

WATERSHED-BASED PLAN FOR THE ROCKY RIVER WATERSHED

*An Action
Plan for
Protection
and
Restoration
Activities*



MARCH 2026

**UPSTATE FOREVER for
THE SOUTH CAROLINA DEPARTMENT OF
ENVIRONMENTAL SERVICES (SCDES)**



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Project Partners and Stakeholders:

- City of Abbeville
- Anderson County Stormwater Department
- Anderson Pickens County Stormwater Partners
- Anderson Regional Joint Water System
- Clemson University Cooperative Extension
- Lake Hartwell Association
- Lake Hartwell Partners for Clean Water
- Starr Iva Water & Sewer District
- South Carolina Department of Environmental Services

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LIST OF ACRONYMS

BMP	Best Management Practice
CE	Conservation Easement
CFU	Colony Forming Units
CHLA	Chlorophyll a
CWA	Clean Water Act
<i>E. coli</i>	<i>Escherichia coli</i>
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FC	Fecal Coliform
FEMA	Federal Emergency Management Agency
FW	Fresh Water
GIS	Geographic Information System
HAB	Harmful Algal Bloom
HOA	Homeowners Association
HUC	Hydrologic Unit Code
KM	Kinder Morgan
LHPCW	Lake Hartwell Partners for Clean Water
mL	Milliliter
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
MSL	Mean Sea Level
ND	No Discharge
NLCD	National Land Cover Dataset
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PLET	Pollutant Load Estimation Tool

RL	Random Lake
RS	Random Stream
SC AAS	South Carolina Adopt-a-Stream
SCCB	South Carolina Conservation Bank
SCDNR	South Carolina Department of Natural Resources
SCFC	South Carolina Forestry Commission
USFWS	United States Fish and Wildlife Service
SCOR	South Carolina Office of Resilience
SCDES	South Carolina Department of Environmental Services (formerly South Carolina Department of Health and Environmental Control (SCDHEC))
SELC	Southern Environmental Law Center
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TNC	The Nature Conservancy
TP	Total Phosphorus
UF	Upstate Forever
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WBP	Watershed-Based Plan
WOTUS	Waters of the United States
WOS	Waters of the State

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1) EXECUTIVE SUMMARY

THIS PLAN ADDRESSES BACTERIAL, SEDIMENT, AND NUTRIENT POLLUTION TO PROTECT WATER QUALITY AND REDUCE DRINKING WATER TREATMENT COSTS IN THE ROCKY RIVER WATERSHED.

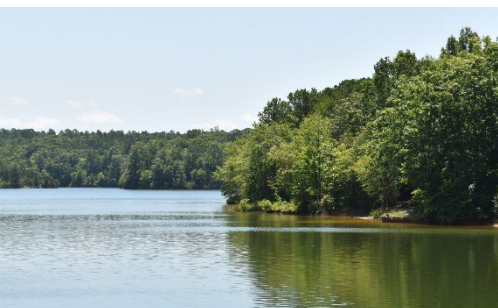


WATER QUALITY FINDINGS

- 7 monitoring stations across Rocky River, Cherokee Creek, Cupboard Creek, Broadway Creek, and Wilson Creek are listed as not meeting State water standards for bacteria
- Primary pollutant: *E. coli* bacteria
- Major sources: wastewater effluent, agriculture, urban runoff, and wildlife

REQUIRED LOAD REDUCTION

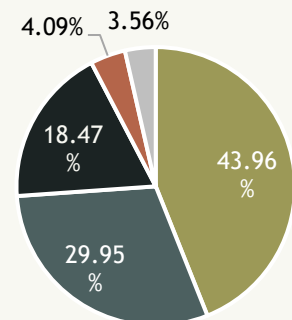
- Existing load: 2.04×10^{15} bacteria counts/year
- Reduction target: 1.39×10^{15} counts/year (68%)



Watershed Characteristics

The Rocky River Watershed-Based Plan (WBP) covers seven HUC-12 subwatersheds (totaling 169,790 land acres and 7,626 lake acres) across Anderson and Abbeville counties, South Carolina. Major waterbodies include Broadway Lake, Lake Secession, and Richard B. Russell Lake.

Land Cover



- Forest
- Agricultural
- Developed
- Open Water
- Other

Population:

- Total: ~64,671 residents
- Households: ~32,336

Water Utilities:

- City of Abbeville provides drinking water from Russell Lake to ~6,000 customers.
- Starr-Iva Water & Sewer District: serves ~10,000 residents.

KEY FINDINGS

To meet incremental reduction goals, a combination of **Best Management Practices (BMPs)** was prioritized using GIS-based land analysis.

BMP CATEGORY	PRIORITY LOCATIONS/FOCUS AREAS
Septic System Repairs/Replacements	<ol style="list-style-type: none"> 1. Broadway Creek & Hencoop Creek 2. Wilson Creek & Middle Rocky River 3. Little Beaverdam Creek & Upper Rocky River
Agricultural BMPs	Wilson Creek-Rocky River watershed
Land Protection	Upper and Lower Rocky River
Riparian Buffers	Agricultural properties (Wilson Creek) Upper watershed reaches (Broadway, Little Beaverdam, Upper Rocky)
Wild Hog Management	Coordinate with agricultural landowners and conservation partners
Wetland Restoration/Enhancement	Within protected and in-progress conservation easements
Forestry BMPs	Partner with SCFC for BMP exams and management plans, especially above Lake Secession

PROJECTED OUTCOMES

IMPROVED WATER QUALITY AND REDUCED TREATMENT COSTS

REACHING WATER QUALITY GOALS WITH STRUCTURAL BMPs AND TARGETED OUTREACH

LONG-TERM LAND AND HABITAT PROTECTION ACROSS KEY SUBWATERSHEDS

IMPLEMENTATION & COST

Projects are designed for **incremental 3-year phases** to meet the 68% reduction target efficiently. Estimated Total (4 phases): ~\$2.07 million

BMP	Average Unit Cost	Planned Quantity	Phase Cost	SCDES 60% Cost Share
Septic Repair/Replacement	\$6,500	45	\$292,500	\$175,500
Agricultural BMPs	\$17,400	10	\$174,000	\$104,400
Land Protection	\$15,140	1-2	\$30,280	\$18,168
Riparian Buffer BMPs	\$515.55/acre	2	\$1,031	\$155
Wild Hog Removal	\$5,000	4 sounders	\$30,000	\$12,000
TOTAL (3-year phase)			\$527,811	\$310,223

2) GENERAL WATERSHED INFORMATION

2.1) WATERSHED SUMMARY

This WBP includes seven Hydrologic Unit Code (HUC)-12s encompassing the Rocky River Watershed (HUC 0306010302) which is a part of the greater Savannah River Basin (HUC 03060103). This document refers to this area as “the watershed,” as shown in Figure 1. The watershed is in Anderson and Abbeville counties and consists primarily of the Rocky River and its tributaries as it flows through Lake Secession and forms an arm of Lake Richard B. Russell. This watershed is over 169,790.28 land acres (United States Geological Survey (USGS), 2023) with the primary land uses being forest, agriculture, and urban lands. The watershed includes a source water intake and protection area for the City of Abbeville, providing 6,000 customers with drinking water in the Abbeville County area. Additionally, Starr Iva Water and Sewer District operates within the watershed, providing water and sewer services to over 10,000 people in Anderson and Abbeville counties. The estimated population of the watershed is approximately 64,671 people, or approximately 32,336 households.

At the top of the watershed, Beaverdam Creek and Little Beaverdam Creek converge to form the Rocky River. Downstream of their confluence, the river receives inflow from Cox’s Creek and Broadway Creek, where the 300-acre impoundment Broadway Lake is located. Further south, the river is joined by Governor’s Creek, Hencoop Creek, and Bear Creek, forming the 1,450-acre Lake Succession. This reservoir, which impounds six miles of the Rocky River, was created to generate power for the City of Abbeville and is a popular sport fishery destination. Below Lake Secession dam, the river is joined by East Beard’s Creek and Long Branch, forming an arm of Richard B. Russell Lake that serves as a drinking water source for the City of Abbeville. There are a total of 639.0 stream miles and 8,443.8 acres of lake waters in this watershed, all classified as Fresh Water (FW). Calhoun Falls State Park is situated at the base of the watershed.

Table 1. Rocky River Watershed Characteristics

Watershed	HUC-12 Code	Total Acreage	Miles of Streams	Acres of Lakes
Little Beaverdam Creek	030601030201	21,327.07	81.29	274.74
Broadway Creek	030601030202	28,785.17	136.12	418.65
Upper Rocky River	030601030203	32,954.15	132.83	202.94
Hencoop Creek	030601030204	18,789.20	77.11	66.8
Middle Rocky River	030601030205	23,467.21	102.39	1,394.62
Wilson Creek	030601030206	24,706.32	92.55	75.68
Lower Rocky River	030601030207	28,156.76	112.64	5,193.49
Total		178,185.88	734.93	7,626.91

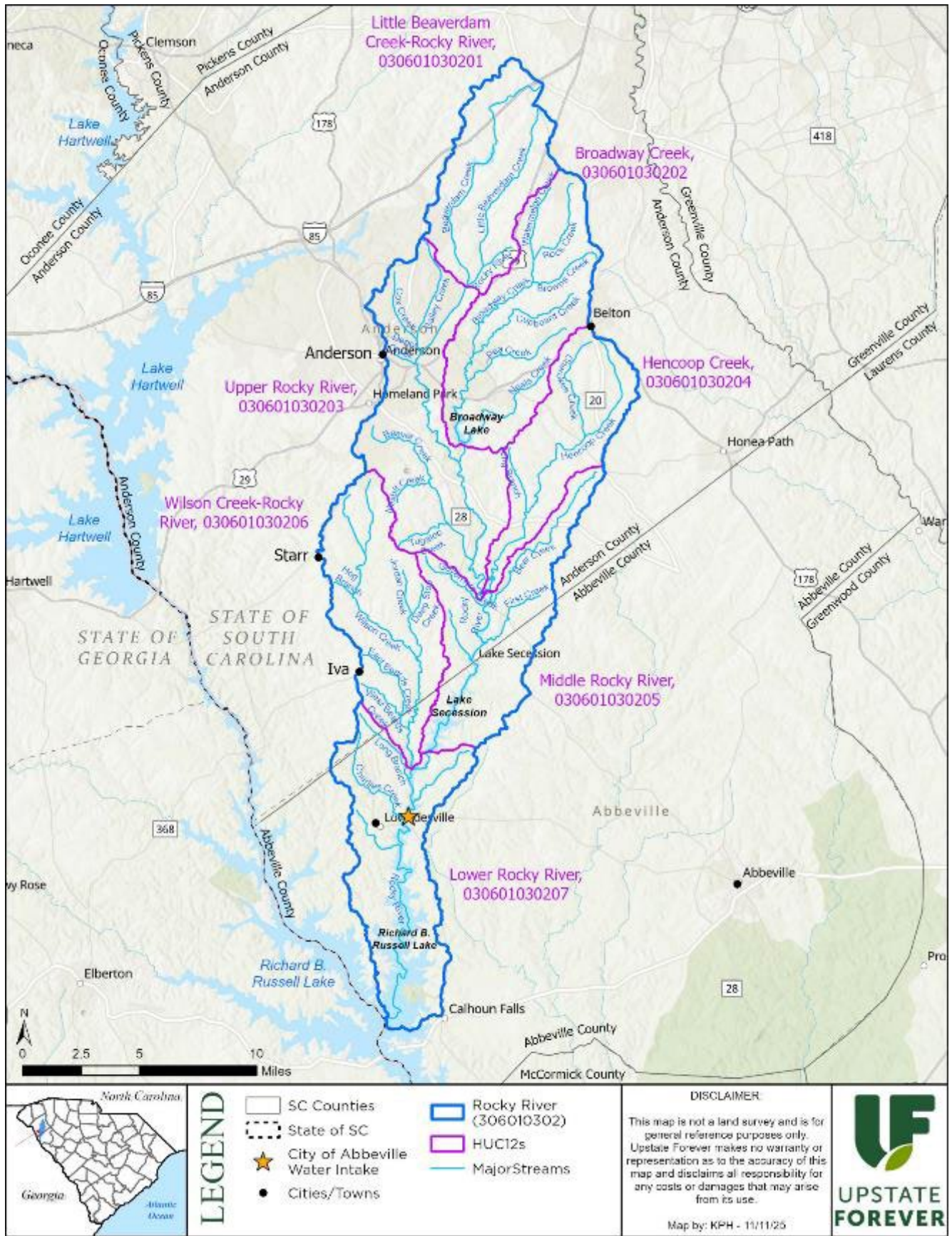


Figure 1. Rocky River Watershed Location

2.2) LOCATION & GEOLOGY

The watershed spans both Anderson and Abbeville counties, near the South Carolina-Georgia state border. To the north, it includes the eastern portion of the City of Anderson, as well as the smaller towns of Starr, Iva, Lowndesville, and Calhoun Falls to the south. The watershed lies almost entirely within the 45b Southern Outer Piedmont Ecoregion (Environmental Protection Agency (EPA) Level IV), with its southernmost portion extending into the 45c Carolina Slate Belt Ecoregion (EPA Level IV). This region is characterized by relatively flat plains with gently rolling hills, with elevations ranging from 380-970 feet above Mean Sea Level (MSL). The watershed’s soil is predominantly sandy loams, formed from gneiss, schist, and granite bedrock. Principle soils include Cecil, Cataula, Cartecay-Chewacla, Pacolet, Madison, Hiwassee, and Toccoa (USDA NRCS, 2025). The soil erodibility factor, or K-factor, for the predominant soils in the watershed range from 0.02-0.28. K-factor values closer to 1.0 indicate higher soil erodibility, which implies a greater need for protective measures against erosion and soil loss. Taken as a whole, the soil found in the watershed is well-drained and moderately permeable.

2.3) LAND COVER

Sourced from the 2023 National Land Cover Dataset (NLCD) (United States Geological Survey (USGS), 2023), land cover in the watershed is categorized into seven types, as detailed in Table 2 and Figure 2. Forested land is the predominant classification, covering 44% of the watershed, followed by agricultural land at 30% and developed land at 18.5%. Together, these three classifications account for 92.4% of the 178,234-acre watershed. Forest lands, wetlands, and shrub/scrub lands all experienced decreases in acreage from 2021 to 2023, while agricultural land had the largest change in acreage with an increase of 5,231 acres. Developed lands also experienced a large increase in acreage of 1,385 acres, highlighting the prominence of the rapid conversion of natural lands to developed lands in the watershed. Land cover changes significantly impact nonpoint sources of water pollution by altering runoff patterns and increasing nutrient and sediment inputs into water bodies. These changes can inevitably lead to increased turbidity, nutrient enrichment, erosion, and degradation of aquatic ecosystems affecting water quality.

