population, Nonessential; XN – Experimental Population, Nonessential: AL - Nonessential experimental population that would extend from the mouth of Long Branch, Lawrence County, Tennessee (Shoal Creek mile (CM) 41.7 (66.7 kilometers (km)), downstream to the backwaters of the Wilson Reservoir at Goose Shoals, Lauderdale County, Alabama (approximately CM 14 (22 km)), and would include the lower 5 CM (8 km) of all tributaries that enter this reach.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Etheostoma zonifer	backwater darter	G4	S3			
Counties of occurrence:	Autauga, Bibb, Bullock, Choctaw, Clarke, Dallas, Elmore, Greene, Lowndes, Macon, Marengo, Monroe, Montgomery, Perry, Pickens, Russell, Sumter, Wilcox					
Etheostoma zonistium	bandfin darter	G4G5	S1			P2
Counties of occurrence:	Colbert					
Etheostoma sp. cf. *zonistium*	blueface darter[7]	G1	S1			P2
Counties of occurrence:	Franklin, Lawrence, Marion, Winston					
Perca flavescens	yellow perch	G5	S3		GF	
Counties of occurrence:	Baldwin, Barbour, Chambers, Henry, Houston, Jackson, Lauderdale, Lawrence, Lee, Limestone, Marshall, Mobile, Morgan, Russell					
Percina aurolineata	goldline darter	G2	S1	LT	SP	P2
Counties of occurrence:	Bibb, Jefferson, Shelby					
Percina austroperca	southern logperch	G3	S2			
Counties of occurrence:	Crenshaw, Escambia, Geneva, Pike					
Percina brevicauda	coal darter[7]	G2	S2	UR		P2
Counties of occurrence:	Bibb, Blount, Coosa, Jefferson, Perry, Shelby, St. Clair[4], Talladega[4], Tuscaloosa[4]					
Percina burtoni	blotchside logperch	G2G3	S1		SP	P1
Counties of occurrence:	Jackson, Lauderdale[4]					
Percina crypta	Halloween darter	G2	S1	UR	SP	P1
Counties of occurrence:	Russell					
Percina evides	gilt darter	G4	S2			P2
Counties of occurrence:	Colbert, Franklin, Lauderdale, Limestone					
Percina lenticula	freckled darter	G3	S2S3			
Counties of occurrence:	Baldwin, Bibb, Cherokee[4], Dallas, Elmore, Macon, Montgomery, Perry, Shelby, Sumter, Talladega, Tuscaloosa, Wilcox					
Percina palmaris	bronze darter	G4	S3			
Counties of occurrence:	Calhoun, Chambers, Cherokee, Chilton, Clay, Cleburne, Coosa, DeKalb, Elmore, Etowah, Lee, Randolph, Shelby, St. Clair, Talladega, Tallapoosa					
Percina phoxocephala	slenderhead darter	G5	S2		SP	P1
Counties of occurrence:	Colbert, Franklin, Marion					
Percina shumardi	river darter	G5	S3			
Counties of occurrence:	Bibb, Calhoun, Cherokee, Chilton, Choctaw, Clarke, Colbert, Coosa, Dallas, Elmore, Franklin, Greene, Hale, Jackson, Lamar, Lauderdale, Lawrence, Limestone, Macon, Marshall, Monroe, Perry, Pickens, Shelby, St. Clair, Sumter, Talladega, Tallapoosa, Tuscaloosa, Walker, Wilcox, Winston					
Percina sipsi	Bankhead darter[7]	G1	S1	UR	SP	P1
Counties of occurrence:	Lawrence, Winston					
Percina smithvanizi	muscadine darter	G3	S2			
Counties of occurrence:	Chambers, Clay, Cleburne, Coosa, Elmore, Lee, Randolph, Tallapoosa					
Percina suttkusi	Gulf logperch	G5	S3			
Counties of occurrence:	Baldwin, Choctaw, Clarke, Dallas, Greene, Hale, Monroe, Perry, Pickens, Sumter, Tuscaloosa, Washington, Wilcox					

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Percina tanasi	snail darter	G2G3	S1	LT	SP	P1
Counties of occurrence: Madison, Marshall						
Sander sp. cf. *vitreus*	southern walleye	G3	S1		GF	P1
Counties of occurrence: Clay, Coosa						
Family Elassomatidae - Pygmy Sunfishes						
Elassoma alabamae	spring pygmy sunfish[7]	G1	S1	LT	SP	P1
Counties of occurrence: Lauderdale[4], Limestone						
Elassoma evergladei	Everglades pygmy sunfish	G5	S3			
Counties of occurrence: Baldwin, Covington, Escambia, Henry, Houston, Monroe						

Class Cephalaspidomorphi – *Lampreys*

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
ORDER PETROMYZONTIFORMES - Lampreys						
Family Petromyzontidae - Lampreys						
Ichthyomyzon greeleyi	mountain brook lamprey	G4	S2			
Counties of occurrence: Lauderdale, Madison, Marshall						
Lethenteron appendix	American brook lamprey	G4	S1			
Counties of occurrence: Colbert, Franklin, Limestone						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Invertebrates

Class Bivalvia – *Bivalves (Clams & Mussels)*

ORDER UNIONOIDA - Freshwater Mussels
Family Margaritiferidae - Margaritifids (Pearl Mussels)

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cumberlandia monodonta	spectaclecase	G3	S1	LE	SP	P1
Counties of occurrence:	Colbert, Lauderdale, Limestone, Madison, Morgan					
Margaritifera marrianae	Alabama pearlshell[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Conecuh, Crenshaw, Escambia, Marion[4], Monroe, Wilcox					

Family Unionidae - Unionids (River Mussels)

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Actinonaias ligamentina	mucket	G5	S2		PSM	P1
Counties of occurrence:	Colbert[4], Jackson[4], Lauderdale, Limestone[4], Morgan[4]					
Actinonaias pectorosa	pheasantshell	G4	SX		PSM	EX
Counties of occurrence:	Colbert[4], Jackson[4], Lauderdale, Limestone[4]					
Alasmidonta marginata	elktoe	G4	S1		PSM	P1
Counties of occurrence:	Colbert[4], Franklin[4], Jackson, Lauderdale[4], Madison[4]					
Alasmidonta triangulata	southern elktoe	G1Q	S1	UR	PSM	P1
Counties of occurrence:	Russell					
Alasmidonta viridis	slippershell mussel	G4G5	S1		SP	P1
Counties of occurrence:	Jackson, Madison					
Amblema elliottii	Coosa fiveridge	G3	S3		PSM	
Counties of occurrence:	Calhoun, Cherokee, Coosa, Elmore, Etowah, Jefferson, Shelby, St. Clair, Talladega, Tuscaloosa, Walker					
Anodonta hartfieldorum	cypress floater	G4	S1		PSM	
Counties of occurrence:	Baldwin, Covington, Escambia					
Anodonta suborbiculata	flat floater	G5	S3		PSM	
Counties of occurrence:	Calhoun, Cherokee, Colbert, Covington, Dallas, Etowah, Lauderdale, Limestone, Madison, Monroe, Morgan, St. Clair, Talladega, Wilcox					
Arcidens confragosus	rock pocketbook	G4	S3		PSM	
Counties of occurrence:	Baldwin, Choctaw, Colbert, Dallas, Elmore, Greene, Hale, Lauderdale, Pickens, Sumter, Tuscaloosa, Wilcox					
Cyprogenia stegaria	fanshell	G1Q	S1	LE	SP	P1
Counties of occurrence:	Colbert, Jackson[4], Lauderdale, Limestone[4], Madison[4], Marshall[4], Morgan[4]					
Dromus dromas	dromedary pearlymussel	G1	SX	LE-XN[37]	SP	EX
Counties of occurrence:	Colbert[4], Jackson[4], Lauderdale[4], Limestone[4], Madison[4], Marshall[4], Morgan[4]					
Elliptio arca	Alabama spike	G2G3Q	S2	UR	PSM	P1
Counties of occurrence:	Blount, Calhoun, Chambers, Cherokee, Chilton, Choctaw, Clarke, Cleburne, Coosa, Dallas, Etowah, Greene, Jefferson, Lamar, Marengo, Monroe, Pickens, Randolph, Shelby, St. Clair, Talladega, Tuscaloosa, Washington, Winston					

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[4] Historic occurrence.
[7] Alabama endemic.
[37] Listed Endangered range wide by USFWS except where listed as Experimental Population, Nonessential; XN - Experimental Population, Non-Essential: AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama. This species was extirpated from Alabama until a trial transplant of 80 individuals was conducted in 2003. The pilot population survived at least 10 years but suitable hosts are unavailable.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Elliptio arctata	delicate spike	G2G3Q	S2	UR	PSM	P2
Counties of occurrence: Barbour, Blount, Calhoun, Cherokee, Cleburne, Coffee, Dale, DeKalb, Etowah, Geneva, Greene, Jefferson, Monroe, Pickens, Pike, Randolph, Shelby, St. Clair, Talladega, Tuscaloosa, Wilcox, Winston						
Elliptio chipolaensis	Chipola slabshell	G1	S1	LT	SP	P1
Counties of occurrence: Houston						
Elliptio dilatata	spike	G5	S1		PSM	P1
Counties of occurrence: Colbert, Jackson, Lauderdale, Lawrence[4], Limestone, Madison, Marshall, Morgan						
Elliptio fraterna	brother spike	G1	SX	UR	PSM	EX
Counties of occurrence: Russell[4]						
Elliptio fumata	Gulf slabshell	G4	S3		PSM	
Counties of occurrence: Barbour, Houston, Lee, Russell						
Elliptio mcmichaeli	fluted elephantear	G3	S2		PSM	
Counties of occurrence: Barbour, Coffee, Conecuh, Covington, Dale, Geneva, Henry, Houston, Pike						
Elliptio nigella	winged spike[38]	G1	SX		PSM	EX
Counties of occurrence[4]: Russell, Houston						
Elliptio purpurella	inflated spike	G2	S1	UR	PSM	P1
Counties of occurrence: Houston, Russell[4]						
Elliptoideus sloatianus	purple bankclimber	G2	S1	LT	SP	P1
Counties of occurrence: Houston[4], Lee						
Epioblasma ahlstedti	Duck River dartersnapper	G1	SH	LE[39]	SP	EX
Counties of occurrence[4]: Colbert, Lauderdale						
Epioblasma brevidens	Cumberlandian combshell	G1	S1	LE-XN[40]	SP	P1
Counties of occurrence: Colbert, Franklin[4], Jackson[4], Lauderdale[4], Morgan[4]						
Epioblasma capsaeformis	oyster mussel	G1	SX	LE-XN[38]	SP	EXCAU
Counties of occurrence[4]: Colbert, Franklin, Jackson, Lauderdale, Limestone, Madison, Marshall, Morgan						
Epioblasma florentina	yellow blossom	G1	SX	LE-XN[41]	SP	
Counties of occurrence[4]: Colbert, Lauderdale, Madison, Marshall						
Epioblasma metastriata	upland combshell	GH[42]	SX	LE	SP	
Counties of occurrence[4]: Bibb, Blount, Calhoun, Cherokee, Chilton, Coosa, Cullman, Etowah, Jefferson, Shelby, St. Clair, Talladega, Tuscaloosa, Walker						
Epioblasma obliquata	catspaw	G1	SX	LE-XN[40]	SP	EX
Counties of occurrence[4]: Lauderdale, Colbert						
Epioblasma othcaloogensis	southern acornshell	GHQ[41]	SX	LE	SP	EXCAU
Counties of occurrence[4]: Cherokee, Etowah, Shelby, St. Clair, Talladega						

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[4] Historic occurrence.

[38] *Elliptio nigella* was thought to be extinct until it was recently rediscovered in the Flint River in Georgia.

[39] *Epioblasma capsaeformis* was listed as endangered under the Endangered Species Act in 1997, including the Duck River population. The Duck River population was described as a new species, *E. ahlstedti*, by Jones and Neves in 2010.

[40] Listed Endangered range wide by USFWS except where listed as Experimental Populations, Nonessential; XN Experimental Population, Non-Essential: AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama, but no reintroductions have been made yet.

[41] Both subspecies of *Epioblasma florentina* that occurred in Alabama (*E. florentina florentina* and *E. florentina walkeri*) were listed endangered rangewide by the USFWS. In 2001, *E. florentina florentina* was included on a list of species approved for a Nonessential Experimental Population in Wilson Dam tailwaters of the Tennessee River, Colbert and Lauderdale counties, Alabama, but no reintroductions have been made yet.

[42] Possibly extinct.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Epioblasma penita	southern combshell	G1	S1	LE	SP	
Counties of occurrence:	Autauga[4], Dallas[4], Elmore[43], Greene[4], Lamar, Lowndes[4], Marengo[4], Monroe[4], Pickens[4], St. Clair[4], Sumter[4], Talladega[4], Wilcox[4]					
Epioblasma triquetra	snuffbox	G3	S1	LE	PSM	P1
Counties of occurrence:	Colbert, Franklin[4], Jackson, Lauderdale[4], Limestone[4], Madison, Marshall, Morgan[4]					
Fusconaia burkei	tapered pigtoe	G2G3	S2	LT	SP	P2
Counties of occurrence:	Barbour, Coffee, Dale, Geneva, Henry, Pike					
Fusconaia cor	shiny pigtoe	G1	S1	LE-XN[40]	SP	P1
Counties of occurrence:	Colbert[4], Jackson, Lauderdale[4], Madison, Marshall					
Fusconaia cuneolus	finerayed pigtoe	G1	S1	LE-XN[40]	SP	P1
Counties of occurrence:	Colbert[4], Jackson, Lauderdale[4], Limestone[4], Madison, Marshall, Morgan[4]					
Fusconaia escambia	narrow pigtoe	G2	S2	LT	SP	P2
Counties of occurrence:	Butler, Conecuh, Covington, Crenshaw, Escambia, Pike					
Fusconaia subrotunda	longsolid	G3	S1	UR	PSM	P1
Counties of occurrence:	Colbert, Jackson, Lauderdale, Limestone[4], Madison, Marshall, Morgan[4]					
Glebula rotundata	round pearlshell	G4G5	S2		PSM	
Counties of occurrence:	Baldwin, Choctaw, Clarke, Escambia, Mobile, Washington					
Hamiota altilis[44]	finelined pocketbook	G2G3	S2	LT	SP	P2
Counties of occurrence:	Bibb, Blount, Calhoun, Cherokee, Chilton, Clay, Cleburne, Coosa, Dallas, Elmore, Etowah, Jefferson, Lee, Macon, Monroe, Perry, Shelby, St. Clair, Talladega, Wilcox					
Hamiota australis[41]	southern sandshell	G2G3	S2	LT	SP	P2
Counties of occurrence:	Barbour, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Pike					
Hamiota perovalis[41]	orangenacre mucket	G2	S2	LT	SP	P2
Counties of occurrence:	Bibb, Blount, Choctaw, Dallas, Fayette, Greene, Jefferson, Lamar, Lawrence, Marion, Monroe, Pickens, Shelby, Sumter, Tuscaloosa, Winston					
Hamiota subangulata[41]	shinyrayed pocketbook	G2	S1	LE	SP	P1
Counties of occurrence:	Barbour[4], Houston, Lee, Russell					
Hemistena lata	cracking pearlymussel	G1	S1	LE-XN[39]	SP	P1
Counties of occurrence:	Colbert[4], Lauderdale[4], Limestone					
Lampsilis abrupta	pink mucket	G2	S1	LE	SP	P1
Counties of occurrence:	Colbert, Jackson[4], Lauderdale, Lawrence[4], Limestone, Madison, Marshall, Morgan					
Lampsilis fasciola	wavyrayed lampmussel	G5	S2		PSM	
Counties of occurrence:	Colbert, Franklin, Lauderdale, Lawrence[4], Limestone, Jackson, Madison, Marshall					
Lampsilis floridensis	Florida sandshell	G4	S2		PSM	
Counties of occurrence:	Barbour, Butler, Covington, Crenshaw, Dale, Escambia, Geneva, Houston, Lee, Pike Russell					

[4] Historic occurrence.
[40] Listed Endangered range wide by USFWS except where listed as Experimental Populations, Nonessential; XN Experimental Population, Non-Essential: AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama, but no reintroductions have been made yet.
[41] Possibly extinct.
[43] An effort to reestablish *Epioblasma penita* into the Coosa River in the tailwaters below Jordan Dam was initiated in 2005.
[44] Species in the genus *Hamiota* were previously considered to be in the genus *Lampsilis*. Species listed under the Endangered Species Act were listed under the genus *Lampsilis*. Roe and Hartfield (2005) placed these four species in the new genus *Hamiota*. The U.S. Fish and Wildlife Service still uses *Lampsilis* on their website except for *Hamiota australis*.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Lampsilis ovata	pocketbook	G5	S2		PSM	
Counties of occurrence:	Colbert, Franklin[4], Jackson, Lauderdale, Limestone, Madison, Marshall, Morgan					
Lampsilis virescens	Alabama lampmussel	G1	S1	LE-XN[39]	SP	P1
Counties of occurrence:	Colbert[4], Franklin, Jackson, Lauderdale[4], Madison[4]					
Lasmigona alabamensis	Alabama heelsplitter	G3	S3		PSM	
Counties of occurrence:	Autauga, Bibb, Blount, Calhoun, Cherokee, Chilton, Coosa, Dallas, Elmore, Etowah, Greene, Jefferson, Lamar, Lowndes, Macon, Montgomery, Perry, Pickens, Shelby, St. Clair, Sumter, Talladega					
Lasmigona complanata	white heelsplitter	G5	S2		PSM	
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan					
Lasmigona costata	flutedshell	G5	S2		PSM	
Counties of occurrence:	Colbert, Franklin[4], Jackson, Lauderdale[4], Limestone, Madison, Marshall					
Lasmigona etowaensis	Etowah heelsplitter	G3	S2		PSM	P2
Counties of occurrence:	Calhoun, Cherokee, Chilton, Cleburne, Coosa, Etowah, Jefferson, Shelby, St. Clair, Talladega					
Lasmigona holstonia	Tennessee heelsplitter	G3	S1	UR	PSM	P2
Counties of occurrence:	Jackson					
Lasmigona subviridis	green floater	G3	SX	UR	PSM	EX
Counties of occurrence:	Russel[4]					
Lemiox rimosus	birdwing pearlymussel	G1	SX	LE-XN[45]	SP	EX
Counties of occurrence:	Colbert[4], Jackson[4], Lauderdale[4], Madison[4], Morgan[4]					
Leptodea leptodon	scaleshell	G1G2	SX	LE	SP	EX
Counties of occurrence[4]:	Colbert, Lauderdale					
Ligumia recta	black sandshell	G4G5	S2		PSM	P2
Counties of occurrence:	Bibb[4], Calhoun[4], Cherokee[4], Colbert, Dallas[4], Elmore[4], Etowah[4], Greene, Hale[4], Jackson, Jefferson[4], Lauderdale, Lawrence[4], Limestone, Lowndes[4], Macon[4], Madison, Marshall, Monroe[4], Montgomery[4], Morgan, Perry[4], Pickens, Shelby[4], St. Clair[4], Sumter[4], Talladega[4], Tuscaloosa[4], Wilcox[4]					
Ligumia subrostrata	Pondmussel	G5	S2		PSM	
Counties of occurrence:	Dallas[4], Hale, Mobile, Pickens					
Medionidus acutissimus	Alabama moccasinshell	G2	S2	LT	SP	P1
Counties of occurrence:	Greene, Lamar, Lawrence, Pickens, Shelby, Tuscaloosa, Winston					
Medionidus conradicus	Cumberland moccasinshell	G3G4	S1	UR	SP	P1
Counties of occurrence:	Colbert, Jackson, Lauderdale[4], Madison[4], Marshall[4]					
Medionidus parvulus	Coosa moccasinshell	G1Q	SX	LE	SP	EXCAU
Counties of occurrence[4]:	Bibb, Blount, Calhoun, Cherokee, Etowah, Jefferson, Shelby, St. Clair, Talladega, Winston					
Medionidus penicillatus	Gulf moccasinshell	G2	S1	LE	SP	P1

[4] Historic occurrence.
[39] Listed Endangered range wide by USFWS except where listed as Experimental Populations, Nonessential; XN Experimental Population, Non-Essential; AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama, but no reintroductions have been made yet.
[45] Listed Endangered range wide (as *Conradilla caelata*) by USFWS except where listed as Experimental Population, Nonessential; XN - Experimental Population, Non-Essential; AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama. This species was extirpated from Alabama until a trial transplant of 80 individuals in Wilson Dam tailwaters was conducted in 2003. The pilot population survived at least 10 years but suitable hosts are limited.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Counties of occurrence: Houston, Russell[4]						
Obovaria arkansasensis	southern hickorynut	G2	S2		PSM	P1
Counties of occurrence: Bibb[4], Fayette, Greene, Lamar, Marengo[4], Marion, Monroe[4], Pickens, Shelby[4], Sumter, Tuscaloosa						
Obovaria choctawensis	Choctaw bean	G2	S2	LE	SP	P2
Counties of occurrence: Barbour, Bullock, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Pike						
Obovaria olivaria	hickorynut	G4	SX		PSM	EX
Counties of occurrence[4]: Colbert, Lauderdale, Limestone, Madison, Marshall, Morgan						
Obovaria retusa	ring pink	G1	SX	LE	SP	EX
Counties of occurrence[4]: Colbert, Jackson, Lauderdale, Limestone, Madison, Marshall, Morgan						
Obovaria subrotunda	round hickorynut	G4	S2	UR	PSM	P1
Counties of occurrence: Colbert, Franklin[4], Jackson, Lauderdale[4], Limestone[4], Madison, Marshall, Morgan[4]						
Obovaria unicolor	Alabama hickorynut	G3	S2	UR	PSM	P2
Counties of occurrence: Autauga[4], Bibb[4], Choctaw, Clarke[4], Dallas[4], Elmore[4], Etowah[4], Greene, Jefferson[4], Lamar, Lowndes[4], Marion, Montgomery[4], Perry, Pickens, Shelby[4], St. Clair[4], Sumter, Talladega[4], Tuscaloosa, Walker[4], Washington[4], Wilcox[4]						
Pegias fabula	littlewing pearlymussel	G1	SX	LE	SP	EX
Counties of occurrence[4]: Lauderdale, Limestone						
Plethobasus cicatricosus	white wartyback	G1	S1	LE	SP	P1
Counties of occurrence: Colbert, Jackson[4], Lauderdale, Madison[4], Marshall[4], Morgan[4]						
Plethobasus cooperianus	orangefoot pimpleback	G1	SX	LE	SP	EX
Counties of occurrence[4]: Colbert, Jackson, Lauderdale, Limestone, Madison, Marshall, Morgan						
Plethobasus cyphyus	sheepnose	G3	S1	LE	SP	P1
Counties of occurrence: Colbert, Jackson, Lauderdale, Limestone[4], Madison, Marshall, Morgan						
Pleurobema athearni	Canoe Creek pigtoe[7]	G1	S1	UR	PS	P1
Counties of occurrence: St. Clair						
Pleurobema beadleianum	Mississippi pigtoe	G3	S1		PSM	P1
Counties of occurrence: Washington						
Pleurobema clava	clubshell	G1G2	SX	LE-XN[39]	SP	EX
Counties of occurrence: Colbert, Jackson, Lauderdale, Madison, Morgan						
Pleurobema cordatum	Ohio pigtoe	G4	S2		PSM	P1
Counties of occurrence: Colbert, Jackson[4], Lauderdale, Limestone, Madison, Marshall, Morgan						
Pleurobema curtum	black clubshell	GH[41]	SX	LE	SP	
Counties of occurrence: Pickens[4]						
Pleurobema decisum	southern clubshell	G2	S2	LE	SP	P2
Counties of occurrence: Bibb, Calhoun, Cherokee, Chilton, Choctaw, Clarke, Cleburne, Coosa, Dallas, Elmore, Etowah, Greene, Jefferson, Lamar, Lee, Macon, Marion, Monroe, Montgomery, Perry, Pickens, Shelby, St. Clair, Sumter, Talladega, Tuscaloosa, Walker, Washington, Wilcox, Winston						

[4] Historic occurrence.
[7] Alabama endemic.
[39] Listed Endangered range wide by USFWS except where listed as Experimental Populations, Nonessential; XN Experimental Population, Non-Essential; AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama, but no reintroductions have been made yet.
[41] Possibly extinct.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Pleurobema georgianum	southern pigtoe	G1	S1	LE	SP	P1
Counties of occurrence: Calhoun, Cherokee, Clay, Cleburne, Coosa, Etowah, Shelby, St. Clair, Talladega						
Pleurobema hanleyianum	Georgia pigtoe	G1	SX	C	SP	P1
Counties of occurrence[4]: Cherokee, Clay, Etowah, St. Clair						
Pleurobema hartmanianum	Cherokee pigtoe	G1	SX		PSM	EX
Counties of occurrence[4]: Cherokee, Elmore, Etowah, Shelby, Talladega						
Pleurobema oviforme	Tennessee clubshell	G2G3	S1	UR	PSM	P1
Counties of occurrence: Colbert[4], Franklin[4], Jackson, Lauderdale[4], Limestone[4], Madison, Marshall						
Pleurobema perovatum	ovate clubshell	G1	S1	LE	SP	P1
Counties of occurrence: Autauga[4], Bibb, Blount, Cherokee, Choctaw[4], Clarke[4], Cullman, Dallas[4], Elmore[4], Etowah, Fayette[4], Greene, Jefferson[4], Lamar, Lee, Macon, Marion[4], Monroe[4], Perry, Pickens, Shelby[4], St. Clair, Sumter, Tuscaloosa, Walker, Wilcox[4], Winston						
Pleurobema plenum	rough pigtoe	G1	S1	LE	SP	P1
Counties of occurrence: Colbert, Jackson[4], Lauderdale, Lawrence[4], Limestone[4], Madison, Marshall, Morgan						
Pleurobema pyriforme	oval pigtoe	G2	S1	LE	SP	P1
Counties of occurrence: Houston, Lee[4], Russell[4]						
Pleurobema rubellum	warrior pigtoe[7]	G1G2	S1	LE[46]	SP	P1
Counties of occurrence: Cullman[4], Fayette, Jefferson[4]. Lawrence, Shelby[4], Tuscaloosa, Winston						
Pleurobema rubrum	pyramid pigtoe	G2G3	S1	UR	SP	P1
Counties of occurrence: Colbert, Jackson[4], Lauderdale, Limestone[4], Madison, Marshall, Morgan						
Pleurobema sintoxia	round pigtoe	G4G5	S1		SP	P1
Counties of occurrence: Colbert, Jackson[4], Lauderdale, Limestone, Madison, Marshall, Morgan						
Pleurobema stabile	Coosa pigtoe	G1	SX		PSM	P1
Pleurobema strodeanum	fuzzy pigtoe	G2	S2	LT	SP	P2
Counties of occurrence: Barbour, Bullock, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Pike						
Pleurobema taitianum	heavy pigtoe	G1	S1	LE	SP	P1
Counties of occurrence: Choctaw, Clarke[4], Dallas, Elmore[4], Greene[4], Jefferson[4], Marengo, Monroe[4], Montgomery[4], Pickens[4], Sumter[4], Walker[4], Washington[4],Wilcox[4]						
Pleuronaia barnesiana	Tennessee pigtoe	G2G3	S1	UR	PSM	P2
Counties of occurrence: Colbert[4], Franklin[4], Jackson, Lauderdale[4], Limestone, Madison, Marshall						
Pleuronaia dolabelloides	slabside pearlymussel	G2	S1	LE	SP	P1
Counties of occurrence: Colbert, Franklin[4], Jackson, Lauderdale[4], Limestone[4], Madison, Marshall, Morgan[4]						
Potamilus inflatus	inflated Heelsplitter	G1G2Q	S1S2	LT	SP	P2
Counties of occurrence: Baldwin, Choctaw, Clarke, Dallas[4], Greene, Hale, Marengo, Monroe[4], Perry[4], Pickens, Sumter, Tuscaloosa, Washington						
Potamilus ohiensis	pink papershell	G5	S3		PSM	
Counties of occurrence: Colbert, Jackson, Lauderdale, Limestone, Morgan						
Ptychobranchus fasciolaris	kidneyshell	G4G5	S2		PSM	P1
Counties of occurrence: Colbert, Franklin, Jackson, Lauderdale, Limestone, Madison, Marshall, Morgan						

[4] Historic occurrence.
[7] Alabama endemic.
[46] The USFWS lists *Pleurobema furvum* as endangered under the Endangered Species Act and considers *P. rubellum* as extinct. ALNHP considers *P. furvum* a synonym of *P. rubellum* following the taxonomy used by James D. Williams, Arthur E. Bogan, and Jeffrey T. Garner in *Freshwater Mussels of Alabama & the Mobile Basin in Georgia, Mississippi, and Tennessee* (2008). Williams et al. (2008) state "A formal reconciliation of the list should replace *P. furvum* with *P. rubellum*."

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Ptychobranchus foremanianus	rayed kidneyshell	G1	S1	LE[47]	SP	
Counties of occurrence: Bibb, Calhoun, Cherokee, Chilton[4], Cleburne, Coosa[4], Elmore[4], Etowah, Jefferson, Monroe[4], Shelby, St. Clair, Talladega						
Ptychobranchus greenii	triangular kidneyshell[7]	G1	S1	LE	SP	P1
Counties of occurrence: Blount, Cullman, Jefferson, Lawrence, Pickens[4], Tuscaloosa, Walker, Winston						
Ptychobranchus jonesi	southern kidneyshell	G1	S1	LE	SP	P1
Counties of occurrence: Barbour, Coffee, Conecuh[4], Covington[4], Dale, Escambia, Geneva, Henry[4], Pike						
Ptychobranchus subtentus	fluted kidneyshell	G2G3	SX	LE	SP	EX
Counties of occurrence[4]: Colbert, Jackson, Lauderdale, Limestone, Madison						
Pyganodon cataract	eastern floater	G5	S1		PSM	
Counties of occurrence: Barbour[4], Russell, Tallapoosa						
Quadrula cylindrica cylindrica	rabbitsfoot	G3G4T3	S1	LT	SP	P1
Counties of occurrence: Colbert, Franklin[4], Jackson, Lauderdale[4], Limestone[4], Madison, Marshall, Morgan[4]						
Quadrula infucata	sculptured pigtoe	G3	S1		PSM	P2
Counties of occurrence: Barbour[4], Chambers[4], Henry[4], Houston, Lee, Russell						
Quadrula intermedia	Cumberland monkeyface	G1	SX	LE-XN[39]	SP	EX
Counties of occurrence[4]: Colbert, Lauderdale, Limestone, Madison, Marshall						
Quadrula kieneriana	Coosa orb	G3Q	SX		PSM	EX
Counties of occurrence[4]: Chilton, Coosa, Elmore, Shelby, St. Clair, Talladega						
Quadrula metanevra	monkeyface	G4	S3		PSM	P2
Counties of occurrence: Autauga, Bibb, Calhoun[4], Cherokee[4], Clarke, Colbert, Dallas, Greene, Jackson, Lauderdale, Lawrence[4], Limestone, Lowndes, Madison, Marshall, Monroe, Montgomery, Morgan, Perry, Pickens, Shelby[4], St. Clair[4], Sumter, Talladega[4], Washington, Wilcox						
Quadrula nobilis	Gulf Mapleleaf	G4	S3		PSM	
Counties of occurrence: Autauga, Clarke, Coosa, Dallas, Elmore, Greene, Jefferson, Lowndes, Macon, Monroe, Pickens, Sumter, Talladega, Tuscaloosa, Washington, Wilcox						
Quadrula sparsa	Appalachian monkeyface	G1	SX	LE	SP	EX
Quadrula stapes	stirrupshell	GH[41]	SX	LE	SP	
Counties of occurrence[4]: Dallas, Green, Lowndes, Montgomery, Pickens, Sumter						
Quadrula succissa	purple pigtoe	G3G4	S3		PSM	
Counties of occurrence: Barbour, Bullock, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Houston, Pike						
Reginaia rotulata	round ebonyshell	G1	S1	LE	SP	P1
Counties of occurrence: Conecuh, Covington, Escambia						
Strophitus connasaugaensis	Alabama creekmussel	G3	S3		PSM	P2
Counties of occurrence: Bibb, Calhoun, Cherokee, Chilton, Clay, Cleburne, Coosa, Dallas, Elmore, Etowah, Lee, Lowndes, Macon, Monroe, Montgomery, Perry, Shelby, St. Clair, Talladega, Wilcox						
	rayed creekshell	G3	S3		PSM	P2

[4] Historic occurrence.
[7] Alabama endemic.
[39] Listed Endangered range wide by USFWS except where listed as Experimental Populations, Nonessential; XN Experimental Population, Non-Essential; AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama, but no reintroductions have been made yet.
[41] Possibly extinct.
[47] *Ptychobranchus greenii* was listed as endangered under the federal Endangered Species Act in 1993. Williams et al. (2008) restricted its distribution to the Black Warrior and Tombigbee River systems, with the form in the remainder of the Mobile Basin recognized as *Ptychobranchus foremanianus*. The listing of *P. greenii* includes what is now considered to be *P. foremanianus*.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Strophitus radiatus						
Counties of occurrence:	Barbour, Bullock, Butler, Dallas, Escambia, Fayette, Hale, Henry, Houston, Lamar, Macon, Marion, Monroe, Perry, Pickens, Russell, Sumter, Tuscaloosa, Wilcox					
Strophitus williamsi	flatwoods creekshell	GNR	S2		PSM	P2
Counties of occurrence:	Barbour, Bullock, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Pike					
Strophitus subvexus	southern creekmussel	G3	S3		PSM	
Counties of occurrence:	Blount, Choctaw, , Fayette, Greene, Jefferson, Lamar, Lawrence, Marion, Pickens, Sumter, Tuscaloosa, Winston					
Strophitus undulatus	creeper	G5	S1		PSM	P1
Counties of occurrence:	Colbert, Franklin[4], Lauderdale[4], Madison[4]					
Toxolasma corvunculus	southern purple lilliput	G1	S1		PSM	P1
Counties of occurrence:	Bibb, Blount, Calhoun, Cherokee, Clay, Cullman, Dallas[4], Etowah, Greene[4], Lee[4], Lowndes[4], Macon[4], Montgomery[4], Shelby, St. Clair, Talladega, Tuscaloosa					
Toxolasma cylindrellus	pale lilliput	G1	S1	LE	SP	P1
Counties of occurrence:	Jackson, Lauderdale[4], Limestone[4], Madison[4]					
Toxolasma lividum	purple lilliput	G3Q	S2	UR	PSM	
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall					
Toxolasma parvum	lilliput	G5	S3		PSM	
Counties of occurrence:	Calhoun, Cherokee, Clay, Colbert, Dallas, Elmore, Etowah, Fayette, Greene, Hale, Jackson, Jefferson, Lamar, Lauderdale, Lawrence, Lee, Limestone, Lowndes, Macon, Madison, Marengo, Marshall, Monroe, Morgan, Pickens, Shelby, St. Clair, Talladega, Tallapoosa, Walker, Washington, Wilcox					
Toxolasma paulus	iridescent lilliput	G4G5Q	S2		PSM	
Counties of occurrence:	Houston, Lee, Russell					
Toxoloasma sp. 1	Gulf lilliput	G2	S2		PSM	
Counties of occurrence:	Barbour, Bullock, Butler, Coffee, Conecuh, Covington, Crenshaw, Dale, Escambia, Geneva, Henry, Pike					
Truncilla donaciformis	fawnsfoot	G5	S3		PSM	
Counties of occurrence:	Autauga, Bibb, Blount, Calhoun, Cherokee, Colbert, Dallas, Elmore, Etowah, Franklin[4], Greene, Jackson, Jefferson, Lauderdale, Limestone, Lowndes, Madison, Marshall, Monroe, Montgomery, Morgan, Perry, Pickens, Shelby, St. Clair, Sumter, Talladega, Wilcox					
Truncilla truncata	deertoe	G5	S1		PSM	
Counties of occurrence:	Colbert, Franklin[4], Jackson, Lauderdale, Lawrence[4], Limestone[4], Madison, Marshall, Morgan[4]					
Uniomerus columbensis	Apalachicola pondhorn	G3	S2		PSM	
Counties of occurrence:	Henry, Houston, Lee, Russell					
Uniomerus declivis	tapered pondhorn	G5Q	S3		PSM	
Counties of occurrence:	Dallas, Lowndes, Wilcox					
Utterbackia peggyae	Florida floater	G3	S1		PSM	P1
Counties of occurrence:	Dale, Geneva, Henry, Houston					
Villosa iris	rainbow	G5Q	S3		PSM	
Counties of occurrence:	Colbert, Franklin, Jackson, Lauderdale, Lawrence[4], Limestone, Madison, Marshall, Morgan					

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Villosa nebulosa	Alabama rainbow	G3	S3	UR	PSM	P2
Counties of occurrence: Bibb, Calhoun, Cherokee, Chilton, Clay, Etowah, Jefferson, Lawrence, Shelby, St. Clair, Talladega, Walker, Winston						
Villosa taeniata	painted creekshell	G4	S2		PSM	P2
Counties of occurrence: Colbert[4], Jackson, Lauderdale, Limestone[4], Madison, Marshall, Morgan[4]						
Villosa trabalis	Cumberland bean	G1	SX	LE-XN[39]	SP	EXCAU
Counties of occurrence[4]: Colbert, Jackson, Lauderdale, Morgan						
Villosa umbrans	Coosa creekshell	G2	S2	UR	PSM	P2
Counties of occurrence: Calhoun, Cherokee[4], Chilton[4], Clay, Coosa, Etowah[4], Shelby, St. Clair, Talladega						
Villosa vanuxemensis	mountain creekshell	G4	S3		PSM	
Counties of occurrence: Colbert, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marshall, Morgan						
Villosa villosa	downy rainbow	G3	S1		PSM	P1
Counties of occurrence: Conecuh, Houston, Lee						

[4] Historic occurrence.
[39] Listed Endangered range wide by USFWS except where listed as Experimental Populations, Nonessential; XN Experimental Population, Non-Essential: AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama, but no reintroductions have been made yet.

Class Gastropoda – *Gastropods (Slugs and Snails)*

FRESHWATER SNAILS

ORDER ARCHITAENIOGLOSSA
Family Viviparidae - Live-bearing Snails

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Campeloma decampi	slender campeloma[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Limestone, Madison[4]					
Lioplax cyclostomaformis	cylindrical lioplax	G1	S1	LE	SP	P1
Counties of occurrence:	Bibb, Jefferson, Shelby					
Tulotoma magnifica	tulotoma snail[7]	G2	S2	LT	SP	P2
Counties of occurrence:	Autauga, Calhoun, Coosa, Dallas, Elmore, Monroe, Shelby, St. Clair, Talladega, Wilcox					

ORDER BASOMMATOPHORA
Family Ancylidae - Freshwater Limpets

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Ferrissia mcneili	hood ancylid[7]	G2G3	S2			
Counties of occurrence:	Mobile					
Rhodacmea cahawbensis	Cahaba ancylid	G1	S1	UR		P1
Counties of occurrence:	Bibb, Shelby					
Rhodacmea filosa	wicker ancylid[7]	G1	S1			P1
Counties of occurrence:	Talladega					
Rhodacmea hinkleyi	knobby ancylid	G2G3	SX			EX

ORDER HETEROSTROPHA
Family Valvatidae - Valvatas

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Valvata bicarinata	two-ridge valvata	G5	S3			

ORDER NEOTAENIOGLOSSA
Family Hydrobiidae - Pebblesnails

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Antrorbis breweri	Manitou snail[7]	G1	S1	UR		P1
Counties of occurrence:	DeKalb					
Clappia cahabensis	Cahaba pebblesnail[7]	G1	S1			P2
Counties of occurrence:	Bibb, Shelby					
Fontigens nickliniana	watercress snail	G5	S1			P1
Counties of occurrence:	Blount, Calhoun, Tuscaloosa					
Lepyrium showalteri	flat pebblesnail[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Bibb. Dallas[4], Shelby, Talladega[4]					
Marstonia angulobasis	angled marstonia[7]	G1	S1			P2
Marstonia hershleri	Coosa pyrg[7]	G1	S1			P2
Marstonia pachyta	armored marstonia[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Limestone					
Marstonia scalariformis	moss pyrg	G1	S1		SP	P2
Counties of occurrence:	Madison					
Pseudotryonia grahamae	Salt Spring hydrobe[7]	G1	S1			P1
Counties of occurrence:	Clarke					

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[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Rhapinema dacryon	teardrop snail	G5	S2			
Somatogyrus aureus	golden pebblesnail	G1	SH			
Somatogyrus biangulatus	angular pebblesnail[7]	GHQ	SH			
Counties of occurrence[4]:	Colbert, Lauderdale					
Somatogyrus constrictus	knotty pebblesnail[7]	GHQ	SH			
Somatogyrus coosaensis	Coosa pebblesnail[7]	GH	SH			
Somatogyrus crassus	stocky pebblesnail[7]	GH	SH			
Somatogyrus currierianus	Tennessee pebblesnail[7]	GH	SH			
Counties of occurrence:	Madison[4]					
Somatogyrus decipiens	hidden pebblesnail[7]	GH	SH			
Somatogyrus excavatus	ovate pebblesnail[7]	GH	SH			
Counties of occurrence:	Lauderdale[4]					
Somatogyrus georgianus	Cherokee pebblesnail[7]	GH	SH			
Somatogyrus humerosus	atlas pebblesnail[7]	GH	SH			
Counties of occurrence[4]:	Colbert, Lauderdale					
Somatogyrus nanus	dwarf pebblesnail[7]	GH	SH			
Somatogyrus obtusus	moon pebblesnail[7]	GH	SH			
Somatogyrus pygmaeus	pygmy pebblesnail[7]	GH	SH			
Somatogyrus quadratus	quadrate pebblesnail[7]	GH	SH			
Counties of occurrence[4]:	Lauderdale					
Somatogyrus sargenti	mud pebblesnail[7]	GH	SH			
Somatogyrus strengi	rolling pebblesnail[7]	G1	S1			
Counties of occurrence:	Jackson, Lauderdale					
Somatogyrus substriatus	Choctaw pebblesnail	GH	SH			
Somatogyrus tennesseensis	opaque pebblesnail	G1	S1			
Counties of occurrence:	Lauderdale					
Somatogyrus walkerianus	Gulf Coast pebblesnail	G2G3	S2			
Counties of occurrence:	Escambia					
Stiobia nana	sculpin snail[7]	G1	S1			P1
Counties of occurrence:	Calhoun					
Family Pleuroceridae - Horn, River, and Rock Snails						
Athearnia anthonyi	Anthony riversnail	G1	S1	LE-XN[48]	SP	P1
Counties of occurrence:	Colbert, Jackson, Lauderdale, Limestone					

[4] Historic occurrence.
[7] Alabama endemic.
[48] Listed Endangered range wide by USFWS except where listed as Experimental Population, Nonessential; XN – Experimental Population, Nonessential: AL - free-flowing reach of the Tennessee River below the Wilson Dam, Colbert and Lauderdale counties, Alabama.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Elimia acuta	acute elimia	G2	S1	UR		
Elimia alabamensis	mud elimia[7]	G1	S1			
Counties of occurrence:	Chilton					
Elimia albanyensis	black-crest elimia	G3Q	SNR			
Elimia ampla	ample elimia[7]	G1	S1			P2
Counties of occurrence:	Bibb, Shelby					
Elimia annae	rainbow elimia[7]	G3	S3			
Counties of occurrence:	Butler, Conecuh, Covington, Crenshaw, Pike					
Elimia annettae	lilyshoals elimia[7]	G1	S1	UR		P2
Counties of occurrence:	Bibb, Shelby					
Elimia bellacrenata	princess elimia[7]	G1Q	S1	UR		P1
Counties of occurrence:	Bibb[4], Shelby, Tuscaloosa[4]					
Elimia bellula	walnut elimia[7]	G1Q	S1	UR		
Counties of occurrence:	Shelby, Talladega					
Elimia boykiniana	flaxen elimia	G2Q	S2			P2
Counties of occurrence:	Henry, Houston					
Elimia broccata	brooch elimia[7]	G1	S1			P1
Counties of occurrence:	Calhoun					
Elimia bullula	a freshwater snail[7]	G1G2Q	S1S2			
Counties of occurrence:	Calhoun, Cleburne, Coosa, Shelby, Talladega					
Elimia caelatura	rippled elimia	G3Q	S3			
Elimia cahawbensis	Cahaba elimia[7]	G4	S4			
Counties of occurrence:	Bibb, Jefferson, Shelby, St. Clair					
Elimia chiltonensis	prune elimia[7]	G2	S2	UR		
Counties of occurrence:	Chilton, Coosa, Shelby, St. Clair					
Elimia clara	riffle elimia[7]	G3	S3			
Counties of occurrence:	Bibb, Jefferson, Shelby, St. Clair					
Elimia clenchi	slackwater elimia	G3Q	S3			
Elimia cochliaris	cockle elimia[7]	G1	S1	UR		P1
Counties of occurrence:	Bibb, Jefferson[3], Tuscaloosa[3]					
Elimia comma	hispid elimia[7]	G2	S2			
Counties of occurrence:	Blount, Jefferson					
Elimia crenatella	lacey elimia[7]	G1	S1	LT	SP	P1
Counties of occurrence:	Calhoun[4], Chilton[4], Coosa[4], DeKalb[4], Etowah[4], Shelby[4], St. Clair[4], Talladega					
Elimia curvicostata	graphite elimia	G5Q	S3			
Counties of occurrence:	Covington					
Elimia cylindracea	cylinder elimia	G2	S2	UR		
Elimia dickinsoni	stately elimia	G5	S3			P2

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Elimia exusta	fire elimia[7]	G2	S2			P2
Counties of occurrence:	Conecuh, Escambia					
Elimia fascinans	banded elimia[7]	G3	S3			
Elimia glarea	gravel elimia[7]	G3	S3			
Counties of occurrence:	Barbour, Coffee, Dale, Henry, Houston, Pike					
Elimia godwini	rusty elimia[7]	G2G3	S2S3			
Counties of occurrence:	Calhoun, St. Clair, Talladega					
Elimia haysiana	silt elimia[7]	G3	S3		SP	
Elimia hydei	gladiator elimia[7]	G2	S2			
Elimia interveniens	slowwater elimia	G2	S2			
Counties of occurrence:	Colbert, Lauderdale					
Elimia lachryma	nodulose Coosa River snail[7]	G1	S1	UR		P1
Counties of occurrence:	Shelby, Talladega					
Elimia laqueata	panel elimia	G5	S2			
Counties of occurrence:	Limestone					
Elimia lecontiana	rippled elimia	G2G3	SNR			
Elimia melanoides	black mudalia[7]	G2	S2			P2
Counties of occurrence:	Blount, Marshall					
Elimia mihalcikae	latticed elimia[7]	G1	S1			
Elimia nassula	round-rib elimia[7]	G1Q	S1	UR		P1
Counties of occurrence:	Colbert, Lawrence, Madison, Morgan					
Elimia olivula	caper elimia[7]	G1Q	S1			P1
Counties of occurrence:	Montgomery					
Elimia paupercula	sooty elimia[7]	G3Q	S3			
Elimia perstriata	engraved elimia[7]	G1	S1	UR		P1
Counties of occurrence:	Lawrence, Madison					
Elimia pybasi	spring elimia[7]	G2	S2			
Elimia showalteri	compact elimia[7]	G1Q	S1			
Counties of occurrence:	Bibb, Shelby					
Elimia taitiana	dented elimia[7]	G3Q	S3			
Counties of occurrence:	Marengo, Monroe, Sumter, Wilcox					
Elimia teretria	auger elimia[7]	G1	S1			P1
Elimia ucheensis	creek elimia[7]	G3	S3			
Counties of occurrence:	Russell					
Elimia vanuxemiana	cobble elimia[7]	G1	S1			P1
Elimia varians	puzzle elimia[7]	G1G2Q	S1S2			P2
Counties of occurrence:	Bibb					

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Elimia variata	squat elimia[7]	G1Q	S1			P2
Counties of occurrence:	Bibb, Jefferson[4], Shelby					
Io fluvialis	spiny riversnail	G2	SX			EX
Leptoxis ampla	round rocksnail[7]	G2	S2	LT	SP	P2
Counties of occurrence:	Bibb, Calhoun[4], Chilton[4], Shelby, St. Clair[4]					
Leptoxis compacta	oblong rocksnail[7]	G1	S1	UR		P1
Counties of occurrence:	Bibb[4], Shelby					
Leptoxis formani	interrupted rocksnail	G1	SX	C	SP	EXCAU
Counties of occurrence:	Cherokee[4], Elmore[49]					
Leptoxis picta	spotted rocksnail[7]	G1	S1	UR	SP	P2
Counties of occurrence:	Autauga, Clarke, Dallas, Monroe, Wilcox					
Leptoxis plicata	plicate rocksnail[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Blount, Greene[4], Jefferson, Tuscaloosa[4]					
Leptoxis taeniata	painted rocksnail[7]	G1	S1	LT	SP	P2
Counties of occurrence:	Calhoun, Chilton, Monroe[4], Shelby, St. Clair[4], Talladega					
Leptoxis virgata	smooth mudalia	G2	SX			EX
Counties of occurrence:	Jackson[4]					
Lithasia armigera	armored rocksnail	G3G4	S1			P2
Counties of occurrence:	Colbert, Lauderdale					
Lithasia curta	knobby rocksnail	G1	SX	UR		EX
Counties of occurrence[4]:	Colbert, Lauderdale					
Lithasia geniculata	ornate rocksnail	G3Q	S1			
Counties of occurrence:	Colbert, Lauderdale					
Lithasia lima	warty rocksnail	G2Q	S1			P2
Counties of occurrence:	Colbert, Lauderdale , Limestone					
Lithasia salebrosa	muddy rocksnail	G2G3Q	S1			P2
Counties of occurrence:	Colbert, Lauderdale, Limestone[4]					
Lithasia verrucosa	varicose rocksnail	G4Q	S3			
Counties of occurrence:	Colbert, Jackson, Lauderdale, Madison, Marshall					
Pleurocera alveare	rugged hornsnail	G3	S1			P2
Counties of occurrence:	Colbert, Lauderdale, Lawrence, Limestone[4]					
Pleurocera annulifera	ringed hornsnail[7]	G3G4	S3S4			
Pleurocera brumbyi	spiral hornsnail[7]	G2G3	S2S3			
Pleurocera corpulenta	corpulent hornsnail	G1	S1	UR		P1
Counties of occurrence:	Jackson					
Pleurocera curta	shortspire hornsnail	G2	S1S2			
Pleurocera foremani	rough hornsnail[7]	G1	S1	C	SP	P1
Counties of occurrence:	Elmore, Shelby					
	noble hornsnail	G2	S2			

[4] Historic occurrence.
[7] Alabama endemic.
[49] Reintroduced in the Coosa River below Jordan Dam in 2004.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Pleurocera nobilis						
Counties of occurrence:	Jackson					
Pleurocera postelli	broken hornsnail[7]	G2Q	S2			
Pleurocera prasinata	smooth hornsnail[7]	G4	S4			
Counties of occurrence:	Choctaw, Dallas, Shelby, Sumter, Washington, Wilcox					
Pleurocera pyrenella	skirted hornsnail[7]	G2	S2	UR		P2
Counties of occurrence:	Limestone, Madison, Morgan[4]					
Pleurocera showalteri	upland hornsnail	G2Q	S2			
Counties of occurrence:	Shelby, St. Clair, Talladega					
Pleurocera trochiformis	sulcate hornsnail	G2	S2			
Pleurocera vestita	brook hornsnail	G3	S2			
Counties of occurrence:	Shelby					
Pleurocera walkeri	telescope hornsnail	G3	S3			
Counties of occurrence:	Lauderdale					

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

TERRESTRIAL SNAILS

ORDER STYLOMMATOPHORA - Terrestrial Snails and Slugs

Family Bulimulidae						
Rabdotus mooreanus	prairie rabdotus	G5	SNR			
Family Cionellidae						
Cochlicopa morseana	Appalachian pillar	G5	SNR			
Family Discidae						
Anguispira alabama	Alabama tigersnail	G2	S2?			
Anguispira alternata	flamed tigersnail	G5	S1S2			
Anguispira cumberlandiana	Cumberland tigersnail	G3	S1S2			
Anguispira jessica	mountain disc	G3G4	S1S2			
Anguispira mordax	Appalachian tigersnail	G4	SNR			
Discus bryanti	sawtooth disc	G3	SNR			
Discus clappi	channelled disc	G1	S1			
Discus nigrimontanus	black mountain disc	G4	S1?			
Family Helicarionidae						
Dryachloa dauca	carrot glass	G2	S1			
Family Helicodiscidae						
Helicodiscus aldrichianus	burrowing coil	G3	SNR			
Helicodiscus barri	raccoon coil	G3G4	SNR			
Counties of occurrence: Colbert, Lauderdale, Madison						
Helicodiscus fimbriatus	fringed coil	G4	SNR			
Counties of occurrence: Jackson, Madison						
Helicodiscus hadenoecus	cricket coil	G3	SNR			
Counties of occurrence: Madison						
Helicodiscus singleyanus	smooth coil	G5	SX			
Family Limacidae						
Deroceras laeve	meadow slug	G5	SNR			
Family Philomycidae						
Philomycus sellatus	Alabama mantleslug	G2G3	S1?			
Philomycus togatus	toga mantleslug	G5	S1?			
Family Polygyridae						
Daedalochila fatigiata	new harmony liptooth	G3	S1?			
Daedalochila subclausa	Suwannee liptooth	G3	SNR			
Daedalochila troostiana	Nashville liptooth	G4	SNR			
Inflectarius approximans	tight-gapped shagreen	G2	S2?			
Inflectarius downieanus	dwarf globelet	G3	SNR			
Inflectarius smithi	Alabama shagreen	G2	S2			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Linisa texasiana	Texas liptooth	G3G4	SNR			
Lobosculum pustule	grooved liptooth	G3G4	SNR			
Mesodon clausus trossulus	a land snail	G5T2T3	S1S2			
Mesodon normalis	grand globe	G5	SNR			
Mesodon sanus	squat globelet	G3	SNR			
Mesodon trossulus	Danby globelet	G1	S1			
Patera sargentiana	grand bladetooth[7]	G2	S2			
Polygyra cereolus	southern flatcoil	G4	SNR			
Polygyra septemvolva	Florida flatcoil	G5	SNR			
Praticolella lawae	Appalachian shrubsnail	G3	SNR			
Praticolella mobiliana	Choctaw shrubsnail	G3	SNR			
Stenotrema brevipila	Talladega slitmouth	G2	SNR			
Stenotrema calvescens	Chattanooga slitmouth	G3	SNR			
Stenotrema exodon	Alabama slitmouth	G2	SNR			
Stenotrema florida	Apalachicola slitmouth	G3	SNR			
Stenotrema magnafumosum	Appalachian slitmouth	G4	SNR			
Stenotrema maxillatum	ridge-lip slitmouth	G3	SNR			
Triodopsis tennesseensis	budded threetooth	G4	SNR			
Xolotrema fosteri	bladetooth wedge	G4	SNR			
Xolotrema obstrictum	sharp wedge	G4	SNR			
Family Punctidae						
Punctum blandianum	brown spot	G4	SNR			
Punctum smithi	lamellate spot	G4	SNR			
Punctum vitreum	glass spot	G5	SNR			
Family Pupillidae						
Columella edentula	toothless column	G5	SNR			
Columella simplex	high spire column	G5Q	SNR			
Gastrocopta abbreviata	plains snaggletooth	G4	S1			
Gastrocopta clappi	bluegrass snaggletooth	G4G5	SNR			
Gastrocopta pellucida	slim snaggletooth	G5	S1			
Gastrocopta procera	wing snaggletooth	G5	SNR			
Gastrocopta riparia	Gulf Coast snaggletooth	G4G5	SNR			
Gastrocopta rupicola	tapered snaggletooth	G4	SNR			
Pupisoma dioscoricola	yam babybody	G3	SNR			
Vertigo alabamensis	Alabama vertigo	G3	S1S2			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Vertigo conecuhensis	Conecuh vertigo	G2	S1			
Vertigo gouldii	variable vertigo	G5	S2S3			
Counties of occurrence: Jackson, Lauderdale, Limestone, Madison						
Vertigo rugosula	Striate vertigo	G4	S1			
Family Strobilopsidae						
Strobilops hubbardi	flattened pinecone	G3G4	SNR			
Family Succineidae						
Catinella aprica	diurnal ambersnail	G2	S2?			
Catinella pugilator	weedpatch ambersnail	G1G2	S1			
Succinea forsheyi	spotted ambersnail	G4	SNR			
Succinea greerii	dryland ambersnail	G3	SNR			
Succinea indiana	xeric ambersnail	G5	SNR			
Succinea paralia	saltmarsh ambersnail	G2	SNR			
Succinea unicolor	squatty ambersnail	G3	SNR			
Succinea urbana	urban ambersnail	G2G3	SNR			
Counties of occurrence: Montgomery[4]						
Family Zonitidae						
Glyphyalinia cumberlandiana	hill glyph	G4	SNR			
Glyphyalinia latebricola	stone glyph	G1G2	SNR			
Counties of occurrence: Jackson						
Glyphyalinia pecki	blind glyph[7]	G1G2	S1S2			
Counties of occurrence: Jefferson						
Glyphyalinia specus	hollow glyph	G4	SNR			
Counties of occurrence: Jackson						
Mesomphix friabilis	brittle button	G5	S1?			
Mesomphix latior	broad button	G3G4	S2?			
Paravitrea bidens	gray supercoil	G1	S1			
Paravitrea conecuhensis	triangular supercoil	G3	SNR			
Paravitrea multidentata	dentate supercoil	G5	S2?			
Paravitrea petrophila	Cherokee supercoil	G4	S1			
Paravitrea pilsbryana	translucent supercoil	G2	S2?			
Paravitrea tantilla	teasing supercoil	G3	S1?			
Paravitrea tiara	crowned supercoil	G1G2	S1?			
Paravitrea toma	sharp supercoil	G1	S1			
Paravitrea umbilicaris	open supercoil	G2	SNR			
Paravitrea variabilis	variable supercoil	G2G3	S1?			

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Ventridens acerra	glossy dome	G4	SNR			
Ventridens cerinoideus	wax dome	G4	SNR			
Ventridens collisella	sculptured dome	G4	SNR			
Ventridens lasmodon	hollow dome	G4	SNR			
Ventridens lawae	rounded dome	G4	SNR			
Ventridens monodon	blade dome	G2	SNR			
Zonitoides elliottii	green dome	G4	SNR			
Zonitoides lateumbilicatus	striate gloss	G3G4	SNR			

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Crustaceans

Class Malacostraca – *Crabs, Krill, Pill Bugs, Shrimp, and Relatives*

ORDER AMPHIPODA - Amphipods
Family Crangonyctidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Bactrurus wilsoni	an amphipod	G1G2	S1			
Crangonyx antennatus	Appalachian Valley cave amphipod	G5	S3S5			
Stygobromus alabamensis	a cave obligate amphipod	G5	SNR			
Stygobromus dicksoni	a cave obligate amphipod	G5	SNR			
Stygobromus exilis	central Kentucky cave amphipod	G5	S1			
Stygobromus inexpectatus	a cave obligate amphipod	G1	S1			
Stygobromus smithi	Alabama well amphipod	G2G3	S1			
Stygobromus vitreus	an amphipod	G4	SNR			

Crayfish & Shrimp

ORDER DECAPODA - Crabs, Shrimps, and Relatives
Family Atyidae - Basket Shrimp

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Palaemonias alabamae	Alabama cave shrimp[7]	G1	S1	LE	SP	P1
Counties of occurrence:	Madison					
Palaemonias sp.1	Tuscumbia cave shrimp[7]	G1	S1			
Counties of occurrence:	Colbert					

Family Cambaridae - Cambarid Crayfish and Crayfishes

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Barbicambarus simmonsi	Tennessee bottlebrush crayfish	G1G2	SNR			P1
Cambarellus diminutus	least crayfish	G3	S2			P1
Counties of occurrence:	Mobile, Washington					
Cambarellus lesliei	angular dwarf crawfish	G3	S2			P1
Counties of occurrence:	Baldwin[4], Mobile[4], Washington					
Cambarellus rotatus	twisted dwarf crayfish[7]	G1	S1			
Counties of occurrence:	Green Hale, Marengo					
Cambarellus shufeldtii	Cajun dwarf crayfish	G5	S2			P2
Counties of occurrence:	Mobile					
Cambarus acanthura	thornytail crayfish	G4G5	S3			
Counties of occurrence:	Baldwin[4], Blount[4], Bullock[4], Calhoun, Chilton, Choctaw[4], Clarke[4], Colbert[4], Conecuh[4], Crenshaw[4], DeKalb, Escambia[4], Etowah[4], Hale[4], Jefferson[4], Lauderdale[4], Limestone, Marengo[4], Perry[4], Pike[4], Russell[4], Shelby, St. Clair[4], Talladega[4], Tuscaloosa[4], Washington[4]					
Cambarus bartonii	Appalachian brook crayfish	G5	S2			
Counties of occurrence[4]:	Chambers, DeKalb, Lee					
Cambarus cracens	slenderclaw crayfish[7]	G1	S1	UR		P1
Counties of occurrence:	DeKalb[4], Marshall					
Cambarus distans	boxclaw crayfish	G5	S1			P1
Counties of occurrence[4]:	DeKalb, Jackson					

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cambarus englishi	Tallapoosa crayfish	G3	S2			P2
Counties of occurrence:	Clay, Cleburne, Randolph, Tallapoosa					
Cambarus graysoni	twospot crayfish	G5	S3			
Counties of occurrence:	Lauderdale[4], Limestone[4], Madison[4]					
Cambarus halli	slackwater crayfish	G3G4	S3			P2
Counties of occurrence:	Chambers, Clay, Cleburne, Lee, Randolph, Tallapoosa					
Cambarus hamulatus	Prickly Cave crayfish	G3	S2			P2
Counties of occurrence:	Blount[4], Jackson[4], Madison, Marshall					
Cambarus howardi	Chattahoochee crayfish	G3Q	S2			P2
Counties of occurrence:	Chambers , Lee					
Cambarus jonesi	Alabama cave crayfish[7]	G2	S2	UR		P2
Counties of occurrence:	Colbert, Lauderdale, Limestone, Madison, Marshall, Morgan					
Cambarus laconensis	Lacon exit cave crayfish	G1	S1			P1
Counties of occurrence:	Morgan					
Cambarus longirostris	longnose crayfish	G5Q	S2			P2
Counties of occurrence:	Calhoun, Cherokee[4], Cleburne[4], DeKalb[4], Lauderdale[4], Madison[4], St. Clair[4]					
Cambarus ludovicianus	painted devil crayfish	G5	S2			
Counties of occurrence:	Bibb, Dallas, Jefferson, Perry, Shelby, St. Clair					
Cambarus manningi	greensaddle crayfish	G4	S2			P2
Counties of occurrence:	Calhoun, Cherokee, Coosa, Etowah, St. Clair, Talladega					
Cambarus miltus	rusty grave digger	G3	S2			
Counties of occurrence:	Baldwin, Covington, Escambia					
Cambarus parvoculus	mountain midget crayfish	G5	S1			P2
Counties of occurrence:	Jackson[4]					
Cambarus pecki	phantom cave crayfish[7]	G1G2	S1S2			P1
Counties of occurrence:	Colbert, Lauderdale, Morgan					
Cambarus polychromatus	paintedhand mudbug	G5	S1			
Counties of occurrence:	Pike					
Cambarus pyronotus	fireback crayfish	G2	S1			P1
Counties of occurrence:						
Cambarus rusticiformes	depression crayfish	G5	S1			P2
Counties of occurrence:	Jackson					
Cambarus scotti	Chattooga River crayfish	G3	S3			
Counties of occurrence:	Calhoun, Cherokee, Cleburne, Shelby, St. Clair[4], Talladega					
Cambarus speleocoopi	sweet home Alabama crayfish	G1	S1			P2
Counties of occurrence:	Marshall					
Cambarus unestami	blackbarred crayfish	G2	S1			
Counties of occurrence:	DeKalb, Jackson					
Cambarus veitchorum	White Spring Cave crayfish[7]	G1	S1			P1
Counties of occurrence:	Limestone					
Creaserinus burrisi	burrowing bog crayfish	G3	S1			P1
Counties of occurrence:	Baldwin, Mobile, Washington					

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Creaserinus byersi	lavender burrowing crayfish	G4	S2			P2
Counties of occurrence[4]:	Baldwin, Conecuh[4], Escambia[4], Monroe[4], Washington[4]					
Creaserinus danielae	speckled burrowing crayfish	G2	S2	UR		P2
Counties of occurrence:	Baldwin, Mobile, Perry					
Creaserinus fodiens	digger crayfish	G5	S3			
Counties of occurrence:	Baldwin[4], Bullock[4], Butler[4], Choctaw[4], Dallas, Lamar[4], Lauderdale[4], Limestone[4], Macon, Marengo[4], Montgomery[4], Perry[4], Sumter[4]					
Creaserinus oryktes	flatwoods digger	G4	S1			
Counties of occurrence[4]:	Baldwin, Mobile					
Hobbseus prominens	Prominence Riverlet crayfish	G4G5	S3			P2
Counties of occurrence[4]:	Chilton, Choctaw, Dallas, Greene, Hale, Marengo, Perry, Sumter					
Orconectes alabamensis	Alabama crayfish	G5	S3			
Counties of occurrence:	Colbert[4], Franklin, Lauderdale, Lawrence, Morgan					
Orconectes australis	southern cave crayfish	G5	S3			
Counties of occurrence:	Jackson, Madison, Morgan					
Orconectes chickasawae	Chickasaw crayfish	G5	S2			
Counties of occurrence:	Bibb, Chilton, Choctaw, Clarke, Dallas, Hale, Jefferson, Pickens, Sumter[4], Tuscaloosa					
Orconectes cooperi	Flint River crayfish	G1	S1			P2
Counties of occurrence:	Madison					
Orconectes durelli	saddle Crayfish	G5	S1			P2
Counties of occurrence:	Lauderdale					
Orconectes forceps	surgeon crayfish	G5	S3			
Counties of occurrence:	Jackson, Lauderdale, Lawrence, Limestone, Madison					
Orconectes holti	bimaculate crayfish[7]	G3Q	S3			
Counties of occurrence:	Autauga, Clarke, Conecuh, Dallas, Escambia, Hale, Lowndes, Marengo, Monroe, Montgomery, Perry, Sumter, Wilcox					
Orconectes jonesi	Sucarnoochee River crayfish	G3	S3	UR		
Counties of occurrence:	Autauga, Choctaw, Clarke, Greene, Marengo, Monroe, Perry[4], Pickens[4], Sumter					
Orconectes lancifer	shrimp crayfish	G5	S1			P2
Counties of occurrence[4]:	Baldwin, Clarke					
Orconectes mirus	wonderful crayfish	G4	S3			
Counties of occurrence:	Jackson, Lauderdale, Limestone, Madison					
Orconectes placidus	bigclaw crayfish	G5	S2			
Counties of occurrence:	Colbert, Jackson, Lawrence, Limestone, Morgan					
Orconectes putnami	phallic crayfish	G5	S3			
Counties of occurrence:	Lauderdale, Lawrence, Limestone, Morgan[4]					
Orconectes sheltae	Shelta Cave crayfish[7]	G1	S1	UR		P1
Counties of occurrence:	Madison					
Procambarus bivittatus	ribbon crayfish	G5	S3S4			
Counties of occurrence[4]:	Baldwin, Bullock, Clarke, Mobile, Monroe, Pike, Washington					
Procambarus capillatus	capillaceous crayfish	G3	S2			P2
Counties of occurrence:	Conecuh[4], Escambia, Monroe[4]					

[4] Historic occurrence.
[7] Alabama endemic

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Procambarus clemmeri Counties of occurrence: Mobile, Washington[4]	cockscomb crayfish	G5	S2			P2
Procambarus escambiensis Counties of occurrence[4]: Baldwin, Escambia	Escambia crayfish	G2	S2			P1
Procambarus evermanni Counties of occurrence: Baldwin, Mobile	panhandle crayfish	G4	S3			P2
Procambarus hagenianus hagenianus Counties of occurrence: Sumter	southeastern prairie crayfish	G4G5T4	S1			P2
Procambarus hayi Counties of occurrence:	straightedge crayfish	G5	S1			P2
Procambarus hubbelli Counties of occurrence: Covington	jackknife crayfish	G4	S2			P2
Procambarus hybus	smoothnose crayfish	G5	S3			P2
Procambarus lagniappe Counties of occurrence: Baldwin, Pickens, Sumter, Washington	lagniappe crayfish	G2	S1			P2
Procambarus leconteii Counties of occurrence: Mobile, Washington	Mobile crayfish	G3G4	S3			P2
Procambarus lewisi Counties of occurrence[4]: Barbour, Bullock, Butler, Lowndes, Macon, Montgomery, Russell	spur crayfish[7]	G4	S3			P2
Procambarus marthae Counties of occurrence: Dallas, Hale, Monroe, Perry	crisscross crayfish	G3	S2			P2
Procambarus okaloosae Counties of occurrence: Butler[4], Covington, Escambia[4]	Okaloosa crayfish	G4	S2			P2
Procambarus paeninsulanaus Counties of occurrence: Houston[4], Lee	Peninsula crayfish	G5	S2			P2
Procambarus penni Counties of occurrence[4]: Mobile, Washington	pearl blackwater crayfish	G3	S2			
Procambarus planirostris	flatnose crayfish	G4	SNR			P2
Procambarus shermani Counties of occurrence: Baldwin[4], Mobile, Washington	Gulf crayfish	G4	S2			
Procambarus suttlusi Counties of occurrence: Bullock, Coffee, Dale, Geneva, Henry, Pike	Choctawhatchee crayfish	G3G4	S3			
Procambarus viaeviridis Counties of occurrence[4]: Lauderdale, Tuscaloosa	vernal crayfish	G5	S1			P1
Procambarus vioscai paynei Counties of occurrence: Choctaw, Clarke, Greene[4], Marengo, Tuscaloosa[4]	Payne's Creek crayfish	G5T4	S3			

[4] Historic occurrence.
[7] Alabama endemic

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

ORDER ISOPODA - Pillbugs and Sowbugs (Isopods)

Family Asellidae

Caecidotea alabamensis	a cave obligate isopod	G3G4	S1S2			
Caecidotea bicrenata bicrenata	a cave obligate isopod	G5T3T4	SNR			
Caecidotea richardsonae	Tennessee valley cave isopod	G5	SNR			

Family Trichoniscidae

Miktoniscus medcofi	a cave isopod	GNR	SNR			

Counties of occurrence: Jackson, Madison, Marshall

Class Ostracoda – *Ostracods*

ORDER PODOCOPIDA - Fresh-water Ostracods

Family Entocytheridae

Dactylocythere arcuata	a cave obligate shrimp	G1G2	S1S2			
Dactylocythere steevesi	a cave obligate shrimp	G4	SNR			

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Class Arachnida – *Spiders, Scorpions, Pseudoscorpions, Harvestmen, Mites*

ORDER ARANEAE - Spiders
Family Ctenidae - Wandering Spiders

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Anahita punctulata	southeastern wandering spider	G4	SNR			
Counties of occurrence: Colbert, Jackson, Madison, Marshall, Morgan						

Family Dictynidae - Meshweb Spiders

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cicurina minima	cave spider	GNR	SNR			
Counties of occurrence: Calhoun, Jefferson, Lawrence						
Cicurina wiltoni	a cave obligate spider	G1	S1			

Family Leptonetidae - Cave Spiders

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Appaleptoneta barrowsi	a cave spider[7]	G1	S1			
Counties of occurrence: Blount						
Appaleptoneta credulai	a cave spider[7]	G1	S1			
Counties of occurrence: Lauderdale						
Appaleptoneta jonesi	a cave spider[7]	G1	S1			
Counties of occurrence: Jefferson						
Neoleptoneta alabama	a cave spider[7]	GNR	S1S2			
Counties of occurrence: Calhoun, DeKalb, Marshall						
Neoleptoneta archeri	a spider	GNR	SH			
Counties of occurrence: Tuscaloosa[4]						
Neoleptoneta blanda	a cave spider[7]	GNR	SH			
Counties of occurrence: Blount[4]						
Neoleptoneta serena	a cave obligate spider[7]	G1G2	S1S2			
Counties of occurrence: Lauderdale						

Family Linyphiidae - Sheet Weaver Spiders

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Islandiana muma	a cave spider	G1G2	S1			
Counties of occurrence: Colbert, Lawrence						

Family Mysmenidae - Dwarf Cobweb Spiders

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Maymena ambita	minute cave spider	GNR	SH			
Counties of occurrence: DeKalb, Madison, Marshall						

Family Nesticidae - Scaffold Web Spiders

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Nesticus barri	a cave obligate spider	G3	S3			
Counties of occurrence: Jackson, Marshall						
Nesticus jonesi	Cave Spring cave spider[7]	G1	S1			
Counties of occurrence: Morgan						

Family Tengellidae - Tengellid Spiders

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Liocranoides archeri	Archer's two-clawed spider	G2	S2			
Counties of occurrence: Jackson, Madison, Marshall						

ORDER OPILONES - Harvestmen
Family Ceratolasmetidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Hesperonemastoma pallidimaculosa	a cave obligate harvestman[7]	G3	S1?			
Counties of occurrence: Marshall, Morgan						

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[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Family Phalangodidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Bishopella jonesi Counties of occurrence: Jackson	a cave obligate harvestman[7]	G1	S1			
Phalangodes appalachius Counties of occurrence: Jackson	a cave obligate harvestman	G3G4	SNR			

ORDER PSEUDOSCORPIONES - Pseudoscorpions

Family Chthoniidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Aphrastochthonius pecki Counties of occurrence: Jefferson	a cave obligate pseudoscorpion[7]	G1	S1			
Aphrastochthonius tenax Counties of occurrence: Blount	a cave obligate pseudoscorpion	G1G2	S1S2			
Apochthonius russelli Counties of occurrence: Jackson	a cave obligate pseudoscorpion	G1	S1			
Tyrannochthonius alabamensis Counties of occurrence: Blount, Jackson	a pseudoscorpion[7]	G1	S1			
Tyrannochthonius aladdinensis Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius aralu Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius archeri Counties of occurrence: Morgan	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius attenuatus Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius avernicolus Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius barri Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius binoculatus Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius chamberlini Counties of occurrence: Calhoun	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius charon Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius diabolus Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1G2	S1S2			
Tyrannochthonius erebicus Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius felix Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius floridensis Counties of occurrence: Cleburne, Hale, Lee, Marshall, Morgan	a pseudoscorpion	G1G2	S1S2			
Tyrannochthonius gnomus Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1	S1			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Tyrannochthonius halopotamus Counties of occurrence: Jackson	a cave obligate pseudoscorpion	G1	S1			
Tyrannochthonius infernalis Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius jonesi Counties of occurrence: Blount	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius nergal Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius orpheus Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1G2	S1S2			
Tyrannochthonius osiris Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius parvus Counties of occurrence: Blount	a cave obligate pseudoscorpion[7]	G1G2	S1S2			
Tyrannochthonius pecki Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius pholeter Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius pluto Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1G2	S1S2			
Tyrannochthonius satan Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius sheltae Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius skeletonis Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius stygius Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius tartarus Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius tenuis Counties of occurrence: Madison	a cave obligate pseudoscorpion[7]	G1	S1			
Tyrannochthonius torodei Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1	S1			
Family Neobisiidae						
Alabamocreagris mortis Counties of occurrence: Jackson	a cave obligate pseudoscorpion[7]	G1G2	S1S2			
Alabamocreagris pecki Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1G2	S1S2			
Lissocreagris persephone Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1	S1			
Lissocreagris pluto Counties of occurrence: Marshall	a cave obligate pseudoscorpion[7]	G1	S1			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Lissocreagris subatlantica	a pseudoscorpion	G2G4	S1S2			
Counties of occurrence: Blount, Colbert, Morgan, Shelby						
Microcreagris eurydice	a cave obligate pseudoscorpion[7]	G1	S1			
Counties of occurrence: Jackson						
Microcreagris nickajackensis	a cave obligate pseudoscorpion	G1G2	S1S2			
Counties of occurrence: Jackson						
Minicreagris pumila	a pseudoscorpion	GNR	S1S2			
Counties of occurrence: Blount, Jackson						
Novobisium ingratum	a pseudoscorpion	GNR	S1			
Counties of occurrence: Jackson						
Trisetobisium fallax	a pseudoscorpion	GNR	S1			
Counties of occurrence: Colbert, Lawrence						

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Hexapods - Diplurans, Springtails, and Proturans
Class Diplura – *Diplurans*