Table 2. Land Cover in the Rocky River Watershed

Land Cover Type	Land Cover in 2023 (acres)	Percent Coverage	Change from 2021-2023 (acres)
Forest Lands (<i>Deciduous, Evergreen, Mixed</i>)	78,333.75	43.96%	-5,505.52
Agricultural Lands (<i>Pasture/Hay, Cultivated Crops, Grasslands</i>)	53,369.18	29.95%	5,231.02
Developed Lands (<i>Open Space, Low Intensity, Medium Intensity, High Intensity</i>)	32,913.17	18.47%	1,385.32
Open Water	7,280.29	4.09%	158.39
Wetlands (<i>Woody, Emergent Herbaceous</i>)	3,402.10	1.91%	-47.14
Shrub/Scrub	2,583.72	1.45%	-1,246.73
Barren Land	351.79	0.20%	77.35
TOTAL	178,234	100.00%	

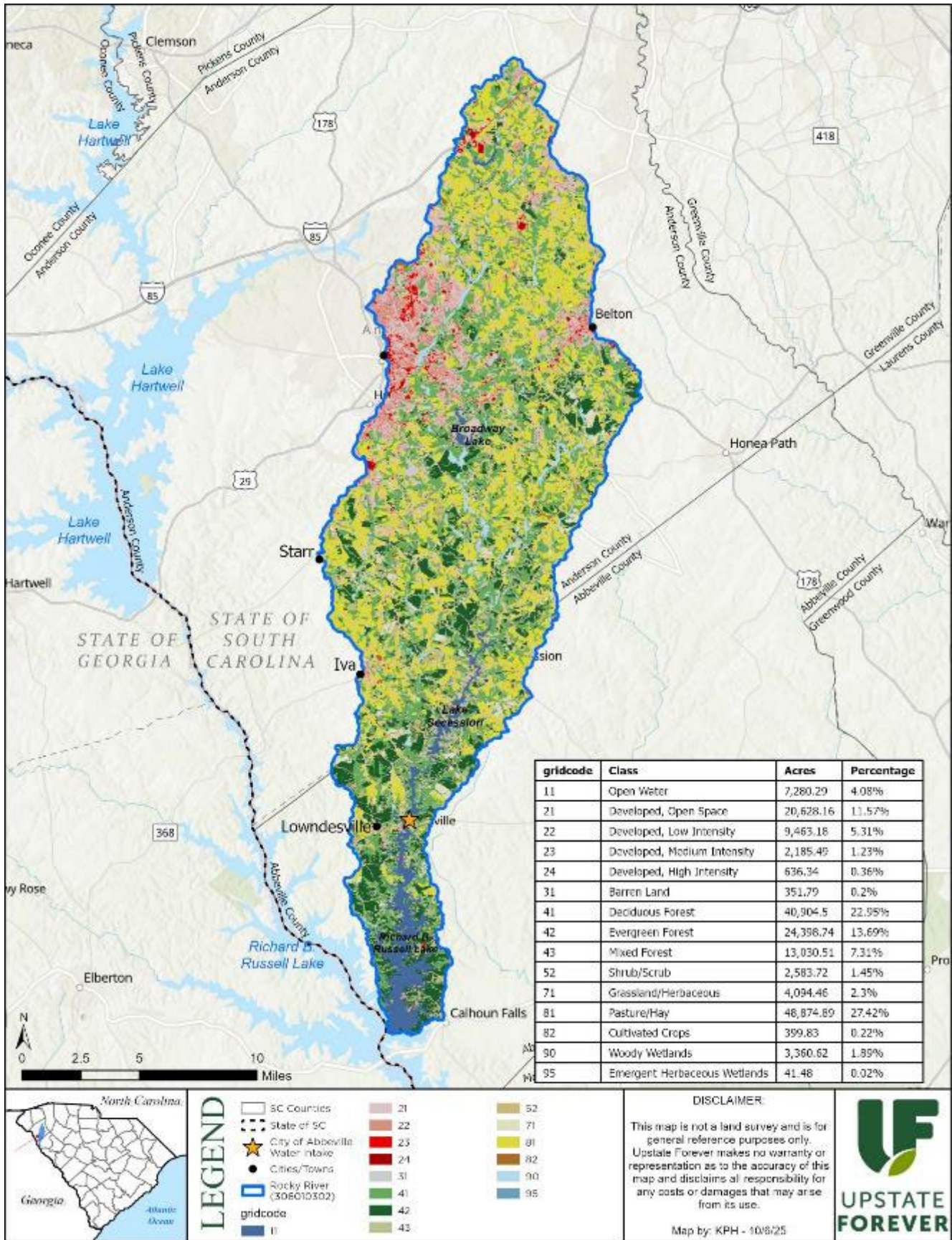


Figure 2. Land Cover

2.4) PRELIMINARY WATERSHED ASSESSMENT

Upstate Forever (UF) conducted in-depth watershed assessments, both on-the-ground and virtually, to gather information on land use, potential sources of pollution, and identify areas of concern.

2.4.1) Windshield and Desktop Surveys

Desktop Survey: Utilizing aerial photography, Google search engine, and Geographic Information System (GIS) data, we were able to identify potential sources of pollution including livestock/farms, sedimentation from upstream rivers, and lakeside development. Because much of the watershed is private property, aerial photography assisted in the identification of areas of concern.

Windshield Surveys: Based on the results of the desktop survey, UF conducted three windshield surveys by car both independently and with City of Anderson staff. These surveys were conducted to assess agricultural sites, impaired streambanks, forestry sites, and other potential sources of pollution. The windshield surveys revealed that agriculture is a predominant land use activity within the watershed.

2.4.2) Stakeholder Engagement

UF provided multiple stakeholder engagement opportunities during the development of this plan. The foundation of our outreach and stakeholder engagement strategy relied on communication and collaboration with the Lake Hartwell Partners for Clean Water (LHPCW) group, which meets monthly. The LHPCW is a nonprofit group of stakeholders seeking to protect and restore the Lake Hartwell watersheds, including members from water utilities, conservation groups, universities, local government entities, and other interest groups. The Rocky River WBP was a standing agenda item throughout the development of this plan, and members of the LHPCW contributed meaningful recommendations to its development in terms of site survey, Best Management Practice (BMP) recommendations, and areas of concern. In addition, UF worked to engage the Rocky River Nature Park, a UF conservation easement owned and operated by Anderson University, on the development of this plan. Lastly, UF continuously reported on the development of this WBP in our quarterly publication, The Water Log, which reaches over 700 Upstate residents.

UF met with representatives from the City of Anderson, Anderson County, and Starr-Iva Water District during the development of this plan to gather details on watershed issues, potential project locations, and priorities for each entity. Some of these priorities included:

- Trash and vegetative removal around streambanks
- Riparian buffer enhancement and streambank stabilization
- Current water quality sampling locations and potential future sites as well as water quality parameter priorities (e.g., Per- and polyfluoroalkyl substances (PFAS) and bacteria)
- Sedimentation in lakes
- Wildlife management, particularly wild hogs and beavers

2.5) WATERSHED HISTORY

2.5.1) Kinder-Morgan Pipeline Spill

Incident and Response: On December 8, 2014, a petroleum release was reported on Kinder Morgan's (KM) 26-inch Plantation Pipeline near Belton, SC, in the Rocky River Watershed. Citizens noticed dead vegetation, a strong petroleum odor, and petroleum pooling where the pipeline runs underground along

Lewis Drive. As a result, KM shut down the pipeline after the report and began remediation once the release was confirmed. The discharge was estimated at 369,600 gallons, or 8,800 barrels of gasoline.

A distinguishing factor in this spill is that the Belton release originated from a buried pipeline on dry land. Gasoline seeped into the groundwater and created a contamination plume that first reached surface waters through a seep in January of 2015, and then a year later entered surface waters through lateral plume movement in other parts of Brown's Creek: a headwater of the Savannah River.

Throughout 2015, the South Carolina Department of Health and Environmental Control (SCDHEC) (SCDHEC is now known as the South Carolina Department of Environmental Services (SCDES)) regional and emergency response teams worked with Plantation/KM to install surface water and groundwater monitoring stations and to conduct petroleum pollutant removal. Within the first day of remediation over 7,000 gallons of gasoline and 2,832 tons of contaminated soil were removed. Early measurements indicated that the gasoline was as thick as 12 feet in some of the groundwater monitoring wells. KM and SCDES removed 209,046 gallons, or 4,977 barrels, or 57% of the estimated loss by the end of 2015. However, no product has been removed from groundwater since early 2016.



Kinder Morgan Pipeline Spill (Source: Megan Chase-Muller)

Litigation and Regulatory Actions: Environmental partners, UF and Savannah Riverkeeper, intervened and filed a federal lawsuit against KM due to inaction that was seen in 2016. Represented by the Southern Environmental Law Center (SELC), UF and the Savannah Riverkeeper called for KM to pay roughly \$30 million in civil penalties for violating the Clean Water Act (CWA). The rationale for this lawsuit was because KM repeatedly ignored SCDHEC's directives for the company to submit a Comprehensive Site Assessment Plan, a Corrective Action Plan, and a Pore Water Sampling Plan. These assessments were originally due one full year after the original spill report, and KM continuously requested extensions that were then granted by SCDHEC. Further, SCDHEC did not pursue fines or enforcement for any of these violations, missed deadlines and delays. UF and Savannah Riverkeeper decided that litigation would increase the likelihood that the spill was cleaned up properly and that the waters and wetlands of the Upstate are protected.

KM denied any violation of the CWA and denied that UF and Savannah Riverkeeper were entitled to any of the relief sought in litigation. On February 17, 2017, KM filed a motion to dismiss litigation and on April 20, 2017, the Honorable Judge Herlong issued an order granting the motion to dismiss. Following this dismissal, UF and Savannah Riverkeeper filed an appeal of the order dismissing the litigation,

“Upstate Forever, et al. v Kinder Morgan Energy Partners” on May 18, 2017. On April 12, 2018, the U.S. Court of Appeals for the Fourth Circuit reversed the District Court’s order granting a motion to dismiss and thereafter KM filed a petition with the United States Supreme Court. Then, on May 4, 2020, the United States Supreme Court granted the petition, vacated the Fourth Circuit’s decision and remanded the case back to the Fourth Circuit for further consideration in light of the County of Maui v. Hawaii Wildlife Fund ruling (County of Maui, Hawaii v. Hawaii Wildlife Fund, 2020). In this case it found that the County violated the CWA by discharging treated wastewater effluent through groundwater and into the ocean without the National Pollutant Discharge Elimination System (NPDES) permit required by the CWA. Thus, the case of the *County of Maui v Hawaii Wildlife Fund* (Wiley Law, 2020) was important because it closed a potential loophole in the CWA by stating that a “permit is required when there is a functional equivalent of a direct discharge to a point source into navigable waters” (County of Maui, Hawaii v. Hawaii Wildlife Fund, 2020).

Following this update, the involved parties undersigned a settlement agreement that KM would pay UF and Savannah Riverkeeper a total of \$1,500,000.00 to be used for environmental remediation and conservation in the Savannah River Basin. This settlement was used to establish the Anderson County Watershed Protection Council in October 2020.

2.5.2) Anderson County Watershed Protection Council

The \$1.5 million settlement established a dedicated fund for water resource protection and remediation in Anderson County. The fund is administered by UF and Savannah Riverkeeper and is held at the Foothills Community Foundation. To ensure community engagement and transparency, an advisory body, the Anderson County Watershed Protection Council, was formed to guide the selection, prioritization, and evaluation of funded projects.

The Council includes representatives from UF, Savannah Riverkeeper, Anderson County Council, the Anderson County Soil and Water Conservation District, Clemson University Public Service and Agriculture (PSA), the Anderson County Board of Education, and a local resident. Its mission is to identify and fund projects that address threats to the Savannah River Basin’s water resources and restore water quality in impacted areas. The Council prioritizes initiatives that empower local communities to collect and publicly share water quality data.

The fund launched publicly in 2022 and issues grant opportunities annually. To date, the Council has funded seven projects, including public outreach programs, citizen science initiatives, best management practice (BMP) installations, and land protection efforts.