ORDER DIPLURA - Diplurans
Family Campodeidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Litocampa cookei	a dipluran	G5	S1			
Counties of occurrence: Madison						
Litocampa henroti	a hexapod[7]	G1G2	S1			
Counties of occurrence: Madison						
Litocampa sp. 1	a cave dipluran (salamander cave)	G1	S1			
Counties of occurrence: Colbert, DeKalb, Jefferson						

Class Elliplura – *Springtails*

ORDER COLLEMBOLA - Springtails
Family Entomobryidae - Slender Springtails

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Pseudosinella argentea	a springtail	GNR	S1			
Counties of occurrence: Jefferson						
Pseudosinella christianseni	a cave obligate springtail	G5	S2			
Counties of occurrence: DeKalb, Jackson, Morgan						
Pseudosinella collina	a springtail	GNR	S1			
Counties of occurrence: Blount, Calhoun, Jackson, Jefferson						
Pseudosinella folsomi	a springtail	GNR	S1			
Counties of occurrence: Blount						
Pseudosinella nata	a cave obligate springtail[7]	G1	S1			
Counties of occurrence: Jefferson						
Pseudosinella pecki	a cave obligate springtail	G2G3	S1			
Counties of occurrence: Jackson						
Pseudosinella violenta	a springtail	GNR	S1			
Counties of occurrence: Blount						
Sinella barri	a springtail	G5	S1			
Counties of occurrence: DeKalb						
Sinella caeca	a springtail	GNR	S1			
Counties of occurrence: Calhoun						
Tomecerus bidentatus	a springtail	GNR	S2			
Counties of occurrence: Blount, Colbert, DeKalb, Jackson, Madison, Marshall						
Tomocerus dubius	a springtail	GNR	S1			
Counties of occurrence: DeKalb, Jackson, Madison						
Tomocerus flavescens	a springtail	G5?	S1			
Counties of occurrence: Blount, Jackson, Marshall						
Tomocerus lamelliferus	a springtail	GNR	S1			
Counties of occurrence: Jackson, Madison						

Family Hypogastruridae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Hypogastrura denticulate	a springtail	GNR	S1			
Counties of occurrence: Jackson						

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Schaefferia alabamensis	a cave obligate springtail	G1G2	S1			
Counties of occurrence: Blount, Jackson						
Schaefferia christianseni	a cave obligate springtail[7]	G1	S1			
Counties of occurrence: Morgan						
Family Isotomida						
Folsomia candida	a springtail	GNR	S1			
Counties of occurrence: Colbert						
Folsomia sp. 1	a springtail	GNR	S1			
Counties of occurrence: Blount, Jackson						
Family Onychiuridae						
Onychiurus janus	a cave obligate springtail	G2G3	S1			
Counties of occurrence: Calhoun						
Onychiurus paro	a cave obligate springtail[7]	G1	S1			
Counties of occurrence: Marshall						
Family Sminthuridae						
Arrhopalites pygmaeus	a springtail	GNR	S2			
Counties of occurrence: Blount, Jackson, Madison, Marshall						
Arrhopalites whitesidei	a springtail	GNR	S1			
Counties of occurrence: Talladega						

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Class Insecta – *True Insects*

ORDER COLEOPTERA - Beetles

Family Carabidae - Ground Beetles

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Anillinus valentinei	a cave obligate beetle	G3G4	S1			
Counties of occurrence: DeKalb, Jefferson						
Pseudanophthalmus alabamae	a ground beetle	G2	S2			
Counties of occurrence: DeKalb						
Pseudanophthalmus alladini	a cave obligate beetle	G3G4	S2			
Counties of occurrence: Jackson, Madison						
Pseudanophthalmus assimilis	West Wills Valley cave beetle	G1G2	S1			
Counties of occurrence: DeKalb						
Pseudanophthalmus distinguens	a ground beetle	G1G2	S1			
Counties of occurrence: Morgan						
Pseudanophthalmus fluviatilis	a cave obligate beetle	G3	S2			
Counties of occurrence: Marshall, Morgan						
Pseudanophthalmus lodingi	a ground beetle	G1G2	S1S2			
Counties of occurrence: Madison						
Pseudanophthalmus meridionalis	a cave obligate beetle	G2	S2			
Counties of occurrence: Marshall						
Pseudanophthalmus nickajackensis	Nickajack Cave beetle	G1	S1			
Counties of occurrence: Jackson						
Pseudanophthalmus profundus	a cave obligate beetle	G2	S2			
Counties of occurrence: Jackson, Madison						
Pseudanophthalmus sequoyah	Sequoyah cave beetle[7]	G1	S1			
Counties of occurrence: DeKalb						
Pseudanophthalmus steevesi	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Blount						
Rhadine caudata	a ground beetle	G3	S2			
Counties of occurrence: Blount, Colbert, DeKalb, Jackson, Jefferson, Limestone, Marshall,						
Rhadine larvalis	a beetle	GNR	S1			
Counties of occurrence: Conecuh						

Family Cerambycidae - Longhorn Beetles

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Dryobius sexnotatus	six-banded longhorn beetle	GNR	SH			

Family Cicindelidae - Tiger Beetles

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cicindela blanda	sandbar tiger beetle	G3G4	SNR			
Cicindela dorsalis saulcyi	eastern beach tiger beetle	G3G4T2T3	SNR			
Cicindela hamata lacerata	coastal tiger beetle	G5T5	SNR			
Cicindela lepida	ghost tiger beetle	G4	SNR			
Cicindela marginipennis	cobblestone tiger beetle	G2	S1	UR		
Counties of occurrence: Elmore, Perry						
Cicindela nigrior	autumn tiger beetle	G2G4	S3			
Cicindela wapleri	white sand tiger beetle	G3G4	SNR			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Dytiscidae - Predacious Diving Beetles						
Heterosternuta folkertsi	Folkerts' hydroporus diving beetle	G1G3	S1S2			
Laccophilus schwarzi	Schwarz' diving beetle	GNR	SNR			
Family Elmidae - Riffle Beetles						
Stenelmis gammon	Gammon's stenelmis riffle beetle	G1G3	S1S2			
Family Eucnemidae - False Click Beetles						
Dicranopselaphus variegatus	variegated false water penny beetle	G1G3	S1S3			
Family Gyrinidae - Whirligig Beetles						
Spanglerogyrus albiventris	primitive whirligig beetle	G1G3	S1S2			
Family Leiodidae - Round Fungus Beetles, Small Carrion Beetles, Mammal-nest Beetles						
Catops gratiosa	a beetle	GNR	S2			
Counties of occurrence: Colbert, DeKalb, Jackson, Madison, Marshall, Morgan						
Ptomaphagus cavernicola	a cave carrion beetle	G4	S1			
Counties of occurrence: Morgan						
Ptomaphagus chromolithus	a cave obligate beetle	G2G3	S2			
Counties of occurrence: Jackson						
Ptomaphagus episcopus	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Marshall						
Ptomaphagus hatchi	a cave obligate beetle	G3	S3			
Counties of occurrence: Jackson, Madison						
Ptomaphagus hazelae	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Jackson						
Ptomaphagus julius	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Jackson						
Ptomaphagus laticornis	a cave obligate beetle[7]	G1G2	S1			
Counties of occurrence: Jackson, Madison						
Ptomaphagus lodingi	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Madison						
Ptomaphagus longicornis	a cave obligate beetle[7]	G3G4	S2			
Counties of occurrence: Jackson, Madison						
Ptomaphagus solanum	a cave obligate beetle[7]	G1	S1			
Counties of occurrence: Jackson						
Ptomaphagus torodei	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Jackson						
Ptomaphagus valentinei	a cave obligate beetle[7]	G3G4	S2			
Counties of occurrence: Jackson, Marshall						
Ptomaphagus walteri	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Blount						
Ptomaphagus whiteselli	a cave obligate beetle	G2G3	S1			
Counties of occurrence: DeKalb						
Family Scarabaeidae - Scarab Beetles						
Onthophagus polyphemi	onthophagus tortoise commensal scarab beetle	GNR	SNR			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Silphidae - Large Carrion and Burying Beetles						
Nicrophorus americanus	American burying beetle	G2G3	SH	LE, UR[50]	SP	EX
Family Staphylinidae - Rove Beetles						
Arianops ashei	a beetle[7]	GNR	S1			
Counties of occurrence:	Butler					
Arianops barri	a beetle[7]	GNR	S1			
Counties of occurrence:	Jackson					
Arianops cavernensis	a cave obligate beetle[7]	GNR	S1			
Counties of occurrence:	Marshall					
Arianops clintoni	a beetle[7]	GNR	S1			
Counties of occurrence:	Monroe					
Arianops extera	a beetle[7]	GNR	S1			
Counties of occurrence:	Jackson					
Arianops folkertsi	a beetle[7]	GNR	S1			
Counties of occurrence:	Walker					
Arianops kingi	a beetle[7]	GNR	S1			
Counties of occurrence:	St. Clair					
Arianops steevesi	a cave obligate beetle[7]	GNR	S1			
Counties of occurrence:	Jackson					
Atheta alabama	a beetle	GNR	S1			
Counties of occurrence:	Morgan					
Atheta lucifuga	light shunning rove beetle	G4	S2			
Counties of occurrence:	Blount, Jackson, Madison, Marshall					
Batriasymmodes spelaeus	a cave obligate beetle	G3G4	S3			
Counties of occurrence:	Blount, DeKalb, Jackson, Lauderdale, Lawrence, Marshall, Morgan, St. Clair,, Walker, Winston					
Batriasymmodes troglodytes	a beetle[7]	G1G2	S1			
Counties of occurrence:	Butler					
Batrisodes cavernosus	a cave obligate beetle[7]	G1	S1			
Counties of occurrence:	Butler, Clarke					
Batrisodes jocuvestus	a cave obligate beetle[7]	G1	S1			
Counties of occurrence:	Madison					
Batrisodes jonesi	a cave obligate beetle[7]	G2G3	S2S3			
Counties of occurrence:	Colbert					
Batrisodes lineaticollis	a beetle	GNR	S1			
Counties of occurrence:	Calhoun, Conecuh					
Batrisodes profundus	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence:	Conecuh					
Batrisodes specus	a cave obligate beetle	G3G4	S2			
Counties of occurrence:	Colbert, Jackson, Madison, Marshall					
Batrisodes subterraneus	a cave obligate beetle	G1	S1			
Counties of occurrence:	Marshall					

[7] Alabama endemic.

[50] On 16 March 2016, the U.S. Fsih & Wildlife Service published a 90-day finding in the Federal Register indicating that delisting *Nicrophorus americanus* may be warranted based on a lack of threats under any of the five listing factors, and initiated a status review to determine if delisting is warranted.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Batrisodes tumoris	a beetle[7]	G1	S1			
Counties of occurrence: Colbert						
Batrisodes valentinei	a cave obligate beetle	G2G4	S2			
Counties of occurrence: Jackson, Madison, Morgan						
Lesteva pallipes	a beetle	GNR	S1			
Counties of occurrence: Jackson, Madison, Marshall						
Quedius erythrogaster	a beetle	GNR	S3			
Counties of occurrence: Blount, Colbert, Jackson, Madison, Marshall						
Quedius fulgidis	a beetle	GNR	S1			
Counties of occurrence: Calhoun						
Speleobama vana	a cave obligate beetle[7]	G1	S1			
Counties of occurrence: Jefferson						
Speleochus croceus	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Madison						
Speleochus stygicus	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Madison						
Speleochus synstygicus	a cave obligate beetle[7]	G1	S1			
Counties of occurrence: Madison						
Subterrochus eurous	a cave obligate beetle[7]	G2G3	S1			
Counties of occurrence: Jackson						
Subterrochus ferus	a cave obligate beetle	G1G2	S1S2			
Counties of occurrence: Jackson, Madison						
Subterrochus steevesi	a cave obligate beetle	G4	SNR			
Counties of occurrence: Marshall						
Tmesiphorus costalis	a beetle	GNR	SNR			
Counties of occurrence: Marshall, Morgan						
Tychobythinus jonesi	a cave obligate beetle[7]	G1G2	S1S2			
Counties of occurrence: Colbert						
ORDER DIPTERA - True Flies						
Family Mycetophilidae - Fungus Gnats						
Rymosia triangularis	a fungus gnat	GNR	S1			
Counties of occurrence: Madison						
Family Sphaeroceridae						
Spelobia tenebrarum	a cave obligate fly	G5	S2			
Counties of occurrence: Jackson, Madison						
ORDER EMPHEMEROPTERA - Mayflies						
Family Baetiscidae						
Baetisca becki	a mayfly	G2G3	S1			
Family Behningiidae						
Dolania americana	American sand burrowing mayfly	G4	S1			
Family Ephemerellidae						
Serratella frisoni	Frison's serratellan mayfly	G4	SH			
Family Isonychiidae						
Isonychia berneri	a mayfly	G2G3	SNR			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Oligoneuriidae						
Homoeoneuria cahabensis	Cahaba sand-filtering mayfly	G2G3	S1S2			
ORDER LEPIDOPTERA - Butterflies and Moths						
Family Hesperiidae - Skippers						
Amblyscirtes alternata	dusky roadside-skipper	G2G3	S2S3			
Atrytone arogos arogos	arogos skipper	G3T1T2	SH			
Autochton cellus	golden-banded skipper	G4	S2			
Euphyes arpa	palmetto skipper	G3G4	SNR			
Euphyes dukesi dukesi	Dukes' skipper	G3T3	SNR			
Euphyes pilatka	palatka skipper	G3G4	S3S4			
Hesperia meskei	Meske's skipper	G2G4	S3?			
Problema byssus	byssus skipper	G3G4	S2S3			
Family Lycaenidae - Gossamer-winged Butterflies						
Callophrys hesseli	Hessel's hairstreak	G3G4	SNR			
Callophrys irus	frosted elfin	G3	SU			
Feniseca tarquinius	harvester	G4	SU			
Satyrium kingi	King's hairstreak	G3G4	S2S3			
Counties of occurrence:	Chilton					
Family Noctuidae - Noctuid and Owlet Moths						
Pyreferra ceromatica	anointed sallow moth	GU	SU			
Scoliopteryx libatrix	a moth	G5	S2			
Counties of occurrence:	Jackson, Madison					
Family Nymphalidae						
Chlosyne gorgone gorgone	gorgone checkerspot	G5T2T3Q	S1			
Enodia creola	Creole pearly eye	G3G4	SU			
Counties of occurrence:	Chilton					
Neonympha areolata	Georgia satyr	G3G4	SU			
Neonympha mitchellii	Mitchell's satyr	G2	S1S2	LE	SP	P1
Counties of occurrence:	Bibb, Hale, Perry, Tuscaloosa					
Speyeria diana	Diana	G3G4	S2			
Counties of occurrence:	Calhoun, Clay, Etowah					
Family Pieridae - Sulphurs and Whites						
Pieris virginiensis	West Virginia white	G3?	SNR			
Counties of occurrence:	Covington, Geneva, Mobile					
Family Saturniidae - Giant Silkworm Moths and Royal Moths						
Hemileuca maia maia	Coastal Barrens buckmoth	G5T5	SNR			
ORDER ODONATA - Dragonflies and Damselflies						
Family Coenagrionidae - Narrow-winged Damselflies, Pond Damselflies						
Argia plana	springwater dancer	G5	S1			
Counties of occurrence:	Jefferson					

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Cordulegasteridae - Biddies						
Cordulegaster obliqua fasciata	banded spiketail	G4T3Q	S3?			
Family Corduliidae - Green-eyed Skimmers						
Epitheca spinosa	robust baskettail	G4	S2S3			
Counties of occurrence: Covington, Escambia, Tuscaloosa						
Neurocordulia molesta	smoky shadowdragon	G4	S3			
Counties of occurrence: Baldwin, Colbert, Elmore, Greene, Jackson, Lauderdale, Macon, Monroe, Perry, Sumter, Tuscaloosa						
Somatochlora calverti	Calvert's emerald	G3	S1S2	UR		
Counties of occurrence: Covington, Escambia						
Somatochlora georgiana	coppery emerald	G3G4	S3S4			
Counties of occurrence: Tuscaloosa						
Somatochlora hineana	Hine's emerald	G2G3	SH	LE	SP	P1
Counties of occurrence: Jackson[3]						
Somatochlora provocans	treetop emerald	G4	S3S4			
Counties of occurrence: Bibb, Calhoun,, Chilton, Clay, Cleburne, Covington, Dale, Escambia, Fayette, Lamar, Marengo, Monroe, Talladega, Tuscaloosa						
Family Gomphidae - Clubtails						
Gomphus consanguis	Cherokee clubtail	G3	S1S2	UR		
Counties of occurrence: Blount, St. Clair						
Gomphus crassus	handsome clubtail	G3G4	S3			
Counties of occurrence: Jackson, Lauderdale, Madison						
Gomphus geminatus	twin-striped clubtail	G3G4	S2			
Counties of occurrence: Covington, Escambia						
Gomphus hodgesi	Hodges' clubtail	G3	S3?			
Gomphus hybridus	cocoa clubtail	G4	S3S4			
Gomphus modestus	Gulf Coast clubtail	G3G4	S3?			
Gomphus quadricolor	rapids clubtail	G3G4	S1			
Gomphus septima	Septima's clubtail	G2	S1S2	UR		
Counties of occurrence: Bibb, Tuscaloosa[4]						
Gomphus viridifrons	green-faced clubtail	G3G4	S3?			
Ophiogomphus acuminatus	acuminate snaketail	G3	S1S2			
Ophiogomphus incurvatus alleghaniensis	Allegheny snaketail	G3T2T3	S1S2	UR		
Counties of occurrence: Blount, Clay, Cleburne, Tuscaloosa						
Ophiogomphus mainensis	Maine snaketail	G4	SNR			
Progomphus bellei	Belle's sanddragon	G3	SH			
Stylurus laurae	Laura's clubtail	G4	SH			
Stylurus notatus	elusive clubtail	G3	SH			
Stylurus townesi	Townes' clubtail	G3	S1S2			

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Libellulidae - Common Skimmers						
Nannothemis bella	elfin skimmer	G4	SNR			
Family Macromiidae						
Macromia margarita	mountain river cruiser	G3	SNR			
ORDER ORTHOPTERA - Grasshoppers, Locusts, and Crickets						
Family Rhaphidophoridae - Camel Crickets						
Ceuthophilus latens	a camel cricket	GNR	S1			
Counties of occurrence: Marshall						
Ceuthophilus stygius	a cricket	GNR	S2			
Counties of occurrence: Jackson, Madison						
Euhadenoecus putaneus	a cave cricket	GNR	S1			
Counties of occurrence: DeKalb, Jackson						
ORDER PLECOPTERA - Stoneflies						
Family Capniidae – Small Winter Stoneflies						
Allocapnia sano	Sano stonefly[7]	G1	S1			
Counties of occurrence: Madison						
Amphinemura alabama	Alabama Forestfly	G3	S2			
Counties of occurrence: Lauderdale, Limestone						
Amphinemura mockfordi	Tennessee forestfly	G2	S1	UR		
Counties of occurrence: Madison						
Family Perlidae - Common Stoneflies						
Beloneuria jamesae	Cheaha beloneurian stonefly[7]	G1G2	S1S2			
Counties of occurrence: Calhoun, Clay, Cleburne, Talladega						

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Class Diplopoda – *Millipedes*

ORDER CHORDEUMATIDA
Family Cleidogonidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Pseudotremia eburnea	a cave obligate millipede	G2G4	SNR			
Counties of occurrence: Jackson, Marshall						
Pseudotremia minos	a cave obligate millipede	G1	S1			
Counties of occurrence: Jackson						
Pseudotremia nyx	a cave obligate millipede[7]	G1	S1			
Counties of occurrence: Marshall						
Pseudotremia rhadamanthus	a cave obligate millipede	G1G2	SNR			

Family Trichopetalidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Scoterpes austrinus austrinus	a cave obligate millipede	G3G4T3T4	SNR			
Counties of occurrence: DeKalb						

ORDER JULIDA
Family Zosteractinidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Ameractis satis	a cave obligate millipede	G2G4	SNR			
Counties of occurrence: Jackson, Marshall						

Class Oligochaeta – *Terrestrial and Freshwater Worms*

ORDER BRANCHIOBDELLIDA
Family Branchiobdellidae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cambarincola sheltensis	a cave obligate worm	G1G2	S1S2			

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Vascular Plants

Ferns & Relatives

Class Filicopsida – *Ferns*

ORDER FILICALES

Family Aspleniaceae - Spleenwort Family

Asplenium abscissum	cutleaf spleenwort	G3G4	S1			
Counties of occurrence: Jackson						
Asplenium bradleyi	Bradley's spleenwort	G4	S2			
Counties of occurrence: Etowah, Jackson, Talladega						
Asplenium monanthes	single-sorus spleenwort	G4	S1			
Asplenium ruta-muraria	wall rue spleenwort	G5	S1			
Counties of occurrence: Bibb, Etowah, Jackson						
Asplenium scolopendrium var. *americanum*	American Hart's-tongue fern	G4T3	S1	LT		
Counties of occurrence: Jackson, Morgan						
Asplenium trichomanes	maidenhair spleenwort	G5	S2S3			
Counties of occurrence: Etowah, Jackson, Talladega, Tuscaloosa						
Asplenium tutwilerae	Scott's spleenwort[7]	G1	S1			
Counties of occurrence: Hale						

Family Dryopteridaceae - Wood Fern Family

Cystopteris tennesseensis	Tennessee bladderfern	G5	S2			
Counties of occurrence: Jackson, Morgan						
Dryopteris celsa	log fern	G4	S2			
Counties of occurrence: Blount, Cherokee, Conecuh, Crenshaw , Jefferson, Lawrence, Limestone, Marion, Monroe, Montgomery, Walker						

Family Hymenophyllaceae - Filmy Fern Family

Hymenophyllum tayloriae	gorge filmy fern	G2	S1			
Counties of occurrence: Franklin, Lamar, Lawrence						
Trichomanes petersii	dwarf filmy-fern	G4G5	S2			
Counties of occurrence: Cleburne, DeKalb, Etowah, Fayette, Franklin, Jackson, Lamar, Lawrence, Marion, Marshall, Pickens, Tuscaloosa, Winston						

Family Lygodiaceae - Climbing Fern Family

Lygodium palmatum	climbing fern	G4	S1			
Counties of occurrence: Clay, Cleburne, DeKalb						

Family Osmundaceae - Royal Fern Family

Osmunda claytoniana	interrupted fern	G5	S1			
Counties of occurrence: Jackson						

Family Pteridaceae - Maidenhair Fern Family

Astrolepis x *integerrima*	hybrid cloak fern	HYB	S1			
Counties of occurrence: Bibb						

Family Thelypteridaceae - Marsh Fern Family

Thelypteris ovata	ovate marsh fern	G3G5	S3			
Counties of occurrence: Bibb, Clarke, Conecuh, Covington, Escambia, Houston, Monroe, Washington						

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Stegnogramma burksiorum Counties of occurrence: Winston	Alabama streak-sorus fern[7]	G1	S1	LT[51]		
ORDER MARSILEALES						
Family Marsileaceae - Water Clover Family						
Pilularia americana	American pillwort	G5	S1			

Class Ophioglossopsida – *Succulent Ferns*

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
ORDER OPHIOGLOSSALES						
Family Ophioglossaceae - Adder's-tongue Family						
Botrychium jenmanii Counties of occurrence: Baldwin, Escambia, Lee, Mobile	Alabama grapefern	G3G4	S1			

Class Psilotopsida – *Whiskferns*

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
ORDER PSILOTALES						
Family Psilotaceae - Whiskfern Family						
Psilotum nudum Counties of occurrence: Lee	whiskfern	G5	S1			

Class Isoetopsida – *Quillworts & Spike-moss*

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
ORDER ISOETALES						
Family Isoetaceae - Quillwort Family						
Isoetes appalachiana Counties of occurrence: Butler, Conecuh, Tallapoosa	Appalachian quillwort	G4	S1			
Isoetes butleri Counties of occurrence: Bibb, Franklin, Lawrence, Morgan	Butler's quillwort	G4	S2			
Isoetes flaccida Counties of occurrence: Houston	southern quillwort	G3	S1			
Isoetes hyemalis Counties of occurrence: Houston	winter quillwort	G2G3	S1	UR		
Isoetes louisianensis Counties of occurrence: Conecuh, Monroe	Louisiana quillwort	G2G3	S1	LE		
Isoetes virginica Counties of occurrence: Chamber, Lee, Randolph, Tallapoosa	Piedmont quillwort	G3	S2			
ORDER SELAGINELLALES						
Family Selaginellaceae - Spike-moss Family						
Selaginella arenicola ssp. *riddellii* Counties of occurrence: Cullman, Franklin, Geneva, Lee, Marion, Wilcox, Winston	Riddell's spike-moss	G4T4	S2			

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[7] Alabama endemic.

[51] *Thelypteris burksiorum* was listed (as *T. pilosa* var. *alabamensis*) as threatened under the federal Endangered Species Act in 1992. Watkins and Farrar (2002) elevated the Alabama variety of *T. pilosa* to specific status as *T. burksiorum*. The U.S. Fish and Willdife Service still uses *T. pilosa* var. *alabamensis* as the species name on their website.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Selaginella ludoviciana	Gulf spike-moss	G3G4	S1S2			
Counties of occurrence: Baldwin, Conecuh, Henry, Houston						
Selaginella rupestris	ledge spike-moss	G5	S2			
Counties of occurrence: Chambers, Franklin, Lee, Marion, Tallapoosa						

Class Lycopodiopsida – *Clubmosses*

ORDER LYCOPODALES

Family Lycopodiaceae - Clubmoss Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Diphasiastrum tristachyum	deep-root clubmoss	G5	S1			
Counties of occurrence: Jackson						
Huperzia lucidula	shining clubmoss	G5	S2			
Counties of occurrence: Franklin, Lawrence, Marion, Winston						
Huperzia porophila	rock clubmoss	G4	S1			
Counties of occurrence: Franklin, Lawrence, Marion, Walker, Winston						
Lycopodium obscurum	tree clubmoss	G5	S1			

Class Equisetopsida – *Horsetails*

ORDER EQUISETALES

Family Equisetaceae - Horsetail Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Equisetum arvense	field horsetail	G5	S2			
Counties of occurrence: Calhoun, Greene, Hale, Jackson, Jefferson, Marshall, Morgan						

Class Monocotyledoneae – *Monocots*

ORDER ALISMATALES

Family Alismataceae - Water-plantain Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Echinodorus parvulus	dwarf burhead	G3Q	S1			
Counties of occurrence: Barbour, Covington, Dallas, Escambia, Geneva						
Sagittaria isoetiformis	slender arrow-head	G4?	S2			
Counties of occurrence: Covington, Henry, Houston						
Sagittaria secundifolia	Little River arrow-head	G1	S1	LT		
Counties of occurrence: Cherokee, Coosa, DeKalb, Winston						

Family Tofieldiaceae - False Asphodel Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Pleea tenuifolia	rush false-asphodel	G4	S1S2			
Counties of occurrence: Baldwin, Escambia						

ORDER ARALES

Family Araceae - Arum Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Peltandra sagittifolia	spoon-flower	G3G4	S2			
Counties of occurrence: Baldwin, Covington, Dale, Escambia, Geneva, Mobile						

ORDER ASPARAGALES

Family Amaryllidaceae - Amaryllis Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Allium speculae	Little River Canyon onion	G2	S2			
Counties of occurrence: Cherokee, DeKalb, Jackson, Marshall						
Allium tricoccum	wild leek	G5	S1			
Counties of occurrence: Jackson, Marshall						

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Hymenocallis choctawensis — panhandle spider-lily — G3G4 — S1
Counties of occurrence:

Hymenocallis coronaria — shoals spider-lily — G2Q — S2
Counties of occurrence: Bibb, Blount, Chilton, Coosa, Cullman, Jefferson, Lee, Randolph, Shelby, Talladega, Tallapoosa

Family Asparagaceae - Asparagus Family

Schoenolirion croceum — yellow sunnybell — G4 — S2
Counties of occurrence: Bibb, Blount, Colbert, DeKalb, Franklin, Jackson, Lawrence, Madison, Morgan, Sumter

Schoenolirion wrightii — Texas sunnybell — G3 — S1
Counties of occurrence: Cherokee, DeKalb, Etowah, Marshall

ORDER COMMELINALES

Family Commelinaceae - Spiderwort Family

Tradescantia ernestiana — Ernest’s spiderwort — G3 — S1
Counties of occurrence: DeKalb, Etowah, Jackson, Jefferson, Madison, Montgomery

Family Xyridaceae - Yellow-eyed Grass Family

Xyris chapmanii — Chapman’s yellow-eyed grass — G3 — S1
Counties of occurrence: Baldwin, Covington, Escambia, Mobile

Xyris drummondii — Drummond's yellow-eyed grass — G3 — S3
Counties of occurrence: Baldwin, Covington, Escambia, Geneva, Mobile, Washington

Xyris isoetifolia — quillwort yellow-eyed grass — G1 — SH
Counties of occurrence: Covington

Xyris longisepala — Kral's yellow-eyed grass — G2G3 — S1 — UR
Counties of occurrence: Covington

Xyris scabrifolia — Harper's yellow-eyed grass — G3 — S1S2
Counties of occurrence: Baldwin, Covington, Escambia, Houston, Mobile

Xyris serotina — acid-swamp yellow-eyed grass — G3G4 — S1
Counties of occurrence: Houston

Xyris spathifolia — a yellow-eyed grass[7] — G1 — S1
Counties of occurrence: Bibb

Xyris tennesseensis — Tennessee yellow-eyed grass — G2 — S1 — LE
Counties of occurrence: Bibb, Calhoun, Franklin, Shelby

ORDER CYPERALES

Family Cyperaceae - Sedge Family

Bolboschoenus fluviatilis — river bulrush — G5 — S1
Counties of occurrence: Morgan

Bulbostylis warei — Ware's hairsedge — G3G4 — S1
Counties of occurrence: Baldwin

Carex acidicola — a sedge — G2G3 — S1
Counties of occurrence: Bibb, Lee, Tuscaloosa

Carex aggregata — glomerate sedge — G5 — S1
Counties of occurrence: Macon

Carex austrocaroliniana — South Carolina sedge — G4 — S2?
Counties of occurrence: Jackson

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Carex baltzellii	Baltzell's sedge	G3	S1			
Counties of occurrence: Dale, Geneva, Pike						
Carex barrattii	Barratt's sedge	G4	S1			
Counties of occurrence: Calhoun, Dekalb, Geneva, Winston						
Carex brysonii	Bryson's sedge[7]	G1	S1	UR		
Counties of occurrence: Tuscaloosa, Walker, Winston						
Carex decomposita	cypress-knee sedge	G3G4	S2			
Counties of occurrence: Crenshaw, Henry, Jackson, Jefferson, Madison, Talladega						
Carex eburnea	ebony sedge	G5	S2			
Counties of occurrence: Bibb, Greene, Jackson, Sumter						
Carex exilis	coast sedge	G5	S1			
Counties of occurrence: Baldwin, Washington						
Carex fissa var. *aristata*	hammock sedge	G4?T4?	S1			
Counties of occurrence: Barbour						
Carex godfreyi	Godfrey's sedge	G3G4	S2			
Counties of occurrence: Conecuh, Houston, Montgomery						
Carex impressinervia	impressed-nerved sedge	G2	S1	UR		
Counties of occurrence: Autauga, Bibb, Butler, Chilton, Monroe, Russell, Wilcox						
Carex purpurifera	purple sedge	G4?	S2			
Counties of occurrence: Jackson, Madison, Marshall						
Carex socialis	social sedge	G4	S2			
Counties of occurrence: Bullock, Butler, Calhoun, Colbert, Coosa, Dallas, Greene, Jackson, Madison, Marengo, Marshall, Montgomery, Morgan						
Carex striata	Walter's sedge	G4G5	S1			
Counties of occurrence: Geneva, Houston, Mobile						
Carex thornei	a sedge	G2G3	S1			
Counties of occurrence: Henry, Russell						
Carex vestita	velvety sedge	G5	S1			
Cladium mariscoides	twig rush	G5	S1			
Counties of occurrence: Baldwin, Mobile						
Cyperus granitophilus	granite-loving flatsedge	G3G4Q	S2			
Counties of occurrence: Chambers, Cherokee, Tallapoosa						
Cyperus tetragonus	Four-angle flatsedge	G4?	S1			
Counties of occurrence: Baldwin						
Eleocharis melanocarpa	black-fruited spike-rush	G4	S1			
Counties of occurrence: Covington, Houston						
Eleocharis olivacea	capitate spikerush	G5	S1			
Counties of occurrence: Mobile						
Eleocharis robbinsii	Robbins' spikerush	G4G5	S1			
Counties of occurrence: Geneva, Henry, Mobile						
Eleocharis rostellata	beaked spikerush	G5	S1			
Counties of occurrence: Baldwin, Mobile						
Eleocharis wolfii	Wolf's spikerush	G3G5	S1			
Counties of occurrence: Lauderdale						

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Fimbristylis brevivaginata	glade fimbristylis	G2	S1			
Counties of occurrence: DeKalb						
Fimbristylis perpusilla	Harper’s fimbry	G2	S1			
Counties of occurrence: Covington						
Rhynchospora alba	white beakrush	G5	S1			
Counties of occurrence: Escambia						
Rhynchospora capillacea	horned beakrush	G4	S1			
Counties of occurrence: Bibb						
Rhynchospora crinipes	hairy-peduncled beakrush	G2	S1	UR		
Counties of occurrence: Baldwin, Conecuh, Covington, Escambia, Mobile, Washington						
Rhynchospora fernaldii	Fernald's beak rush	G3G4	S1			
Counties of occurrence: Baldwin						
Rhynchospora globularis var. *saxicola*	Stone Mountain beakrush	G3Q	S1			
Counties of occurrence: Lee, Tallapoosa						
Rhynchospora harperi	Harper’s beakrush	G4?	S1			
Counties of occurrence: Baldwin, Cherokee						
Rhynchospora macra	southern white beak rush	G3	S1			
Counties of occurrence: Covington, Mobile						
Rhynchospora pleiantha	brown beakrush	G2G3	S1			
Counties of occurrence: Baldwin, Covington, Houston						
Rhynchospora stenophylla	Chapman beakrush	G4	S2			
Counties of occurrence: Baldwin, Covington, Escambia, Geneva, Mobile						
Rhynchospora thornei	Thorne's beakrush	G3	S1	UR		
Counties of occurrence: Bibb, Cherokee, Geneva						
Rhynchospora tracyi	Tracy's beak rush	G4	S1			
Counties of occurrence: Baldwin, Houston, Mobile						
Schoenoplectus subterminalis	water bulrush	G4G5	S1			
Counties of occurrence: Monroe						
Family Poaceae - Grass Family						
Amphicarpum muehlenbergianum	blue maiden-cane	G4	S1			
Counties of occurrence: Covington, Houston						
Andropogon arctatus	pine-woods bluestem	G3	S1			
Counties of occurrence: Covington, Geneva						
Andropogon perangustatus	Elliott’s beardgrass	G5T4	S1			
Counties of occurrence: Baldwin, Mobile, Covington						
Andropogon virginicus var. *glaucus*	beardgrass	G4T4T5	S2			
Counties of occurrence: Covington, Houston, Mobile						
Aristida mohrii	Mohr’s three-awn grass	G1	S1			
Counties of occurrence: Baldwin, Covington, Geneva, Mobile						
Aristida simpliciflora	southern three-awned grass	G3G4	S1			
Counties of occurrence: Baldwin, Covington, Dale, Escambia						
Aristida spiciformis	pine barren three-awned grass	G4	S1			
Counties of occurrence: Baldwin						
Calamovilfa arcuata	Cumberland sandgrass	G2G3	S1	UR		
Counties of occurrence: Blount						

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Chasmanthium nitidum	shiny spikegrass	G3G4	S1			
Counties of occurrence: Houston, Mobile						
Coelorachis tessellata	Lattion jointgrass	G5	S1			
Counties of occurrence: Baldwin, Butler, Covington, Escambia, Geneva, Mobile						
Coelorachis tuberculosa	Florida jointgrass	G3	S1			
Counties of occurrence: Covington, Geneva, Houston						
Diarrhena americana	American beakgrain	G4G5	S2			
Counties of occurrence: Jackson, Madison						
Elymus churchii	Church's wildrye	G2G3	S1			
Counties of occurrence: Madison						
Eustachys floridana	two-spike finger grass	G2?	S1			
Counties of occurrence: Geneva						
Luziola bahiensis	Brazilian luziola	G4G5	S1			
Counties of occurrence: Baldwin						
Melica nitens	three-flower melic grass	G5	S1			
Counties of occurrence: Lawrence						
Muhlenbergia sobolifera	cliff muhly	G5	S1			
Counties of occurrence: Franklin, Jackson, Lauderdale, Madison						
Panicum lithophilum	Swallen's panic-grass	G2G3Q	S1			
Counties of occurrence: DeKalb, Lee						
Panicum nudicaule	naked-stemmed panic grass	G3Q	S2			
Counties of occurrence: Baldwin, Covington, Escambia, Mobile, Washington						
Schizachyrium maritimum	Gulf bluestem	G3G4Q	S1			
Counties of occurrence: Mobile						
Schizachyrium scoparium ssp. *divergens*	eastern little bluestem	G5T5	SH			
Counties of occurrence: Mobile						
Sporobolus curtissii	pineland dropseed	G3	S1			
Counties of occurrence: Covington						
Sporobolus floridanus	Florida dropseed	G3	S1			
Counties of occurrence: Houston						
Sporobolus teretifolius	wire-leaved dropseed	G2	S1	UR		
Counties of occurrence: Houston						
Tridens carolinianus	Carolina fluff grass	G3G4	S1			
Counties of occurrence: Conecuh, Covington, Escambia[4], Mobile[4]						