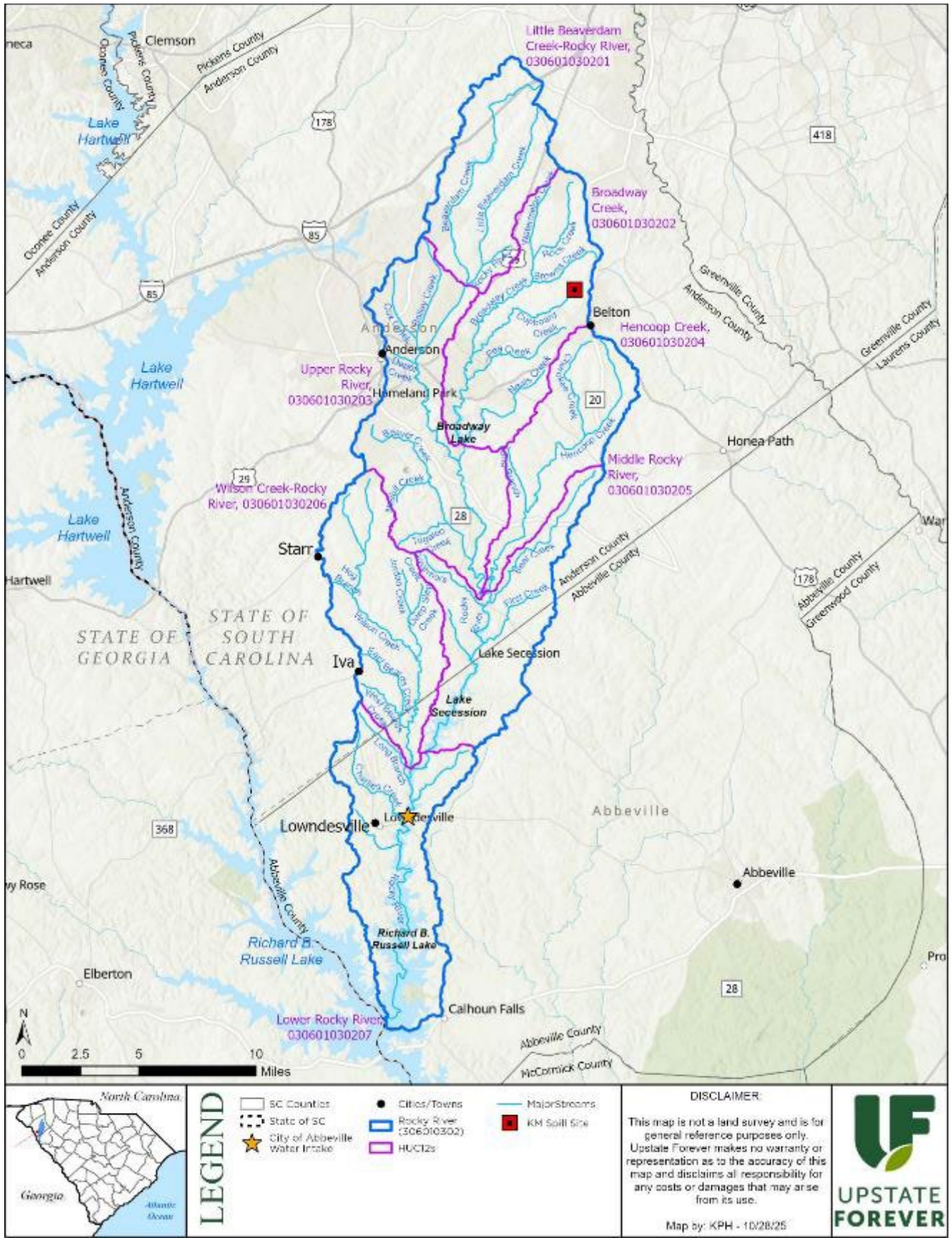


Figure 3. Kinder Morgan Spill Site

3) AVAILABLE WATER QUALITY DATA

Water quality monitoring is the systematic assessment of water bodies to determine their chemical, physical, and biological conditions, ensuring they are safe for human use and environmental health (SCDES, 2024). Water quality monitoring results were analyzed from several sources, including SCDES, SC Adopt-a-Stream (SC AAS), and Anderson County. While data from SCDES is the only regulatory data available, data from other sources serves a supporting role in the identification of problem areas and potential sources of pollution. Since 1998, there have been a total of 73 SCDES water quality monitoring stations in the watershed, although only three sites are currently active (Figure 5). Many water quality monitoring stations in the watershed are “Random,” meaning they are chosen for sampling for one calendar year; only the three active stations are considered “Ambient” and are directed towards providing long-term water quality trends; these sites are sampled monthly every year. Sites that are found to be impaired for a water quality indicator are listed on the biannual SCDES 303(d) List of Impaired Waters (SCDES, 2024).

3.1) HISTORY OF WATER QUALITY IMPAIRMENTS

UF analyzed the SCDES 303(d) Lists of Impaired Water from 1998-2024 (SCDES, 2024) to identify long-term trends in water quality impairments in the Rocky River watershed. The 303(d) List of Impaired Water is a biannual publication of waterbodies that do not meet State standards for water quality indicators. For this analysis, Fecal Coliform (FC) and *Escherichia coli* (*E. coli*) were combined into a single “bacteria” category, reflecting their shared role as indicators of fecal contamination. Figure 4 shows water quality impairment trends over time in the watershed.

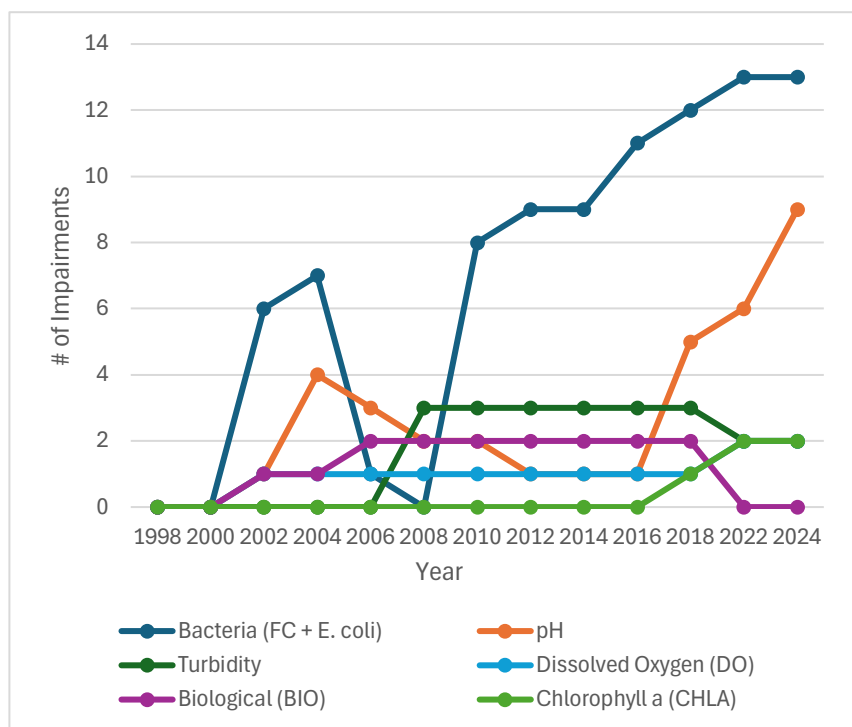


Figure 4. History of Water Quality Impairments

**A decrease in biological (BIO) impairments in this figure does not necessarily indicate a water quality improvement. Sometimes BIO impairments are removed from the 303(d) list because a more specific parameter is identified and is then listed as impaired for a different reason.*

3.1.1) Overall Impairment Trends and Key Findings

As seen in Figure 4 above, bacterial contamination is the most pervasive and persistent water quality impairment in the watershed, followed by pH, Turbidity, and Chlorophyll a (CHLA). Bacterial impairments have seen a steady incline and remain the primary pollutant to address. The number of stations listed for pH impairment has also risen, particularly at reservoir and random lake (RL)

monitoring sites. Turbidity has remained persistent since 2008, only recently seeing a slight decline, and CHLA impairments have emerged more recently, beginning in 2018. Key findings:

- **Bacteria** remain the dominant water quality impairment, with many stations currently under Total Maximum Daily Loads (TMDLs) that are considered “Not Supported,” explained further in [Section 4.1.3](#). In 2024, 13 stations are listed as either impaired for bacteria or under current TMDLs that are “Not Supported”, meaning they do not meet water quality standards. Some bacterial impairments date back to 1998 (SV-031, SV-041, SV-043, and SV-141), suggesting long-term concerns that persist into 2024.
- **CHLA** impairments found in lake-based stations suggest localized eutrophication potential in reservoir environments. Specifically, site SV-331 (Lake Secession) has been listed as impaired for CHLA since 2022, and site RL-16120 (Broadway Lake) has been listed as impaired for CHLA since 2018; these listings warrant targeted nutrient management in both reservoirs.
- **Turbidity** remains a persistent issue in certain stream segments throughout the watershed. Stations SV-031 (Rocky River just south of City of Anderson) and SV-141 (Broadway Creek just upstream of Broadway Lake) have both been listed as impaired for turbidity since 2008.

3.1.2) Current Impairments (2024)

According to the most recent 303(d) List of Impaired Waters (SCDES, 2024), the stations in Table 3 are currently listed as impaired or otherwise not meeting State water quality standards.

Table 3. Stations Listed as Impaired on the 303(d) List (2024)

Station	Location	Impairment(s)	Acronym	Indicator
RL-16044	Lake Secession	pH	CHLA	Chlorophyll A
RL-16112	Broadway Lake	pH	DO	Dissolved Oxygen
RL-16120	Broadway Lake	CHLA, pH	FC	Fecal Coliform
RL-17076	Lake Secession	pH	<i>E. coli</i>	<i>Escherichia coli</i>
RL-19165	Lake Secession	DO, pH	TURB	Turbidity
RL-21209	Lake Russell	pH	FC TMDL (NS)	FC Total Maximum Daily Load (Not Supported)
RL-21217	Lake Secession	pH	FC wnTMDL (NS)	within a TMDL area (Not Supported)
RS-09330	Pea Creek	FC wnTMDL (NS)		
RS-11053	Wilson Creek	FC wnTMDL (NS)		
RS-15281	East Beards Creek	<i>E. coli</i>		
RS-19458	Bear Creek	<i>E. coli</i>		
SV-031	Rocky River	TURB, FC TMDL (NS)		
SV-037	Betsy Creek	<i>E. coli</i>		
SV-041	Rocky River	FC TMDL (NS)		
SV-043	Cherokee Creek	FC TMDL (NS)		
SV-139	Cupboard Creek	DO, FC TMDL (NS)		
SV-140	Cupboard Creek	FC TMDL (NS)		
SV-141	Broadway Creek	TURB, FC TMDL (NS)		
SV-331	Lake Secession	CHLA, pH, <i>E. coli</i>		
SV-347	Wilson Creek	FC TMDL (NS)		
SV-357	Lake Russell	pH		

3.2) BACTERIAL DATA

3.2.1) SCDES Bacterial Data

UF analyzed bacterial data from 13 random and three ambient SCDES water quality monitoring stations from 2019-2024 (National Water Quality Monitoring Council, 2025); Results are shown below in Table 4. The highest exceedances are seen at sites RS-19458 (Bear Creek just upstream of Lake Secession) and SV-331 (Lake Secession).

Table 4. *E. coli* Results from SCDES Water Monitoring Stations (2019-2024)

Station	2024 303(d) List (<i>E. coli</i>)	# Samples	Sample Years	Avg. Sample (MPN/100mL)*	Exceedances	% Exceedances	Highest Sample (MPN/100mL)
RL-19165		12	2019	71.31	1	8.33%	816.4
RL-19177		12	2019	1.08	0	0.00%	2.0
RL-20193		12	2020	2.06	0	0.00%	6.3
RL-20266		12	2020	44.74	0	0.00%	325.5
RL-21209		12	2021	16.92	0	0.00%	80.8
RL-21217		12	2021	52.50	0	0.00%	186.0
RL-21278		12	2021	35.12	0	0.00%	78.9
RL-22006		12	2022	16.14	0	0.00%	139.6
RL-22022		10	2022	9.42	0	0.00%	24.6
RL-23038		12	2023	2.18	0	0.00%	11.0
RL-23124		12	2023	56.42	0	0.00%	307.6
RL-24073		1	2024	5.10	0	0.00%	5.1
RS-19458	x	12	2019	367.03	3	25.00%	2,092.4
SV-321		10	2022	31.54	0	0.00%	178.5
SV-331	x	59	2019-2024	236.68	7	11.86%	4,839.2
SV-357		62	2019-2024	25.36	1	1.61%	648.8

*MPN: Most Probable Number; mL: milliliter

3.2.2) SC AAS Bacterial Data

There are 20 volunteer water quality monitoring sites through the SC AAS program in the watershed that have collected *E. coli* data between the years of 2014 and 2025 (SC Adopt-a-Stream (SC AAS), 2025).

Table 5. E. coli Results from SC AAS Water Monitoring Stations (2016-2025)

Station	Location	# Samples	Sample Years	Avg. Sample (MPN/100mL)	Exceedances	% Exceedances	Highest Sample (MPN/100mL)
BC-0148	Broadway Creek	12	2018	422.22	5	41.67%	2000
BC-5494	Broadway Creek	4	2025	383.34	2	50.00%	566.67
BC-5501	Broadway Creek	3	2025	855.56	2	66.67%	1,566.67
BC-5508	Broadway Creek	3	2025	622.22	2	66.67%	933.33
BC-5515	Broadway Creek	3	2025	633.33	2	66.67%	1,033.33
CC-0033	Cupboard Creek	65	2016-2022	233.85	13	20.00%	1,166.67
CC-081	Cupboard Creek	35	2014-2017	552.38	13	37.14%	4,766.67
CC1-0043	Cupboard Creek	15	2017-2019	213.33	3	20.00%	500
CC2-0044	Cupboard Creek	6	2017-2018	216.67	1	16.67%	766.67
CC2-3653	Cupboard Creek	5	2023	173.33	0	0.00%	200
CC-2640	Cupboard Creek	2	2022	316.67	1	50.00%	500
CC3-0045	Cupboard Creek	7	2017-2018	309.53	3	42.86%	700
CC-3291	Cupboard Creek	8	2022-2025	254.17	2	25.00%	900
CC4-0046	Cupboard Creek	11	2017-2019	448.49	6	54.55%	966.67
CC-5522	Cupboard Creek	3	2025	500.00	2	66.67%	766.67
PC-5949	Pea Creek	1	2025	633.33	1	100.00%	633.33
RR-3298	Rocky River	13	2022-2023	148.72	0	0.00%	300
RRDT-0245	Rocky River	2	2019	200.00	0	0.00%	233.33
RRUT-0244	Rocky River	1	2019	166.67	0	0.00%	166.67
RRUT-0245	Rocky River	1	2019	366.67	1	100.00%	366.67

3.2.3) Anderson County Bacterial Data

Anderson County has conducted monitoring of a site on Cox Creek since 2015 in both wet and dry weather conditions, summarized in Table 6. Specifically for 2024, 5 dry-weather samples and 7 wet-weather samples were taken. Three of the five dry-weather samples had *E. coli* levels in exceedance of the State water standard of 349 Most Probable Number (MPN)/100mL (60%), and six of the seven wet-weather samples were in exceedance (86%). Cox Creek is located within the City of Anderson in an urbanized area of downtown Anderson.