ORDER ERIOCAULALES
Family Eriocaulaceae - Pipewort Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Eriocaulon aquaticum	seven-angled pipewort	G5	SH			
Eriocaulon lineare	narrow pipewort	G4	S2			
Counties of occurrence: Covington, Houston						
Eriocaulon texense	Texas pipewort	G4	S2			
Counties of occurrence: Baldwin, Escambia, Mobile, Washington						
Lachnocaulon digynum	pineland bogbutton	G3	S2			
Counties of occurrence: Baldwin, Covington, Escambia, Mobile						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Lachnocaulon engleri	Engler's bogbutton	G3	S1			
Counties of occurrence: Baldwin, Covington						
Lachnocaulon minus	Small's bog-button	G3G4	S1?			
Counties of occurrence: Covington, Houston, Mobile						
ORDER HYDROCHARITALES						
Family Hydrocharitaceae - Frog's-bit Family						
Elodea canadensis	broad waterweed	G5	S1			
Counties of occurrence: Limestone, Marshall						
ORDER JUNCALES						
Family Juncaceae - Rush Family						
Juncus georgianus	Georgia rush	G4	S1			
Counties of occurrence: Chambers, Lee, Randolph, Tallapoosa						
Juncus gymnocarpus	naked-fruited rush	G4	S2			
Counties of occurrence: Covington, Dale, Geneva, Mobile						
Juncus interior var. *interior*	inland rush	G4T4Q	S1			
Counties of occurrence: Perry						
Juncus nodatus	stout rush	G5	S1			
Counties of occurrence: Blount, Covington, Crenshaw, Dallas, Greene, Jackson, Lauderdale, Lawrence, Marshall, Montgomery, Morgan, Pickens, Pike, Sumter						
ORDER LILIALES						
Family Iridaceae - Iris Family						
Nemastylis geminiflora	prairie pleatleaf	G4	S1			
Counties of occurrence: Greene, Pickens, Sumter						
Family Liliaceae - Lily Family						
Erythronium albidum	white trout lily	G5	S1S2			
Counties of occurrence: Franklin						
Erythronium umbilicatum ssp. *monostolum*	dimpled trout lily	G5T3	S1			
Counties of occurrence: Etowah						
Lilium canadense	Canada lily	G5	S2			
Counties of occurrence: Etowah, Jackson, Lawrence, Madison, Morgan, St. Clair						
Lilium iridollae	panhandle lily	G2	S1			
Counties of occurrence: Baldwin, Covington, Escambia, Geneva						
Lilium michiganense	Michigan lily	G5	S1			
Counties of occurrence: Colbert, Dekalb, Franklin, Lawrence, Lowndes, Madison, Pickens, Shelby						
Lilium superbum	Turk's-cap lily	G5	S3			
Counties of occurrence: Baldwin, Bullock, Butler, Chilton, Choctaw, Conecuh, Crenshaw, Escambia, Henry, Jackson, Macon, Madison, Marengo, Randolph, Russell, Shelby, Sumter, Tallapoosa						
Prosartes maculata	spotted mandarin	G3G4	S1			
Counties of occurrence: Jackson						
Family Melanthiaceae - Bunchflower Family						
Stenanthium leimanthoides	Pine Barren Deathcamas	G4Q	S1			
Counties of occurrence: Barbour, Clay, Mobile[4], Monroe, Washington[4]						
Trillium flexipes	nodding trillium	G5	S2S3			
Counties of occurrence: Etowah, Jackson, Lawrence, Marshall, Morgan, Winston						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Trillium grandiflorum	large-flowered trillium	G5	S1			
Counties of occurrence: Jackson						
Trillium lancifolium	narrow-leaved trillium	G3	S2S3			
Counties of occurrence: Calhoun, Cherokee, Dallas, Greene, Houston, Jackson, Marengo, Montgomery, Perry, Shelby, Tuscaloosa, Wilcox						
Trillium pusillum var. 1	Alabama least trillium	G3T2Q	S2			
Counties of occurrence: Jackson, Limestone, Madison, Marshall						
Trillium recurvatum	prairie trillium	G5	S2			
Counties of occurrence: Franklin, Lawrence, Morgan, Pickens						
Trillium reliquum	relict trillium	G3	S2	LE		
Counties of occurrence: Bullock, Henry, Lee						
Trillium rugelii	southern nodding trillium	G3	S2?			
Counties of occurrence: Calhoun, Clay, Coosa, Lee, Shelby, Tuscaloosa, Wilcox						
Trillium sessile	toadshade	G4G5	S2			
Counties of occurrence: Blount, Cullman, Jackson, Limestone, Marshall						
Trillium sulcatum	southern red trillium	G4	S1			
Counties of occurrence: DeKalb, Jackson, Marshall						
Trillium vaseyi	Vasey's trillium	G4	S1?			
Counties of occurrence: Lee						
Veratrum hybridum	broadleaf bunchflower	G5	S1			
Counties of occurrence: Autauga[4], Bibb, Coosa, Lee[4]						
Veratrum parviflorum	small-flowered false hellebore	G4?	S1S2			
Counties of occurrence: Blount, Cherokee[4], Cleburne, Dekalb, Jackson, Marshall						
Veratrum woodii	wood's false hellebore	G5	S1			
Counties of occurrence: Bibb, Dale, Geneva, Henry						
Xerophyllum asphodeloides	turkeybeard	G4	S1			
Counties of occurrence: Calhoun						
ORDER NAJADALES						
Family Najadaceae - Naiad Family						
Najas gracillima	thread-like naiad	G5?	S1			
Counties of occurrence: Chambers						
ORDER ORCHIDALES						
Family Orchidaceae - Orchid Family						
Aplectrum hyemale	puttyroot	G5	S2			
Counties of occurrence: Conecuh, Etowah, Lawrence						
Calopogon barbatus	bearded grass-pink	G4?	S1			
Counties of occurrence: Escambia, Mobile						
Calopogon multiflorus	many-flowered grass-pink	G2G3	S1			
Counties of occurrence: Baldwin, Mobile						
Calopogon oklahomensis	Oklahoma grass-pink	G3	S1			
Counties of occurrence: Baldwin						
Corallorhiza wisteriana	spring coralroot	G5	S2			
Counties of occurrence: Bibb, Choctaw, Houston, Jackson, Lamar, Tuscaloosa						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cypripedium candidum	small white lady's-slipper	G4	S1			
Counties of occurrence: Colbert, Dallas, Lowndes						
Cypripedium kentuckiense	southern lady’s-slipper	G3	S1			
Counties of occurrence: Clarke, Coosa, Hale, Lowndes, Sumter, Tallapoosa, Washington						
Epidendrum magnoliae	green-fly orchid	G4	S3			
Counties of occurrence: Baldwin, Barbour, Butler, Coffee, Conecuh, Covington, Dale, Escambia, Geneva, Henry, Houston, Mobile						
Habenaria quinqueseta var. *quinqueseta*	Michaux's orchid	G4G5T4?	S1			
Counties of occurrence: Baldwin						
Isotria verticillata	large whorled pogonia	G5	S2			
Counties of occurrence: Bibb, Cherokee, Cleburne, DeKalb, Etowah, Jackson, Madison, Winston						
Liparis liliifolia	lily-leaved twayblade	G5	S1			
Counties of occurrence: Colbert, Jackson						
Liparis loeselii	Loesel's twayblade	G5	S1?			
Counties of occurrence: Lee						
Orthochilus ecristatus	crestless eulophia	G2	S1			
Counties of occurrence: Baldwin, Mobile						
Platanthera blephariglottis var. *conspicua*	large white fringed orchid	G4G5T3T4	S1S2			
Counties of occurrence: Escambia, Mobile						
Platanthera integra	yellow fringeless orchid	G3G4	S2			
Counties of occurrence: Baldwin, Conecuh, Escambia, Mobile						
Platanthera integrilabia	white fringeless orchid	G2G3	S2	LT		
Counties of occurrence: Calhoun, Clay, Cleburne, DeKalb, Jackson, Marion, Tuscaloosa, Winston						
Platanthera lacera	green-fringed orchid	G5	S2			
Counties of occurrence: Autauga, Cleburne, Geneva, Limestone, Walker						
Platanthera nivea	snowy orchis	G5	S2			
Counties of occurrence: Conecuh, Covington, Escambia, Geneva, Houston, Mobile						
Platanthera peramoena	purple fringeless orchid	G5	S1			
Counties of occurrence: Clay, Lauderdale, Madison[4]						
Spiranthes brevilabris	Texas ladies’-tresses	G1G2	SH			
Spiranthes longilabris	giant spiral ladies’-tresses	G3	S1			
Counties of occurrence: Mobile						
Spiranthes lucida	shining ladies’-tresses	G5	S1			
Counties of occurrence: Bibb						
ORDER ZINGIBERALES						
Family Cannaceae - Canna Family						
Canna flaccida	bandana-of-the-Everglades	G4?	S1			
Counties of occurrence: Baldwin, Geneva, Houston, Mobile						
Family Marantaceae - Arrowroot Family						
Thalia dealbata	powdery thalia	G4	S1			
Counties of occurrence: Baldwin						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Class Dicotyledoneae – *Dicots*

ORDER APIALES

Family Apiaceae - Carrot Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Harperella nodosa	harperella	G2	S1	LE		
Counties of occurrence: Cherokee, Cullman[4], DeKalb, Tuscaloosa[4]						
Lilaeopsis carolinensis	Carolina lilaeopsis	G3G5	S1			
Counties of occurrence: Covington, Mobile						
Ptilimnium costatum	eastern bishop-weed	G4	S1			
Counties of occurrence: Mobile, St. Clair						
Sium floridanum	Florida water-parsnip	G1Q	S1			
Counties of occurrence: Houston						

Family Araliaceae - Aralia Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Aralia racemosa	American spikenard	G4G5	S1			
Counties of occurrence: Etowah, Jackson						

ORDER ARISTOLOCHIIALES

Family Aristolochiaceae - Birthwort Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Hexastylis shuttleworthii var. *harperi*	Harper's wild ginger	G4T3	S2			
Counties of occurrence: Autauga, Bibb, Chilton, Perry, Russell						
Hexastylis speciosa	Harper's heartleaf[7]	G2	S2	UR		
Counties of occurrence: Autauga Chilton, Elmore						

ORDER ASTERALES

Family Asteraceae - Aster Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Ampelaster carolinianus	Carolina aster	G5	S1			
Counties of occurrence: Mobile						
Arnica acaulis	Leopardsbane	G4	SH			
Counties of occurrence: Houston						
Arnoglossum diversifolium	variable-leaved Indian-plantain	G2	S1	UR		
Counties of occurrence: Houston						
Arnoglossum sulcatum	Indian-plantain	G3	S3			
Counties of occurrence: Baldwin, Conecuh, Covington, Dale, Escambia, Geneva, Monroe, Pike						
Balduina atropurpurea	purple balduina	G2	SH	UR		
Counties of occurrence: Geneva[4]						
Bidens cernua	nodding beggar-ticks	G5	S1			
Counties of occurrence: Blount, Conecuh, Etowah, Shelby						
Bigelowia nuttallii	Nuttall's rayless goldenrod	G3G4	S3			
Counties of occurrence: Blount, Cherokee, DeKalb, Etowah, Jackson, Jefferson, Marshall						
Brickellia cordifolia	Flyr's brickell-bush	G2G3	S2			
Counties of occurrence: Bullock, Coffee, Conecuh, Covington, Crenshaw, Dale, Geneva, Henry, Houston, Lee, Macon, Pike, Russell						
Chrysopsis godfreyi	Godfrey's golden-aster	G2	S1			
Counties of occurrence: Baldwin						
Chrysopsis gossypina ssp. *cruiseana*	Cruise's golden-aster	G5T2	SH			
Cirsium lecontei	Le Conte’s thistle	G2G3	S1			
Counties of occurrence: Baldwin, Mobile						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Cirsium muticum	swamp thistle	G5	S1			
Counties of occurrence: Butler, Cherokee, Cleburne, Crenshaw, Pike						
Cirssium nuttallii	Nuttall's thistle	G5	S1			
Counties of occurrence: Mobile						
Coreopsis grandiflora var. *inclinata*	Ketona tickseed[7]	G5T2	S2			
Counties of occurrence: Bibb						
Coreopsis nudata	Georgia tickseed	G3?	S1			
Counties of occurrence: Baldwin, Geneva, Houston, Mobile						
Coreopsis pulchra	Woodland tickseed	G2	S2			
Counties of occurrence: Cherokee, DeKalb, Etowah, Jackson						
Echinacea pallida	pale-purple coneflower	G4	S2			
Counties of occurrence: Calhoun, Chambers, Greene, Lee, Sumter						
Echinacea simulata	wavy-leaf purple coneflower	G3	S1			
Counties of occurrence: Cherokee						
Erigeron strigosus var. *dolomitica*	Cahaba daisy fleabane[7]	G5T2?	S2?			
Counties of occurrence: Bibb						
Eurybia chapmanii	Chapman aster	G2G3	SH			
Counties of occurrence: Geneva, Houston, Mobile						
Eurybia eryngiifolia	coyote-thistle aster	G3G4	S1			
Counties of occurrence: Covington, Geneva						
Eurybia spectabilis	showy aster	G5	S2			
Counties of occurrence: Covington, DeKalb						
Eurybia surculosus	creeping aster	G4G5	S1			
Counties of occurrence: Jackson						
Helenium brevifolium	little leaf sneezeweed	G4	S1			
Counties of occurrence: Baldwin, Escambia, Geneva						
Helenium vernale	spring sneezeweed	G4?	S2			
Counties of occurrence: Baldwin, Escambia, Geneva						
Helianthus eggertii	Eggert's sunflower	G3	S2			
Counties of occurrence: Bibb, Blount, Butler, Calhoun, DeKalb, Franklin, Madison						
Helianthus glaucophyllus	white-leaved sunflower	G3G4	SH			
Counties of occurrence: Coosa, Jackson						
Helianthus longifolius	longleaf sunflower	G3	S1S2			
Counties of occurrence: Cherokee, DeKalb, Jackson						
Helianthus porteri	confederate daisy	G4	S2			
Counties of occurrence: Chambers, Lee, Randolph						
Helianthus smithii	Smith's sunflower	G2Q	S2			
Counties of occurrence: Bibb, Blount, Calhoun, Cherokee, Clay, Cleburne, Jackson[4], Lee[4], Marion[4], Randolph[4], Talladega						
Helianthus verticillatus	whorled sunflower	G1	S1	LE		
Counties of occurrence: Cherokee						
Iva microcephala	small-headed marsh-elder	G5	S1			
Counties of occurrence: Baldwin, Barbour, Conecuh, Houston, Mobile						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Jamesianthus alabamensis	jamesianthus	G3	S3			
Counties of occurrence: Bibb, Blount, Calhoun, Cleburne, Colbert, Franklin, Jefferson, Lowndes, Shelby, Winston						
Liatris chapmanii	Chapman's gay-feather	G5	S1			
Counties of occurrence: Baldwin, Escambia[4]						
Liatris cylindracea	slender blazing-star	G5	S2			
Counties of occurrence: Bibb						
Liatris oligocephala	Cahaba torch[7]	G1	S1			
Counties of occurrence: Bibb						
Lygodesmia aphylla	Rose rush	G4G5	S1			
Counties of occurrence: Houston						
Marshallia mohrii	Mohr's Barbara's buttons	G3	S3	LT		
Counties of occurrence: Bibb, Blount, Calhoun, Cherokee, Cullman[4], Etowah, Walker						
Mikania cordifolia	Florida Keys hempweed	G5	S2			
Counties of occurrence: Baldwin, Clarke, Geneva, Houston, Mobile, Monroe						
Phoebanthus tenuifolius	pineland false sunflower	G3	SH			
Counties of occurrence: Escambia						
Pityopsis oligantha	Coastal-Plain golden-aster	G2G4	S2			
Counties of occurrence: Covington, Escambia, Geneva						
Pityopsis pinifolia	golden aster	G4	S1			
Counties of occurrence: Autauga						
Polymnia laevigata	Tennessee leafcup	G3	S2S3			
Counties of occurrence: Bibb, Jackson, Madison, Tuscaloosa						
Prenanthes barbata	barbed rattlesnake-root	G3	S1S2			
Counties of occurrence: Cherokee, Clarke, Dallas, Etowah, Madison						
Pterocaulon virgatum	barbed rattlesnake-root	G5	S1			
Counties of occurrence: Escambia						
Rudbeckia auriculata	Wand blackroot	G2	S2	UR		
Counties of occurrence: Barbour, Blount, Covington, Crenshaw, Geneva, Jefferson, Pike, Shelby, St. Clair						
Rudbeckia heliopsidis	sun-facing coneflower	G2	S2	UR		
Counties of occurrence: Cherokee, DeKalb, Lee, Macon, Monroe						
Rudbeckia mollis	soft-hair coneflower	G3G5	S1			
Counties of occurrence: Henry, Houston						
Rudbeckia nitida	shiny coneflower	G3	S1			
Counties of occurrence: Conecuh						
Rudbeckia triloba var. *pinnatiloba*	pinnate-lobed black-eyed Susan	G5T3	S2S3			
Counties of occurrence: Autauga, Bibb, Dallas, Lowndes, Tallapoosa, Wilcox						
Silphium brachiatum	Cumberland rosinweed	G2G3	S2			
Counties of occurrence: Blount, Jackson, Madison, Marshall, Morgan						
Silphium glutinosum	sticky rosinweed[7]	G2	S2			
Counties of occurrence: Bibb						
Silphium mohrii	Mohr's rosinweed	G3?Q	S1			
Counties of occurrence: Cherokee, Jackson, Marshall						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Silphium perplexum	Old Cahaba rosinweed[7]	G1	S1			
Counties of occurrence: Dallas, Perry						
Silphium pinnatifidum	prairie-dock	G3Q	S2			
Counties of occurrence: Bullock, Colbert, DeKalb, Etowah, Franklin, Lawrence, Morgan						
Solidago arenicola	southern racemose goldenrod	G2G3	S1	UR		
Counties of occurrence: Blount						
Solidago buckleyi	Buckley's goldenrod	G4	S1			
Counties of occurrence: St. Clair						
Symphyotrichum ericoides	heath aster	G5	S1			
Counties of occurrence: Sumter						
Symphyotrichum georgianum	Georgia aster	G3	S3			
Counties of occurrence: Bibb, Blount, Clay, Etowah[4], Shelby[4], St. Clair[4], Talladega[4], Tuscaloosa[4]						
Symphyotrichum kralii	pale-violet aster	GNR	SH			
Counties of occurrence: Houston						
Symphyotrichum oolentangiense var. *oolentangiense*	sky blue aster	G5T5	S1			
Counties of occurrence: Calhoun						
Symphyotrichum pratense	barrens silky aster	G4?	S1			
Counties of occurrence: Etowah, Russell, Sumter						
Symphyotrichum sericeum	western silvery aster	G5	S1			
Counties of occurrence: Colbert						
Symphyotrichum simmondsii	Simmonds' aster	G4G5	S1			
Counties of occurrence: Mobile						
Thelesperma filifolium	stiff greenthread	G4G5	S1			
Counties of occurrence: Sumter						
Verbesina walteri	Carolina Crownbeard	G4	S1			
Counties of occurrence: Sumter, Wilcox						
ORDER CAMPANULALES						
Family Campanulaceae - Bellflower Family						
Lobelia boykinii	Boykin's lobelia	G2G3	S1	UR		
Counties of occurrence: Barbour, Henry, Houston						
ORDER CAPPARALES						
Family Brassicaceae - Mustard Family						
Arabis georgiana	Georgia rockcress	G1	S1	LT		
Counties of occurrence: Bibb, Dallas, Elmore, Monroe, Russell, Sumter, Wilcox						
Arabis patens	spreading rockcress	G3	S1			
Counties of occurrence: Marengo, Pickens						
Armoracia lacustris	lake cress	G4?	S1			
Counties of occurrence: Colbert, Greene, Lawrence, Limestone						
Draba ramosissima	branched Whitlow-grass	G4	S1			
Counties of occurrence: Marshall						
Leavenworthia alabamica	Alabama glade-cress[7]	G2	S2			
Counties of occurrence: Franklin, Lawrence						

[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Leavenworthia crassa fleshy-fruit glade cress[7] G2 S2 LE
Counties of occurrence: Lawrence, Morgan

Leavenworthia exigua var. *lutea* pasture glade-cress G4T1 S1
Counties of occurrence: Bibb, Jefferson, Marshall, St. Clair

Leavenworthia torulosa necklace glade cress G4 SX

Leavenworthia uniflora Michaux leavenworthia G4 S2
Counties of occurrence: Bibb, Lawrence, Madison, Morgan

Lesquerella densipila duck river bladderpod G3 S1
Counties of occurrence: Lawrence, Limestone, Morgan

Paysonia lyrata lyrate bladderpod[7] G1 S1 LT
Counties of occurrence: Colbert, Franklin, Lawrence

Warea sessilifolia sessile-leaved warea G2G4 S1
Counties of occurrence: Coffee, Dale, Henry, Houston, Mobile, Pike

Family Capparaceae - Caper Family

Polanisia tenuifolia slenderleaf clammy-weed G5 S1
Counties of occurrence: Baldwin

ORDER CARYOPHYLLALES

Family Caryophyllaceae - Pink Family

Paronychia argyrocoma Silvery nailwort G4 S1
Counties of occurrence: Dekalb

Paronychia herniarioides coastal plain nailwort G2G4 S1
Counties of occurrence: Autauga, Dallas

Paronychia rugelii Rugel’s nailwort G2? S1
Counties of occurrence: Geneva

Paronychia virginica yellow nailwort G4 S2
Counties of occurrence: Bibb

Silene caroliniana ssp. *wherryi* Wherry's catchfly G5T2T4Q S2
Counties of occurrence: Autauga, Bibb, Blount, Calhoun, Cherokee, Chilton, DeKalb, Etowah, Jefferson, Marshall, St. Clair, Shelby

Silene ovata ovate catchfly G3 S2
Counties of occurrence: Dallas, Etowah, Geneva, Henry, Madison, Marengo, Marshall, St. Clair

Silene regia royal catchfly G3G4 S2?
Counties of occurrence: Bibb, Monroe, Wilcox

Silene rotundifolia roundleaf catchfly G4 S1S2
Counties of occurrence: Jackson, Lawrence, Winston

Stellaria corei chickweed G4 S1

Stellaria fontinalis water stitchwort G3 S1 UR
Counties of occurrence: Lawrence

Family Nyctaginaceae - Four-o'clock Family

Mirabilis albida pale umbrella-wort G5 S2
Counties of occurrence: Bibb, Dallas, Franklin, Greene, Sumter

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[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Portulacaceae - Purslane Family						
Claytonia caroliniana	Carolina spring beauty	G5	S1			
Counties of occurrence: Jackson						
Phemeranthus calcaricum	limestone fame-flower	G3	S2			
Counties of occurrence: Franklin, Lawrence						
Phemeranthus parviflorum	small-flowered fame-flower	G5	S1			
Counties of occurrence: Coosa						
Phemeranthus teretifolium	quill fame-flower	G4	S1			
ORDER CELASTRALES						
Family Aquifoliaceae - Holly Family						
Ilex amelanchier	serviceberry holly	G4	S2			
Counties of occurrence: Baldwin, Houston, Mobile, Washington						
Family Celastraceae - Bittersweet Family						
Celastrus scandens	climbing bittersweet	G5	S1			
Counties of occurrence: Etowah						
ORDER DIPSACALES						
Family Adoxaceae - Moschatel Family						
Viburnum ashei	Ashe's arrowwood		S1			
Counties of occurrence: Escambia						
Viburnum bracteatum	limerock arrowwood	G1G2	S1			
Counties of occurrence: Calhoun, Etowah[4], Jackson, Madison						
Viburnum obovatum	small-leaf viburnum	G5	S1			
Counties of occurrence: Geneva, Houston						
Viburnum rafinesquianum	downy arrowwood	G5	S1			
Counties of occurrence: Limestone						
Family Caprifoliaceae - Honeysuckle Family						
Diervilla rivularis	mountain bush-honeysuckle	G3	S2			
Counties of occurrence: Jackson						
Triosteum angustifolium	yellowleaf tinker's-weed	G5	S1			
Counties of occurrence: Calhoun, Colbert, Dallas, Etowah, Franklin, Jackson, Jefferson, Morgan						
Family Valerianaceae - Valerian Family						
Valeriana pauciflora	valerian	G4	S1			
Counties of occurrence: Jackson, Madison						
ORDER EBENALES						
Family Sapotaceae - Sapote Family						
Sideroxylon reclinatum	buckthorn	G4G5	S1?			
Counties of occurrence: Houston						
Sideroxylon thornei	swamp buckthorn	G2	S1	UR		
Counties of occurrence: Baldwin, Clarke, Geneva, Houston						
ORDER ERICALES						
Family Clethraceae - Pepperbush Family						
Clethra acuminata	mountain pepper-bush	G4	S1			
Counties of occurrence: Clay						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Ericaceae - Heath Family						
Kalmia hirsuta	hairy laurel	G5	S2			
Counties of occurrence: Baldwin, Houston						
Pieris phillyreifolia	climbing fetter-bush	G3	S2			
Counties of occurrence: Covington, Geneva, Houston, Mobile						
Rhododendron austrinum	orange azalea	G3	S2S3			
Counties of occurrence: Baldwin, Butler, Coffee, Conecuh, Covington, Crenchaw, Dale, Escambia, Geneva, Mobile, Monroe						
Rhododendron colemanii	Red Hills azalea	G?	S1			
Counties of occurrence: Barbour, Butler, Clarke, Conecuh, Monroe, Pike, Russell						
Rhododendron cumberlandense	Cumberland azalea	G4?	S2			
Counties of occurrence: Calhoun, Clay, Jackson						
Rhododendron minus	Carolina rhododendron	G4	S2			
Counties of occurrence: Barbour, Coosa, Henry, Jackson, Monroe						
Rhododendron prunifolium	plumleaf azalea	G3	S2S3			
Counties of occurrence: Barbour, Henry, Lee, Russell						
Family Monotropaceae - Indian Pipe Family						
Monotropsis odorata var. *odorata*	sweet pinesap	G3T?	S1			
Counties of occurrence: Cullman, Hale, Lawrence						
ORDER EUPHORBIALES						
Family Buxaceae - Boxwood Family						
Pachysandra procumbens	Allegheny-spurge	G4G5	S2S3			
Counties of occurrence: Bibb, Bullock, Colbert, Franklin, Lamar, Lawrence, Lowndes, Monroe						
Family Euphorbiaceae - Spurge Family						
Croton alabamensis var. *alabamensis*	Alabama croton[7]	G3T3	S3			
Counties of occurrence: Bibb, Tuscaloosa						
Croton elliottii	Elliott's croton	G2G3	S1	UR		
Counties of occurrence: Barbour, Escambia, Geneva, Houston						
Euphorbia discoidalis	euphorbia	G3?Q	S2?			
Counties of occurrence: Baldwin						
Euphorbia inundata	Florida pine spurge	G4G5	S1			
Counties of occurrence: Baldwin[4]						
Phyllanthopsis phyllanthoides	maidenbush	G4	S2S3			
Counties of occurrence: Bibb, Blount						
Stillingia aquatica	water toothleaf	G4G5	S1			
Counties of occurrence: Baldwin, Houston						
ORDER FABALES						
Family Fabaceae - Pea Family						
Amorpha nitens	indigo bush	G3?	S1?			
Counties of occurrence: Elmore[4]						
Apios priceana	Price's potato-bean	G2	S2	LT		
Counties of occurrence: Autauga, Dallas, Jackson, Lawrence, Madison, Marshall, Monroe, Wilcox						
Astragalus canadensis	Canadian milkvetch	G5	S1			
Counties of occurrence: Dallas, Madison, Sumter						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Astragalus obcordatus	Florida milkvetch	G3G4	S1			
Counties of occurrence: Dallas						
Astragalus tennesseensis	Tennessee milkvetch	G3	S1S2			
Counties of occurrence: Lawrence, Morgan						
Astragalus villosus	hoary milkvetch	G4	S2			
Counties of occurrence: Baldwin[4], Butler, Coffee, Conecuh, Dale, Escambia[4], Mobile[4], Pike, Russell[4]						
Baptisia australis var. *aberrans*	blue wild indigo	G5T2		S1		
Counties of occurrence: Bibb						
Baptisia megacarpa	Apalachicola wild indigo	G2	S2	UR		
Counties of occurrence: Autauga, Bibb, Bullock, Crenshaw, Elmore, Henry, Lee, Lowndes, Macon, Montgomery, Pike, Tallapoosa						
Chamaecrista deeringiana	Florida senna	G2G4Q	S1			
Counties of occurrence: Covington, Escambia, Geneva, Houston						
Dalea cahaba	Cahaba prairie clover[7]	G2	S2			
Counties of occurrence: Bibb						
Dalea foliosa	leafy prairie clover	G2G3	S1	LE		
Counties of occurrence: Franklin, Lawrence, Jefferson, Morgan						
Dalea gattingeri	Gattinger's prairie clover	G3G4	S3			
Counties of occurrence: Cherokee, Franklin, Lawrence, Morgan						
Desmodium ochroleucum	cream tick-trefoil	G2G3	S2			
Counties of occurrence: Autauga, Clarke, Dallas, Greene, Hale, Lowndes, Madison, Monroe, Montgomery, Sumter, Wilcox						
Galactia floridana	Florida milk pea	G3G4	S1			
Counties of occurrence: Mobile						
Lathyrus venosus	smooth veiny peavine	G5	S1			
Counties of occurrence: Bibb, Cherokee, Chilton, Clay, St. Clair						
Orbexilum lupinellum	lupine scurfpea	G3G4	S1			
Counties of occurrence: Autauga[4], Pike						
Orbexilum simplex	single-stemmed scurf-pea	G4G5	S1			
Counties of occurrence: Mobile, Washington						
Pediomelum subacaule	Nashville breadroot	G4	S2			
Counties of occurrence: Colbert, Franklin, Lawrence						
Tephrosia mohrii	pineland hoary-pea	G3	S1?			
Counties of occurrence: Covington, Houston						
Thermopsis mollis	soft-haired thermopsis	G3G4	S1			
Counties of occurrence: Jackson, Marshall						

ORDER FAGALES

Family Fagaceae - Beech Family

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Castanea pumila var. *ozarkensis*	Ozark chinquapin	G5T3	SH			
Quercus arkansana	Arkansas oak	G3	S3			
Counties of occurrence: Autauga, Bibb, Chilton, Hale, Henry, Perry, Pike, Sumter						
Quercus boyntonii	Boynton's sand post oak	G1	S1			
Counties of occurrence: Blount, Etowah, St. Clair						

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4 Historic occurrence.

7 Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Quercus georgiana	Georgia oak	G3	S2			
Counties of occurrence: Chambers, Jefferson, St. Clair						
Quercus macrocarpa	bur oak	G5	S2			
Counties of occurrence: Montgomery, Pickens, Sumter						
Quercus minima	dwarf live oak	G5	S2			
Counties of occurrence: Baldwin, Geneva						
Quercus oglethorpensis	Oglethorpe's oak	G3	S1			
Counties of occurrence: Marengo, Sumter, Wilcox						
Quercus similis	bottomland-post oak	G4	S1			
Counties of occurrence: Mobile						
ORDER GENTIANALES						
Family Apocynaceae - Dogbane Family						
Amsonia rigida	stiff blue-star	G4	S1			
Counties of occurrence: Geneva, Houston						
Family Asclepiadaceae - Milkweed Family						
Asclepias cinerea	Carolina milkweed	G4?	S1			
Counties of occurrence: Covington, Geneva						
Asclepias exaltata	poke milkweed	G5	S1			
Counties of occurrence: Etowah, Jackson, Winston						
Asclepias rubra	red milkweed	G4G5	S1			
Counties of occurrence: Autauga. Covington, Escambia						
Asclepias tomentosa	velvet milkweed	G4	SH			
Counties of occurrence: Covington, Geneva						
Asclepias viridula	southern milkweed	G2	S1			
Counties of occurrence: Houston						
Matelea alabamensis	Alabama anglepod	G2	S1			
Counties of occurrence: Henry						
Matelea baldwyniana	Baldwin's milkvine	G3	S1			
Counties of occurrence: Barbour, Clarke, Monroe, Tallapoosa, Wilcox						
Family Gentianaceae - Gentian Family						
Sabatia brevifolia	short-leaved pink	G3G4	S1			
Counties of occurrence: Baldwin						
Sabatia capitata	rose gentian	G2	S2			
Counties of occurrence: Calhoun, Chilton, Clay, Cleburne, DeKalb, St. Clair						
Sabatia grandiflora	large-flowered pink	G3G4	S1?			
Sabatia quadrangula	four-angled pink	G4G5	SH			
Counties of occurrence: Houston						
Family Loganiaceae - Logania Family						
Mitreola angustifolia	narrow-leaf miterwort	G4G5	S1			
Counties of occurrence: Houston						
Spigelia alabamensis	Alabama pinkroot[7]	G1	S1			
Counties of occurrence: Bibb						
Spigelia gentianoides	gentian pinkroot	G1	S1	LE		
Counties of occurrence: Geneva						

4 Historic occurrence.
7 Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

ORDER GERANIALES
Family Oxalidaceae - Oxalis Family

Oxalis grandis	giant wood-sorrel	G4G5	S1			

Counties of occurrence: Jackson, Madison,

ORDER HALORAGALES
Family Haloragaceae - Water-milfoil Family

Myriophyllum laxum	loose water-milfoil	G3	S2			

Counties of occurrence: Conecuh, Covington, Escambia, Mobile, Washington

ORDER HAMAMELIDALES
Family Hamamelidaceae - Witch-hazel Family

Fothergilla gardenii	dwarf witch-alder	G3G4	S1			

Counties of occurrence: Baldwin, Escambia[4], Geneva

Fothergilla major	mountain witch-alder	G3	S2			

Counties of occurrence: Blount, Cherokee, Cullman, DeKalb, Franklin, Jackson, Marshall, St. Clair

Hamamelis ovalis	Mississippi witch hazel	G1	S1			

Counties of occurrence: Clarke, Covington, Monroe, Wilcox

ORDER ILLICIALES
Family Schisandraceae - Starvine Family

Schisandra glabra	bay starvine	G3	S2			

Counties of occurrence: Bibb, Clarke, Monroe

ORDER JUGLANDALES
Family Juglandaceae - Walnut Family

Juglans cinerea	butternut	G4	S1			

Counties of occurrence: DeKalb, Jackson, Lawrence, Madison, Winston

ORDER LAMIALES
Family Boraginaceae - Borage Family

Onosmodium decipiens	Alabama marbleseed[7]	G2	S2			

Counties of occurrence: Bibb

Onosmodium molle ssp. *molle*	soft false gromwell	G4G5T3	S2			

Counties of occurrence: Franklin, Lawrence, Wilcox

Onosmodium molle ssp. *subsetosum*	false gromwell	G4G5T4	S1			

Counties of occurrence: Madison

Family Lamiaceae - Mint Family

Agastache nepetoides	yellow giant hyssop	G5	S1			

Counties of occurrence: Jackson, Lawrence, Madison, Marshall

Blephilia subnuda	smooth blephilia	G1G2	S1S2			

Counties of occurrence: Jackson, Madison

Clinopodium glabellum	Ozark savory	G3Q	S1			

Counties of occurrence: Jefferson

Dicerandra fumella	large-flowered pennyroyal	G4G5	S2			

Counties of occurrence: Barbour Butler, Conecuh, Covington, Dale, Escambia, Geneva, Houston