Table 6. E. coli Results from Anderson County Monitoring of Cox Creek (2015-2024)

Year	# Samples	Avg. Sample (MPN/100mL)	Highest Sample (MPN/100mL)	Exceedances
2015-2017	65	1,662	9,222	77%
2018-2019	47	2,501	17,330	83%
2020-2021	33	4,943	39,730	87%
2022	7	7,601	24,070	86%
2023	12	2,485	12,260	83%
2024	12	2,697	15,400	75%

3.2) SEDIMENT DATA

3.2.1) SCDES Sediment Data

UF analyzed turbidity data from 13 random and three ambient SCDES water quality monitoring stations from 2019-2024 (National Water Quality Monitoring Council, 2025); Results are shown below in Table 7. The highest percentage of exceedances occurred at sites RS-19458* (Bear Creek just upstream of Lake Secession) and SV-321 (Broadway Lake). (*RS = Random Stream)

Table 7. Turbidity Results from SCDES Water Monitoring Stations (2019-2024)

Station	# Samples	Sample Years	Avg. Sample (NTU)	Exceedances	% Exceedances	Highest Sample (NTU)
RL-19165	11	2019	7.19	11	0.00%	36
RL-19177	11	2019	2.17	11	0.00%	3.5
RL-20193	12	2020	2.20	12	0.00%	4
RL-20266	12	2020	8.82	12	0.00%	38
RL-21209	12	2021	9.19	12	0.00%	45
RL-21217	12	2021	6.23	12	0.00%	12
RL-21278	12	2021	6.88	12	0.00%	11
RL-22006	12	2022	4.70	12	0.00%	10
RL-22022	10	2022	3.58	10	0.00%	7
RL-23038	12	2023	1.62	12	0.00%	2.3
RL-23124	12	2023	11.78	11	8.33%	50
RL-24073	1	2024	3.10	1	0.00%	3.1
RS-19458	11	2019	9.20	9	18.18%	45
RS-22078	7	2022	4.29	7	0.00%	8.1
SV-321	10	2022	5.14	9	10.00%	15
SV-331	58	2019-2024	14.28	56	3.45%	95
SV-357	61	2019-2024	61	1	1.64%	55

3.2.2) SC AAS Sediment Data

UF analyzed turbidity data from 11 SC AAS volunteer water quality monitoring sites from 2023-2025 (SC Adopt-a-Stream (SC AAS), 2025); results are shown below in Table 8. The highest percentage of exceedances are seen at sites PC-5949 (Pea Creek) and three of the Broadway Creek (BC) sites. Site CC-0033 (Cox Creek) has also seen elevated turbidity levels.

Table 8. Turbidity Results from SC AAS Water Monitoring Stations (2023-2025)

Station	# Samples	Sample Years	Avg. Sample (NTU)	Exceedances	% Exceedances	Highest Sample (NTU)
BC-5494	8	2025	6.71	1	12.50%	13
BC-5501	7	2025	64.25	2	28.57%	240
BC-5508	6	2025	7.83	2	33.33%	15
BC-5515	6	2025	6.17	0	0.00%	7
CC-0033	20	2023-2025	12.80	4	20.00%	90
CC2-3653	6	2023	6.67	1	16.67%	15
CC-3291	3	2023	5.00	0	0.00%	5
CC-5522	6	2025	7.33	1	16.67%	13
CC-5641	3	2025	7.00	0	0.00%	8
PC-5949	3	2025	14.33	3	100.00%	19
RR-3298	9	2023	8.00	1	11.11%	19

3.3) NUTRIENT DATA

3.3.1) SCDES Nutrient Data

UF analyzed nutrient data collected between 2019-2024 (National Water Quality Monitoring Council, 2025); this time frame yielded data from 14 random stations (11 for nitrogen and 14 for phosphorus) and three ambient stations. Results are shown below in Table 9 (Nitrogen) and Table 10 (Phosphorus). The only exceedances for both nutrients occurred at SV-331(Lake Secession). There are no in-stream nutrient standards in South Carolina.

Table 9. Nitrogen Results from SCDES Water Monitoring Stations (2019-2024)

Station	# Samples	Sample Years	Avg. Sample (mg/L)	Exceedances	% Exceedances	Highest Sample (mg/L)
RL-19165	12	2019	0.59	0	0.00%	1.12
RL-19177	11	2019	0.25	0	0.00%	0.42
RL-20266	12	2020	0.62	0	0.00%	0.82
RL-21209	12	2021	0.47	0	0.00%	0.76
RL-21217	12	2021	0.72	0	0.00%	1.34
RL-21278	12	2021	0.60	0	0.00%	1.12
RL-22006	12	2022	0.46	0	0.00%	0.82
RL-22022	10	2022	0.49	0	0.00%	0.83
RL-23124	12	2023	0.47	0	0.00%	0.78
RL-24073	1	2024	0.69	0	0.00%	0.69
RS-19458	11	2019	0.40	N/A*	N/A*	0.68
SV-321	10	2022	0.47	0	0.00%	0.82
SV-331	59	2019-2024	0.88	6	10.17%	2.13
SV-357	60	2019-2024	0.42	0	0.00%	0.95

**There are no in-stream standards for nutrients in SC*

Table 10. Phosphorus Results from SCDES Water Monitoring Stations (2019-2024)

Station	# Samples	Sample Years	Avg. Sample (mg/L)	Exceedances	% Exceedances	Highest Sample (mg/L)
RL-19165	12	2019	0.03	0	0.00%	0.053
RL-19177	12	2019	0.02	0	0.00%	0.02
RL-20193	12	2020	0.02	0	0.00%	0.051
RL-20266	12	2020	0.02	0	0.00%	0.035
RL-21209	12	2021	0.02	0	0.00%	0.052
RL-21217	12	2021	0.03	0	0.00%	0.044
RL-21278	12	2021	0.02	0	0.00%	0.034
RL-22006	12	2022	0.02	0	0.00%	0.022
RL-22022	10	2022	0.02	0	0.00%	0.02
RL-23038	12	2023	0.02	0	0.00%	0.041
RL-23124	12	2023	0.03	0	0.00%	0.038
RL-24073	1	2024	0.03	0	0.00%	0.032
RS-19458	12	2019	0.03	N/A*	N/A*	0.053
RS-22078	7	2022	0.02	N/A*	N/A*	0.027
SV-321	10	2022	0.02	0	0.00%	0.029
SV-331	59	2019-2024	0.04	8	13.56%	0.11
SV-357	62	2019-2024	0.02	0	0.00%	0.059

*There are no in-stream standards for nutrients in SC

3.4) PROPOSED WATER QUALITY MONITORING

3.4.1) Gaps in Current Water Quality Monitoring

Currently, there are two active ambient sites that are monitored monthly in the watershed:

- SV-331 (Lake Seccession)
- SV-357 (Lake Russell)

Both sites are within reservoirs, which is a major gap in regulatory water quality monitoring as there are no long-term in-stream monitoring sites. While random stream (RS) monitoring sites help fill this gap, having in-stream monitoring sites with more than one year of data would help identify long-term water quality concerns throughout the watershed. Continuing to monitor these three sites is of utmost importance as there is both historical pollution and emerging threats of contamination in these reservoirs.

Additionally, the SC AAS program has helped fill in the gaps of in-stream monitoring. There are currently seven SC AAS volunteer active water quality monitoring sites on three streams within the watershed.

3.4.2) Water Quality Monitoring Recommendations

Regular water quality monitoring is important to the protection and restoration of drinking water quality because it can help to identify contaminants of concern as well as ongoing or new contamination. Identifying areas that could benefit from both water quality protection and restoration efforts is essential in the consideration of drinking water quality; addressing the sources of contaminants as well as protection of areas with no current water quality concerns will help to safeguard drinking water before it reaches a drinking water intake. The cost of restorative and protective water quality projects is often less expensive than the cost of drinking water utility/facility upgrades that would be required to address drinking water with higher levels of contamination.

Locations: In addition to maintaining the existing ambient water quality monitoring sites, UF recommends adding the following sites back to the regular SCDES monitoring schedule:

Table 11. Recommended Water Quality Monitoring Sites

Site	Location	Reason(s)
SV-041	Rocky River southeast of City of Anderson	<ul style="list-style-type: none"> Bacterial impairment dating back to 1998 Turbidity impairment dating back to 2008 Current TMDL site (<i>E. coli</i>), at the base of the TMDL area (downstream of site SV-031) Downstream of City of Anderson (urban development considerations)
SV-141	Broadway Creek between Anderson and Belton	<ul style="list-style-type: none"> Bacterial impairment dating back to 1998 Turbidity impairment dating back to 2008 Current TMDL site (<i>E. coli</i>), at the base of the TMDL area SC AAS monitoring has shown elevated levels of bacteria (<i>E. coli</i>)
SV-347	Wilson Creek	<ul style="list-style-type: none"> Current TMDL site (<i>E. coli</i>), at the base of the TMDL area Above City of Abbeville’s drinking water intake Near the base of the watershed in a more rural area
New Site	Rocky River upstream of Lake Secession at Highway 413	<ul style="list-style-type: none"> Downstream of 3 TMDL areas and other Random Lake/Stream sites currently listed as Not Supported on the 303(d) List Mid-watershed area, no current in-stream sites in this region

Parameters: Because of widespread bacterial contamination within the watershed, continued *E. coli* monitoring is recommended. Additionally, microbial source tracking could be a beneficial addition to current water quality monitoring efforts as it would help to identify sources of bacterial contamination. This would help to specify BMP recommendations within certain areas to address the highest contributors of bacterial contamination. SCDES should continue water quality sampling at these sites, including pH, turbidity, nutrients, DO, and CHLA. In addition to regulatory monitoring, UF recommends sampling waters for per- and polyfluoroalkyl substances (PFAS) levels, as this is an emerging contaminant of concern in the state.