Hedeoma drummondii	Drummond's pennyroyal	G5	S2			

Counties of occurrence: Greene, Lowndes, Marengo, Sumter

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Monarda clinopodia	basil bee-balm	G5	S2			
Counties of occurrence: Etowah, Jackson, Jefferson, Lauderdale, Madison, Shelby						
Physostegia leptophylla	slenderleaf false dragonhead	G4?	SH			
Counties of occurrence: Baldwin						
Pycnanthemum curvipes	a mountain-mint	G3	S1?			
Counties of occurrence: Calhoun, Chambers, Lee, Randolph						
Pycnanthemum nudum	Coastal Plain mountain mint	G5	S1			
Counties of occurrence: Covington, Geneva						
Pycnanthemum virginianum	Virginia mountain mint	G5	S1			
Counties of occurrence: Cherokee						
Scutellaria alabamensis	Alabama skullcap[7]	G2	S2			
Counties of occurrence: Bibb, Calhoun, Coosa, Cullman, Etowah, Jefferson, Lawrence, Shelby, St. Clair, Tuscaloosa						
Scutellaria glabriuscula	glabrous skullcap	G2?	S1			
Counties of occurrence: Covington, Geneva						
Stachys alabamica	Alabama hedge-nettle	G1	S1			
Counties of occurrence: Clay						
Stachys nelsonii	Nelson's hedge-nettle	G1	S1			
Counties of occurrence: Talladega						
Synandra hispidula	Guyandotte beauty	G4	S1			
Counties of occurrence: Jackson						
ORDER LAURALES						
Family Lauraceae - Laurel Family						
Lindera melissifolia	pondberry	G2G3	S1	LE		
Counties of occurrence: Covington, Wilcox[4]						
Lindera subcoriacea	bog spicebush	G2G3	S1	UR		
Counties of occurrence: Baldwin, Clarke, Escambia, Mobile						
ORDER LINALES						
Family Linaceae - Flax Family						
Linum macrocarpum	flax	G2	S1			
Counties of occurrence: Baldwin, Escambia, Mobile, Washington						
Linum sulcatum var. *harperi*	Harper's grooved-yellow flax	G5T2	S1			
Counties of occurrence: Autauga, Colbert, Dallas, Franklin, Hale, Lawrence, Lowndes, Marengo, Sumter						
ORDER MAGNOLIALES						
Family Magnoliaceae - Magnolia Family						
Magnolia fraseri	Fraser's magnolia	G5	S1			
ORDER MALVALES						
Family Malvaceae - Mallow Family						
Callirhoe alcaeoides	clustered poppy-mallow	G5?	S2			
Counties of occurrence: Bibb, Morgan						
Callirhoe papaver	woods poppy-mallow	G5	S1			
Counties of occurrence: Washington						
Callirhoe triangulata	clustered poppy-mallow	G3?	S1			
Counties of occurrence: Autauga[4], Elmore, Sumter						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Hibiscus coccineus	brilliant hibiscus	G4?	S1			
Counties of occurrence: Mobile, Wilcox						
Kosteletzkya smilacifolia	southern seashore mallow	G1G3Q	S1?			
Counties of occurrence: Mobile						
ORDER MYRTALES						
Family Melastomataceae - Melastome Family						
Rhexia aristosa	awned meadowbeauty	G3G4	S1			
Counties of occurrence: Barbour, Henry						
Rhexia parviflora	small-flowered meadowbeauty	G2	S1	UR		
Counties of occurrence: Covington, Escambia, Geneva						
Rhexia salicifolia	panhandle meadowbeauty	G2	S1	UR		
Counties of occurrence: Covington, Houston						
Family Onagraceae - Evening Primrose Family						
Epilobium coloratum	purple-leaf willow-herb	G5	S1			
Ludwigia arcuata	pond seedbox	G4G5	S1			
Counties of occurrence: Mobile						
Ludwigia spathulata	spathulate seedbox	G2	S1S2	UR		
Counties of occurrence: Covington, Geneva, Houston, Mobile						
Oenothera heterophylla	vari-leaf evening-primrose	G4	S2			
Counties of occurrence: Dallas, Greene, Pickens, Sumter						
ORDER NEPENTHALES						
Family Droseraceae - Sundew Family						
Drosera rotundifolia	round-leaved sundew	G5	S1			
Counties of occurrence: Lawrence						
Family Sarraceniaceae - Pitcher-plant Family						
Sarracenia leucophylla	whitetop pitcher-plant	G3	S3			
Counties of occurrence: Baldwin, Conecuh, Covington, Escambia, Geneva, Mobile, Monroe, Washington						
Sarracenia oreophila	green pitcher-plant	G2	S2	LE		
Counties of occurrence: Cherokee, DeKalb, Elmore[4], Etowah, Jackson, Marshall						
Sarracenia rubra ssp. *alabamensis*	Alabama canebrake pitcher-plant[7]	G4T1T2	S1S2	LE		
Counties of occurrence: Autauga, Chilton, Elmore						
Sarracenia rubra ssp. *wherryi*	Wherry's sweet pitcher-plant	G4T3	S3	UR		
Counties of occurrence: Baldwin, Covington, Escambia, Mobile, Monroe, Washington						
ORDER NYMPHAEALES						
Family Nymphaeaceae - Water Lily Family						
Nuphar lutea ssp. *ulvacea*	west Florida cowlily	G5T2	S1	UR		
Counties of occurrence: Baldwin, Mobile						
ORDER PAPAVERALES						
Family Fumariaceae						
Dicentra cucullaria	Dutchman's breeches	G5	S2			
Counties of occurrence: Calhoun, Colbert, Etowah, Jackson, Lauderdale, Lawrence, Madison, Marshall						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Papaveraceae - Poppy Family						
Stylophorum diphyllum	celandine poppy	G5	S1			
Counties of occurrence: Colbert, Jackson, Madison						
ORDER PLANTAGINALES						
Family Plantaginaceae - Plantain Family						
Chelone obliqua var. *obliqua*	red turtlehead	G4T3T4Q	S1			
Counties of occurrence: Calhoun, Randolph, Talladega						
Chelone lyonii	pink turtlehead	G4	S1			
Counties of occurrence: DeKalb, Jackson						
Collinsia verna	blue-eyed Mary	G5	S1			
Counties of occurrence: Colbert						
Gratiola pusilla	granite pool sprite	G2	S1	LT		
Counties of occurrence: Chambers, Randolph, Tallapoosa						
Penstemon multiflorus	many-flower beardtongue	G4	S1			
Counties of occurrence: Baldwin, Covington, Escambia, Houston						
Penstemon kralii	Kral's beardtongue	G2	S1			
Counties of occurrence: Jackson, Madison						
Penstemon smallii	Small's beardtongue	G3	S1			
Plantago cordata	heart-leaved plantain	G4	S2			
Counties of occurrence: Bibb, Butler, Cherokee, Colbert, Lowndes, Wilcox						
Veronicastrum virginicum	Culver's root	G4	S1			
Counties of occurrence: Bibb, Coosa, Dallas						
ORDER POLYGALALES						
Family Polygalaceae - Milkwort Family						
Polygala balduinii	white milkwort	G4	S1?			
Polygala crenata	crenate milkwort	G4?	S1			
Counties of occurrence: Baldwin, Mobile						
Polygala hookeri	Hooker's milkwort	G3	S1S2			
Counties of occurrence: Baldwin, Covington, Escambia, Geneva						
Polygala senega var. *latifolia*	Seneca snakeroot	G4G5T?	S1			
Counties of occurrence: Franklin, Jackson						
ORDER POLYGONALES						
Family Polygonaceae - Buckwheat Family						
Eriogonum longifolium var. *harperi*	Harper's umbrella plant	G4T2	S1			
Counties of occurrence: Colbert, Franklin, Lawrence, Madison						
Polygonella americana	southern jointweed	G5	S1			
Counties of occurrence: Blount, Cherokee, Cullman, DeKalb, Lamar						
Polygonella macrophylla	large-leaved jointweed	G3	S1			
Counties of occurrence: Baldwin						
ORDER PRIMULALES						
Family Primulaceae - Primrose Family						
Dodecatheon frenchii	French's shooting star	G3	S1			
Counties of occurrence: Colbert						
Hottonia inflata	featherfoil	G4	S2			
Counties of occurrence: Dallas, Greene, Jefferson, Macon, Madison, Montgomery, Perry						
Lysimachia fraseri	Fraser's loosestrife	G3	S1			

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Counties of occurrence: Calhoun, St. Clair						
Lysimachia graminea	grass-leaf loosestrife	G1Q	S1			
Counties of occurrence: Cherokee						
Lysimachia lewisii	Lewis's yellow loosestrife	G2	S1			
Counties of occurrence: Blount						
ORDER RANUNCULALES						
Family Berberidaceae - Barberry Family						
Berberis canadensis	American barberry	G3	SH			
Counties of occurrence: Jefferson[4], Lee[4]						
Jeffersonia diphylla	twinleaf	G5	S2			
Counties of occurrence: Jackson, Madison						
Family Ranunculaceae - Buttercup Family						
Aconitum uncinatum	blue monkshood	G4	S1			
Actaea rubifolia	Appalachian bugbane	G3	S1			
Counties of occurrence: Madison						
Clematis morefieldii	Morefield's leather-flower	G2	S2	LE		
Counties of occurrence: Jackson, Madison						
Clematis socialis	Alabama leather-flower	G1	S1	LE		
Counties of occurrence: Cherokee, Etowah, St. Clair						
Delphinium alabamicum	Alabama larkspur[7]	G3	S2			
Counties of occurrence: Autauga, Blount, Butler, Dallas, Franklin, Jefferson, Lawrence, Lowndes, Monroe, Morgan[4]						
Delphinium carolinianum ssp. *calciphilum*	prairie larkspur	G5T2T4	S1			
Enemion biternatum	false rue-anemone	G5	S2			
Counties of occurrence: Bibb, Colbert, Conecuh, Jackson, Madison, Tuscaloosa, Winston						
Hydrastis canadensis	golden seal	G3G4	S2			
Counties of occurrence: Blount, Franklin, Jackson, Lawrence, Marshall						
Ranunculus flabellaris	yellow water-crowfoot	G5	S1			
Counties of occurrence: Greene, Limestone, Madison, Sumter						
Ranunculus longirostris	eastern white water crowfoot	G5	S1			
Counties of occurrence: Morgan						
Thalictrum debile	southern meadowrue	G2	S2	UR		
Counties of occurrence: Colbert, Greene, Lawrence, Madison, Pickens, Sumter, Wilcox						
Thalictrum mirabile	Little Mountain meadowrue	G3Q	S2			
Counties of occurrence: Colbert, Franklin, Lawrence, Winston						
ORDER RHAMNALES						
Family Rhamnaceae - Buckthorn Family						
Ceanothus microphyllus	Little-leaf buckbrush		S2			
Counties of occurrence: Bakdwin, Covington, Escambia, Geneva, Houston						
Rhamnus lanceolata	lance-leaved buckthorn	G5	S2			
Counties of occurrence: Butler, Dallas, Hale, Lowndes, Pickens, Sumter						
Sageretia minutiflora	tiny-leaved buckthorn	G4	S1			
Counties of occurrence: Baldwin, Mobile						

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Family Vitaceae - Grape Family						
Vitis mustangensis	mustang grape	G4?	S1			
Counties of occurrence: Wilcox						
ORDER ROSALES						
Family Crassulaceae - Stonecrop Family						
Sedum nevii	Nevius' stonecrop	G3	S3			
Counties of occurrence: Bibb, Fayette, Greene, Hale, Jefferson, Talladega, Tuscaloosa, Walker						
Family Grossulariaceae - Gooseberry Family						
Ribes curvatum	granite gooseberry	G4	S2			
Counties of occurrence: DeKalb, Jackson, Marshall						
Ribes cynosbati	prickly gooseberry	G5	S1S2			
Counties of occurrence: Cherokee, DeKalb, Jackson, Madison, Marshall						
Family Rosaceae - Rose Family						
Agrimonia incisa	incised groovebur	G3	S2			
Counties of occurrence: Baldwin, Bullock, Covington, Geneva, Mobile, Pike, Washington						
Crataeus aemula	Rome hawthorn	G2G3	S1			
Crataegus ashei	Ash's hawthorn	G1	S1			
Counties of occurrence: Autauga, Dallas, Lowndes, Montgomery						
Crataegus triflora	three-flowered hawthorn	G2G3	S2			
Counties of occurrence: Autauga, Clarke, Colbert, Crenshaw, Dallas, Franklin, Marion, Montgomery, Sumter						
Geum vernum	spring avens	G5	S1			
Counties of occurrence: Lawrence, Morgan						
Geum virginianum	pale avens	G5	S2			
Counties of occurrence: Jackson, Madison						
Neviusia alabamensis	Alabama snow-wreath	G2	S2			
Counties of occurrence: Bibb, Blount, Jackson, Jefferson, Limestone, Madison, St. Clair, Tuscaloosa						
Rubus allegheniensis	Allegheny blackberry	G5	S1			
Counties of occurrence: Madison						
Spiraea tomentosa	hardhack	G5	S1			
Counties of occurrence: Jackson						
Waldsteinia lobata	Piedmont barren strawberry	G2G3	S1	UR		
Counties of occurrence: Lee, Randolph						
Family Saxifragaceae - Saxifrage Family						
Boykinia aconitifolia	brook saxifrage	G4	S1			
Counties of occurrence: Franklin, Marion						
Chrysosplenium americanum	American golden-saxifrage	G5	SH			
Counties of occurrence: Madison[4]						
Heuchera longiflora	long-flower alumroot	G4	S1			
Counties of occurrence: Clay, Talladega						
Lepuropetalon spathulatum	southern lepuropetalon	G4G5	S2			
Counties of occurrence: Butler, Choctaw, Conecuh Crenshaw, Lee[4], Marengo, Mobile, Monrore, Sumter						
Mitella diphylla	miterwort	G5	S1			
Counties of occurrence: Jackson, Morgan						

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Parnassia asarifolia — kidneyleaf grass-of-parnassus — G4 — S2
Counties of occurrence: Clay, Cleburne, Jackson, Lee

Parnassia grandifolia — large-leaved grass-of-parnassus — G3 — S1
Counties of occurrence: Bibb, Choctaw[4], Washington[4]

ORDER RUBIALES
Family Rubiaceae - Madder Family

Galium lanceolatum — Torrey's wild licorice — G5 — S1

ORDER SALICALES
Family Salicaceae - Willow Family

Salix floridana — Florida willow — G2 — S1 — UR
Counties of occurrence: Butler, Covington, Houston

ORDER SANTALALES
Family Santalaceae - Sandalwood Family

Comandra umbellata — bastard toad-flax — G5 — S1
Counties of occurrence: Colbert, Jackson

Nestronia umbellula — nestronia — G4 — S3
Counties of occurrence: Bibb, Cherokee, Clarke, DeKalb, Hale, Lowndes, Marshall, Pike, Winston

Pyrularia pubera — buffalo-nut — G5 — S2
Counties of occurrence: Cherokee, Cleburne, DeKalb, Tallapoosa

ORDER SAPINDALES
Family Anacardiaceae - Cashew Family

Cotinus obovatus — American smoketree — G4 — S2
Counties of occurrence: DeKalb, Jackson, Madison, Morgan

Family Rutaceae - Rue Family

Zanthoxylum americanum — northern prickley ash — G5 — S1
Counties of occurrence: Bibb, Lowndes, Montgomery, Tuscaloosa

ORDER SCROPHULARIALES
Family Acanthaceae - Acanthus Family

Dyschoriste oblongifolia — oblong-leaved dyschoriste — G4G5 — S1
Counties of occurrence: Barbour, Henry, Houston

Ruellia noctiflora — night-flowering wild-petunia — G2 — S1
Counties of occurrence: Baldwin, Covington, Escambia, Mobile

Family Lentibulariaceae - Bladderwort Family

Pinguicula planifolia — Chapman's butterwort — G3? — S1S2
Counties of occurrence: Baldwin, Covington, Mobile

Pinguicula pumila — small butterwort — G4 — S1?

Utricularia floridana — Florida bladderwort — G3G5 — S1S2
Counties of occurrence: Covington, Houston, Mobile

Utricularia inflata — swollen bladderwort — G5 — S1S2
Counties of occurrence: Autauga, Baldwin, Chilton

Utricularia olivacea — dwarf bladderwort — G4 — S1
Counties of occurrence: Baldwin

[4] Historic occurrence.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Utricularia resupinata Counties of occurrence: Covington	northeastern bladderwort	G4	S1S2			
Family Orobanchaceae - Broomrape Family						
Agalinis aphylla Counties of occurrence: Baldwin, Mobile, Washington	leafless false-foxglove	G3G4	S2			
Agalinis auriculata Counties of occurrence: Montgomery[4], Morgan[4], Pickens, Wilcox[4]	auriculate false-foxglove	G3	S1			
Agalinis divaricata Counties of occurrence: Covington, Geneva	pineland false-foxglove	G3?	S1			
Agalinis filicaulis Counties of occurrence: Mobile	thin-stemmed false-foxglove	G3G4	S2			
Agalinis gattingeri	Gattinger's false-foxglove	G4	SH			
Agalinis georgiana Counties of occurrence: Covington, Geneva	Georgia false-foxglove	GNR	S1			
Agalinis heterophylla Counties of occurrence: Bullock, Dallas, Elmore, Hale, Marengo, Montgomery, Perry, Sumter	prairie false-foxglove	G4G5	S2			
Agalinis linifolia Counties of occurrence: Baldwin, Covington, Houston, Mobile	flax-leaf false-foxglove	G4?	S2			
Agalinis oligophylla Counties of occurrence: Dallas, Sumter	ridge-stem false-foxglove	G4	S1			
Aureolaria patula Counties of occurrence: Cherokee	spreading false-foxglove	G3	S1			
Castilleja coccinea Counties of occurrence: DeKalb, Jackson, Madison, Marshall	scarlet Indian paintbrush	G5	S1			
Castilleja kraliana Counties of occurrence: Bibb	Cahaba paintbrush[7]	G2	S2			
Macranthera flammea Counties of occurrence: Conecuh, Covington, Crenshaw, Escambia, Geneva, Mobile	flame flower	G3	S2			
Orobanche uniflora Counties of occurrence: Bibb, Blount, Bullock, Cherokee, Cullman, DeKalb, Etowah, Jackson, Marshall	one-flowered broomrape	G5	S2			
Schwalbea americana Counties of occurrence: Baldwin, Bullock, Geneva[4], Mobile[4]	chaffseed	G2G3	S1	LE		
ORDER SOLANALES						
Family Convolvulaceae - Morning-glory Family						
Evolvulus sericeus var. *sericeus* Counties of occurrence: Dallas	creeping morning-glory	G5T3T5	S1			
Stylisma aquatica Counties of occurrence: Covington, Dallas, Escambia, Geneva, Houston	water southern morning-glory	G4	S2			
Stylisma pickeringii var. *pickeringii* Counties of occurrence: Autauga, Dallas, Wilcox	Pickering's morning-glory	G4T3	S1			

[4] Historic occurrence.
[7] Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Family Cuscutaceae - Dodder Family

Cuscuta harperi — Harper's dodder — G2G3 — S2
Counties of occurrence: Chambers, Cherokee, DeKalb, Etowah, Franklin, Jackson, Jefferson, Marion, Marshall, Winston

Family Hydrophyllaceae - Waterleaf Family

Hydrophyllum appendiculatum — appendage waterleaf — G5 — S2?
Counties of occurrence: Jackson

Phacelia dubia var. *georgiana* — outcrop small-flower phacelia — G5T3 — S2
Counties of occurrence: Chambers, Chilton, Lee, Randolph, Tallapoosa

Phacelia strictiflora var. *robbinsii* — prairie scorpion-weed — G5T4 — S1
Counties of occurrence: Sumter

Family Polemoniaceae - Phlox Family

Phlox pulchra — Wherry's phlox[7] — G1 — S1
Counties of occurrence: Autauga, Bibb, Butler, Elmore, Lawrence, Pike, Shelby, Winston

Family Solanaceae - Nightshade Family

Lycium carolinianum — Christmas berry — G4 — S1S2
Counties of occurrence: Mobile

Calliphysalis carpenteri — carpenter's ground-cherry — G3 — S1
Counties of occurrence: Autauga, Monroe, Wilcox

Solanum carolinense var. *hirsutum* — horse-nettle — G5T1 — S1
Counties of occurrence: Bibb, Coosa

ORDER THEALES

Family Hypericaceae - St. John's-wort Family

Hypericum dolabriforme — straggling St. John's-wort — G4 — SH
Counties of occurrence: Cherokee[4]

Hypericum harperi — Harper's St. John's-wort — G3G4 — S1
Counties of occurrence: Henry, Houston

Hypericum lloydii — Lloyd St. John's-wort — G4? — S1
Counties of occurrence: Randolph

Hypericum microsepalum — Flatwoods St. John's-wort — G4 — S1
Counties of occurrence: Houston

Hypericum nitidum — Carolina St. John's-wort — G4 — S2
Counties of occurrence: Covington

Hypericum nudiflorum — pretty St. John's-wort — G5 — S2
Counties of occurrence: Bibb, Butler, Choctaw, Clarke, Crenshaw, Henry, Lee, Madison, Tallapoosa, Wilcox

Hypericum reductum — Atlantic St. John's-wort — G5 — S2
Counties of occurrence: Baldwin, Covington, Escambia, Geneva, Mobile, Washington

Family Theaceae - Tea Family

Gordonia lasianthus — loblolly bay — G5 — S1
Counties of occurrence: Baldwin, Houston, Mobile, Monroe

Stewartia malacodendron — silky camellia — G4 — S2S3
Counties of occurrence: Barbour, Bibb, Blount, Bullock, Butler, Chilton, Coosa, Dale, DeKalb, Geneva, Houston, Jackson, Marshall, Pike, Shelby

---

4 Historic occurrence.
7 Alabama endemic.

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status

Stewartia ovata — mountain camellia — G4 — S2S3
Counties of occurrence: Cullman, DeKalb, Franklin, Jackson, Lamar, Lawrence, Marion, Winston

ORDER Urticales
Family Urticceae - Nettle Family

Pilea fontana — springs clearweed — G5 — S1
Counties of occurrence: Houston, Jackson

ORDER VIOLALES
Family Cistaceae - Rockrose Family

Helianthemum arenicola — coastal-sand frostweed — G3 — S1
Counties of occurrence: Baldwin, Mobile

Family Violaceae - Violet Family

Viola canadensis — Canada violet — G5 — S2
Counties of occurrence: Autauga, Butler, DeKalb, Jackson, Lowndes, Tuscaloosa

Viola egglestonii — Eggleston's violet — G4 — S1
Counties of occurrence: Franklin, Lawrence

Class Pinopsida – *Conifers*

ORDER PINALES
Family Cupressaceae - Cypress Family

Juniperus communis — ground juniper — G5 — S1
Counties of occurrence: Calhoun

Family Pinaceae - Pine Family

Pinus clausa — sand pine — G4 — S2
Counties of occurrence: Baldwin

Pinus serotina — pond pine — G5 — S1
Counties of occurrence: Barbour, Butler, Covington, Geneva, Pike

Non-vascular plants

MOSSES

Class Bryopsida – *Mosses With Arthrodontous Peristome*

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
ORDER ARCHIDIALES						
Family Archidiaceae						
Archidium tenerrimum	large-spored moss	G5?	S1?			
ORDER BRYALES						
Family Bryaceae						
Brachymenium macrocarpon	tree moss	GNRQ	S1?			
ORDER DICRANALES						
Family Bryoxiphiaceae						
Bryoxiphium norvegicum	sword moss	G5?	S1			
Family Dicranaceae						
Dichodontium pellucidum	a moss	G4G5	S1			
ORDER FISSIDENTALES						
Family Fissidentaceae						
Fissidens hyalinus	filmy fissidens	GNR	S1			
Fissidens kegelianus	fan moss	GNRQ	S1?			
Fissidens neonii	moss	G2?	S1?			
ORDER GRIMMIALES						
Family Grimmiaceae						
Schistidium rivulare	streamside schistidium moss	G4G5	S2?			
Counties of occurrence: Jackson						
ORDER LEUCODONTALES						
Family Fontinalaceae						
Fontinalis welchiana	difficult moss	GU	S1?			
Counties of occurrence: DeKalb						
ORDER POTTIALES						
Family Calymperaceae						
Syrrhopodon prolifer	moss	G5	S1			
Family Pottiaceae						
Tortula rhizophylla	moss	G3G5	S1			
Counties of occurrence: Shelby						
Trichostomum crispulum	moss	G4G5	S2			
Counties of occurrence: Morgan						

LIVERWORTS

Class Jungermanniopsida – *Liverworts*

ORDER JUNGERMANNIALES
Family Jubulaceae

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Status	SWAP Status
Frullania riparia	liverwort	G4G5	S1?			
Counties of occurrence: Jackson						
Family Lejeuneaceae						
Cheilolejeunea evansii	liverwort	G1G2	S1			
Cololejeunea ornata	liverwort	G2G4	S1			
Counties of occurrence: Jackson						
Lejeunea blomquistii	liverwort	GNR	S1			
Lejeunea cardoti	liverwort	G3	S1			
Counties of occurrence: Lamar						
Family Plagiochilaceae						
Homaliadelphus sharpii	liverwort	GNR	S1			
Myurella siberica	liverwort	GNR	S1			

EXTINCT SPECIES THAT ONCE OCCURRED IN ALABAMA

Class Aves – *Birds*

ORDER COLUMBIFORMES - Pigeons and Doves
Family Columbidae - Doves and Pigeons

Ectopistes migratorius	passenger pigeon

ORDER PSITTACIFORMES - Parrots
Family Psittacidae - Lorises, Parakeets, Macaws, and Parrots

Conuropsis carolinensis	Carolina parakeet

Class Actinopterygii – *Ray-finned Fishes*

ORDER CYPRINODONTIFORMES - Topminnows, Livebearers, and Allies
Family Fundulidae - Topminnows

Fundulus albolineatus	whiteline topminnow[7]

ORDER CYPRINIFORMES - Carps, Minnows, and Suckers
Family Catostomidae - Suckers

Moxostoma lacerum	harelip sucker

Class Bivalvia – *Bivalves (Clams & Mussels)*

ORDER UNIONOIDA - Freshwater Mussels
Family Margaritiferidae

Alasmidonta mccordi	Coosa elktoe[7]
Elliptio nigella	winged spike
Epioblasma arcaeformis	sugarspoon
Epioblasma biemarginata	angled riffleshell
Epioblasma cincinnatiensis	Gulf riffleshell
Epioblasma flexuosa	leafshell
Epioblasma haysiana	acornshell
Epioblasma lenior	narrow catspaw
Epioblasma lewisii	forkshell
Epioblasma personata	round combshell
Epioblasma propinqua	Tennessee riffleshell
Epioblasma stewardsonii	Cumberland leafshell
Epioblasma torulosa torulosa	tubercled blossom
Epioblasma turgidula	turgid blossom
Fusconaia apalachicola	Apalachicola ebonyshell
Lampsilis binominata	lined pocketbook
Medionidus mcglameriae	Tombigbee moccasinshell[7]
Obovaria haddletoni	Haddleton lampmussel[7]
Pleurobema fibuloides	Kusha pigtoe
Pleurobema marshalli	flat pigtoe
Pleurobema verum	true pigtoe[7]

[7] Alabama endemic.

Class Gastropoda – *Gastropods (Snails & Slugs)*

ORDER BASOMMATOPHORA

Family Planorbidae - Rams-horn Snails

Amphigyra alabamensis	shoal sprite[7]
Neoplanorbis carinatus	carinate flat-top snail[7]
Neoplanorbis smithi	angled flat-top snail[7]
Neoplanorbis tantillus	little flat-top snail[7]
Neoplanorbis umbilicatus	umbilicate flat-top snail[7]

ORDER NEOTAENIOGLOSSA

Family Hydrobiidae - Pebblesnails

Clappia umbilicata	umbilicate pebblesnail[7]
Marstonia olivacea	olive marstonia[7]

Family Pleuroceridae - Horn, River, and Rock Snails

Elimia brevis	short-spire elimia[7]
Elimia capillaris	spindle elimia
Elimia clausa	closed elimia[7]
Elimia fusiformis	fusiform elimia[7]
Elimia gibbera	shouldered elimia
Elimia hartmaniana	high-spired elimia[7]
Elimia impressa	constricted elimia[7]
Elimia jonesi	hearty elimia[7]
Elimia laeta	ribbed elimia[7]
Elimia macglameriana	Macglamery's Coosa river snail
Elimia pilsbryi	rough-lined elimia[7]
Elimia pupaeformis	pupa elimia[7]
Elimia pupoidea	bot elimia[7]
Elimia pygmaea	pygmy elimia[7]
Gyrotoma excisa	excised slitshell[7]
Gyrotoma lewisii	striate slitshell[7]
Gyrotoma pagoda	pagoda slitshell[7]
Gyrotoma pumila	ribbed slitshell[7]
Gyrotoma pyramidata	pyramid slitshell[7]
Gyrotoma walkeri	round slitshell[7]
Leptoxis clipeata	agate rocksnail[7]
Leptoxis formosa	maiden rocksnail
Leptoxis ligata	rotund rocksnail[7]
Leptoxis lirata	lirate rocksnail[7]
Leptoxis minor	knob mudalia[7]
Leptoxis occultata	bigmouth rocksnail[7]
Leptoxis showalterii	Coosa rocksnail[7]
Leptoxis torrefacta	squat rocksnail[7]
Leptoxis vittata	striped rocksnail[7]

Family Pomatiopsidae - Seep Snails

Pomatiopsis hinkleyi	Dixie seep snail

[7] Alabama endemic.

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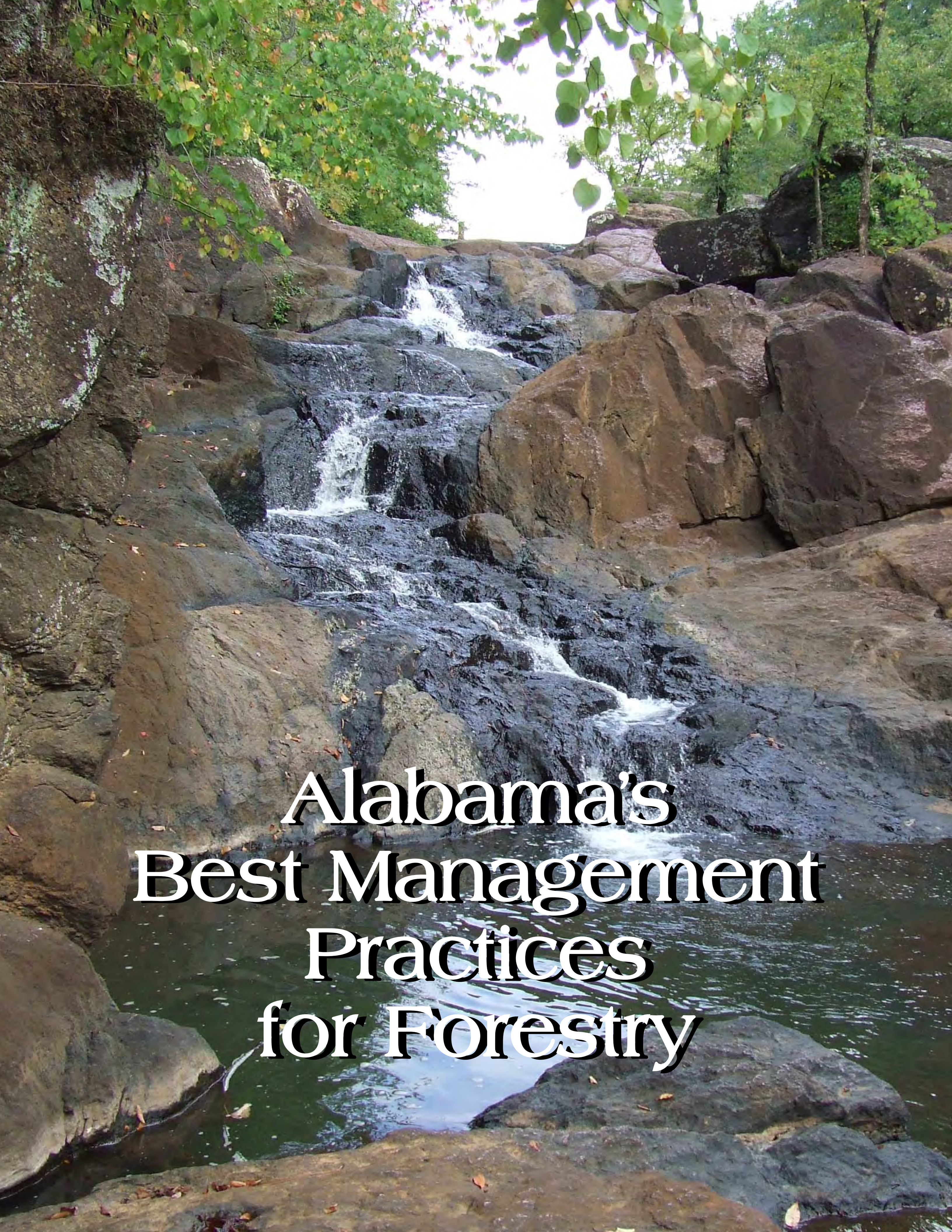
APPENDIX C



Alabama's Best Management Practices for Forestry

Photographs Contributed by:

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Tennessee Division of Forestry
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TABLE OF CONTENTS

Foreword . . . . .Page 1

Specifications for Individual BMPs . . . . .Page 3

1. Streamside Management Zones . . . . .Page 4

2. Stream Crossings . . . . .Page 6

3. Forest Roads . . . . .Page 9

4. Timber Harvesting . . . . .Page 13

5. Reforestation/Stand Management . . . . .Page 15

6. Forested Wetland Management Page17

7. Revegetation/Stabilization . . . . .Page 22

Appendices

1. Glossary . . . . .Page 24

2. Additional Resources . . . . .Page 28

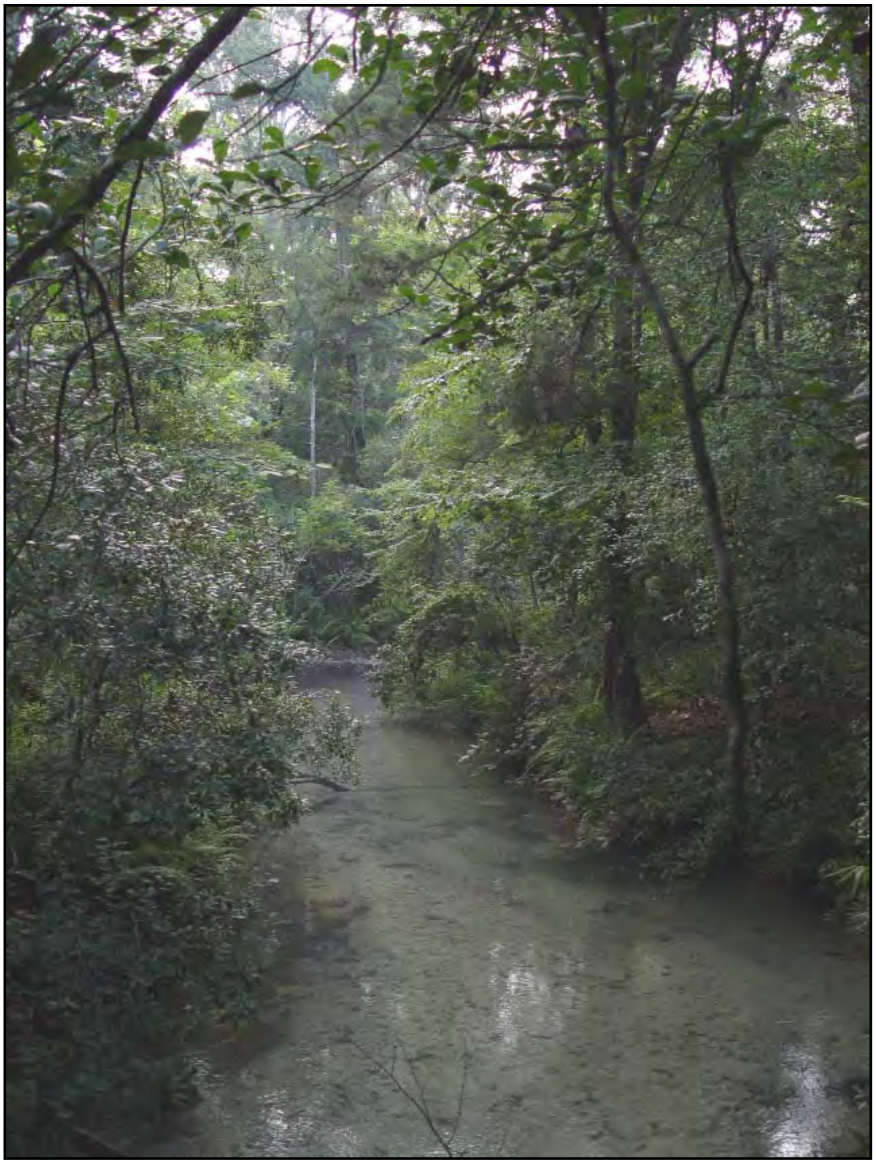
3. Sources of Technical Assistance . . . . .Page 31

Foreword

Water Quality Management in Alabama

The Alabama Environmental Management Act authorizes the Alabama Department of Environmental Management (ADEM) to establish and enforce water quality standards, regulations and penalties in order to carry out the provisions of state and federal water quality laws. From that authorization, ADEM Administrative Code prohibits the deposition of pollutants into or the degradation of the physical, chemical, or biological integrity of waters of the state (see glossary for definitions). With regard to silviculture, nonpoint source pollutants include, but are not limited to, sediment, organic materials, temperature, trash, pesticides and nutrients (see glossary for definitions and impacts) that are man induced.

In addition, the Alabama Water Pollution Control Act states that ADEM shall have the authority to propose remedial measures necessary to clean up waters that have been determined to be polluted. ADEM advocates, however, that avoiding environmental problems through voluntary application of preventative techniques is much less expensive, more cost effective and practical than restoration after the fact.



The Alabama Forestry Commission's Role in Best Management Practices

The Alabama Forestry Commission was established and is mandated by Code of Alabama, 1975, Section 9-3-4 (1), to protect, conserve, and increase the timber and forest resources of the state. All citizens of Alabama are our valued customers. However, as the lead agency for forestry in the state, we seek to strike a balance between serving Alabama forest owners' needs and enhancing the benefits flowing to society from their forests. Our mission is to promote environmentally and economically sound forestry practices, and we are committed to optimizing available resources to achieve this mission.

The Alabama Forestry Commission is not an environmental regulatory or enforcement agency, but it does accept the responsibility to maintain and update *Alabama's Best Management Practices (BMPs) for Forestry* whenever necessary to help Alabama's forestry community meet state water quality needs. The Commission will work in a cooperative manner with all state and federal agencies concerned, and is determined to utilize technical expertise from within and without the forestry community in any BMP revision process.

The Alabama Forestry Commission also accepts responsibility to provide education and technical assistance to landowners, loggers, foresters, vendors and the general public to ensure that good stewardship principles are understood and used.

Purpose of Best Management Practices

Alabama's Best Management Practices for Forestry are **non-regulatory guidelines** (except for the U.S. Army Corps of Engineer's baseline BMPs on pages 16 and 17 which are mandatory) suggested to help Alabama's forestry community maintain and protect the physical, chemical and biological integrity of waters of the state as required by the Federal Water Pollution Control Act, the Alabama Water Pollution Control Act, the Clean Water Act, the Water Quality Act, and the Coastal Zone Management Act.

The BMPs in this booklet lay out a framework of sound stewardship practices that, when consistently applied, will contribute positively to maintaining a high degree of water quality flowing from a forest. These BMPs are not intended to be all inclusive. Rational and objective on-site judgement must be applied to ensure that water quality standards are maintained.

The most important guidance that these BMPs can offer the forestry community is to **think and plan before you act**. Adequate forethought will pay off in two ways: to avoid unnecessary site disturbance or damage in the first place and to minimize the expense of stabilizing or restoring unavoidable disturbances when the operation is finished.

The enclosed BMPs are directed only toward the maintenance of water quality.

However, these BMPs will have an indirect, positive impact on other forest resource values. Sound stewardship principles that enhance wildlife habitat, clean air, aesthetics and general environmental quality are compatible with water quality BMPs and the Alabama Forestry Commission encourages their use when applicable to the landowner's objectives.

Following sound stewardship principles in carrying out forestry practices will ensure that our forests continue to meet the needs of their owners, provide jobs, forest products, clean water and a healthy environment without costly regulations. Only through sound stewardship principles will all of these needs be met.

Responsibility

Responsibility for maintaining water quality standards during a forestry operation has been broadly interpreted to include all parties involved in the authorization, planning or implementation of the operation. **The responsible parties may include professional forestry practitioner(s) such as forest resource managers, timber purchasers, loggers, vendors, forest engineers or others.**

Due to this inherent responsibility it is in the best interest of all those involved in silvicultural operations to make every effort to prevent and correct violations of state and federal water quality laws, regulations and standards by consistently implementing BMPs.

SPECIFICATIONS FOR INDIVIDUAL BMPs

1. STREAMSIDE MANAGEMENT ZONES

Landowners should have adequate streamside management zones marked before negotiating bids for timber sales.

A streamside management zone (SMZ) is a strip of land immediately adjacent to a water of the state where soils, organic matter and vegetation are managed to protect the physical, chemical and biological integrity of surface water adjacent to and downstream from forestry operations. Table 1 provides guidelines for protecting the critical area within a SMZ.

Harvesting in streamside management zones should be done so as to protect the forest floor and under story vegetation from damage. Do not remove (harvest) trees from banks, beds, or steep slopes if it will destabilize the soil and cause degradation of the water. Trees on the south and west banks provide the most critical shading of water. Fell and skid trees directly away from waters of the state. According to Alabama Department of Environmental Management (ADEM) regulations, any tops or other logging debris dropped into the water or channel must be removed; **however, organic debris in the water prior to harvest should not be removed from the stream.** Stabilize wheel ruts if they could carry sediment into waters of the state. Locate log decks and roads outside of SMZs (except at proper stream crossings and access points or unless steep topography/wetland conditions necessitate location within the SMZ).