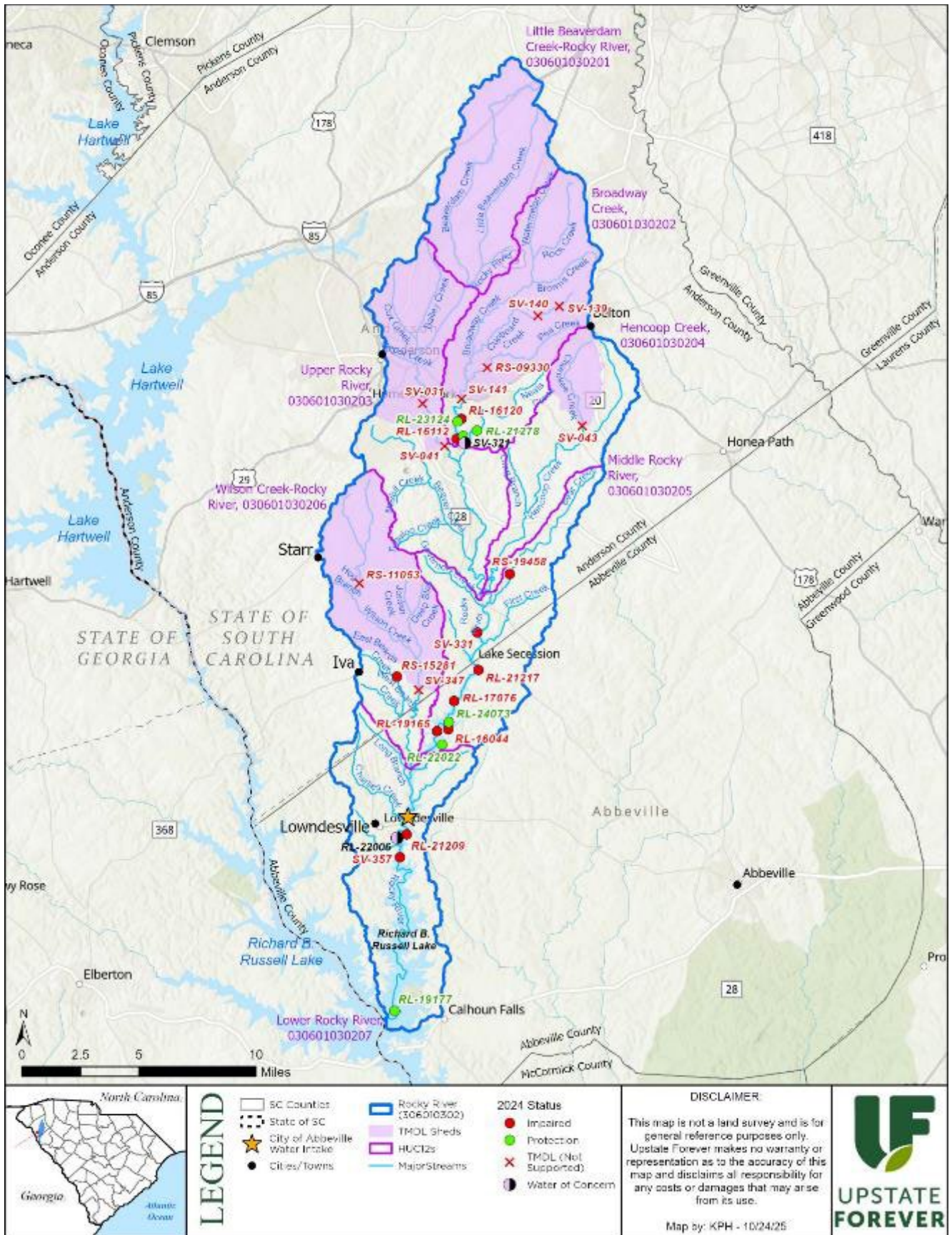


Figure 5. SCDES Water Quality Monitoring and Status

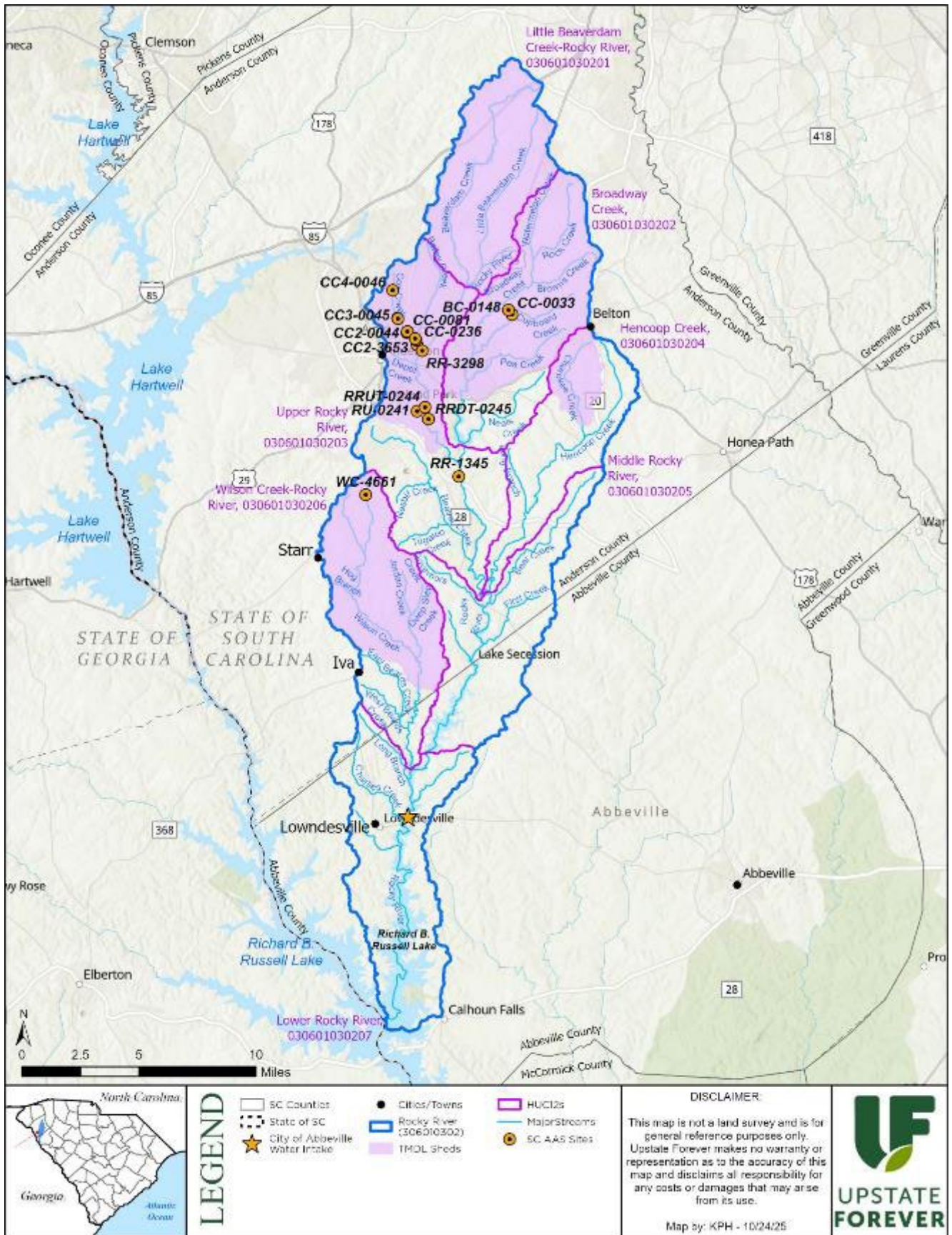


Figure 6. SC AAS Monitoring Sites

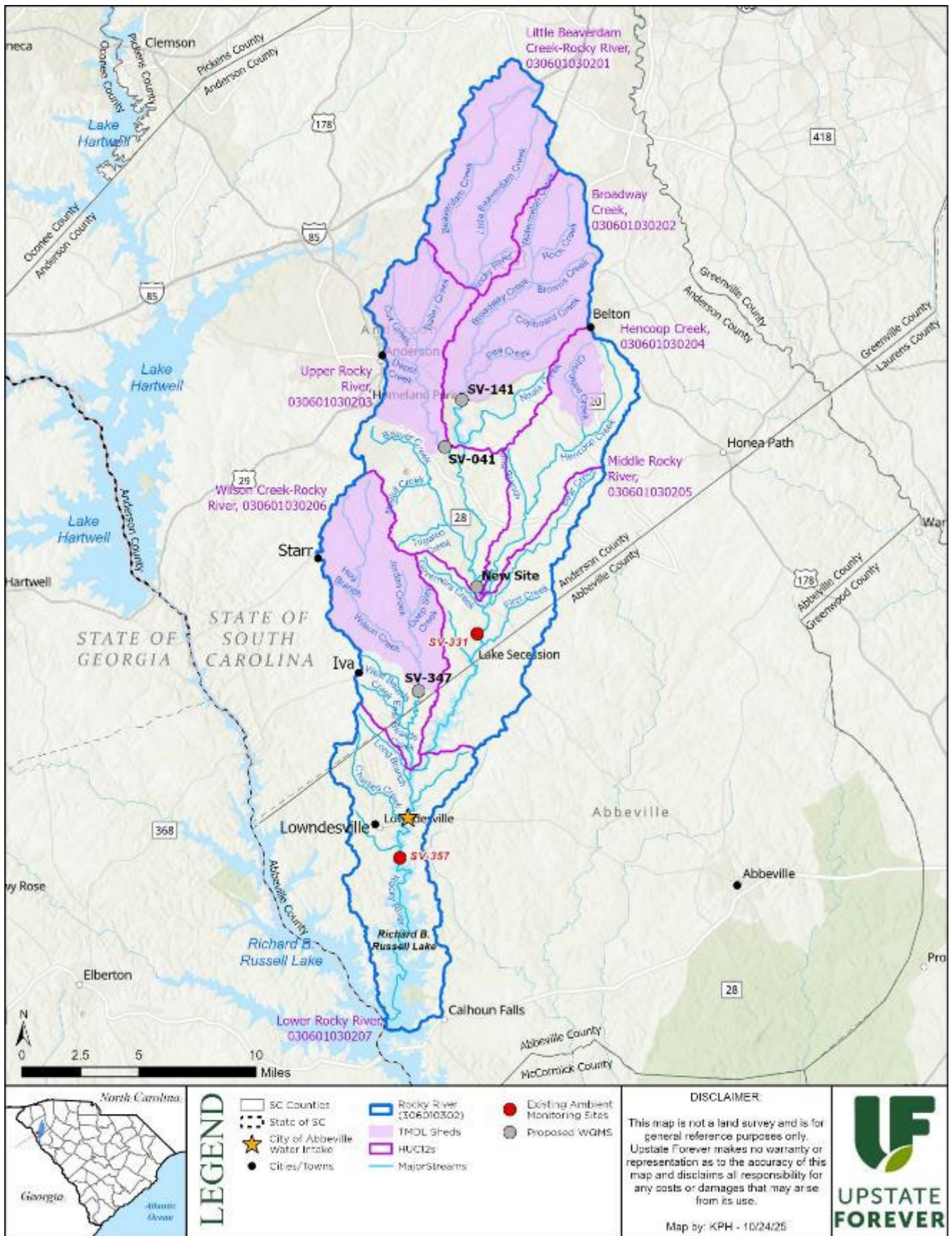


Figure 7. Proposed Water Quality Monitoring

4) POLLUTANT LOADING & SOURCES

4.1) BACTERIAL LOADING

Bacterial pollution can be attributed to both point and nonpoint sources within the Rocky River Watershed, including wastewater effluent, agricultural uses, urban runoff, and wildlife (Table 12) (SCDHEC, 2004).

Bacteria is a very important water quality parameter because it can be linked to other pollutants and measuring it ensures that water is safe for public recreation. Individuals who swim, fish, canoe, or come in contact with water with elevated levels of bacteria are at risk of getting sick because of the potential exposure to fecal pathogens. High levels of bacteria may contribute to cloudy water, unpleasant odors, and increased oxygen demand which may reduce levels of dissolved oxygen in water.

The presence of high bacterial levels in water may be linked to other parameters such as high total suspended solids and turbidity concentrations because bacteria are between 2 and 1000 times more abundant in sediment than the water column. Thus, when the sediment is disturbed, bacteria is released into the water (Luo, et al., 2019). Additionally, bacterial concentrations may also be linked with high phosphorus, nitrate, and biological oxygen demand (BOD) concentrations because these substances can provide the organic matter that bacteria need to thrive in the environment (US EPA, 2021).

Table 12. Potential Point and Nonpoint Sources of Bacterial Pollution in the Watershed

Wastewater	Agriculture	Urban	Wildlife
<ul style="list-style-type: none">• Septic Tanks• Wastewater Treatment Facilities• Manufacturing Facilities• Sewage Collection Systems	<ul style="list-style-type: none">• Cattle• Horses• Sheep & Goats• Poultry• Swine• Cropland	<ul style="list-style-type: none">• Stormwater Runoff• Domestic Pets	<ul style="list-style-type: none">• Deer• Wild Hogs• Raccoons• Wild Turkeys• Waterfowl

4.1.1) Point Sources of Bacterial Pollution

As defined in Section 502(14) of the CWA (US EPA, 2025), a point source pollutant is any discrete and confined conveyance (e.g., pipe, ditch, channel, tunnel, well, confined animal feeding operation) from which pollutants are discharged.

National Pollution Discharge and Elimination System (NPDES) Sites - The NPDES controls water pollution by regulating point sources that discharge pollutants into Waters of the United States (WOTUS). Major municipal dischargers include all facilities with design flows greater than one million gallons per day, while minor dischargers are less than one million gallons per day. According to the SC Watershed Atlas (SCDES, 2025), there is one NPDES permit holder within the watershed that has bacterial limits on their NPDES discharge permit, which are covered under SC General Permits. This site is listed in Table 13 and shown in Figure 8. Several bacterial violations have been recorded for this permit within the last five years (2019-2024). All NPDES permit information for this facility was obtained from the following website: <https://echo.epa.gov/facilities/facility-search> (US EPA, 2025).

No-Discharge (ND) Class B Sludge Application Sites - There are 11 permitted ND sites within the watershed where Wastewater Treatment Plants (WWTPs) are permitted to land-apply wastewater treatment effluent, non-hazardous sludge, and septage (Table 13 and Figure 8). These permits are considered ND because there is no direct discharge to surface waters. However, these sites have been included in this WBP because they have the potential to contribute bacteria and nutrients to surface waters if improperly managed (e.g., applications taking place during or preceding rain events).

Table 13. Active NPDES and ND Permits within the Rocky River Watershed

Permit Type	Permit #	Facility Name	Facility Type	Bacterial Compliance Violations (2016-2020)
NPDES	SCG730051	Vulcan Construction Materials	Industrial	None
NPDES	SC0023744	Anderson/Rocky River	Municipal	2024-2025
NPDES	SC0047210	FMR ELISKIM INC/C/O	Industrial	None
NPDES	SC0000400	Owens Corning Composite Materials/Anderson	Industrial	None
NPDES	SCG670006	Transcontinental Gas Pipe Line	Industrial	None
NPDES	SCG730222	Hanson Aggr SC/Anderson	Industrial	None
NPDES	SCG340024	KINDER MORGAN SE TERMINAL/BELTON 1	Industrial	None
NPDES	SCG731503	Cooper Sand & Gravel/Rocky River Mine	Industrial	None
NPDES	SC0000299	MOHAWK IND/ROCKY RIVER PLANT	Industrial	None
ND	SC0048381	Renewable Water Resources - REWA	Wastewater	n/a*
ND	ND0073253	Hanes Companies/Falcon Industries	Subsurface Injection	n/a*

**n/a - bacterial violations are not reported since there is no direct discharge to a waterway.*

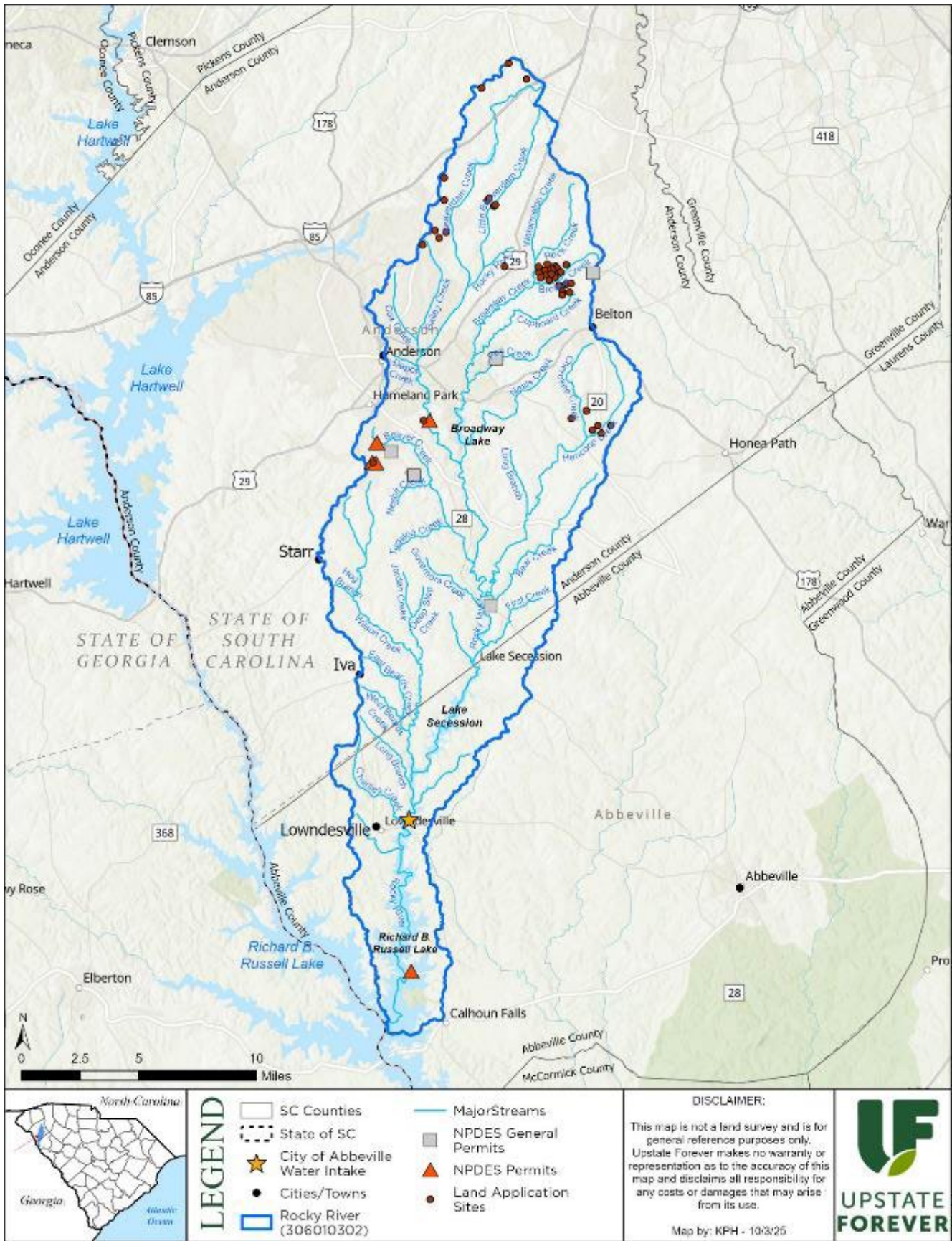


Figure 8. Permitted Discharge and Land Application Sites

4.1.2) Nonpoint Sources of Bacterial Pollution

Nonpoint source pollution is the result of precipitation moving over and through the ground, transporting pollutants such as bacteria into waterways. Nonpoint source bacterial pollution can be associated with malfunctioning septic systems, agriculture (e.g., livestock operations, cropland, and sediment), domestic pets, stormwater runoff, and wildlife. Approximately 86% of the land in this watershed is rural. Accordingly, this WBP focuses on bacterial load reductions primarily from failing septic tanks and agricultural practices.