Courtesy of the South Carolina Forestry Commission

Table 1: SMZ Minimum Standards[1]

Purpose:	Protect banks, bed, and floodplains from erosion; control direct deposition of pollutants; provide shade, food, and cover for aquatic ecosystems; filter out pollutants from uplands.	
Management	**Perennial Stream**	**Intermittent Stream**
Minimum width on each side of channel	In no cases should SMZs be less than 35 feet from a definable bank.[2] A landowner's personal management objectives, on-site condition or stream sensitivity may require wider SMZs and more stringent control of forestry operations within the SMZ. For example, width should be extended to account for erodibility of soil, steepness of slopes and activities to be performed outside of the SMZ.[3] SMZs must always be wide enough to maintain water quality standards.	
Delineation	Outside boundaries should be well marked before operations begin.	
Roads	Follow state and federal BMPs (see Sections 2, 3, and 6) for roads and stream crossings.	
Harvesting Method	Partial cut only within minimum of 35 feet; partial cut or regeneration cut can take place beyond 35 feet.	Partial cut or regeneration cut when water quality degradation can be avoided.
Minimum Residual Cover	50% Crown cover	Vegetative[4]
Reforestation	Natural regeneration, hand planting, direct seeding.	
Mechanical Site Preparation	No	
Herbicide	If herbicide is used, adhere strictly to label restrictions. Direct application is preferred over broadcast spraying.	
Fertilizer	No	

[1]In cases where the stream channel is significantly braided, the forest should be managed under wetland BMP management recommendations (Section 6).

[2]If wildlife is a major objective, a minimum SMZ of 50 feet is recommended.

[3]USDA Natural Resources Conservation Service can provide information on soil erodibility.

[4]Permanent residual tree cover is not required along intermittent streams as long as other vegetation and organic debris are left to protect the forest floor during regeneration.

2. STREAM CROSSINGS

The crossing of streams by roads, skid trails, or firebreaks should be avoided. Stream crossings cause a break in the canopy and filtration strip provided by an SMZ. It may take a large amount of time and effort to stabilize water quality impairment from excessive stream crossings. If stream crossings are unavoidable, use the fewest number, cross the stream/SMZ by the least disruptive manner possible, and control sediment and other pollutants.

In general, stream crossings should be located where the bank and SMZ will be least disturbed. They should be installed at right angles to the stream where the stream channel is straight, and should have gentle slopes and straight paths in and out of the SMZ. Water diversions should divert upland runoff so that sediment and other pollutants can be filtered out on the forest floor before reaching the stream. At no time should a perennial or intermittent stream be crossed without providing a way for normal passage of water or aquatic animals within the channel. **Follow mandatory federal BMPs listed on pages 19 and 20 when roads cross streams or any other wetlands.**

Log crossings involve placing hollow or solid logs into shallow channels. Green and/or small diameter tops, limbs and brush should not be used for this purpose. The surface can be improved by use of secured decking or portable logging mats; do not use fill dirt. All log crossings must be removed when the logging operation is complete.

Fords can be used where the stream bed is firm, banks are low and stream is shallow. Banks should be back bladed away from water and used to improve the approaches. Rock may be brought in to stabilize the approaches and stream bottom.

Culverts, properly sized and installed, should be used to reduce road washouts and impoundments of water. Culvert sizes in Table II are best estimates for normal rainfall but may not handle the largest storm events. One large pipe is better than several smaller pipes. Culverts should be long enough to extend at least one foot beyond the fill on either end. Fill material upstream and down must be stabilized. Possible techniques include use of sand bags, concrete, rip-rap, hay bales, mulch, and vegetation. Culverts should be cleaned out regularly.

Proper culvert installation.

After an operation or phase of an operation has been completed or is going into a period of inactivity, all temporary crossings must be removed and the site stabilized; all permanent crossings must be stabilized and maintained.

Table II

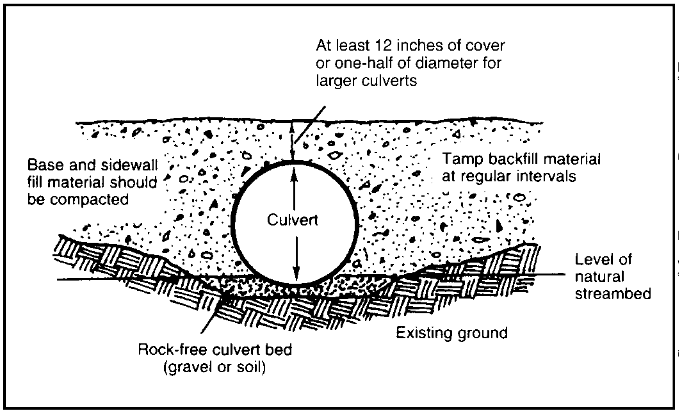
Recommended Diameters for Culverts

Drain Area (acres)	Lower Coastal Plain	Upper Coastal Plain	Piedmont	Mountains
10	12”	12”	12”	18”
50	30”	18”	30”	36”
100	48’’	30”	42”	48”
200	60”	42”	54”	two 48” pipes

Cleared stream crossing, stabilized with hay.

Culvert Installation

- Place culvert on stream bottom; do not dig below natural stream level to bury pipe.
- Culvert should have 2-3% pitch downstream for self-cleaning.
- Compact lower half of fill during installation.
- Earth cover over pipe should be a minimum of 12” or half the culvert’s diameter, whichever is greater. Make fill over a culvert the high spot in the stream crossing.
- Provide for stream overflow away from culvert fill to prevent blowouts.



Courtesy of the Tennessee Division of Forestry

Proper installation prevents culverts from being crushed by heavy roads.

***Bridges** create the least disruption to stream flow. According to the Alabama Department of Environmental Management (ADEM) and Corps of Engineer regulations, banks and fill material must be stabilized and protected from erosion. Spans must be installed to permit passage of all expected high flow.*

Portable bridges can be used in a way that protects water quality and reduces effort and expense in the long run.

3. FOREST ROADS

Crowned forest road.

Proper planning and location of roads will minimize the potential for deposition of pollutants into waters of the state, future maintenance and expense, and the amount of land taken out of production. Old roads should be reopened only if they are properly located and drainage devices will function properly. New roads must avoid streamside management zones (except at proper stream crossings and access points or unless steep topography/wetland conditions necessitate location within the SMZ), troublesome or sensitive moisture-laden soils, eroded gullies, etc. Road grades should also be minimized where soils are highly erodible and/or topography is steep. Dredge and fill operations which may alter the flow, circulation or reach of waters of the state, especially wetlands, may require a permit from the Corps of Engineers.

Adequate drainage is the most important factor in controlling soil erosion and keeping roads in a serviceable condition. Construction techniques such as crowned roads, turnout ditches, out-sloping and in-sloping should be used to provide some slope to flat roads which would hold water.

Crowned roads are designed to quickly drain road surfaces from the center of the road to side ditches. This technique helps to prevent water from soaking into the road and making it soft and muddy.

Turnout ditches should be installed at appropriate intervals to disperse water collected in roadside ditches away from the road base into surrounding vegetation.

Outsloped roads in hilly or mountainous terrain are graded at a 2-4% pitch to the downhill side of the road to drain off water as quickly as possible. Avoid berms of dirt along the outer edge of outsloped roads because they hold water in the road.

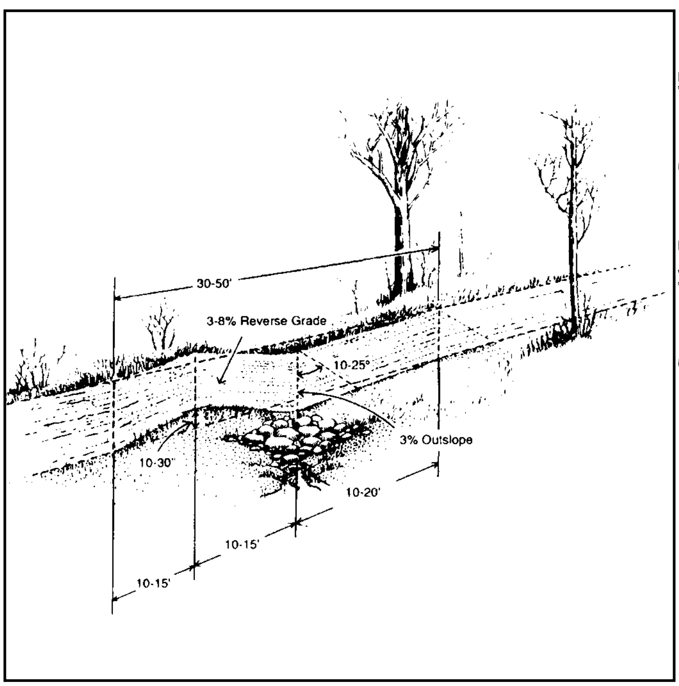
Insloped roads may be preferable when roads are built on side slopes with slippery soils and/or in steep terrain. Water collecting in the inside ditch, however, will have to be drained under the roads through culverts and be dispersed into vegetation on the outside of the road.

Construction of permanent roads should take place with the following considerations:

- Use at least the minimum design standard consistent with anticipated traffic and reasonable safety.
- Merchantable timber should be cleared from the right of way before the arrival of grubbing equipment.
- Stumps, logs, slash and other organic debris should not be covered with fill material and incorporated into road beds.
- Minimize the amount of soil on the road banks or roadsides that is exposed to soil erosion. Balancing cuts and fills whenever practical is one means of minimizing soil exposure. Stabilize these areas as they are created to minimize any problems.
- Functional water diversion techniques or devices should be installed at the same time that roads are constructed. Drainage water should be dispersed onto the undisturbed forest floor whenever possible.

Excessive road steepness, on the other hand, may allow surface water to build up velocity and cause erosion. A variety of water diversion devices can be used to direct water from roads and ditches into vegetated areas upslope from streams in order to slow water down and filter out sediment.

Broad-based dips are an effective means of diverting water off a permanent road without interfering with truck or skidder traffic. They hold up well and remain effective under traffic as long as the outfall remains below the dip in the road grade. Gravel in the bottom of the dip may be necessary on some soils to hold up vehicles operating in wet conditions.



Courtesy of the Tennessee Division of Forestry

Broad-based dips are designed to move water off roads and facilitate the ease of vehicle use.

Water bars (and turnouts) installed at 30-45 degree angles are best used to stabilize temporary roads and skid trails that will no longer be used. Water bars may not hold up well or maintain their effectiveness when they are packed down or rutted by truck, skidder or four-wheeler traffic. A series of small water bars, well anchored into the hillside, can be constructed by a skidder or bulldozer.

Outfall protection should be provided to prevent erosion by absorbing the energy of water falling from the outlet end of water diversion devices. Use rocks, concrete, mulch, woody debris or dense vegetation. Outfalls must never be installed where runoff can be discharged or flushed directly into waters of the state.

Table III

Diversion devices can generally be installed using the following spacing guide. However, soil erodibility and natural drainage opportunities should also be considered for determining appropriate spacings. The USDA Natural Resources Conservation Service can provide information about the erodibility of soils.

% Slope	Distance between water bars	Distance between broad-base dips and turnouts
3%	200’	235’
5%	135’	180’
10%	80’	140’
15%	60’	125’
20%	45’	
30%	35’	
40%	30’	

Maintenance of permanent roads should take place with the following considerations:

- Regular periodic inspection should start immediately after construction to determine maintenance requirements that prevent excessive erosion, impairment of natural drainage, or water quality problems.
- After an operation is completed, rutted or channeled roads should be reshaped and stabilized with functional water diversion devices to allow good drainage and control erosion.
- Seeding and mulching may be necessary to stabilize roadsides and closed temporary roads.
- Special soil stabilizing materials are available for particularly vulnerable areas (see USDA Natural Resources Conservation Service for dealers).

Control non-essential traffic during wet weather on roads which have a high potential for erosion; particularly immediately following construction.

A single large water bar constructed by a bulldozer can be used to close temporary roads to any further two-wheel drive traffic.

4. TIMBER HARVESTING

Harvesting activities should be conducted to ensure long-term maintenance of water quality. The following suggestions will help timber harvesters achieve this objective.

Temporary access roads (logging roads) and landing locations should be planned before operations begin to minimize soil disturbance. Road construction should be kept to a minimum, consistent with reasonable skidding distance. Spring heads, natural drainages and gullies should be avoided. Landings should also be kept as small as possible, consistent with safe and efficient operation. Logging roads and landings must be located on firm ground, outside of Streamside Management Zones and above the ordinary high water mark of streams.

Landings must be located to prevent the adverse impact of skidding on water quality. Locating logging decks uphill and skidding up to them results in a cone-shaped pattern of skid trails which disperses water running downhill. If the logging deck is on the lower slope, the V-shaped pattern of skid trails could concentrate runoff and erode the logging deck areas. If the trees must be skidded downhill, erosion can be minimized by using several, smaller logging decks with fewer, smaller skid trails leading to any one.

When operations are completed, landings and temporary roads should be stabilized with water diversion devices and/or vegetation where there is a possibility of significant erosion and/or water quality degradation.

Felling should be done carefully to minimize the impact of subsequent phases of logging operations on water quality. Timber cut in Streamside Management Zones should be harvested in accordance with recommended guidelines on pages 4 and 5.

Skidding should be done to avoid disrupting natural drainages, prevent excessive soil displacement, and minimize impacts of rutting, compaction, and puddling on water quality and soil stability.

Stream channels and natural drainages must not be used as skid trails. They should be crossed following guidelines in Section 2.

Where slopes are steep but short in duration, trees can be felled uphill and winched to the skidder. Skid trails on steep slopes should have occasional breaks in grade and upon completion of use, must be water barred. Erosion in skid trails can sometimes be reduced by covering them with logging slash. Logging slash can also be scattered over temporary landings to help stabilize them.

When wet and/or soft ground conditions cannot be avoided, it is better to concentrate soil compaction from skidder traffic on a few trails that can be stabilized rather than disperse the effects over many trails.

Cut-to-length harvesting systems offer state-of-the-art equipment and best available technology to maximize timber production and protect water quality and other forest resources at the same time.

Primary benefits of this system are from forwarders (or prehaulers) which can haul wood off the ground for long distances and need only minimum skid trails or landings. Less soil is displaced, rutted, and compacted. The on-board loader can be used to place logs for stream crossings and easily remove them when the crossing is no longer needed. In addition to high initial costs, however, this equipment is also limited by very steep terrain.

Trash disposal must be properly handled throughout the operation in accordance with all applicable laws. Fuel, lubricants and other toxic chemicals must never be drained into the soil. Food and drink containers, discarded equipment parts, and used fluids must be properly removed and disposed of. Trash must not be burned or buried on site.

5. REFORESTATION / STAND MANAGEMENT

Bedding on a contour.

On slopes 2% or less, beds should follow the natural drainage of the land. *Ripping and/or sub-soiling* should be done on the contour.

Disking should be done on the contour and restricted to areas with slopes 10% or less.

Shearing requires that the operator keep the blade out of the soil to minimize soil disturbance. Avoid over-raking the area. The retention of small limbs, twigs, bark and rock on the ground surface helps reduce soil erosion.

Windrows should be laid out on the contour of the land 100 to 300 feet apart depending upon the slope of the land and erodibility of the soil. Topsoil should not be pushed into windrows. Debris may not be piled into any water of the state.

Straight blade bulldozing is the least desirable method of mechanical site preparation.

Mechanical site preparation treatments must be used in such a manner as to minimize displacement of forest litter and topsoil, soil compaction and erosion, stream sedimentation and the deposition of debris into waters of the state. The degree of mechanical site preparation should be limited to the amount that is needed to get a well stocked stand of desirable trees. In general, mechanical site preparation should be excluded from soils with slopes exceeding 25%. No mechanical site preparation should be used in SMZs.

Drum chopping is one of the most desirable methods of mechanical site preparation for the protection of soil and water quality. When chopping is done on steep slopes it should always be done up and down hill so that sediment can be trapped in the slits created by the chopper blades.

Bedding on slopes exceeding 2% should follow the contour.

Windrows.

Chemical site preparation, with or without the use of fire, can duplicate or surpass mechanical site preparation results with less water quality impact.

Herbicide applications must follow the manufacturer's label instructions, EPA guidelines and Alabama State Law. Herbicides should not be aerially or broadcast applied in SMZs. Under no circumstances should herbicides be applied directly onto or allowed to drift or wash into surface waters unless labeled for such applications. Do not mix or clean equipment or herbicide containers in or near streams or water bodies. Frequent inspection of equipment is recommended.

Prescribed burning should be designed and managed to minimize adverse environmental effects. Avoid intense spray and burns on steep slopes and highly erodible soils if water quality would be impacted.

Constructed firebreaks can be tied into existing natural barriers to minimize the need for fresh soil disturbances. Firebreaks should be stabilized with water diversion devices to minimize erosion and conveyance of sediment laden runoff into waters of the state. Vegetating firebreaks can further reduce erosion and the movement of sediment and other pollutants into waters of the state.

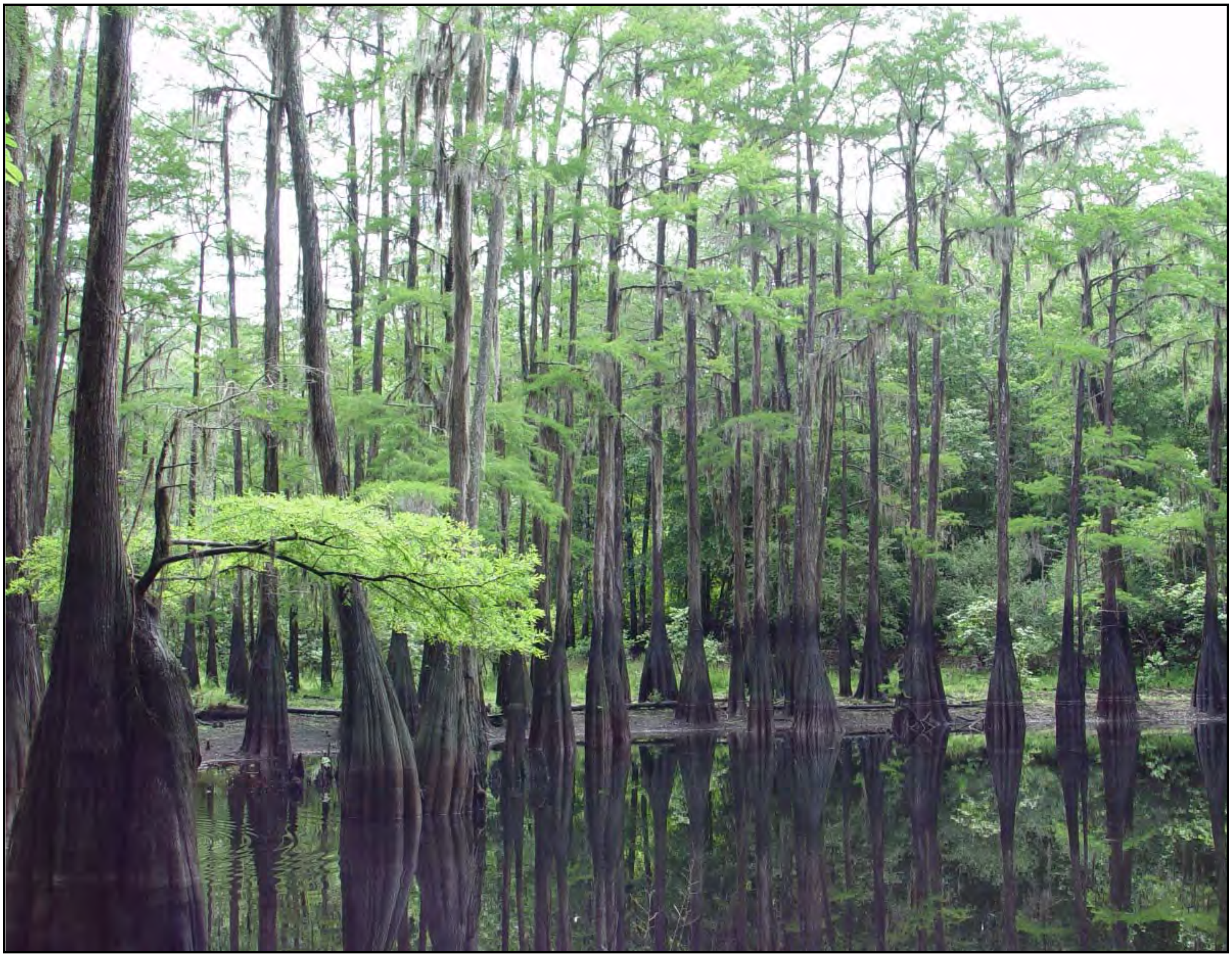
Wildfires demand that the primary objective of firebreak construction is to bring the fire under control.

Tree planting with a furrow type machine should be done on the contour.

Planting on a contour.

Constructed firebreak.

6. FORESTED WETLAND MANAGEMENT



Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support (and under normal circumstances do support) a prevalence of vegetation typically adapted for life in saturated soil conditions.

The U.S. Army Corps of Engineers, using the *Federal Manual for Delineating Jurisdictional Wetlands*, determines under which conditions hydrophytic vegetation, hydric soils, and wetland hydrology must be present on the same site, under normal circumstances, for an area to be classified as a wetland. Jurisdictional wetlands may be found in the following

- Coves and lower slopes
- Branch bottoms
- Creek bottoms
- River bottoms
- Muck swamps
- Peat swamps and cypress/gum ponds
- Wet flats

Section 404 of the Clean Water Act usually requires that a permit be obtained from the Corps of Engineers before a discharge of dredged or fill materials can be made into waters of the United States (U.S.), including wetlands. A regulated discharge occurs when fill or dredged material is deposited into wetlands.

Exemptions for forestry activities from having to obtain an individual Section 404 permit from the Corps of Engineers may apply if the activities meet the following conditions:

1. It is not part of an activity whose purpose is to convert a wetland into an upland, where the flow or circulation of the waters of the U.S. may be impaired or the reach of water reduced; and

2. It is part of an established (i.e. ongoing) silvicultural, farming or ranching operation and not a new use to which the wetland was not previously subject; and

3. It uses "normal" silvicultural, farming or ranching activities which are in compliance with federal BMPs (listed under "Roads and Stream Crossings . . ." on, pages 19 and 20); and

4. It has not lain idle for so long that hydrological modifications will be necessary to resume operations; and

5. It does not contain any toxic pollutant listed under Section 307 of the Clean Water Act.

What is an established silvicultural operation? Established or ongoing operations are included in a management system (not necessarily written) which is planned over conventional rotation cycles for a property or are introduced as part of an ongoing operation.

Evidence of use of the property may be used to determine whether an operation is ongoing. Such evidence includes the following:

1) a history of harvesting with either natural or artificial regeneration; 2) a history of fire, insect, and disease control to protect the maturing timber; and 3) the presence of stumps, logging roads, landings, or other indications of established silvicultural operations that will continue on the site.

While past management may have been relatively non-intensive, intensification of management involving artificial regeneration and other practices can occur as part of a conventional rotation and be considered an established operation.

Although wetland regulations do not require a written forest management plan, it is in a landowner's best interest to have one to document that operations are established, that BMPs are implemented and effective, and that all activities are consistent with other Section 404 exemption criteria.

A change in ownership between landowners (both of which manage forested wetlands for silvicultural purposes) has no bearing on whether a forestry operation is part of an established ongoing activity. Continuation or strict adherence to a management plan written for the previous owner is not required by Section 404 silvicultural exemptions.

"Normal" silvicultural activities (such as road construction, timber harvesting, mechanical or chemical site preparation, reforestation, timber stand improvement, and minor drainage) conducted as part of established ongoing silvicultural operations are exempt from Section 404 Corps of Engineers permit requirements as long as the appropriate measures are implemented. Those measures are listed under "Roads and Stream Crossings. . ." on pages 19-20. *Alabama's Best Management Practices for Forestry* are not required for exemption from Section 404 Corps of Engineer permit requirements; they are, however, **strongly** recommended to minimize nonpoint source pollution of waters of the state and/or waters of the U.S.

A forestry activity or operation WILL require a 404 permit from the Corps of Engineers when the following applies:

1. The activity results in the immediate or gradual conversion of a wetland to an upland as a consequence of altering the flow and circulation or reducing the reach of waters of the U.S.

   Changes in flow, circulation or reach of waters can be affected by permanent major drainage such as channelization or by placement of fill material. A discharge which changes the bottom elevation of waters of the U.S., without converting it to dry land, does not reduce the reach of waters but may alter flow or circulation and therefore may be subject to permitting requirements.

   The criteria that are used to determine if a wetland has been converted include a change in hydrology, soils and vegetation to such an extent that the area no longer qualifies as a jurisdictional wetland according to the *Federal Manual for Delineating Jurisdictional Wetlands.*

2. A new activity results in a change from the past, historical use of the wetland into a different use to which it was not previously subject where the flow or circulation of waters is impaired or the reach of the water is reduced. Such a change does not meet the established, ongoing requirement and causes the activity or operation to lose its exemption.

   Examples of this situation are areas where tree harvesting has been the established use and the landowner wishes to convert the site for use as pasture, green tree reservoir, agriculture, real estate or aquaculture. In such cases the landowner must first obtain a 404 permit before proceeding with the change. (Changes of use to farm stock ponds may be exempt under a nationwide Corps of Engineers permit).

3. Roads and stream crossings are constructed in a wetland without following the mandatory, federal BMPs listed under the wetland road regulations.

4. The area has lain idle for so long that hydrologic modifications are necessary to resume operations. This does not refer to temporary water management techniques such as minor drainage, plowing, bedding and seeding which exempt, normal silvicultural activities as long as they don't result in the conversion of wetlands to uplands. However, it does apply to reopening ditches which were once established as permanent wetland drainage structures but have lost their effectiveness for this purpose as they filled in with soil and vegetation.

BMPs for wetlands are not intended to make up for uncontrolled negative impacts on uplands but are part of the overall management of the full landscape to protect water quality.

Streamside management zones should be established and managed around the perimeter of all major drainages and open bodies of water (i.e., main stream courses, oxbow lakes, sloughs) contained within wetlands.

Minor drainage refers to installation of ditches or other water control facilities for temporary dewatering of an area. Minor drainage is considered a normal silvicultural activity in wetlands to temporarily lower the water level and minimize adverse impacts on a wetland site during road construction, timber harvesting and reforestation activities. Minor drainage does not include construction of a canal, dike or any other structure which continuously drains or significantly modifies a wetland or other aquatic area.

Minor drainage is exempt from needing an individual 404 permit if it is part of an ongoing silvicultural operation and does not result in the immediate or gradual conversion of a wetland to an upland or other uses. Artificial drainage must be managed. Once silvicultural activity has been completed the hydrology that existed prior to the activity should be restored by closing drainage channels.

Roads and stream crossings within wetlands and other waters of the U.S. *must* be constructed and maintained in accordance with the following U.S. Army Corps of Engineer baseline BMPs (from Section 404, Corps of Engineers Permit Requirements, 40 CFR Part 233.22) in order to retain exemption status for the road operation:

1. Permanent roads, temporary access roads and skid trails (all for forestry) in waters of the U.S. shall be held to the minimum feasible number, width, and total length consistent with the purpose of specific silvicultural operations, and local topographic and climatic conditions;

2. All roads, temporary or permanent, shall be located sufficiently far from streams or other water bodies (except for portions of such roads which must cross water bodies) to minimize discharges of dredged or fill material into waters of the U.S.;

3. The road fill shall be bridged, culverted or otherwise designed to prevent the restriction of expected flood flows;

4. The fill shall be properly stabilized and maintained during and following construction to prevent erosion;

5. Discharges of dredged or fill material into waters of the U.S. to construct a road fill shall be made in a manner that minimizes the encroachment of trucks, tractors, bulldozers, or other heavy equipment within waters of the U.S. (including adjacent wetlands) that lie outside the lateral boundaries of the fill itself;

6. In designing, constructing and maintaining roads, vegetative disturbance in the waters of the U.S. shall be kept to a minimum;

7. The design, construction and maintenance of the road crossing shall not disrupt the migration or other movement of those species of aquatic life inhabiting the water body;

8. Borrow material shall be taken from upland sources whenever feasible;

9. The discharge shall not take, or jeopardize the continued existence of a threatened or endangered species as defined under the Endangered Species Act, or adversely modify or destroy the critical habitat of such species;

10. Discharges into breeding and nesting areas for water fowl, spawning, and wetlands shall be avoided if less harmful alternatives exist;

11. The discharge shall not be located in the proximity of a public water supply intake;

12. The discharge shall not occur in areas of concentrated shellfish production;

13. The discharge shall not occur in a component of the National Wild and Scenic River System;

14. The discharge of material shall consist of suitable material free from toxic pollutants in toxic amounts; and

15. All temporary fills shall be removed in their entirety and the area restored to its original elevation.

Timber harvesting using normal methods and equipment may be appropriate if harvesting is timed during dry periods.

Harvesting during wet periods or sites that remain wet require special precautions and harvesting systems to minimize water quality hazards and other negative site impacts. Site damaging effects from harvesting equipment such as rutting, puddling and compaction should be controlled and minimized. For example, concentrate skidder traffic on a few trails rather than over the entire area. Do not harvest sites during periods of flowing water whether from overbank flooding or other water accumulation.

Roads must be constructed and maintained in accordance with BMPs to assure that flow and circulation pattern and chemical and biological characteristics of waters of the U.S. are not impaired, that the reach of the waters of the U.S. is not reduced and that any adverse effect on the aquatic environment will be otherwise minimized.

Minor drainage is allowed (i.e., to maintain a dry road bed) unless it becomes obvious that BMPs have not been followed or that the road is serving some function other than conveyance of vehicles (i.e., a continuous roadside barrow ditch may not be used to drain adjacent wetlands.

Reforestation in wetlands is not much different from regenerating uplands in regards to water quality; the main factors to consider are the site's potential for erosion/sedimentation and hydrology.

Land clearing is an exempt silvicultural activity if it is associated with timber harvesting or reforestation operations. However, land clearing using mechanical equipment for purpose of removing vegetation in preparation for converting the site to a different land use is not part of an established silvicultural operation and is not exempt from having to go through the Corps of Engineer permitting process.

Herbicides bearing the "wetlands" warning on the label can be applied to vegetation on dry soils of jurisdictional wetland areas but must not be applied directly to surface water or to inter-tidal areas below the main high water mark.

Bedding is the construction of earthen mounds from surrounding soil resulting in adjacent and alternating "beds" and furrows. Seedling beds create temporary elevated soil conditions which allow seedlings to escape saturated soil conditions and have a greater opportunity to survive and grow.

Bedding is considered a normal silvicultural activity that is exempt from Section 404 permitting requirements if the following conditions exist:

- The bedding does not result in the gradual or immediate conversion of a wetland to upland as a consequence of impairing the flow or circulation or reducing the reach of waters of the U.S.; and
- It is performed as part of an established, ongoing silvicultural operation.

However, if bedding were to significantly alter the flow, circulation, or reach of waters of the U.S. and consequently result in conversion of a wetland to an upland, the exemption would no longer apply.

Species composition change (i.e., bottomland hardwood to pine plantation) resulting from intensification of management is considered a normal, silvicultural activity that is exempt from 404 permitting if the property is in silvicultural usage before and after the harvesting and planting.

However, a species composition change is not exempt if the activities used to clear, prepare or plant the site would result in a change in use that is accompanied by an impairment of the flow or circulation or the reduction of the reach of waters. An example of such a new use situation would be where the change in species composition would cause a conversion of wetlands to uplands.

Removal of beaver dams and other blockages to remove impounded surface water is considered exempt from 404 permitting as long as the process does not include enlarging or extending the dimension or changing the bottom elevation of the affected drainage way as it existed prior to the formation of the blockage, or without changing the use of the land in question.

Beaver dams can be dismantled by hand without any problems. Dynamite and heavy equipment can also be used to destroy dams as long as they are not used to construct drainage channels that will result in conversion of wetlands to uplands. However, when dynamite or heavy equipment is to be used to remove beaver dams or other blockages, the Corps of Engineers should be contacted for possible permit requirements.

***Before and After**: Top photo shows blockage caused by beaver dam. Bottom photo illustrates flow restored.*

7. Revegetation/Stabilization

Skid trail stabilized with logging slash.

As already pointed out in previous sections, some temporary haul roads, skid trails, log landings, firebreaks and other forestry related soil disturbing activities require the establishment of a vegetative cover to stabilize mineral soil surfaces so as to reduce erosion and runoff of sediment into state waters. The USDA Natural Resources Conservation Service can provide a detailed plan for establishing vegetation on these disturbed sites.

Site preparation, such as smoothing or reshaping rutted roads and landings, may be required before conventional equipment can be used for seedbed preparation, seeding, mulching and drainage improvement. Heavily compacted areas may require ripping and/or disking to allow water infiltration and provide a suitable seedbed for root growth.

Agricultural limestone and fertilizer may be needed to ensure success in establishing a vegetative cover. Soil tests are recommended. Incorporate lime and fertilizer into the top 2-4” of soil on slopes less than 6%; into the top 2”of soil on slopes of 6-10%; and onto the surface only on slopes greater than 10%.

Plant species recommendations can be obtained from the local county office of the USDA Natural Resources Conservation Service or Cooperative Extension Service. Areas treated by temporary seeding or mulch should be reseeded with permanent vegetative species as soon as possible during the correct growing season to ensure stabilization of disturbed areas. Disking or mowing of temporary cover is recommended before application of permanent seed and fertilizer.

Mulch is recommended for critical situations to hold seed, lime and fertilizer in place, maintain moisture and prevent extreme temperatures on the soil surface. Mulch needs to be applied immediately after seeding to provide best benefits.

Vegetative establishment for control of erosion and sedimentation can be considered successful once a 75% cover has been obtained. Within one

Vegetated forest road.

year of establishment, a second broadcast application of fertilizer at half the original rate is recommended to ensure plant survival and growth.

Silt screen and hay bales can be used to filter runoff water from closed roads and skid trails to prevent or stop sediment from flowing downslope into waters of the state. When using silt screen, 5-6 foot-long posts should be staked 5-10 feet apart across the problem area. The porous material is stapled 3 feet high on the post and excess material at the bottom of the screen is folded uphill and anchored down with rocks or fill material. Hog wire can be stapled to the stakes before the material is attached to give strength to the silt screen as intercepted sediment builds up.

Square hay bales can be used for the same purpose by lining them up across the road, end to end and one to two bales high. Stake the bales in place on their sides with the strings off the ground to prevent rotting.

Gully stabilization should receive high priority during all land management activities. The most effective way to reduce sediment production and/or reduce the change of reactivating the erosion process in healed gully systems is to avoid operating in them and maintain all existing vegetation. Site preparation, including herbicide and burning, should be excluded.

Actively eroding gully systems need to be stabilized. The USDA Natural Resources Conservation Service can provide technical assistance in planning and installing gully stabilization measures.

APPENDICES

Glossary

ADEM – The state regulatory agency (Alabama Department of Environmental Management) which administers and enforces the Alabama Water Pollution Control Act.

Approaches – The entry and exit of a road or skid trail through a stream crossing.

Aquatic ecosystem – An interacting community of plants and animals (i.e., insects, crayfish, fish and amphibians) requiring an abundance of water during some part of their life cycle.

Backblade – To pull dirt by dropping a dozer blade into the soil and operating the tractor in reverse.

Back slope – The soil profile in the side of a hill that is exposed from cut and fill type road construction.

Banks – The sides of a channel which holds or carries water.

Bed – The bottom of a stream.

Bedding – A mechanical site preparation technique where top soil is mounded into rows. Trees planted on top of the row will be well drained and will benefit from a concentration of nutrients and organic matter during initial stages of growth.

Biological integrity of waters of the state – The ability of a body of water to support the natural level of diverse plants and animals that would normally occur without man-made disturbance or manipulation of the landscape.

Broad based dip – An alteration of a road grade to intercept water from the surface and dispel it to the side without seriously interfering with vehicular traffic.

Canopy – The upper leafy branches of dominant and codominant trees and shrubs which intercept sunlight and shade the ground.

Chemical integrity of waters of the state – The natural range of nutrient and pH levels which would normally occur in waters passing through an undisturbed site.

Compaction – The result of all air and moisture holding spaces being squeezed out from between soil particles by operation of heavy equipment during unfavorable ground conditions. All soils are generally more easily compacted when wet. Compacted soil is less productive and more erodible.

Contour – An imaginary line on the surface of the earth connecting points of the same elevation.

Corps of Engineers – The federal regulatory agency, a branch of the U.S. Army, which administers and enforces the Section 404 permitting program of the Clean Water Act.

Critical shading of water – Shading when water receives the greatest protection from overheating and ultraviolet exposure caused by solar radiation.

Cross drain – A pipe, ditch or channel which safely conveys water from one side of the road to the other.

Crown – The top of a tree consisting of trunk and expanding branches.

Culverts – Usually metal or plastic pipe but can be a constructed wooden trough.

Cut and fill – Earthen material which is dug out of a hill and placed down slope to provide a relatively level road bed.

Deck – An area cleared to provide a site for loading logs onto a transport vehicle.

Decking – Rough or unfinished lumber used to provide a stable surface for roads, stream crossings or landings.

Definable bank – The bounds of a water body at or below its normal flow level which is usually devoid of terrestrial plants and accumulations of light organic debris.

Deposition – The act of depositing or putting into.

Destabilize (the soil) – To expose and/or loosen soil thus making it more susceptible to erosion.

Direct seeding – Artificially placing seed by hand, land machine or aircraft onto a germination surface.

Disking – Breaking up plants (above and below ground portions), organic matter and soil in preparation to improve the ground for replanting and to reduce plant competition.

Diversion device – A structure to intercept and re-route water from a road surface.

Drainage device – Same as diversion device.

Dredge – Earthen material that is dug from a channel or removed from the bottom of a water body, often to improve drainage.

Ephemeral streams – Low places in the landscape that only flow shortly after significant rainfall. Does not have a well defined channel.

EPA – The U.S. Environmental Protection Agency. The federal agency created and mandated by the U.S. Congress to administer and enforce the Clean Water Act upon waters of the United States.

Erosion – The dislodging and carrying away of soil particles by wind or water.

Fell – To cut or knock down standing trees or other vegetation.

Fill – To raise the elevation of a surface by depositing dredged or excavated material onto it.

Filtration strip – A strip of land where vegetation, mulch, or fabric is maintained or placed to intercept and prevent upland sediment and other pollutants from flowing into water.