Septic Systems - Damaged or improperly maintained septic systems can be a significant source of bacteria to surface and groundwater resources. Septic systems typically have four main components: an exit pipe that transports the wastewater out of the home to the septic tank, a septic tank where waste material naturally breaks down, a drain field where the effluent is discharged, and a soil layer that filters and breaks down wastewater contaminants. Improper connections, clogs, heavy use, or unmaintained septic systems increase the probability that untreated wastewater will leak into surface and groundwater resources.



Failing septic drain fields in the Three & Twenty Creek (left) and Tyger River (right) watersheds.

Most of the land cover within the Rocky River Watershed is rural, with only 18.5% of land cover classified as urban. As such, sewer infrastructure is not available in much of the watershed and private septic systems are the primary means for wastewater treatment. Consequently, it is reasonable to infer that failing septic systems within the watershed are likely a source of bacterial pollution in the watershed.

According to the Pollutant Load Estimation Tool (PLET) (US EPA, 2025), there are an estimated 10,190 septic systems in the Rocky River Watershed, which translates to approximately 20,380 users (US EPA, 2025). While sewer infrastructure is available in the northern part of the watershed in Anderson County, septic systems serve as the primary method of wastewater treatment for 31.9% of households in the watershed. With that in mind, the estimated failure rate for septic systems in this watershed is 27%, which is approximately 2,715 septic systems (US EPA, 2025).

Agriculture - Livestock (e.g., cattle, horses, and goats) and poultry are the primary agricultural sources of bacteria in the watershed, contributing to the increased concentration of bacteria in waterways. Livestock with access to waterways can contribute bacteria directly into waterways through their fecal matter or indirectly by causing erosion by disturbing streambanks. Runoff from

agricultural facilities (e.g., barnyards, feeding areas, manure storage areas) can also lead to increases in bacteria levels as well as other contaminants (e.g., fertilizers, pesticides, and sediment). Additionally, fertilizers such as manure and sludge, when applied to cultivated crops, can cause increased bacteria levels if applied in excess amounts or before precipitation. According to PLET, there are approximately 9,431 heads of livestock, 500 pigs, and 536,764 poultry within the watershed (US EPA, 2025).



Cattle enjoying some shade in the Rocky River Watershed (above).

Domestic Pets - Domestic pet waste is a threat to human health and water quality when not disposed of properly. Pet waste left on the ground can runoff into nearby waterways during precipitation and is a concern especially in developed areas containing higher densities of impervious surfaces. Developed land (e.g., commercial and residential) accounts for only 18.5% of total land cover in the watershed and is mostly concentrated around the City of Anderson.

Wildlife - Wildlife has the potential to impact bacteria levels in water and is a contributor to elevated levels of bacteria in this watershed. Examples of species contributing to bacterial loads in watershed include deer, geese, beavers, and wild hogs. A single Canada goose can produce an average of 82 grams (0.18 pounds(lbs)) of waste per day, 29,930 grams per year (365 lbs/year) (Lakes of Missouri Volunteer Program, n.d.). Wild hogs, which are present in the watershed, are also a threat to water quality because their rooting behavior contributes to soil erosion while their fecal matter contains viruses and pathogens that are harmful to human health. A single wild hog is estimated to excrete $3.17E+12$ counts/year (*E. coli*) (Appendix A). Due to lack of literature available on bacterial concentrations associated with feral hogs, we are using the best available data and assume that hogs raised as livestock may produce roughly the same counts/year of bacteria. Additionally, it is essential to note that wild hogs are non-native species compared to other wildlife that is native referenced in this section.



Waterfowl congregating along the Broadway Lake shoreline (above).

Stormwater Runoff - Urbanized areas, particularly those built prior to stormwater management requirements, present an increased risk of negatively impacting nearby waterways from the high density of impervious surfaces. Impacts such as increased surface water runoff, decreased groundwater recharge, stream channelization, heightened erosion, and flooded areas can all contribute to impaired water quality. Bacteria runoff in urban settings is largely attributed to wildlife and pet waste but can also result from leaking sewer infrastructure. As was previously noted, failing sewer infrastructure is not a primary concern in this watershed due to its limited geographical extent in the region.



Shorelines with high runoff potential on Broadway Lake (left) and Richard B. Russel Lake (right).

4.1.3) Bacteria TMDL

A TMDL was developed by SCDHEC (now known as SCDES) in 2004 for several waterways within the watershed:

https://des.sc.gov/sites/des/files/docs/HomeAndEnvironment/Docs/tmdl_rockywilson_fc.pdf

(SCDHEC, 2004). A TMDL is the calculation of the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet water quality standards for that pollutant. There are a total of seven water quality monitoring stations included in the approved TMDL on the following waterbodies: Rocky River (SV-031, SV-041), Cherokee Creek (SV-043), Cupboard Creek (SV-139, SV-140), Broadway Creek (SV-141), and Wilson Creek (SV-347).

Within the TMDL document, existing loads of both point and nonpoint sources of bacterial pollution are calculated, and target percentage reductions are identified. Table 14 below summarizes the estimated existing loads and target reductions needed to meet the identified TMDLs for the watershed. Because the TMDL is calculated for fecal coliform (FC), numbers were converted to *Escherichia coli* (*E. coli*) for consistency with current sampling results and BMP load reduction calculations by multiplying values by 0.8725 (SCDHEC, 2013). In summary, there is an estimated existing nonpoint load of 6.42E+12 counts/year (*E. coli*) and a total reduction of 1.39E+15 counts/year (*E. coli*) (68%) is needed to meet water quality standards for bacteria.

Table 14. TMDL Bacterial Load Reduction Calculations (*E. coli*)

Station	Existing Nonpoint Load (counts/day)	Target Reduction (%)	Reduction Needed (counts/day)	Reduction Needed (FC) (counts/year)	Reductions Needed (<i>E. coli</i>) (counts/year)
SV-031	1.08E+12	50%	5.40E+11	1.97E+14	1.72E+14
SV-041	3.37E+12	83%	2.72E+12	9.93E+14	8.66E+14
SV-043	3.51E+11	76%	2.67E+11	9.74E+13	8.50E+13
SV-139	2.21E+11	93%	2.06E+11	7.50E+13	6.55E+13
SV-140	1.02E+11	74%	7.55E+10	2.76E+13	2.40E+13
SV-141	8.17E+11	55%	4.49E+11	1.64E+14	1.43E+14
SV-347	4.79E+11	22%	1.05E+11	3.85E+13	3.36E+13
TOTAL					1.39E+15

4.2) SEDIMENT LOADING

According to the EPA, sediment is the most common pollutant in rivers, streams, lakes, and reservoirs in the country (US EPA). Sediment can come from both natural sources (e.g., erosion) and human-induced activities (e.g., construction and agriculture). Excess sediment has the potential to degrade water quality and aquatic habitats. For example, too much sediment can increase the cost of drinking water treatment, lead to flooding issues, clog fish gills, and destroy aquatic habitats. Additionally, sedimentation can cause the infilling of lakes, especially in areas where water levels are lower in warmer months. This can cause issues for lake access, recreation, and aquatic life. Although approximately 30% of sedimentation can be attributed to natural erosion, the remaining 70% is caused by accelerated erosion from human land use practices (US EPA). Table 15 details the potential point and nonpoint sources of sediment pollution in the watershed (SCDHEC, 2004).



The Rocky River at Rocky River Nature Park following a heavy rainfall event and exhibiting elevated sediment loading.

Table 15. Potential Sources of Sediment Pollution in the Rocky River Watershed

Agriculture	Forestry	Urban
<ul style="list-style-type: none">• Croplands• Livestock Operations	<ul style="list-style-type: none">• Road Construction• Road Use• Clear Cutting• Silviculture	<ul style="list-style-type: none">• Stormwater Runoff• Construction

4.2.1) Point Sources of Sediment Pollution

As stated in [Section 4.1.1](#), the NPDES permit system is operated by SCDES in South Carolina and protects water quality by regulating point sources of pollution from being discharged into WOTUS. Sediment is regulated as a point source through the NPDES permit system within a Municipal Separate Storm Sewer System (MS4) program area. An MS4 is a public system of structures (*i.e.*, ditches, curbs, gutters, storm drains, pipes) that discharge stormwater into Waters of the State (WOS). Additionally, an MS4 is not designed to treat sewage but acts as a permitted drainage system for stormwater runoff only. In this watershed, there are two MS4 areas, the City of Anderson and Anderson County.

4.2.2) Nonpoint Sources of Sediment Pollution

Nonpoint sources of sediment pollution typically include construction sites, agriculture (e.g., livestock operations, cropland), stormwater runoff, and forestry practices. Sediment is considered a nonpoint source pollutant both inside and outside of MS4 boundaries.

Agriculture - The most common source of pollution from agriculture is sediment runoff from fields during precipitation. This sediment often transports pollutants and chemicals including livestock waste, fertilizers, pesticides, and heavy metals into waterways as these contaminants attach themselves to sediment particles. Agricultural practices that exacerbate sediment erosion include overgrazing, misplaced and mismanaged feeding operations, over plowing, and poorly timed/excessive fertilizer, pesticide, or irrigation water applications. Additionally, livestock with access to streams can also contribute to sediment pollution by causing erosion along streambanks (Section 5.2).

Urban - In general, urbanized watersheds often have negative impacts on water quality. Activities most associated with urbanization are land disturbances; the channelization of streams, expansion of impervious surfaces, and increases in stormwater runoff. Sediment pollution from urban areas is usually linked to mismanaged construction sites, but can also come from streets, yards, and instream sediment load.

Forestry - Large amounts of sediment can run off into water bodies from forestry practices, such as clear cutting and access road building, as these practices expose large amounts of bare soil to the elements. With the increased slope and topographical variation in the Upstate, higher erosion rates are expected as opposed to the Midlands and Coastal Plain areas of the state which might see lower rates of erosion based on flatter topography. This is particularly a concern with clear-cutting or any other practice that creates greater erosion potential. Therefore, for the Rocky River Watershed, extra care should be taken to preserve forested areas and utilize forestry BMPs in the watershed, particularly on parcels with steeper slopes, to maximize the soil retention and stabilization potential for forest lands.

4.2.3) Current Sediment Loading

Annual sediment loading for the watershed was calculated with PLET. Using this tool, it is estimated that cumulatively the watershed contributes 7,840 tons of sediment per year to the region (Table 16), largely attributed to agricultural land and urban development (Figure 9). The subwatersheds with the highest concentrations of sediment in the watershed are the Upper Rocky River and Broadway Creek watersheds, due to large percentages of urban, agricultural, and forest land cover. The Upper Rocky River watershed encompasses a portion of the City of Anderson, pointing to land development-derived sedimentation concerns.

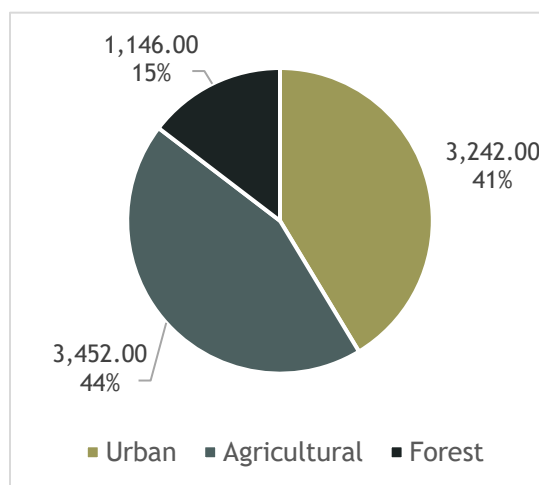


Fig. 9. Sediment Loading per Land Use (tons/year)

Table 16. Current Sedimentation in the Rocky River Watershed

Watershed	Sediment Load (tons/year)	% Urban Land Cover	% Ag. Land Cover	% Forest Land Cover
030601030201 - Little Beaverdam Creek-Rocky River	870	19.61%	39.43%	35.76%
030601030202 - Broadway Creek	1,132	22.55%	30.51%	42.12%
030601030203 - Upper Rocky River	3,071	32.53%	32.49%	3.52%
030601030204 - Hencoop Creek	831	12.24%	31.71%	51.43%
030601030205 - Middle Rocky River	649	11.83%	28.04%	51.92%
030601030206 - Wilson Creek-Rocky River	775	12%	34.24%	48.21%
030601030207 - Lower Rocky River	512	5.71%	33.78%	21.88%
TOTAL	7,840			

4.3) NUTRIENT LOADING

Excess levels of nitrogen and phosphorus can cause negative economic and environmental impacts such as harmful algal blooms in surface waters, increased drinking water treatment costs, and aquatic habitat degradation (US EPA, 2025). Nutrient pollution in the watershed originates from both point and nonpoint sources and is most often associated with anthropogenic activities (Table 17).

Table 17. Potential Sources of Nutrient Pollution in the Rocky River Watershed

Agriculture	Urban	Wastewater	Industrial
<ul style="list-style-type: none">• Livestock• Fertilizer applications• Soil erosion	<ul style="list-style-type: none">• Stormwater Runoff• Yard Waste• Yard Fertilizers/Pesticides• Pet waste	<ul style="list-style-type: none">• WWTPs• Septic Systems	<ul style="list-style-type: none">• Factories

Harmful Algal Blooms (HABs)

Harmful algal blooms (HABs) are events in which algae, often microscopic types like cyanobacteria or dinoflagellates, multiply rapidly in aquatic environments and form dense layers on or below the water's surface. These blooms can produce potent toxins that pose serious risks to human health, pets, livestock, and wildlife. Additionally, even non-toxic algal blooms can degrade water quality by blocking sunlight, disrupting aquatic ecosystems, and increasing the cost of water treatment (US EPA, 2019).

The occurrence and severity of HABs are strongly tied to nutrient pollution, particularly excess nitrogen and phosphorus, which enter water bodies through human activities such as agriculture, sewage discharge, and stormwater runoff (US EPA, 2025). In aquatic systems, excess nutrients fuel algal growth beyond what the ecosystem can naturally regulate. As algae die off, their decomposition consumes oxygen, often creating low-oxygen "dead zones" where aquatic life struggles to survive, and certain bloom-forming algae may produce toxins that intensify health and ecosystem risks (US EPA, 2019).