Firebreaks – Natural or artificially constructed barriers to the spread of fire.

Floodplain – Areas adjacent to bodies of water that are most prone to flooding when the water overflows its banks.

Forest floor – Accumulations of organic debris and low vegetation on the ground beneath a stand of trees.

Forest resource managers – This group includes foresters, wildlife biologists, recreational planners and other developers.

Fragile area – Areas that are easily altered physically, biologically, or chemically, and are difficult or slow to recover.

Grade – The steepness of rise or fall of a road surface.

Ground cover – Low growing vegetation such as grass, forbs, vines, or shrubs.

Ground water – Water stored and/or flowing out of sight under the surface of the ground.

Hand planting – Re-establishing vegetation by planting seed or seedlings into prepared planting holes in the ground.

Harvests – Gathering merchantable portions of trees for commercial or domestic use.

Herbicide – a natural or synthetic chemical pesticide applied specifically to control competition from undesirable plant species.

High flow – The increased volume and speed of water that exceeds a stream's normal rate of flow.

High water mark – Physical evidence of past flooding such as discoloration of the lower portions of vegetation or debris suspended in branches off the ground.

Implementation – The carrying out of instructions contained in a management plan, harvest plan or reforestation plan (written or verbal).

Impoundments – An accumulation of water into pools or ponds formed by blocking the natural drainage.

Inslope – Sloping of a road surface so drainage is toward a ditch between the road and hill.

Intermittent bodies of water – Contain water within well defined channels during part of the year.

Label restrictions – Explicit instructions from the manufacturer with approval from federal and state authorities on when, where, and how a particular pesticide may be applied. Instructions also usually include worker and environmental safety precautions.

Landing - A site where logs are sorted and loaded onto trucks for hauling to handling or processing facilities.

Litter Layer – The natural buildup of dead leaves, branches and stems of dead trees and other forest vegetation which accumulate on the ground and then decay with time.

Log decks – Same as landings.

Mechanical planter – A tree planting machine pulled by a tractor and manned by a person who places trees into the ground.

Mechanical site preparation – Use of heavy machinery such as bulldozers with special attachments that clear debris or incorporate it into the soil to improve planting, sprouting, growth and or survival conditions for new forest trees.

Minimum residual cover - The fewest number of trees necessary to provide shade, natural recruitment of organic material, and soil holding capability for protection of the biological integrity of aquatic ecosystems.

Mulch – A coarse material used to protect soil from rainfall impact and erosion and to improve germination and growth of vegetation. Examples are hay, straw, bark and geotextile fabric.

Natural barrier – Areas that are devoid of fuel or food to support a spreading fire or insect or disease epidemic.

Natural drainage – Perennial, intermittent and ephemeral stream courses in a watershed that collect and expel runoff water.

Natural regeneration – Young trees that originate from seed or sprouts of trees that do or did grow on the site.

Nonpoint source – Water pollution which is not traceable to any discrete or identifiable facility but comes from a broad treatment area.

Normal passage of water and/or aquatic animals – Movement of water or animals which has not been obstructed or inhibited as the result of man-made activity.

Nutrients – Substances that nourish such as nitrogen, potassium and phosphorus in fertilizer. Excess nutrients can destabilize aquatic ecosystems.

Organic debris – Refuse such as tree tops, limbs or severely damaged tree stems which are left following road construction, logging, or site preparation.

Organic matter – Dead plant parts or animals. While natural recruitment of organic matter is part of the energy and nutrient cycles of an aquatic ecosystem, decay of excess amounts in water depletes oxygen needed by fish and other aquatic animals. Tops and other debris can sometimes block and divert the flow of streams causing additional erosion.

Partial cut – A selective timber harvest method where particular trees are usually designated to remain in the stand and the rest are removed in a thinning harvest.

Perennial bodies of water – Contain water within well defined channels virtually year round under normal climate conditions.

Permanent road – A road constructed, used and maintained beyond the time period of a single operation such as a timber sale.

Pesticide - See herbicide for specific application.

Physical integrity of waters of the state – The retention of water in its natural condition without alteration of stream course, depth, clarity or freedom of obstructions that might occur as the direct result of man-made activity.

Plowed fire control line – A man-made fire break constructed by a heavy piece of equipment such as a small bulldozer pushing or pulling a heavy duty plow designed for cutting through the forest floor and root mat to clear combustible material and expose mineral soil.

Pollutants – Man-induced elements such as sediment, organic debris, increased temperature, nutrients, chemicals, trash and soil degradation which exceed a water's natural ability to neutralize before changes in the physical, chemical or biological integrity of waters of the state occur.

Portable bridge – a stream crossing device that is preassembled, installed across a channel and removed following completion of an activity with minimum adverse impact to water quality.

Portable logging mats – Temporary road or stream crossing surface constructed of rough cut lumber nailed or bolted together. These are usually expected to be removed and reused following completion of a particular operation.

Prescribed burning – Preplanned fire that is deliberately set in a time and manner when prescribed conditions will allow accomplishment of specific objectives and is under control until it burns out or is extinguished.

Puddling – The destruction of root systems and soil structure by the tearing and churning action of heavy equipment operating in saturated soils. Puddled soils are more susceptible to erosion than undisturbed soils.

Reforestation – The restocking of a forest stand through natural regeneration or artificially planted seed or seedlings.

Regeneration – A young stand of a forest.

Regeneration cut – Either partial harvests where selected trees are left to provide adequate seed or silvicultural clearcuts where all merchantable and non-merchantable tree stems are removed or felled to encourage sprouting of desirable tree species.

Riprap – Large stones which are arranged over loose soil to protect it from erosion.

Rutting – Impression left in the ground after soil is compacted by the wheels or tracks of heavy equipment operating in soft earth. Deep rutting can disrupt surface and subsurface hydrology on flat lands and cause soil erosion on steep lands by concentrating surface runoff.

Sediment – Accumulations of loose soil particles. Excessive amounts of sediment can pollute water needed for aquatic ecosystems, drinking, wildlife, outdoor recreation, and industrial use.

Shearing and raking – A site preparation technique that uses a large tractor equipped with a special cutting blade to cut down trees just above the ground surface and a second tractor equipped with a specialized raking blade that pushes the felled trees and other debris into piles or windrows.

Side bank – Same as back slope.

Silviculture – The care and cultivation of forest trees; forestry.

Site preparation – Use of machines, herbicides, fire or combinations thereof to dispose of slash, improve planting conditions and provide initial control of competing vegetation.

Skid – To drag logs with a specialized tractor to a landing.

Skid trails – Paths where logs have been dragged.

Slash – Unmerchantable debris such as brush or tree stems, tops, branches or leaves that are left following a commercial timber harvest operation.

Slough – An open water inlet from a larger body of water.

Soil stabilizing materials – Silt fencing, straw blankets, geotextile fabric, geoweb, etc., applied to protect soil from erosion.

Soil type – Consistent characteristics of an identifiable soil such as particle sizes, moisture holding capacity, plasticity and ease of compaction.

Span – A structural beam designed to hold other bridge components and traffic above a stream or channel.

Steep gradient – A high rate of ascent or descent on a road.

Stringent – Tightly regulated or controlled.

Surface water – Exposed water above the ground surface.

Temperature – The degree of hotness or coldness of an environment. Removal of vegetative shade from banks of streams and shores will directly raise water temperature and indirectly result in lower dissolved oxygen levels. These influences place some fish and other organisms under stress.

Temporary access roads – Roads not expected to be maintained much longer than the activity for which they were installed to support.

Timber purchasers – Agents who locate commercial stands of timber and negotiate terms of purchase on either their own behalf or on the behalf of timber brokerage or forest product companies.

Topography – The lay of the land.

Tops – The upper (usually referring to unmerchantable) portions of trees.

Trash – Unnaturally occurring, man-made refuse or discarded substances. Openly discarded trash and petroleum wastes may be carried into waters of the state by storm runoff and is unsightly.

Understory vegetation – Small trees, shrubs or other plants which grow beneath the canopy of more dominant trees.

Upland runoff – Surface drainage water which flows from higher elevations of a landscape into the natural drainage system of a watershed.

Vendors – Contractors who provide tree harvesting, site preparation, tree planting or other forestry services for a fee.

Washouts – Clearing of natural or man made obstructions of drainage systems during high stream flows.

Water bar – A long mound of dirt constructed to prevent soil erosion and water pollution by diverting drainage from a road or skid trail into a filter strip.

Water bodies – Branches, creeks, rivers, ponds, lakes, bays, etc.

Water diversions – Structures or devices which change the direction of drainage flow.

Water quality impairment – The reduction of water quality below established water quality standards.

Waters of the State – Include every watercourse, stream, river, wetland, pond, lake, coastal, ground or surface water, wholly or partially in the state, natural or artificial which is not entirely confined and retained on the property of a single landowner.

Waters of the United States (U.S.) – Include all waters such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands and sloughs which are susceptible to use in interstate or foreign commerce, recreation, fish and shellfish production and industrial use; impoundments of waters just described; tributaries of waters just described (other than waters that are themselves wetlands).

Wildfire – Fires burning without the control of a responsible person.

Windrows – Long piles of accumulated debris.

Wing ditch – A secondary “turn out” ditch that diverts drainage water from primary roadside ditches, to be filtered out into the surrounding area.

Additional Resources

Additional information pertaining to silvicultural BMPs and water quality is available from the following publications and sources of assistance:

Streamside Management Zones

Comerford, N.B., D.G. Neary and R.S Mansel. *The Utility of Buffer Strips to Protect Forested Wetlands from Impacts Due to Forest Silvicultural Operations,* Gainesville, FL, National Council of the Paper Industry for Air and Stream Improvement, In Press.

Dickson, J.G. and J.C. Huntley. "Riparian Zones and Wildlife in Southern Forests," *Managing Southern Forests for Wildlife and Fish*, Ed. J. Dickson and O. Maughan, USDA Forest Service General Technical Report 50-65, (1987), 37-39.

Helfrich, L.A. et al. *Landowner's Guide to Managing Streams in the Eastern United States,* Virginia Cooperative Extension Service Publication 420-141, 1986.

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Miller, E. "Effects of Forest Practices on Relationships Between Riparian Areas and Aquatic Ecosystems," *Managing Southern Forests for Wildlife and Fish*, Ed. J. Dickson and O. Maughan, USDA Forest Service General Technical Report 50-65, (1987), 40-47.

Practical Approaches to Riparian Resource Management: An Educational Workshop, Billings, MT, US Bureau of Land Management BLM-MT-PT-89-001-4351, 1989.

Rudolph, D.G and J.G. Dickinson. "Streamside Zone Width and Amphibian and Reptile Abundance," *The Southwestern Naturalist,* 35, (1990), 472-476.

Schilling, Erik B. and B. Graeme Lockaby. *Streamside Management Zones in Alabama: Functions and Management,* Auburn University Center for Forest Sustainability.

Swift, L.W. "Filter Strip Widths for Forest Roads in Southern Appalachians," *Southern Journal of Applied Forestry*, 10 (1984), 27-34.

Warmwater Streams Symposium: A National Symposium on Fisheries Aspects of Warmwater Streams, Southern Division American Fisheries Society, (1980).

Stream Crossings

Baker, C.O. and F.E. Votapka. "Fish Passage Through Culverts," *USDA Forest Service Technology and Development Center Report No. FHWA-FL-90-006*, 1990.

Mason, L. *Portable Wetland Area and Stream Crossings*, USDA Forest Service Technology and Development Center, 1990.

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Kochenderfer, J.N. *Cost of and Soil Loss in "Minimum-Standard" Forest Truck Roads Constructed in the Central Appalachians,* USDA Forest Service Research Paper NE-544, 1984.

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The Layman's Guide to Private Access Road Construction in the Southern Appalachian Mountains, Tennessee Valley Authority, Waynesville, N. C.: Haywood Press, Inc. 1985.

Wallbridge, T.A., Jr. *The Paper Location of Forest Roads*, Blackburge, AA, Virginia Polytechnical Institute and State University, 1989.

Wallbridge, T.A., Jr. *The Direct Location of Forest Roads*, Blacksburg, VA, Virginia Polytechnical Institute State University, 1990.

Timber Harvesting

Brinker, R.W. *Best Management Practices for Timber Harvesters*, Alabama Cooperative Extension Service Circular ANR-539, 1989.

Simmons, F.C. *Handbook for Eastern Timber Harvesting,* USDA Forest Service Northeastern Area State and Private Forestry, 1979.

Swindel, B.F. “Multi-Resource Effects of Harvest, Site Preparation and Planting in Flatwoods,” *Southern Journal of Applied Forestry*, 7, (1983), 6-15.

Reforestation/Stand Management

Beasley, R.S., and A. Granillo, “Water Yields and Sediment Losses from Chemical and Mechnical Site Preparation in Southwest Arkansas,” *Forestry and Water Quality. A Mid-South Symposium*, Arkansas Cooperative Extension Service, 1985.

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Gosselink, J.G. and L.C. Lee. *Cumulative Impact Assessment in Bottomland Hardwood Forest*, Baton Rouge, LA, Center for Wetlands Resources, Louisiana State University LSU-CEI-86-09, 1987.

Federal Manual for Identifying and Delineating Jurisdictional Wetlands, Federal Interagency Committee for Wetland Delineation, 1989.

Forested Wetlands of the Southeast: Review of Major Characteristics and Role in Maintaining Water Quality, USDI Fish and Wildlife Service Publication 163, 1986.

Forested Wetlands of the United States: Proceedings of the Symposium, USDA Forest Service Southeastern Forest Experiment Station General Technical Report SE-50, 1988.

Good, R.E., D.F. Whigham and R. L. Simpson. *Freshwater Wetlands: Ecological Processes and Management Potential*, New York, Academic Press, 1978.

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National List of Plant Species That Occur in Wetlands: Southeast (Region 2), U.S. Fish and Wildlife Service, Biological Report 88 (26.2), 1988.

National Wetlands Policy Forum, The Conservation Foundation, 1989.

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Alabama Nonpoint Source Management Program, Montgomery, Alabama. Alabama Department of Environmental Management. October 2000. http://www.adem.state.al.us/Education%20Div/Nonpoint%20Program/ManagePlan/partIIsi.pdf

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Burns, R.G., and J.D. Hewlett. "A Decision Model to Predict Sediment Yield from Forest Practices," *Water Resources Bulletin 19*, (1983), 9-14.

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Forestry and Water Quality: A mid-south symposium, Arkansas Cooperative Extension Service, 1985.

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Golden, M.S. et al. *Guidelines for Refinement of Best Management Practices in Alabama*, Auburn University, AL, Department of Forestry, 1984.

National Management Measures to Control Nonpoint Source Pollution from Forestry, U.S. Environmental Protection Agency, Office of Water, Washington DC 20460 (4503F) EPA-841-B-05-001 April 2005. http://www.epa.gov/owow/nps/forestrymgmt/ (May 2005).

Sources of Technical Assistance

Technical assistance and/or additional information may be available from the following agencies and organizations to help you plan forestry operations that may affect water quality.

Alabama Department of Conservation and Natural Resources
64 North Union Street, Suite 468
Montgomery, AL 36130
(334) 242-3465
www.outdooralabama.com

Alabama Department of Environmental Management (ADEM)
1400 Coliseum Boulevard
Montgomery, AL 36110-2059
or
P. O. Box 301463
Montgomery, AL 36130-1463
(334) 271-7700
http://www.adem.alabama.gov

Alabama Cooperative Extension System
109-D Duncan Hall
Auburn University, AL 36849
(334) 844-4444
www.aces.edu

Alabama Forestry Association
555 Alabama Street
Montgomery, AL 36104
(334) 265-8733
www.alaforestry.org

Alabama Forestry Commission
513 Madison Avenue
Montgomery, AL 36130
(334) 240-9365 or 240-9332
www.forestry.state.al.us

American Forest and Paper Association
1111 19th St. NW, Suite 800
Washington, DC 20036
(800) 878-8878
www.afandpa.org

U.S. Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, AL 36628
(251) 471-5966
www.sam.usace.army.mil

Nashville District
P.O. Box 1070
Nashville, TN 37202
(615) 736-7161
www.orn.usace.army.mil

U.S. Environmental Protection Agency (EPA)
Region 4
Sam Nunn Atlanta Federal Center
61 Forsyth Street SW
Atlanta, GA 30303-8960
(404) 562-9900 or 1-800-241-1754
http://www.epa.gov/region04/about/index.html

USDA Forest Service
2946 Chestnut Street
Montgomery, AL 36107
(334) 832-4470
www.fs.fed.us

USDA Natural Resources Conservation Service
P.O. Box 311
Auburn, AL 36830
(334) 887-4560
www.nrcs.usda.gov/programs

U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, AL 36526-4419
(251) 441-5181
www.fws.gov


Alabama Forestry Commission
2007

APPENDIX D

USDA

United States Department of Agriculture

Natural Resources
Conservation Service

ALABAMA

Natural Resources Conservation Service

CONSERVATION PRACTICE CATALOG

As a landowner or farm operator, you face many decisions when managing your natural resources. When you evaluate options for your operation, consider installing conservation practices listed in this handout to help improve your resource management and cropping system. A conservation plan can be developed to improve management for additional resource concerns. NRCS staff and your local soil and water conservation district (SWCD) are available to help you make the right choices to protect your operation and resources.

Helping People Help the Land

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October 2016

This document is not to be used as technical guidance or policy. All NRCS practices shall be applied according to current Conservation Practice Standards available in the Field Office Technical Guide, Section IV (http://efotg.sc.egov.usda.gov/efotg_locator.aspx?map=).

For information on the USDA Natural Resources Conservation Service in Alabama, visit www.al.nrcs.usda.gov or follow us on Twitter at http://twitter.com/NRCS_AL

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INDEX

Code	Practice	Page
472	Access Control	1
560	Access Road	1
309	Agrichemical Handling Facility	1
591	Amendments for the Treatment of Agricultural Waste	2
366	Anaerobic Digester	2
316	Animal Mortality Facility	2
575	Animal Trails and Walkways	3
450	Anionic Polyacrylamide (PAM) Erosion Control	3
397	Aquaculture Ponds	3
314	Brush Management	4
584	Channel Bed Stabilization	4
326	Clearing and Snagging	4
372	Combustion System Improvements	5
317	Composting Facility	5
327	Conservation Cover	5
328	Conservation Crop Rotation	6
656	Constructed Wetland	6
332	Contour Buffer Strips	6
330	Contour Farming	7
331	Contour Orchard and Other Perrenial Crops	7
340	Cover Crop	7
342	Critical Area Planting	8
402	Dam	8
324	Deep Tillage	8
356	Dike	9
362	Diversion	9
554	Drainage Water Management	9
432	Dry Hydrant	10
647	Early Successional Habitat Development/Management	10
374	Farmstead Energy Improvement	10
382	Fence	11
297	Feral Swine Management Conservation Activity	11
386	Field Border	11
393	Filter Strip	12
394	Firebreak	12
399	Fishpond Management	12
512	Forage and Biomass Planting	13
511	Forage Harvest Management	13
666	Forest Stand Improvement	13
655	Forest Trails and Landings	14
383	Fuel Break	14
410	Grade Stabilization Structure	14
412	Grassed Waterway	15

INDEX

Code	Practice	Page
561	Heavy Use Area Protection	15
422	Hedgerow Planting	15
515	Herbaceouss Weed Control	16
595	Integrated Pest Management	16
320	Irrigation Canal or Lateral	16
388	Irrigation Field Ditch	17
464	Irrigation Land Leveling	17
430	Irrigation Pipeline	17
436	Irrigation Reservoir	18
441	Irrigation System, Microirrigation	18
442	Irrigation System, Sprinkler	18
443	Irrigation System, Surface and Subsurface	19
447	Irrigation System, Tailwater Recovery	19
449	Irrigation Water Management	19
527	Karst Sinkhole Treatment	20
460	Land Clearing	20
543	Land Reconstruction, Abandoned Mined Land	20
453	Land Reclamation, Landslide Treatment	21
466	Land Smoothing	21
670	Lighting System Improvement	21
576	Livestock Shelter Structure	22
484	Mulching	22
590	Nutrient Management	22
500	Obstruction Removal	23
582	Open Channel	23
516	Pipeline	23
378	Pond	24
521C	Pond Sealing or Lining, Bentonite Sealant	24
521D	Pond Sealing or Lining, Compacted Clay Treatment	24
521A	Pond Sealing or Lining, Flexible Membrane	25
521B	Pond Sealing or Lining, Soil Dispersant	25
462	Precision Land Forming	25
338	Prescribed Burning	26
528	Prescribed Grazing	26
533	Pumping Plant	26
345	Residue and Tillage Management, Mulch Till	27
329	Residue and Tillage Management, No-Till & Strip Till	27
643	Restoration and Management of Declining Habitats	27
391	Riparian Forest Buffer	28
654	Road/Trail/Landing Closure-Treatment	28
558	Roof Runoff Structure	28

INDEX

Code	Practice	Page
367	Roofs and Covers	29
798	Seasonal High Tunnel System for Crops	29
350	Sediment Basin	30
646	Shallow Water Development and Management	30
381	Silvopasture Establishment	30
632	Solid/Liquid Waste Separation Facility	30
572	Spoil Spreading	31
574	Spring Development	31
578	Stream Crossing	31
570	Storm Water Runoff Control	32
395	Stream Habitat Improvement and Management	32
580	Streambank and Shoreline Protection	32
585	Stripcropping	33
587	Structure for Water Control	33
649	Structure for Wildlife	33
607	Surface Drain Field Ditch	34
608	Surface Drain Main or Lateral	34
600	Terrace	34
612	Tree/Shrub Establishment	35
660	Tree/Shrub Pruning	35
490	Tree/Shrub Site Preparation	35
620	Underground Outlet	36
645	Upland Wildlife Habitat Management	36
635	Vegetated Treatment Area	36
360	Waste Facility Closure	37
633	Waste Recycling	37
313	Waste Storage Facility	37
634	Waste Transfer	38
629	Waste Treatment	38
359	Waste Treatment Lagoon	38
636	Water Harvesting Catchment	39
638	Water and Sediment Control Basin	39
614	Watering Facility	39
642	Water Well	40
351	Well Decommissioning	40
658	Wetland Creation	40
659	Wetland Enhancement	41
657	Wetland Restoration	41
644	Wetland Wildlife Habitat Management	41
384	Woody Residue Treatment	42

Access Control - 472

Practice Description

The temporary or permanent exclusion of animals, people, vehicles, and/or equipment from an area

Purpose

Acheive and maintain by monitoring and managing animals people, vehicles, coordination with the practices, measures conservation plan

Access Road - 560

Practice Description

A travel-way for equipment and vehicles constructed to provide a fixed route for vehicular travel for resource activities involving the management of timber, livestock, agriculture, wildlife habitat, and other conservation enterprises while protecting the soil, water, air, fish, wildlife, and other adjacent natural resources

Purpose

This practice is planned where access is needed from a private or public road or highway to a land use enterprise or conservation measure, or where travel ways are needed in a planned land use area. Access roads range from seasonal use roads, designed for low speed and rough driving conditions, to all-weather roads heavily used by the public and designed with safety as a high priority. Some roads are only constructed for a single purpose; i.e. control of forest fires, logging and forest management activities, access to remote recreation areas, or access for maintenance of facilities.

Agrichemical Handling Facility - 309

Practice Description

A facility with an impervious surface to provide an environmentally safe area for on-farm agrichemicals. Provides a safe environment to store, mix, load and cleanup agrichemicals, retain incidental spillage, retain leakage, and reduce surface water, groundwater, air, and/or soil pollution

Purpose

Practice applies where:

- The handling of agrichemicals creates significant potential for pollution of surface water, groundwater, air or soil and a facility is needed to properly manage and handle the chemical operation;
- An adequate water supply is available for filling application equipment tanks, rinsing application equipment and chemical containers as needed;
- Soils and topography are suitable for construction.

NOTE: This practice does not apply to the handling or storage of fuels, or to commercial or multi-landowner agrichemical handling operations.

Amendments for Treatment of Ag Waste - 591

Practice Description
The treatment of manure, wastewater, storm water runoff from high use areas, and other wastes, with chemical or biological additives

Purpose
This practice applies where the use of a chemical or biological amendments will alter the physical and chemical characteristics of animal waste as a part of a planned waste management system to:

• Improve or protect air quality
• Improve or protect water quality
• Improve or protect animal health
• Alter the consistency of the waste stream of facilitates implementation of a waste management system

Anerobic Digester - 366

Practice Description
A component of a waste management system that provides biological treatment in the absence of oxygen

Purpose
This practice is applied for the treatment of manure and other byproducts of animal agricultural operations for one or more of the following reasons:

• Capture biogas for energy production
• Manage odors
• Reduce the net effect of greenhouse gas emissions
• Reduce pathogens

Animal Mortality Facility - 316

Practice Description
An on-farm facility for the treatment or disposal of livestock and poultry carcasses for routine and catastrophic mortality events

Purpose
This practice is applied for one or more of the following purposes:

• Reduce impacts to surface and groundwater resources
• Reduce the impact of odors
• Decrease the spread of pathogens

Animal Trails and Walkways - 575

Practice Description
Established lanes or travel ways that facilitate animal movement

Purpose
This practice is applied to achieve one or more of the following:

- Provide or improve access to forage, water, working/handling facilities, and/or shelter
- Improve grazing efficiency and distribution, and/or
- Protect ecologically sensitive, erosive and/or potentially erosive sites

Anionic Polyacrylamide Erosion Control - 450

Practice Description
Application of water-soluble Anionic Polyacrylamide (PAM) to meet a resource concern

Purpose
This practice is applied as part of a conservation system to support one or more of the following:

- Reduce soil erosion by water or wind
- Improve water quality
- Improve air quality by reducing dust emissions

Aquaculture Ponds - 397

Practice Description
A water impoundment constructed and managed for commercial production of fish and other aquaculture products

Purpose
This practice applies to all types of ponds installed or modified for commercial production of fish and other animals and plants. The purpose of the practice is to provide a favorable water environment for producing, growing, harvesting, and marketing commercial aquaculture crops.

Brush Management - 314

Practice Description
The management or removal of woody (non-herbaceous or succulent) plants including those that are invasive and noxious

Purpose
This practice is applied to achieve one or more of the following:

- Create the desired plant community consistent with the ecological site
- Restore or release desired vegetative cover to protect soils, control erosion, reduce sediment, improve water quality or enhance stream flow
- Maintain, modify, or enhance fish and wildlife habitat
- Improve forage accessibility, quality and quantity for livestock and wildlife
- Manage fuel loads to achieve desired conditions

Channel Bed Stabilization - 584

Practice Description
Measure(s) used to stabilize the bed or bottom of a channel. This practice applies to the beds of existing or newly constructed alluvial or threshold channels that are undergoing damaging aggradation or degradation and that cannot be feasibly controlled by clearing or snagging, by the establishment of vegetative protection, by the installation of bank protection, or by the installation of upstream water control measures

Purpose
This practice may be applied as part of a conservation management system to support one or more of the following:

- Maintain or alter channel bed elevation or gradient
- Modify sediment transport or deposition
- Manage surface water and groundwater levels in floodplains, riparian areas, and wetlands

Clearing and Snagging - 326

Practice Description
Removal of vegetation along the bank (clearing) and/or selective removal of snags, drifts, or other obstructions (snagging) from natural or improved channels and streams

Purpose
Reduce risks to agricultural resources or civil infrastructure by removing obstructions that hinder channel flow or sediment transport in order to accomplish one or more of the following:

- Restore flow capacity and direction
- Prevent excessive bank erosion by eddies or redirection of flow
- Reduce the undesirable formation of bars; and/or;
- Minimize blockages by debris and ice

Combustion System Improvement - 372

Practice Description
Installing, replacing, or retrofitting agricultural combustion systems and/or related components or devices for air quality and energy efficiency improvement

Purpose
This practice is applied to achieve one or more of the following:

• To improve air quality by addressing the air quality resource concerns for particulate matter and ozone precursors by mitigating actual or potential emissions of oxides of nitrogen and/or fine particulate matter
• To improve the energy efficiency of agricultural combustion systems

Composting Facility - 317

Practice Description
A facility to process raw organic by-products such as, animal mortality and manure into biologically stable organic material

Purpose
This practice is applied to reduce the pollution potential of organic agricultural wastes to surface and groundwater by one or more of the following:

• Reduces volume by 25 to 50 percent
• Improves fertilizing capabilities by converting nitrogen to less soluble form
• Aids in nutrient management

Conservation Cover - 327

Practice Description
Establishing and maintaining permanent vegetative cover

Purpose
This practice may be applied to accomplish one or more of the following:

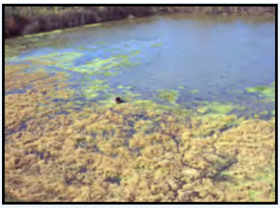
• Reduce soil erosion and sedimentation
• Improve water quality
• Enhance wildlife habitat

Conservation Crop Rotation - 328

Practice Description
Growing crops in a recurring sequence on the same field

Purpose
This practice may be applied as part of a conservation management system to support one or more of the following:

• Reduce sheet and rill erosion
• Reduce soil erosion from wind
• Maintain or improve soil organic matter content
• Manage the balance of plant nutrients
• Improve water use efficiency
• Manage plant pests (weeds, insects, and diseases)
• Provide food for domestic livestock
• Provide food and cover for wildlife



Constructed Wetland - 656

Practice Description
An artificial ecosystem with hydrophytic vegetation for water treatment

Purpose
For treatment of wastewater and contaminated runoff from agricultural processing, livestock, and aquaculture facilities, or for improving the quality of storm water runoff or other water flows lacking specific water quality discharge criteria

Contour Buffer Strips - 332

Practice Description
Narrow strips of permanent, herbaceous vegetative cover established around the hill slope, and alternated down the slope with wider cropped strips that are farmed on the contour

Purpose
This practice is applied to achieve one or more of the following:

• Reduce sheet and rill erosion
• Reduce transport of sediment and other water-borne contaminants downslope
• Increase water infiltration

Contour Farming - 330

Practice Description
Using ridges and furrows formed by tillage, planting and other farming operations to change the direction of runoff from directly downslope to around the hillslope

Purpose
This practice is applied to achieve one or more of the following:

• Reduce sheet and rill erosion
• Reduce transport of sediment, other solids and the contaminants attached to them
• Increase water infiltration

Contour Orchard and Other Perennial Crops - 331

Practice Description
Planting orchards, vineyards, or small fruits so that all cultural operations are done on the countour

Purpose
• Reduce soil erosion
• Reduce water loss

Cover Crop - 340

Practice Description
Crops including grasses, legumes and forbs for seasonal cover and other conservation purposes

Purpose
This practice is applied to achieve one or more of the following:

• Reduce erosion from wind and water
• Increase soil organic matter content
• Promote biological nitrogen fixation
• Increase biodiversity
• Weed suppression
• Provide supplemental forage
• Soil moisture management
• Minimize and reduce soil compaction

Critical Area Planting - 342

Practice Description
Establishing permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices

Purpose

• Stabilize areas with existing or expected high rates of soil erosion by water.
• Stabilize areas with existing or expected high rates of soil erosion by wind
• Rehabilitate and re-vegetate degraded sites that cannot be stabilized through normal farming practices.
• Stabilize coastal areas, such as sand dunes and riparian areas.

Dam - 402

Practice Description
An artificial barrier that can impound water for one or more beneficial purposes

Purpose
This practice is applied to achieve one or more of the following:

• Reduce downstream flood damage
• Provide permanent water storage for one or more beneficial uses such as irrigation or livestock supply, fire control, municipal or industrial uses, or recreational uses
• Create or improve habitat for fish and wildlife

Deep Tillage - 324

Practice Description
Performing tillage operations below the normal tillage depth to modify adverse physical or chemical properties of a soil

Purpose
This practice is applied to achieve one or more of the following:

• Bury or mix soil deposits from wind or water erosion or flood overwash
• Reduce concentration of soil contaminants, which inhibit plant growth
• Fracture restrictive soil layers

Dike - 356

Practice Description
A berm or ridge, or ridge and channel combination of compacted soil to channel water to a desired location or away from an undesired location

Purpose
This practice is applied to achieve one or more of the following:

• Protect people and property from floods
• Control water level in connection with crop production, fish and wildlife management; or wetland maintenance, improvement, restoration, or construction
• Direct water to stable outlets or traps
• Direct clean water away from disturbed or polluted areas

Diversion - 362

Practice Description
A channel constructed across the slope with a supporting ridge on the lower side

Purpose
This practice may be applied as part of a resource management system to support one or more of the following purposes:

• Break up concentrations of water on long slopes, on undulating land surfaces, and on land that is generally considered too flat or irregular for terracing
• Increase or decrease the drainage area above ponds
• Protect terrace systems by diverting water from the top terrace where topography, land use, or land ownership prevents terracing the land above
• Intercept surface and shallow subsurface flow
• Reduce runoff damages from upland runoff

Drainage Water Management - 554

Practice Description
The use of structures for water control in the process of managing water discharges from surface and/or subsurface agricultural drainage systems

Purpose
The purpose of this practice is:

• Reduce nutrient, pathogen, and/or pesticide loading from drainage systems into downstream receiving waters
• Improve productivity, health, and vigor of plants
• Reduce oxidation of organic matter in soils
• Reduce wind erosion or particulate matter (dust) emissions
• Provide seasonal wildlife habitat

Dry Hydrant - 432

Practice Description
A non-pressurized permanent pipe assembly system installed into water source that permits the withdrawal of water by suction. To provide all weather access to an available water source for fire suppression

Purpose
Where a dependable source of water is available, where transport vehicles can access the site, and where a source of water is needed for fire suppression.

Early Successional Habitat Development / Management - 647

Practice Description
Manage plant succession to develop and maintain early successional habitat to benefit desired wildlife and/or natural communities. To provide habitat for species requiring early successional habitat for all or part of their life cycle

Purpose
This practice is applied on all lands that are suitable for the kinds of desired wildlife and plant species. Management will be designed to achieve the desired plant community structure (e.g., density, vertical and horizontal cover) and plant species diversity.

Farmstead Energy Improvement - 374

Practice Description
Installing, replacing, or retrofitting agricultural equipment systems and/or related components or devices which results in an on-farm and/or off-site reduction in actual or potential emissions of greenhouse gases

Purpose
This practice is applied to achieve the following:

• Reduce net greenhouse gas emissions (on farm and/or off-site) from agricultural systems or components by implementing the recommendations from on-site energy audits

Fence - 382

Practice Description
A constructed barrier to animals or people

Purpose
This practice facilitates the accomplishment of conservation objectives by providing a means to control movement of animals, people, and vehicles.

Feral Swine Management Conservation Activity - 297

Practice Description
Feral swine management is a component of an area wide effort of assessment, planning, exclusion, scouting, control, and monitoring to document and reduce resource damage caused by feral swine and focus interagency management efforts to reduce adverse resource impacts and health concerns for other animals and humans.

Purpose
• Determine locations and intensity of feral swine impacts upon resource conditions and potential means to reduce or eliminate these impacts
• Develop a management plan to address feral-swine-impacted resources of concern using a conservation practice or system of conservation practices
• Evaluate the effectiveness of a practice or system of practices in reducing resource impacts from feral swine

Field Border - 386

Practice Description
A strip of permanent vegetation established at the edge or around the perimeter of a field

Purpose
This practice may be applied to accomplish one or more of the following:

• Reduce soil erosion
• Provide turn rows for farm machinery
• Soil and water quality protection
• Management of harmful insect populations
• Provide wildlife food and cover
• Increase carbon storage in biomass and soils
• Improve air quality

Filter Strip - 393

Practice Description
A strip or area of herbaceous vegetation that removes contaminants from overland flow

Purpose
This practice is applied to achieve one or more of the following:

• Reduce suspended solids and associated contaminants in runoff
• Reduce dissolved contaminant loadings in runoff
• Reduce suspended solids and associated contaminants in irrigation tailwater

Firebreak - 394

Practice Description
A permanent or temporary strip of bare or vegetated land planned to retard fire

Purpose
This practice applies on all land uses where protection from wildfire is needed or prescribed burning is applied to accomplish one or more of the following:

• Reduce the spread of wildfire
• Contain prescribed burns

Fishpond Management - 399

Practice Description
Managing impounded water for the production of fish or other aquatic organisms

Purpose
This practice is applied in warm and cold water ponds, lakes, and reservoirs not managed for commercial aquaculture purposes to accomplish one or more of the following:

• To provide favorable habitat for fish and other aquatic organisms.
• To develop and maintain a desired species composition and ratio.
• To develop and maintain a desired level of production

Forage and Biomass Planting - 512

Practice Description
Establishing adapted and/or compatible species, varieties, or cultivars of herbaceous species suitable for pasture, hay, or biomass production

Purpose
This practice is applied to achieve one or more of the following:

•Improve or maintain livestock nutrition and/or health
•Provide or increase forage supply during periods of low forage production
• Reduce soil erosion
• Improve soil quality and water quality
• Produce feedstock for biofuel or energy production

Forage Harvest Management - 511

Practice Description
The timely cutting and removal of forages from the field as hay, green-chop or ensilage

Purpose
• Optimize yield and quality of forage at the desired levels
• Promote vigorous plant re-growth
• Manage for the desired species composition
• Use forage plant bio-mass as a soil nutrient uptake tool
• Control insects, dis-eases and weeds
• Maintain and/or im-prove wildlife habitat

Forest Stand Improvement - 666

Practice Description
The manipulation of spe-cies composition, stand structure and stocking by cutting or killing selected trees and understory vegetation

Purpose
This practice may be ap-plied to accomplish one or more of the following:

• Increase the quan-tity and quality of forest products by manipulat-ing stand density and structure
• Harvest forest products
• Initiate forest stand regeneration
• Reduce wildfire hazard
• Improve forest health reducing the potential of damage from pests and moisture stress
• Restore natural plant communities
• Achieve or maintain a desired native understory plant community for special forest products, grazing, and browsing
• Improve aesthetic and recreation, values
• Improve wildlife habitat
• Alter water yield
• Increase carbon storage in selected trees

Forest Trails and Landings - 655

Practice Description
A temporary or infrequently used route, path or cleared area. Trails and landings including skid trails are applicable on forest land. They typically connect to an Access Road (560)

Purpose
This practice may be applied to accomplish one or more of the following:

• Provide routes for temporary or infrequent travel by people or equipment for management activities
• Provide periodic access for removal and collection of forest products

Fuel Break - 383

Practice Description
A strip or block of land on which the vegetation, debris and detritus have been reduced and/ or modified to control or diminish the risk of the spread of fire crossing the strip or block of land

Purpose
This practice applies on all land where protection from wildfire is needed to control and reduce the risk of the spread of fire by treating, removing or modifying vegetation, debris and detritus.

Grade Stabilization Structure - 410

Practice Description
A structure used to control the grade and head cutting in natural or artificial channels

Purpose
The purpose of this practice is to stabilize the grade and control erosion in natural or artificial channels, to prevent the formation or advance of gullies, and to enhance environmental quality and reduce pollution hazards.

Grassed Waterways - 412

Practice Description
A shaped or graded channel that is established with suitable vegetation to carry surface water at a non-erosive velocity to a stable outlet

Purpose
This practice is applied to achieve one or more of the following:

• Convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding
• Reduce gully erosion
• Protect/improve water quality

Heavy Use Area Protection - 561

Practice Description
The stabilization of areas frequently and intensively used by people, animals or vehicles by establishing vegetative cover, by surfacing with suitable materials, and/or by installing needed structures

Purpose
This practice is applied to achieve one or more of the following:

• Reduce soil erosion
• Improve water quantity and quality
• Improve air quality
• Improve aesthetics
• Improve livestock health

Hedgerow Planting - 422

Practice Description
Establishment of dense vegetation in a linear design to achieve a natural resource conservation purpose

Purpose
This practice may be installed to accomplish one or more of the following:

• Habitat, including food, cover, and corridors for terrestrial wildlife
• To enhance pollen, nectar, and nesting habitat for pollinators
• Food, cover, and shade for aquatic organisms that live in adjacent streams or watercourses
• To provide substrate for predaceous and beneficial invertebrates as a component of integrated pest management
• To intercept airborne particulate matter
• To reduce chemical drift and odor movement
• Screens and barriers to noise and dust
• To increase carbon storage in biomass and soils
• Living fences
• Boundary delineation and contour guidelines

Herbaceous Weed Control - 315

Practice Description
The removal or control of herbaceous weeds including invasive, noxious and prohibited plants

Purpose
• Enhance accesibility, quantity, and quality of forage and/or browse.
• Restore or release native ore create desired plant communities and wildlife habitats consistent with the ecological site.
• Protect soils and control erosion
• Reduce fine-fuels fire hazard and improve air quality

Integrated Pest Management - 595

Practice Description
A site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies

Purpose
This practice is applied on all lands where pests will be managed to accomplish one or more of the following:

• Prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses
• Prevent or mitigate off-site pesticide risks to soil, water, air, plants, animals and humans from drift and volatilization losses
• Prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact
• Prevent or mitigate cultural, mechanical and biological pest suppression risks to soil, water, air, plants, animals and humans

Irrigation Canal or Lateral - 320

Practice Description
A permanent channel constructed to convey irrigation water from the source of supply to one or more irrigated areas

Purpose
Apply this practice to facilitate the efficient distribution and use of water on irrigated land to accomplish one or more of the following:

• Where a canal or lateral and related structures are needed as an integral part of an irrigation water conveyance system
• Where water supplies for the area served are sufficient to make irrigation practical for the crops to be grown and the irrigation water application methods to be used

Conservation Practice Standard Irrigation Field Ditch (388) should be used for on-farm irrigation water conveyance and/or distribution of less than 25 cubic feet per second

Irrigation Field Ditch - 388

Practice Description
A permanent irrigation ditch constructed in or with earth materials, to convey water from the source of supply to a field or fields in an irrigation system

Purpose
This practice may be applied as part of an irrigation water management system to efficiently convey and distribute irrigation waters. This standard is limited to open channels and elevated ditches of 25 cubic feet per second or less in capacity and constructed of earth materials. The practice applies where field ditches are needed as an integral part of an irrigation water distribution system design to facilitate the conservation use of soil and water resources.

Irrigation Land Leveling - 464

Practice Description
Reshaping the surface of land to be irrigated, to planned lines and grades

Purpose
This practice applies to the leveling of land irrigated by surface or subsurface irrigation systems. The leveling is based on a detailed engineering survey, design, and layout. Land to be leveled shall be suitable for irrigation and for the proposed methods of water application. Soils shall be deep enough that, after leveling, an adequate usable root zone remains that will permit satisfactory crop production with proper conservation measures. Limited areas of shallow soils may be leveled to provide adequate irrigation grades or an improved field alignment. The finished leveling work must not result in exposed areas of highly permeable soil materials that would inhibit proper distribution of water over the field.

Irrigation Pipeline - 430

Practice Description
A pipeline and appurtenances installed in an irrigation system to convey water

Purpose
This practice is applied to convey water from a source of supply to an irrigation system or storage reservoir.

Irrigation Reservoir - 436

Practice Description
An irrigation water storage structure made by constructing a dam, embankment, pit, or tank

Purpose
This practice may be applied as part of a resource conservation system to achieve one or more of the following:

• Store water to provide a reliable irrigation water supply or regulate available irrigation flows
• Improve water use efficiency on irrigated land
• Provide storage for tailwater recovery and reuse
• Provide irrigation runoff retention time to increase breakdown of chemical contaminants
• Reduce energy consumption

Irrigation System, Microirrigation - 441

Practice Description
An irrigation system for frequent application of small quantities of water on or below the soil surface: as drops, tiny streams or miniature spray through emitters or applicators placed along a water delivery line

Purpose
This practice may be applied as part of a conservation management system to support one or more of the following purposes:

• To efficiently and uniformly apply irrigation water and maintain soil moisture for plant growth
• Prevent contamination of ground and surface water by efficiently and uniformly applying chemicals
•Establish desired vegetation

Irrigation System, Sprinkler - 442

Practice Description
An irrigation system in which all necessary equipment and facilities are installed for efficiently applying water by means of nozzles operated under pressure

Purpose
This practice may be applied as part of a conservation management system to achieve one or more of the following:

• Efficiently and uniformly apply irrigation water to maintain adequate soil water for the desired level of plant growth and production without causing excessive water loss, erosion, or water quality impairment
• Climate control and/or modification
• Applying chemicals, nutrients, and/or waste water
• Leaching for control or reclamation of saline or sodic soils
• Reduction in particulate matter emissions to improve air quality

Irrigation System, Surface and Subsurface - 443

Practice Description
A system in which all necessary earthwork, multi-outlet pipelines, and water-control structures have been installed for distribution of water by surface means, such as furrows, borders, and contour levees, or by subsurface means through water table control

Purpose
Applied as part of a resource conservation system to achieve one or more of the following:

- Efficiently convey and distribute irrigation water to the surface point of application without causing excessive water loss, erosion, or water quality impairment
- Efficiently convey and distribute irrigation water to the subsurface point of application without causing excessive water loss or water quality impairment
- Apply chemicals and/or nutrients as part of a surface irrigation system in a manner which protects water quality
- Improve energy use efficiency

Irrigation Tailwater Recovery - 447

Practice Description
A planned irrigation system in which all facilities utilized for the collection, storage, and transportation of irrigation tailwater and/or rainfall runoff for reuse have been installed

Purpose
This practice shall be applied as part of a conservation management system to support one or more of the following:

- Conserve irrigation water supplies
- Improve off-site water quality

Irrigation Water Management - 449

Practice Description
The process of determining and controlling the volume, frequency and application rate of irrigation water in a planned, efficient manner

Purpose
This practice is applied to achieve one or more of the following:

- Manage soil moisture to promote desired crop response
- Optimize use of available water supplies
- Minimize irrigation induced soil erosion
- Decrease non-point source pollution of surface and groundwater resources
- Manage salts in the crop root zone
- Manage air, soil, or plant micro-climate
- Proper and safe chemigation or fertigation
- Improve air quality by managing soil moisture to reduce particulate matter movement

Karst Sinkhole Treatment - 527

Practice Description
The treatment of sinkholes in karst areas to reduce contamination of groundwater resources, and/or to improve farm safety

Purpose
This practice may be applied as part of a conservation management system in karst topography, which is an area underlain by solutioned carbonate bedrock with sinkholes and caverns. The practice supports one or more of the following purposes:

• Improve water quality
• Improve farm safety

Land Clearing - 460

Practice Description
Removing trees, stumps, and other vegetation to achieve a conservation objective

Purpose
This practice applies to wooded areas where the removal of trees, stumps, brush, and other vegetation is needed in carrying out a conservation plan to allow needed land use adjustments and improvements in the interest of conservation.

Land Reclamation, Abandoned Mined Land - 543

Practice Description
Reclamation of land and water areas adversely affected by past mining activities

Purpose
Apply this practice to abandoned mined land that degrades the quality of the environment and prevents or interferes with the beneficial uses of soil, water, air, plant or animal resources, or endangers human health and safety to accomplish one or more of the following:

• Stabilize abandoned mined areas to decrease erosion and sedimentation, support desirable vegetation and improve off-site water quality and or quantity
• Maintain or improve landscape visual and functional quality
• Protect public health, safety and general welfare

Land Reclamation, Landslide Treatment - 453

Practice Description
Managing natural materials, mine spoil (excavated over-burden), mine waste or overburden to reduce down-slope movement.

Purpose
Apply where in-place material, mine spoil, waste, or overburden, or rock cut road banks are unstable, moving, or judged to have potential of moving down slope in a manner that will cause damage to life, property, or the environment to accomplish one or more of the following:

- Repair unstable slopes caused by slope failure, and reduce the chance of enlargement or movement of slope surfaces
- Protect life and property
- Prevent excessive erosion and sedimentation
- Improve water quality and landscape resource quality
- Create a condition conducive to establishing surface protection and beneficial land use

This practice does not apply to constructed embankment surfaces (road fills, dams, dikes, levees and terraces.

Land Smoothing - 466

Practice Description
Removing irregularities on the land surface. To improve surface drainage, provide for more uniform cultivation, and improve equipment operation and efficiency.

Purpose
This practice applies on areas where depressions, mounds, old terraces, turn-rows, and other surface irregularities interfere with the application of needed soil and water conservation and management practices. It is limited to areas having adequate soil depth or where topsoil can be salvaged and replaced. This practice does not apply to the regular maintenance on irrigated land or on land that has been modified using practice standards Precision Land Forming (462) or Irrigation Land Leveling (464).

Lighting System Improvement - 670

Practice Description
Complete replacement or retrofitting of one or more components of an existing agricultural lighting system.

Purpose
This practice may be applied as part of a conservation management system to reduce energy use.

Livestock Shelter Structure - 576

Practice Description
A permanent or portable structure with less than four walls and/or a roof to provide for improved utilization of pastureland and rangeland and to shelter livestock from negative environmental factors. This structure is not to be construed to be a building

Purpose
• To provide protection for livestock from excessive heat, wind, cold, or snow.
• Protect surface waters from nutrient and pathogen loading.
• Protect wooded areas from accelerated erosion and excessive nutrient deposition by providing alternative livestock shelter/shade location.
• Improve the distribution of grazing livestock to enhance wildlife habitat, reduce overused areas, or correct other resource concerns resulting from improper livestock distribution

Mulching - 484

Practice Description
Applying plant residues or other suitable materials produced off site, to the land surface

Purpose
This practice is applied to achieve one or more of the following:

• Conserve soil moisture
• Moderate soil temperature
• Provide erosion control
• Suppress weed growth
• Establish vegetative cover
• Improve soil condition and increase soil fertility

Nutrient Management - 590

Practice Description
Managing the amount, source, placement, form and timing of the application of plant nutrients and soil amendments

Purpose
This practice is applied to achieve one or more of the following:

• Budget and supply nutrients for plant production
• Properly utilize manure or organic by-products as a plant nutrient source
• Minimize agricultural non-point source pollution of surface and groundwater resources
• Protect air quality by reducing nitrogen emissions (ammonia and NO2 compounds) and the formation of atmospheric particulates
• Maintain or improve the physical, chemical and biological condition of soil

Obstruction Removal - 500

Practice Description
Removal and disposal of buildings,
structures, other works of improvement, vegetation, debris or other materials

Purpose
To safely remove and dispose of unwanted obstructions in order to apply conservation practices or facilitate the planned land use.

CONDITIONS WHERE PRACTICE APPLIES
On any land where existing obstructions interfere with planned land use development, public safety or infrastructure. This standard is not intended for the removal of obstructions from aquatic environments

Open Channel - 582

Practice Description
Pipeline having an inside diameter of 4 inches or less where conveyance of water is desirable or necessary to conserve the supply, or maintain the quality of water

Purpose
This practice is applied to improve water quantity and quality by conveying water from a source of supply to points of use for livestock or wildlife; make practical the exclusion of livestock from ponds and streams.

Pipeline (Livestock Pipeline) - 516

Practice Description
A pipeline and appurtenances installed to convey water for livestock and wildlife

Purpose
This practice may be applied as part of a resource management system to achieve one or more of the following purposes:
• Convey water to the points of use for livestock or wildlife
• Reduce energy use
• Develop renewable energy systems

Pond - 378

Practice Description
A water impoundment made by constructing an embankment or by excavating a pit or dugout. Ponds constructed by the first method are referred to as embankment ponds, and those constructed by the second method are referred to as excavated ponds. Ponds constructed by both the excavation and the embankment methods are classified as embankment ponds if the depth of water impounded against the embankment at the auxiliary spillway elevation is 3 feet or more

Purpose
This practice is applied to provide water for livestock, fish and wildlife, recreation, fire control, and other related uses, and to maintain or improve water quality.

Pond Sealing or Lining, Bentonite Sealant - 521c

Practice Description
A liner for a pond or waste storage impoundment consisting of a compacted soil-bentonite mixture.

Purpose
This practice is applied to reduce seepage losses from ponds or waste impoundments for water conservation and environmental protection to accomplish one or more of the following:

• Soils are suitable for treatment with bentonite
• Ponds or waste storage impoundments require treatment to reduce seepage rates and to impede the migration of contaminants to within acceptable limits

Pond Sealing or Lining, Compacted Clay Treatment - 521d

Practice Description
A liner for a pond or waste storage impoundment constructed using compacted soil without soil amendments

Purpose
Apply this practice to reduce seepage losses from ponds or waste storage impoundments constructed for water conservation and environmental protection to accomplish one or more of the following:

• In-place soils at the site would exhibit seepage rates in excess of acceptable limits or would allow an unacceptable migration of contaminants from the impoundment
• An adequate quantity of soil suitable for constructing a clay liner without amendments is available at an economical haul distance

Pond Sealing or Lining, Flexible Membrane - 521a

Practice Description
Pond sealing with a flexible membrane is installing a liner made of impervious flexible material to reduce seepage to an acceptable level

Purpose
This practice is used to improve the functionality of a pond, and prevent damage to the natural resources including unacceptable loss of water from seepage. This method of pond sealing is relatively expensive, but often necessary for sandy textured sites and projects that require a very effective sealant. Ponds to be lined may include Irrigation Storage Reservoirs, Irrigation Pits, Waste Treatment Lagoons, Waste Treatment Ponds, and Ponds For Livestock/Wildlife.

Pond Sealing or Lining, Soil Dispersant - 521b

Practice Description
A liner for a pond or waste storage impoundment consisting of a compacted soil-dispersant mixture

Purpose
Apply this practice to reduce seepage losses from ponds or waste impoundments for water conservation and environmental protection to accomplish one or more of the following:

• Soils are suitable for treatment with dispersants
• Ponds or waste storage impoundments require treatment to reduce seepage rates and to impede the migration of contaminants to within acceptable limits

Precision Land Forming - 462

Practice Description
Reshaping the surface of land to planned grades

Purpose
All precision land forming shall be planned as an integral part of an overall system to facilitate the conservative use to improve surface drainage and control erosion.

Prescribed Burning - 338

Practice Description
Controlled fire applied to a predetermined area

Purpose
This practice is applied to achieve one or more of the following:

- Control undesirable vegetation
- Prepare sites for harvesting, planting or seeding.
- Control plant disease.
- Reduce wildfire hazards
- Improve wildlife habitat
- Improve plant production quantity and/or quality
- Remove slash and debris
- Enhance seed and seedling production
- Facilitate distribution of grazing and browsing animals
- Restore and maintain ecological sites

Prescribed Grazing - 528

Practice Description
Managing the harvest of vegetation with grazing and/or browsing animals

Purpose
This practice may be applied as a part of conservation management system to achieve one or more of the following:

- Improve or maintain desired species composition and vigor of plant communities
- Improve or maintain quantity and quality of forage for grazing
- Improve or maintain surface and/or subsurface water quality and quantity
- Improve or maintain riparian and watershed function
- Reduce accelerated soil erosion, and maintain or improve soil condition
- Improve or maintain the quantity and quality of food and/or cover available for wildlife
- Manage fine fuel loads to achieve desired conditions

Pumping Plant - 533

Practice Description
A facility that delivers water at a designed pressure and flow rate. Includes the required pump, associated power unit(s), plumbing, appurtenances, and may include on-site fuel or energy sources, and protective structures.

Purpose
This practice may be applied as a part of a resource management system to achieve one or more of the following:

- Delivery of water irrigation, water facilities
- Removal of excessive surface water
- Provide efficient use of water on irrigated land
- Transfer of animal waste as part of a manure transfer system
- Improve energy use efficiency
- Improve air quality

Residue & Tillage Management, Reduce Till - 345

Practice Description
Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting the soil-disturbing activities used to grow crops in systems where the entire field surface is tilled prior to planting.

Purpose
This practice is applied as part of a conservation management system to support one or more of the following purposes:

• Reduce sheet and rill erosion
• Reduce tillage-induced particulate emissions
• Maintain or increase soil quality and organic matter content
• Reduce energy use
• Increase plant-available moisture

Residue Management, No-Till, and Strip Till - 329

Practice Description
Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting soil-disturbing activities to only those necessary to place nutrients, condition residue and plant crops.

Purpose
This practice is applied to achieve one or more of the following:

• Reduce sheet and rill erosion
• Reduce wind erosion
• Improve soil organic matter content
• Reduce CO_2 losses from soil
• Increase plant-available moisture
• Provide food and escape cover for wildlife

Restoration and Management of Rare and Declining Habitats - 643

Practice Description
Restoring and managing rare and declining habitats and their associated wildlife species to conserve biodiversity.

Purpose
This practice may be installed to provide habitat for rare and declining species.

Riparian Forest Buffer - 391

Practice Description
An area predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies

Purpose
This practice is applied to achieve one or more of the following:

- Create shade to lower or maintain water temperatures to improve habitat for aquatic organisms
- Create or improve riparian habitat and provide a source of detritus and large woody debris
- Reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow groundwater flow
- Reduce pesticide drift entering the water body
- Restore riparian plant communities
- Increase carbon storage in plant biomass and soils

Road / Trail / Landing Closure - Treatment - 654

Practice Description
The closure, decommissioning, or abandonment of roads, trails, and/or landings and associated treatment to achieve conservation objectives.

Purpose
To minimize various resource concerns associated with existing roads, trails, and/or landings by closing them and treating to a level where one or more the following objectives are achieved:

- Controlling erosion (road, sheet and rill, gully, wind), chemical residues and offsite movement, sediment deposition and damage, accentuated storm runoff, and particulate matter generation;
- Restoring land to a productive state by reestablishing adapted plants and habitat (wildlife food, cover, and shelter), reconnecting wildlife habitat and migration corridors including streams and riparian areas, and controlling noxious and invasive species;
- Reestablishing drainage patterns that existed prior to construction of the road, trail, or landing to restore the form and integrity of associated hill slopes, channels and floodplains and their related hydrologic and geomorphic processes;
- Minimizing human impacts to the closure area to meet safety, aesthetic, sensitive area protection, or wildlife habitat requirements

Roof Runoff Structure - 558

Practice Description
Structures that collect, control, and transport precipitation from roofs

Purpose
This practice may be installed to improve water quality, reduce soil erosion, increase infiltration, protect structures, improve animal health, and/or increase water quantity.

Roofs and Covers - 367

Practice Description
A rigid, semi-rigid, or flexible manufactured membrane, composite material, or roof structure placed over a waste management facility

Purpose
This practice is applied to achieve one or more of the following:

• Water quality improvement
• Diversion of clean water from animal management areas (i.e. barnyard, feedlot or exercise area) and/or waste storage facilities
• Capture of biogas for energy production
• Reducing net effect of greenhouse gas emissions
• Air quality improvement and odor reduction

High Tunnel System - 325

Practice Description
An enclosed polyethylene, polycarbonate, plastic, or fabric covered structure that is used to cover and protect crops from sun, wind, execessive rainfall, or cold to extend the growing season in an envrionmentally safe manner

Purpose
Improve plant health and vigor.

Sediment Basin - 350

Practice Description
A basin constructed to collect and store debris or sediment

Purpose
This practice is applied to achieve one or more of the following:

• Preserve the capacity of reservoirs, wetlands, ditches, canals, diversion, waterways, and streams
• Prevent undesirable deposition on bottom lands and developed areas
• Trap sediment originating from construction sites or other disturbed areas
• Reduce or abate pollution by providing basins for deposition and storage of silt, sand, gravel, stone, agricultural waste solids, and other detritus

Shallow Water Development and Management - 646

Practice Description
The inundation of lands to provide habitat for fish and/or wildlife

Purpose
To provide habitat for wildlife such as shorebirds, waterfowl, wading birds, mammals, fish, reptiles, amphibians and other species that require shallow water for at least a part of their life cycle.

Silvopasture Establishment - 381

Practice Description
An application establishing a combination of trees or shrubs and compatible forages on the same acreage

Purpose
This practice is applied to achieve one or more of the following:

• Provide forage for livestock and the production of wood products
• Increase carbon sequestration
• Improve water quality
• Reduce erosion
• Enhance wildlife habitat
• Reduce fire hazard
• Provide shade for livestock
• Develop renewable energy systems

Solid/Liquid Waste Separation Facility - 632

Practice Description
A filtration or screening device, settling tank, settling basin, or settling channel used to separate a portion of solids from a liquid waste stream

Purpose
This practice is applied to partition solids, liquids and their associated nutrients as part of a conservation management system to achieve one or more of the following:

• Improve or protect air quality
• Improve or protect water quality
• Improve or protect animal health
• Meet management objectives

Spoil Spreading - 572

Practice Description
Disposal of surplus excavated materials

Purpose
This practice applies to sites where spoil material is available from the excavation of open channels, ponds or other construction sites to dispose of excess soil from construction activities in an environmentally sound manner that minimizes soil erosion, protects water quality and fits with the land use and landscape

Spring Development - 574

Practice Description
Collection of water from springs or seeps to provide water for a conservation need

Purpose
In areas where a spring or seep will provide a dependable supply of suitable water to improve the quantity and/or quality of water for livestock, wildlife or other agricultural uses

Stream Crossing - 578

Practice Description
Controlling the quantity and quality of stormwater runoff

Purpose
To control stormwater runoff to achieve one or more of the following:
• Minimize erosion and sedimentation during and following construction activities.
• Reduce the quantity of stormwater leaving developing or developed sites.
• Improve the quality of stormwater leaving developing or developed sites

Storm Water Runoff Control - 570

Practice Description
A stabilized area or structure constructed across a stream to provide a travel way for people, livestock,equipment, or vehicles

Purpose
This practice may be applied to achieve improved water quality by the following:

- Reduce sediment, nutrient, organic, and inorganic loading of the stream
- Reduce stream bank and streambed erosion
- Provide crossing for access to another land unit
- Provide limited access for livestock water use

Stream Habitat Improvement and Management - 395

Practice Description
Maintain, improve or restore physical, chemical and biological functions of a stream, and its associated riparian zone, necessary for meeting the life history requirements of desired aquatic species.

Purpose
This practice is applied to achieve one or more of the following:

- Provide suitable habitat for desired fish and other aquatic species
- Provide stream channel and associated riparian conditions that maintain stream corridor ecological processes and hydrological connections of diverse stream habitat types important to aquatic species

Streambank and Shoreline Protection - 580

Practice Description
Treatment(s) used to stabilize and protect banks of streams or constructed channels, and shorelines of lakes, reservoirs, or estuaries

Purpose
This practice is applied to achieve one or more of the following:

- To prevent the loss of land or damage to land uses, or facilities adjacent to the banks of streams or constructed channels, shoreline of lakes, reservoirs, or estuaries including the protection of known historical, archeological, and traditional cultural properties
- To maintain the flow capacity of streams or channels
- Reduce the off-site or downstream effects of sediment resulting from bank erosion
- To improve or enhance the stream corridor for fish and wildlife habitat, aesthetics, and recreation

Stripcropping - 585

Practice Description
Growing planned rotations of row crops, forages, small grains, or fallow in a systematic arrangement of equal width strips across a field

Purpose
This practice may be applied to achieve one or more of the following:

• Reduce soil erosion from water and transport of sediment and other water-borne contaminants
• Reduce soil erosion from wind
• Protect growing crops from damage by wind-borne soil particles

Structure For Water Control - 587

Practice Description
A structure in a water management system that conveys water, controls the direction or rate of flow, maintains a desired water surface elevation or measures water

Purpose
The practice may be applied as a management component of a water management system to control the stage, discharge, distribution, delivery or direction of water flow.

Structure for Wildlife - 649

Practice Description
A structure installed to replace or modify a missing or deficient wildlife habitat component.
PURPOSE
To provide structures, in proper amounts, locations and seasons to:

Purpose
A structure installed to replace or modify a missing or deficient wildlife habitat component.
PURPOSE
To provide structures, in proper amounts, locations and seasons to:
• Enhance or sustain non-domesticated wildlife; or
• Modify existing structures that pose a hazard to wildlife

Surface Drain Field Ditch - 607

Practice Description
A graded ditch for collecting excess water in a field

Purpose
This practice may be applied as part of a resource conservation system to achieve one or more of the following:

• Interception of excess subsurface water and conveyance to an outlet
• Collection or interception of excess surface water, such as sheet flow from natural and graded land surfaces or channel flow from furrows, and conveyance to an outlet
• Drainage of surface depressions

Surface Drain, Main or Lateral - 608

Practice Description
An open drainage constructed to a designed cross section alignment and grade

Purpose
This practice is applied as part of a water management system (tailwater recovery) to collect and convey excess irrigation water to storage area for reuse through out the growing season.

Terrace - 600

Practice Description
An earthen embankment, or a combination ridge and channel, constructed across the field slope

Purpose
This practice is applied as a part of a resource management system for one or more of the following purposes:

• Reduce erosion by reducing slope length
• Retain runoff for moisture conservation

Tree/Shrub Establishment - 612

Practice Description
Establishing woody plants by planting seedlings or cuttings, direct seeding, or natural regeneration

Purpose
This practice is applied to establish woody plants for:

• Forest products such as timber, pulpwood, and energy biomass
• Wildlife habitat
• Long-term erosion control and improvement of water quality
• Treating waste
• Storing carbon in biomass
• Energy conservation
• Improving or restoring natural diversity
• Enhancing aesthetics

Tree/Shrub Pruning - 660

Practice Description
The removal of all or part of selected branches, leaders or roots from trees and shrubs

Purpose
This practice when applied may achieve one or more of the following:

• Improve the appearance of trees or shrubs, e.g., ornamental plants and Christmas trees
• Improve the quality of wood products
• Improve the production of plant products, e.g., nuts, fruits, boughs and tips
• Reduce fire and/or safety hazards
• Improve the growth and vigor of understory plants
• Adjust the foliage and branching density or rooting length for other specific intents, such as wind and snow control, noise abatement, access control, and visual screens and managing competition
• Improve health and vigor of woody plants e.g. disease, insect and injury management

Tree/Shrub Site Preparation - 490

Practice Description
Treatment of areas to improve site conditions for establishing trees and/or shrubs

Purpose
This practice when applied may achieve one or more of the following:

• Encourage natural regeneration of desirable woody plants
• Permit artificial establishment of woody plants

Underground Outlet - 620

Practice Description
A conduit or system of conduits installed beneath the surface of the ground to convey surface water to a suitable outlet.

Purpose
This practice is applied to carry water to a suitable outlet from terraces, water and sediment control basins, diversions, waterways, surface drains or other similar practices without causing damage by erosion or flooding.

Upland Wildlife Habitat Management - 645

Practice Description
Provide and manage upland habitats and connectivity within the landscape for wildlife.

Purpose
Treating upland wildlife habitat concerns identified during the conservation planning process that enable movement, or provide shelter, cover, food in proper amounts, locations and times to sustain wild animals that inhabit uplands during a portion of their life cycle.

Vegetated Treatment Area - 635

Practice Description
An area of permanent vegetation used for agricultural wastewater treatment.

Purpose
To improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with livestock, poultry, and other agricultural operations.

Waste Facility Closure - 360

Practice Description
The closure of waste impoundments (treatment lagoons and liquid storage facilities), that are no longer used for their intended purpose, in an environmentally safe manner

Purpose
This practice is applied to achieve one or more of the following:

- Protect the quality of surface water and groundwater resources
- Eliminate a safety hazard for humans and livestock
- Safeguard the public health

Waste Recycling - 633

Practice Description
Using agricultural wastes such as manure and wastewater or other organic residues

Purpose
This practice is applied to achieve one or more of the following:

- Protect water quality
- Protect air quality
- Provide fertility for crop, forage, fiber production and forest products
- Improve or maintain soil structure
- Provide feedstock for livestock
- Provide a source of energy

Waste Storage Facility - 313

Practice Description
A waste storage impoundment made by constructing an embankment and/or excavating a pit or dugout, or by building a structure

Purpose
This practice is installed to temporarily store wastes such as manure, to protect from runoff as a component of an agricultural waste management system.

Waste Transfer - 634

Practice Description
A system using structures, conduits or equipment to convey by-products (wastes) from agricultural operations to points of usage

Purpose
To transfer agricultural material associated with production, processing, and/or harvesting through a hopper or reception pit, a pump (if applicable), a conduit, and/or hauling equipment to:

• A storage/treatment facility
• A loading area, and/or
• Agricultural land for final utilization as a resource

Waste Treatment - 629

Practice Description
The mechanical, chemical or biological treatment of agricultural waste

Purpose
To use mechanical, chemical, or biological treatment facilities and/ processes as part of an agricultural waste management system:

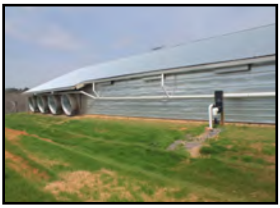
• Improve ground and surface water quality by reducing the nutrient content, organic strength, and/or pathogen levels of agricultural waste
• Improve air quality by reducing odors and gaseous emissions
• Produce value added by-products
• Facilitate desirable waste handling, storage, or land application alternatives

Waste Treatment Lagoon - 359

Practice Description
A waste treatment impoundment made by constructing an embankment and/or excavating a pit or dugout

Purpose
To biologically treat waste, such as manure and wastewater, and thereby reduce pollution potential by serving as a treatment component of a waste management system.

• Where the lagoon is a component of a planned agricultural waste management system
• Where treatment is needed for organic wastes generated by agricultural production or processing
• On any site where the lagoon can be constructed, operated and maintained without polluting air or water resources
• To lagoons utilizing embankments with an effective height of 35 feet or less where damage resulting from failure would be limited to damage of farm buildings, agricultural land, or township and country roads



Water Harvesting Catchment - 636

Practice Description
The closure of waste impoundments (treatment lagoons and liquid storage facilities), that are no longer used for their intended purpose, in an environmentally safe manner

Purpose
This practice is applied to achieve one or more of the following:

• Protect the quality of surface water and groundwater resources
• Eliminate a safety hazard for humans and livestock
• Safeguard the public health

Water and Sediment Control Basin - 638

Practice Description
An earthen embankment or a combination ridge and channel constructed across the slope of minor watercourses to form a sediment trap and water detention basin with a stable outlet

Purpose
This practice may be applied as part of a resource management system for one or more of the following purposes:

• Reduce watercourse and gully erosion
• Trap sediment
• Reduce and manage on-site and downstream runoff

Watering Facility - 614

Practice Description
A permanent or portable device to provide an adequate amount and quality of drinking water for livestock and or wildlife

Purpose
To provide access to drinking water for livestock and/or wildlife in order to:

• Meet daily water requirements
• Improve animal distribution

Water Well - 642

Practice Description
A hole drilled, dug, driven, bored, jetted or otherwise constructed to an aquifer for water supply

Purpose
This practice is applied to achieve one or more of the following:

• Provide water for livestock, wildlife, irrigation, and other agricultural uses
• Facilitate proper use of vegetation, such as keeping animals on rangeland and pastures and away from streams, and providing water for wildlife

Water Well Decommissioning - 351

Practice Description
The sealing and permanent closure of an inactive, abandoned, or unusable water well

Purpose
This practice is applied to achieve one or more of the following:

• Eliminate physical hazard to people, animals, and farm machinery; and to prevent entry of animals, debris, or other foreign substances
• Prevent contamination of groundwater by surface water inflow
• Restore the natural hydrogeologic conditions, to the extent possible, by preventing vertical cross-contamination or commingling of groundwaters between separate water bearing zones
• Eliminate the possibility of the water well being used for any other purpose
• Allow future alternative use or management of the site

Wetland Creation - 658

Practice Description
The creation of a wetland on a site that was historically non-wetland

Purpose
This practice may be applied as part of a resource management system to create wetland functions and values.

Wetland Enhancement - 659

Practice Description
The rehabilitation of a degraded wetland or the re-establishment of a former wetland so that soils, hydrology, vegetative community, and habitat are a close approximation of the original natural condition and boundary that existed prior to the modification

Purpose
To provide specific wetland conditions to favor specific wetland functions and targeted species by:

• Hydrologic enhancement (depth duration and season of inundation, and/or duration and season of soil saturation)
• Vegetative enhancement (including the removal of undesired species, and/or seeding or planting of desired species)

Wetland Restoration - 657

Practice Description
The rehabilitation of a degraded wetland or the reestablishment of a wetland so that soils, hydrology, vegetative community, and habitat are a close approximation of the original natural condition that existed prior to modification to the extent practicable

Purpose
To restore wetland function, value, habitat, diversity, and capacity to a close approximation of the pre-disturbance by:

• Restoring hydric soil
• Restoring hydrology (depth duration and season of inundation, and/or duration and season of soil saturation)
• Restoring native vegetation (including the removal of undesired species, and/or seeding or planting of desired species

Wetland Wildlife Habitat Management - 644

Practice Description
Retaining, developing or managing wetland habitat for wetland wildlife

Purpose
To maintain, develop, or improve wetland habitat for waterfowl, shorebirds, fur-bearers, or other wetland dependent or associated flora and fauna on or adjacent to wetlands, rivers, lakes and other water bodies where wetland associated wildlife habitat can be managed. This practice applies to natural wetlands and/or water bodies as well as wetlands that may have been previously restored (657), enhanced (659), and created (658).

Woody Residue Treatment - 384

Practice Description
Treating woody plant residues created during forestry, agroforestry and horticultural activities to achieve management objectives

Purpose
This practice is applied to achieve one or more of the following:

- Reduce hazardous fuels
- Reduce the risk of harmful insects and disease
- Protect/maintain air quality by reducing the risk of wildfire
- Improve access to forage for grazing and browsing animals
- Enhance aesthetics
- Reduce the risk of harm to humans and livestock
- Improve the soil organic matter
- Improve the site for natural or artificial regeneration

County/Field Service Center Index

County	Field Service Center	Phone
Autauga	Autaugaville	(334) 365-5532
Baldwin	Bay Minette	(251) 937-3297
Barbour	Clayton	(334) 775-3266
*Bibb	Centerville	(334) 926-4360
Blount	Oneonta	(205) 274-2363
*Bullock	Union Springs	(334) 738-2079
Butler	Greenville	(334) 382-8538
Calhoun	Anniston	(256) 835-7821
*Chambers	LaFayette	(334) 864-9983
Cherokee	Centre	(256) 927-8732
*Chilton	Clanton	(205) 646-0277
*Choctaw	Butler	(205) 459-2496
Clarke	Jackson	(251) 246-0245
*Clay	Ashland	(256) 354-7512
*Cleburne	Heflin	(256) 463-2877
Coffee	New Brockton	(334) 894-5581
Colbert	Tuscumbia	(256) 383-4323
Conecuh	Evergreen	(251) 578-1520
*Coosa	Rockford	(256) 377-4750
Covington	Andalusia	(334) 222-3519
Crenshaw	Luverne	(334) 335-3613
Cullman	Cullman	(256) 734-6471
Dale	Ozark	(334) 774-4749
Dallas	Selma	(334) 872-2611
Dekalb	Rainsville	(256) 638-6398
Elmore	Wetumpka	(334) 567-2264
Escambia	Brewton	(251) 867-3185
Poarch Band of Creek Indians		(251) 368-0826
Etowah	Gadsden	(256) 546-2336
Fayette	Fayette	(205) 932-8959
Franklin	Russellville	(256) 332-0274
Geneva	Geneva	(334) 684-2235
Greene	Eutaw	(205) 372-3271
Hale	Greensboro	(334) 624-3856
Henry	Abbeville	(334) 585-2284
Houston	Dothan	(334) 793-2310
Jackson	Scottsboro	(256) 574-1005
Jefferson	Bessemer	(205) 424-9990
Lamar	Vernon	(205) 695-7622

*Note | Offices with an asterisk (*) are Soil and Water Conservation District Offices.

County/Field Service Center Index

County	Field Office	Phone
Laurderdale	Florence	(256) 764-5833
Lawrence	Moulton	(256) 974-1174
Lee	Opelika	(334) 745-4791
Limestone	Athens	(256) 232-4025
Lowndes	Haynesville	(334) 548-2767
Macon	Tuskegee	(334) 725-3321
Madison	Huntsville	(256) 532-1677
Marengo	Linden	(334) 295-8724
Marion	Hamilton	(205) 921-3103
Marshall	Guntersville	(256) 582-3923
Mobile	Mobile	(251) 441-6505
Monroe	Monroeville	(251) 743-2587
Montgomery	Montgomery	(334) 279-3579
Morgan	Hartselle	(256) 773-6541
Perry	Marion	(334) 683-9017
Pickens	Carrollton	(205) 367-8168
Pike	Troy	(334) 566-2300
Randolph	Wedowee	(256) 357-4561
Russell	Phenix City	(334) 297-6692
Shelby	Columbiana	(205) 669-5121
*St. Clair	Pell City	(205) 338-7215
Sumter	Livingston	(205) 652-5105
Talladega	Talladega	(256) 362-8210
Tallapoosa	Alexander City	(256) 329-3084
Tuscaloosa	Tuscaloosa	(205) 553-1733
Walker	Jasper	(205) 387-1879
*Washington	Chatom	(251) 847-6041
Wilcox	Camden	(334) 682-4117
*Winston	Double Springs	(205) 489-5227

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