In South Carolina, HABs are monitored by the Aquatic Science Division at SCDES. This monitoring program was developed in 2018 and is tasked with monitoring, testing, and issuing advisories related to HABs and other emerging contaminants across the state. According to the Aquatic Science Division, there have been no reports or issued watches/advisories related to HABs in either Lake Secession or Russell Lake since the program started. However, there was a HAB watch issued for Broadway Lake in 2025 (Table 18). HAB watches are imposed when a potential toxin-producing species has been identified, but it is not producing toxins or is producing toxins below our state recreational limits (8 ug/L for microcystins).

Table 18. HAB Data on Broadway Lake in the Rocky River Watershed

Watch Date Issued	Watch Date Removed	Bloom Species	Microcystins (ug/L)
6/11/2025	6/20/2025	<i>Dolichospermum sp.</i>	0.342
7/16/2025	9/24/2025	<i>Planktothrix sp.</i>	0.291

4.3.1) Point Sources of Nutrient Pollution

The primary point sources of nutrients include sewage treatment plants, industry, and factories. As stated in [Section 4.1](#), the NPDES system controls water pollution by regulating point sources that discharge pollutants into WOTUS.

NPDES Discharges - There are 11 NPDES facilities permitted to discharge into surface waters in the Rocky River Watershed (Table 13, Figure 8). These facilities are regulated by SCDES to ensure compliance with the CWA. None of the listed NPDES facilities (Table 13) have compliance violations for nutrients such as total phosphorus (TP) and total nitrogen (TN).

4.3.2) Nonpoint Sources of Nutrient Pollution

Nutrient pollution (*i.e.*, nitrogen and phosphorus) from nonpoint sources is common in the Rocky River Watershed. Within the watershed, excess nitrogen and phosphorus loading to waterways is associated with agricultural, urban, and domestic wastewater sources.

Agriculture - Agriculture is considered one of the largest sources of nitrogen and phosphorus pollution to waterways in the country (United States Geological Survey (USGS), 2025). Fertilizers and animal manure, both rich with nitrogen and phosphorus, are the primary causes of nutrient pollution from agriculture when not managed properly. Restricting livestock access to streams and properly managing fertilizer applications protects water quality by reducing the amount of excess nutrients entering local waterways.

Agricultural nutrient load reductions reflect the amount of nutrients projected to be removed annually using the Agricultural BMPs installed on high priority agricultural sites within the watershed ([Section 5.2](#)).

Urban - Nutrient pollution from urban areas is typically attributed to stormwater runoff. As impervious surfaces in a region increase (*e.g.*, roads, parking lots, roof tops), landscapes lose their ability to absorb precipitation during precipitation. As a result, stormwater runs off these surfaces at higher volumes and speeds, picking up debris and other pollutants and then discharging them into nearby waterways. Nitrogen and phosphorous can be found in yard waste, fertilizers, and pet waste and is often washed into local rivers and streams during precipitation.

Forestry - Managed forested land can serve as a buffer to nonpoint source runoff and absorb other nonpoint sources of water quality impairments. Unmanaged silviculture loses the ability to effectively buffer and absorb nonpoint source pollutants. Some examples that contribute to nonpoint source pollution on forested lands include removal of streamside vegetation, logging road construction and use, timber harvesting, and mechanical preparation for planting trees. In each of these examples,

nutrient rich soils are not buffered or absorbed and instead reach the nearby waterbodies causing increased nutrient loading. Nutrients such as fertilizers, insecticides, and herbicides from silviculture may also reach nearby water bodies if not properly managed.

Wastewater - Domestic wastewater contains nutrients from human waste, food scraps, soaps, and detergents. Consequently, malfunctioning or mismanaged septic systems are a potential source of nutrient pollution in the Rocky River Watershed. When not properly maintained, septic systems can cause increased nitrogen and phosphorus levels through leakage of untreated wastewater into local surface waters or groundwater systems ([Section 5.1](#)).

4.3.3) Current Nutrient Loading

Annual nutrient loading for the watershed was calculated using PLET. The model estimates that the watershed contributes 92,165 lbs of phosphorus per year and 809,659 lbs of nitrogen per year to the region with most of the loading attributed to agricultural practices, urban development, forestry, and septic systems. The breakdown of annual nutrient loading per land use is shown in Figure 10. The areas in the watershed experiencing the greater impacts of nutrient pollution are the Upper Rocky River and Broadway Creek watersheds. Sources of nutrients in the Upper Rocky River watershed can be largely attributed to urban and agricultural land cover, which together account for 65% of land cover in this subwatershed. Sources of nutrients in the Broadway Creek subwatershed can be largely attributed to forest land use, which accounts for 42% of land cover in this subwatershed.

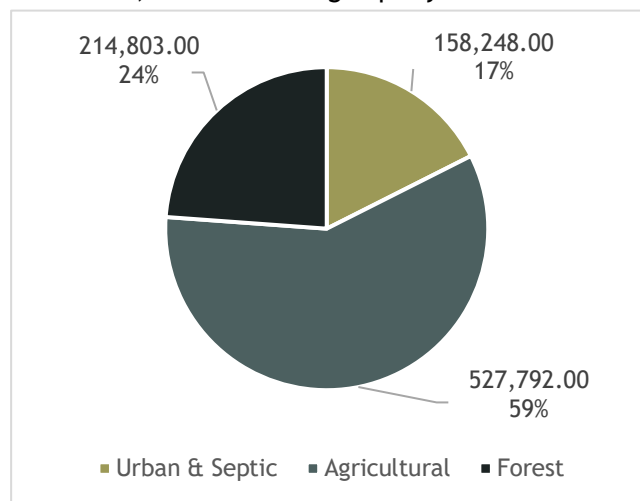


Fig. 10. Nutrient Loading per Land Use (lbs/year)

Table 19. Current Nutrient Loading in the Rocky River Watershed

Watershed	Nitrogen Load (lbs/year)	Phosphorus Load (lbs/year)	% Urban Land Cover	% Ag. Land Cover	% Forest Land Cover
030601030201 - Little Beaverdam Creek-Rocky River	115,190	13,399	19.61%	39.43%	35.76%
030601030202 - Broadway Creek	142,176	16,432	22.55%	30.51%	42.12%
030601030203 - Upper Rocky River	157,710	20,504	32.53%	32.49%	3.52%
030601030204 - Hencoop Creek	108,037	11,817	12.24%	31.71%	51.43%
030601030205 - Middle Rocky River	91,631	9,659	11.83%	28.04%	51.92%
030601030206 - Wilson Creek-Rocky River	121,296	13,228	12%	34.24%	48.21%
030601030207 - Lower Rocky River	73,619	7,126	5.71%	33.78%	21.88%
SUM	809,659	92,165			

4.4) PREVENTING POLLUTANT LOADING

Land Protection - Pollutant load prevention from land protection represents the amount of pollutants that are prevented from entering/impacting waterways if significant development of the land is avoided. By placing a conservation easement on a high-quality forested or agricultural property, the conversion of that land into high-density urban land is prevented, preserving the natural benefits those lands provide such as water filtration, erosion control, flooding mitigation, and more, in perpetuity ([Section 5.3](#)).

Riparian Buffer Restoration - Properly installed riparian buffers can reduce bacteria, sediment, and nutrients from reaching waterways by slowing stormwater, preventing erosion, and filtering out pollutants before entering waterways. Nutrient removal estimates for riparian buffers represent the pollutant loading prevented from impacting waterways if riparian buffers are protected, enhanced, and/or restored. Examples of actions include, but are not limited to, riparian buffer protection ordinances, planting vegetation, erosion control techniques, and/or stream enhancement/restoration activities ([Section 5.4](#)).

5) ADDRESSING NON-POINT POLLUTION WITH BEST MANAGEMENT PRACTICES

Best Management Practice (BMP) - A BMP is a device, practice, or procedure that helps to mitigate both point and nonpoint source pollution. Within the context of this WBP, BMPs are the units for which we address bacterial, sediment, and nutrient pollution. For each pollutant source, this WBP will outline specific BMPs for addressing that pollutant (Sections 5.1-5.7) and summarize the net impact of these BMPs into ideal phases of funding and implementation ([Section 5.8](#)).

5.1) SEPTIC REPAIRS & REPLACEMENTS

Damaged or improperly maintained septic systems can be a significant source of bacteria to surface and groundwater resources. Improper connections, clogs, heavy use, or unmaintained systems can increase the chance that untreated wastewater will leach into surface and groundwater, which can pose a threat to public health and impact water quality. Septic tanks should be pumped every 3-5 years to maintain efficiency. Septic system repairs and replacements can reduce bacteria pollution in nearby streams by preventing bacteria leakage from faulty systems into waterways. The estimated failure rate for septic systems in this watershed is 27% (US EPA, 2025).



Septic drain-line repairs in the Three & Twenty Creek Watershed. EZ-flow pipe (left), outlet pipe (right).

5.1.1) Analysis Results

A Geographic Information System (GIS)-based land prioritization analysis was done to identify which areas would be of highest priority in addressing potential septic tank failures. Criteria for this analysis included water quality considerations (adjacency to water bodies and upstream of known bacterial impairments), soil suitability for septic tank absorption fields (very limited), flood susceptibility, climate resilience priority areas, and areas with high potential for urban sprawl. Parcels along the following waterways have been identified as high priority for septic tank repair/replacement: Little Beaverdam Creek, Broadway Creek/Broadway Lake, Hencoop Creek, Bear Creek, Wilson Creek, and the mainstem of Rocky River (Figure 11).

5.1.2) Location Recommendations

Based on the results from the septic prioritization analysis, UF recommends focusing outreach efforts for septic repair/replacements within the following HUC-12 watersheds (listed by priority):

- Priority 1: Broadway Creek (030601030202) and Hencoop Creek (030601030204)
- Priority 2: Wilson Creek (030601030206) and Middle Rocky River (030601030205)
- Priority 3: Little Beaverdam Creek-Rocky River (030601030201) and Upper Rocky River (030601030203)

Working in priority watersheds based on the results of the prioritization analysis will allow for a localized/cluster approach, making meaningful bacterial reductions by focusing on septic system repairs near specific waterways, particularly ones with historical bacterial pollution.

5.1.3) Expected Load Reductions Per Septic Repair

The standard bacteria removal rates per septic repair/replacement that were used to estimate pollutant loads were provided by SCDEs and found in Appendix A, as shown in Table 20.

Table 20. Standard Pollutant Removal for Septic Repairs/Replacements

Pollutant	Standard Pollutant Removal/Prevention per BMP
Bacteria (<i>E. coli</i>)	2.42E+10 counts/year
Nutrients - Phosphorus	31.1 lbs/year
Nutrients - Nitrogen	12.2 lbs/year

5.1.4) Cost Estimates & Funding

In nearby watersheds of Upstate South Carolina, the average cost of a septic tank repair/replacement from 2023-2025 has been \$6,400 in the Anderson/Pickens County area, \$8,500 in the Pickens/Oconee County area, and \$6,500 in the Spartanburg/Greenville County area. Higher costs have been associated with mountainous, lakeside homes with difficult-to-access septic systems as well as the availability of contractors. Based on this data, it is estimated that the cost of septic system repairs in the Rocky River Watershed is currently \$6,500-\$7,000 per system.

Table 21. Septic Repair/Replacement Cost Estimates

Nonpoint Sources of Bacterial Pollution	BMP	Estimated BMP Unit Cost	Potential Funding Sources
Septic Tanks	Replace/repair onsite failing septic systems and leach fields	\$6,500-\$7,000 per system	SCDES Section 319(h) Funds Local Governments and Organizations
	Tie into Existing Sewer Infrastructure	\$2,500/hookup*	USDA Rural Utilities Service State Revolving Funds USDA Rural Development US Department of Housing and Urban Development (HUD)

*Estimate from City of Anderson 2025

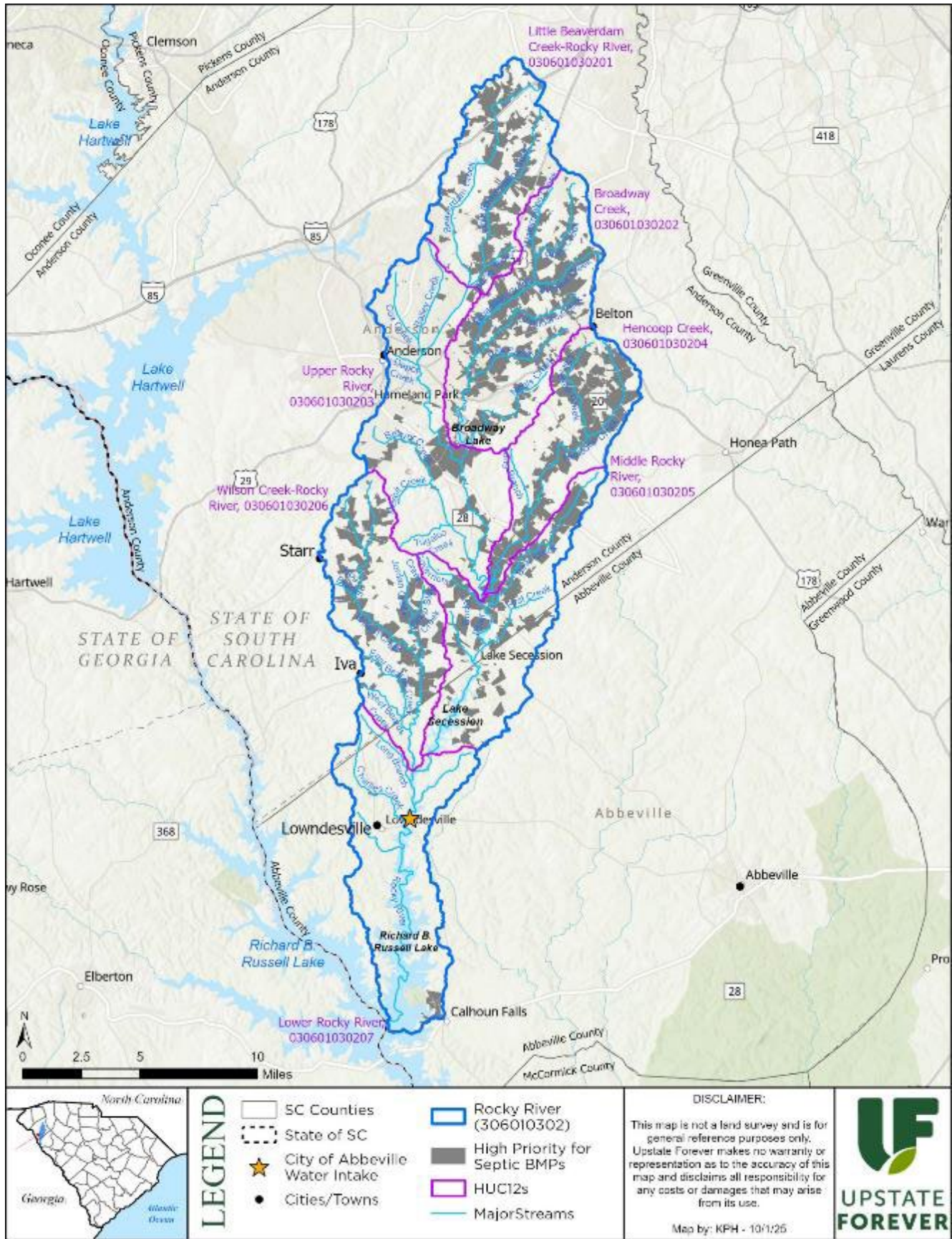


Figure 11. High Priority Areas for Septic Repairs/Replacements

5.2) AGRICULTURAL BMPS

The implementation of agricultural BMPs reduces bacteria, nutrient, and sediment pollution into nearby streams while maintaining, and often improving, conditions for livestock and overall land productivity. For the purposes of this plan, agricultural land includes pasture for livestock, grasslands, hay, and cultivated crops. Livestock is considered the primary agricultural source of bacterial pollution throughout the watershed and can also contribute to nutrient and sediment pollution. Therefore, to address bacteria inputs, agricultural BMPs will focus on restricting animal access to streams, providing alternative water sources, and reinforcing heavy use areas. Agricultural BMPs are often installed in combination with one another; for example, if exclusion fencing is installed to restrict livestock from a stream, an alternative watering source would also need to be installed to provide water to the livestock. The BMPs listed below are some commonly utilized practices in the Anderson/Abbeville area. Most practices are as described by the United States Department of Agriculture Natural Resource Conservation Service (USDA NRCS).

5.2.1) Agricultural BMPs

Agricultural practice codes are listed throughout this section with reference to the Natural Resources Conservation Service (NRCS) Environmental Quality (EQIP) cost list. The NRCS publishes a cost list for their EQIP program annually that helps estimate unit cost for installation.

Stabilizing Farm Roads (Code 560): Long drives to barns, pastures, and fields are typically prone to heavy use and large equipment and can be areas of soil loss and erosion transported by wind as dust or by precipitation as stormwater runoff. It is recommended that funds be used for heavy use area protection to stabilize soil and prevent erosion on farm roads. These practices may include stabilizing private and public dirt drives and providing areas of stormwater treatment (e.g., linear rain gardens, regenerative stormwater conveyance, vegetated ditches) to better mitigate sediment discharge to nearby wetlands and waterways. This work may require grading, installation of ditch check dams, stabilization, crushed concrete (as a low budget road material), and stormwater runoff capture and treat areas (USDA NRCS, 2020).



Example of farm road stabilization in the Tyger River Watershed.

Road Drainage and Ditch Maintenance (Code 608): Roadside ditches act to protect the integrity of a road by moving water away; a properly maintained ditch can reduce turbidity of water runoff, reduce sedimentation/erosion, and filter pollutants before it reaches creeks/streams. Correcting sediment buildup, unblocking culverts, replacing damaged culverts, and adding in erosion control measures such as rocks, riprap, or plantings can ensure proper function of water runoff (Regents of the University of Minnesota, 2014).

Culvert Repairs and Replacements (Code 587): A culvert is a tunnel-like structure that allows water to pass under a road, railway, trail, or similar obstruction. Its primary function is to channel water efficiently, prevent flooding, and maintain the integrity of transport routes. By directing water under roads or pathways, culverts prevent erosion and therefore decrease sediment loading in waterways. Problems arise when culverts are poorly designed or deteriorate and fail. The failure of culverts causes barriers to aquatic organisms, habitat fragmentation, and increased sediment loading (Richard J. Lehrter, 2024).

Linear Streambank Fencing (Code 382): Installing fences limits livestock access to waterways. This practice ensures that manure is not deposited directly into streams or ponds, protects riparian vegetation, and reduces erosion along streambanks. (USDA NRCS, 2021)



Example of livestock exclusion fencing in Tyger River area (above).

Watering Facility/Water Wells and Livestock Pipeline (Codes 614, 516, and 642): Streams and ponds in pastures are often used as the primary watering source for livestock. If fences restrict livestock access to water, an alternative watering source will be needed (USDA NRCS, 2023). Alternative watering sources support removal of livestock from waterways, therefore reducing manure deposited directly into streams. Linear pipelines (USDA NRCS, 2020) may be necessary to transport water from the well (USDA NRCS, 2020) to the alternative watering sources.



Examples of alternative watering source (left) and linear pipeline (right) in the Three & Twenty Creek Watershed.

Heavy Use Area Protection (Code 561): Installing durable material (e.g., crush and run gravel) can reduce erosion and pollutant loading of stormwater runoff, especially around areas of heavy use such as an alternative watering source and can be utilized as a substitute for maintaining vegetation (USDA NRCS, 2020).



Example of animal heavy use area (left) and watering facility (right) in the Three & Twenty Creek Watershed.

Riparian Herbaceous Cover/Forest Cover/Filter Strips (Codes 390, 391, and 393): Riparian buffers are vegetated areas along waterways that stabilize soil, filter runoff, and provide wildlife habitat. In an agricultural setting, they can function to filter runoff from farms that could include manure, sediment, fertilizers, or pesticides (USDA NRCS, 2022) (USDA NRCS, 2020). Similarly, filter strips are typically located on croplands adjacent to waterways and are usually made up of native grasses, legumes, and/or flowers; they provide filtration of sediment, nutrients, and other contaminants (USDA NRCS, 2016).



Example of a riparian buffer along a stream.

Stream Crossing (Code 578): When stream crossings are necessary to move livestock from one area to another, armored crossings can provide additional support to areas around streams that are prone to erosion (USDA NRCS, 2022).



Armored Streambank Crossing.

Conservation Cover/Cover Crops (Code 327 & 340): Conservation cover is a permanent protective vegetative cover of plants on lands that will not be used for forage production; it can reduce soil erosion and sedimentation and improve water quality (USDA NRCS, 2024). Similarly, cover crops are plantings of grasses, legumes, and forbs on lands that will be utilized for future crop production (USDA NRCS, 2024). Benefits include erosion control, suppressing weeds, reduction of soil compaction, increasing moisture and nutrient content of soil, improving yield potential, and more.



Crimper-roller (left), planted wheat, oat, and sorghum (right). Source: Save Our Saluda (left). Cover crop planting in South Tyger Watershed (right).

Residue and Tillage Management, No Till (Code 329): No till is a practice that manages the amount, orientation, and distribution of crops and other plant residue on the surface over the course of the year while limiting soil-disturbing activities in fields used for crop production. By leaving the crop residue, sheet, rill, and wind erosion are decreased, and soil health is improved (USDA NRCS, 2016).

Critical Area Planting (Code 342): Critical Area Planting works to minimize erosion of streambanks and channels, fortifying streambanks to prevent them from falling into the waterway or otherwise modifying or redirecting the flow that is impacting the streambank (USDA NRCS, 2016). This is best done through establishing permanent vegetation (Code 342) or streambank and shoreline protection (Code 580). This BMP may also include livestock crossings (Code 578) or livestock fencing (Code 382) with the objective of minimizing in-stream and streambank erosion.

Streambank and Shoreline Protection (Code 580): Streambank and shoreline protection is the act of minimizing erosion of streambanks and channels, fortifying streambanks to prevent them from falling into the waterway or otherwise modifying or redirecting the flow that is impacting the streambank. This best management practice may be done in conjunction with practices that include livestock crossings or livestock fencing with the objective of minimizing in-stream and streambank erosion. (USDA NRCS, 2020).



Example of riparian buffer restoration. Source: Save Our Saluda.

5.2.2) Analysis Results

A GIS-based land prioritization analysis was done to identify which areas would be of highest priority for agricultural BMP installations. Criteria for this analysis included presence of agricultural land cover, adjacency to water, and soil considerations (e.g., prime/important farmland soils, NRCS source water protection priority areas). Based on the analysis, concentrations of high priority lands for agricultural BMPs (Figure 12) can be seen in the Wilson Creek-Rocky River Watershed (HUC 030601030206).

5.2.3) Location Recommendations

While high priority sites exist throughout the watershed, the Wilson Creek Watershed should be a priority for future outreach and implementation efforts based on the findings of the land prioritization analysis (Figure 12). Participation in future implementation efforts is reliant on landowner participation. As such, UF has found success in nearby watersheds in partnering with NRCS to identify existing NRCS EQIP contracts within the watershed and connecting with landowners through this avenue.

5.2.4) Expected Load Reductions Per Agricultural BMP

Agricultural BMPs are often done in combination and referred to as “agricultural BMP bundles.” Load reduction calculations for agricultural BMP bundles within the Rocky River Watershed were developed based on the average pollutant load reductions associated with projects completed in Three & Twenty Creek Section 319(h) Implementation Phases 1 & 2 (2020-2025) (Appendix B). Projects included livestock exclusion fencing, alternative watering sources, and heavy use protection areas. The load reductions calculated for the plan are the best approximation that can be made for agricultural BMP load reductions in the Rocky River Watershed. Due to constraints such as location, size of a parcel, project type, and other geological features related to the agricultural BMP project, each load reduction will be variable until calculated for a specific parcel when a project is completed.

Table 22. Agricultural BMP Bundle to Reduce Pollutant Loads

Pollutant Type	Standard Pollutant Removal/Prevention per BMP Bundle
Bacteria (<i>E. coli</i>)	4.03E+12 counts/year
Sediment	73.84 tons/year
Nutrient - Phosphorus	96.69 lbs/year
Nutrient - Nitrogen	418.19 lbs/year

5.2.5) Cost Estimates & Funding

Unit costs for agricultural BMPs are listed in Table 23 and based on information provided by the United States Department of Agriculture (USDA) (USDA NRCS, 2024).

Table 23. Agricultural BMP Unit Costs (SC EQIP, 2025)

BMP	EQIP Code	Estimated Cost Per Unit
Stabilizing Farm Access Roads	560	\$15.16/ft
Drainage Ditch	608	\$2.27/CuYd
Culvert Maintenance	587	\$3.50/DialnFt
Linear Streambank Fencing	382	\$2.81/ft
Watering Facility	614	\$1,078.40 each
Livestock Pipeline	516	\$52.17/lb
Water Well	642	\$14,770.73 each
Heavy Use Area Protection	561	\$3.24/sq ft
Riparian Forest or Herbaceous Cover	390	\$749.82/acre
Forest Cover	391	\$399.38/acre
Filter Strip	393	\$2223.11/acre
Stream Crossing	578	\$10.32/sq ft
Conservation Cover	327	\$218.43/acre
Cover Crop	340	\$63.81/acre
No Till	329	21.77/acre
Critical Area Planting	342	1,054.26/acre
Streambank and Shoreline Protection	580	\$67.82/ft

On average, the federal portion of cost-share amounted to \$2,900 per project according to Three & Twenty Implementation Phases 1 & 2 (2020-2025). Furthermore, the total cost per project (federal and landowner contribution) amounts to approximately \$4,837.

With respect to the completed agricultural projects in Three & Twenty Creek, the total cost and federal cost-share is lower because most projects were also NRCS EQIP recipients. Because this funding source was used in addition to the EQIP cost-share program, this funding was only used on the remaining landowner contribution. For example, if the total cost of an agricultural project in the Three & Twenty was \$10,000, the standard EQIP cost-share rate (75%) would cover \$7,500. Then, federal cost-share would only be applied to the remaining 2,500. With that, the federal cost-share on this example (60%) would only be \$1,500 (or 15% of the total cost) (Figure 12). Therefore, it is assumed through these approximations that the cost-share covered by Section 319(h) grant funding was based on the remaining landowner contribution after EQIP cost-share was considered. Without EQIP cost-share on the example above, it is estimated that the federal cost-share would have been \$6,000.

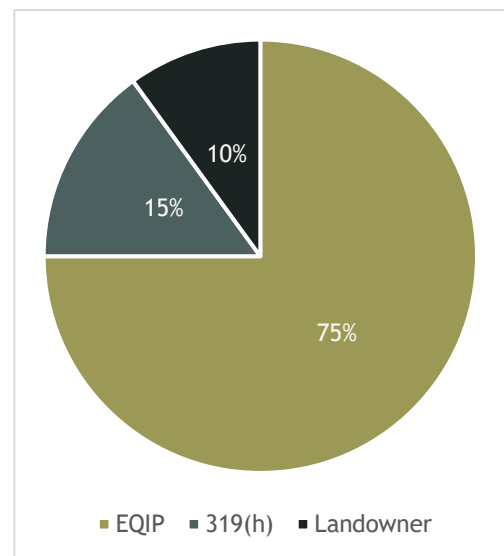


Fig. 12. Funding Breakdown for Ag. Projects with EQIP Contracts

Using the projects completed during the Three & Twenty Implementation Phases 1 & 2 (2020-2025), without EQIP cost-share the average Agricultural BMP bundle (containing a suite of suitable and completable projects) would amount to approximately \$17,400. There are two different cost-share rates provided by EQIP to consider. The traditional cost-share rate is 75%; however, if a landowner meets specific criteria related to income, years farming, or other socioeconomic factors, they could receive a 90% cost-share if classified as Historically Underserved (HU) by NRCS. Some agricultural projects completed during these project phases did not use EQIP funding and therefore only received a 60% cost-share rate that is standard with SCDES 319(h) projects. Averaging completed projects over a six -year timeframe allows us to approximate the best cost estimate for agricultural projects in this region.

In summary, combining federal and state funding sources has been identified as a successful practice. This is because it can spread the reach of present funding sources and it reduces the landowner contribution thereby making what would be unaffordable practices more affordable.

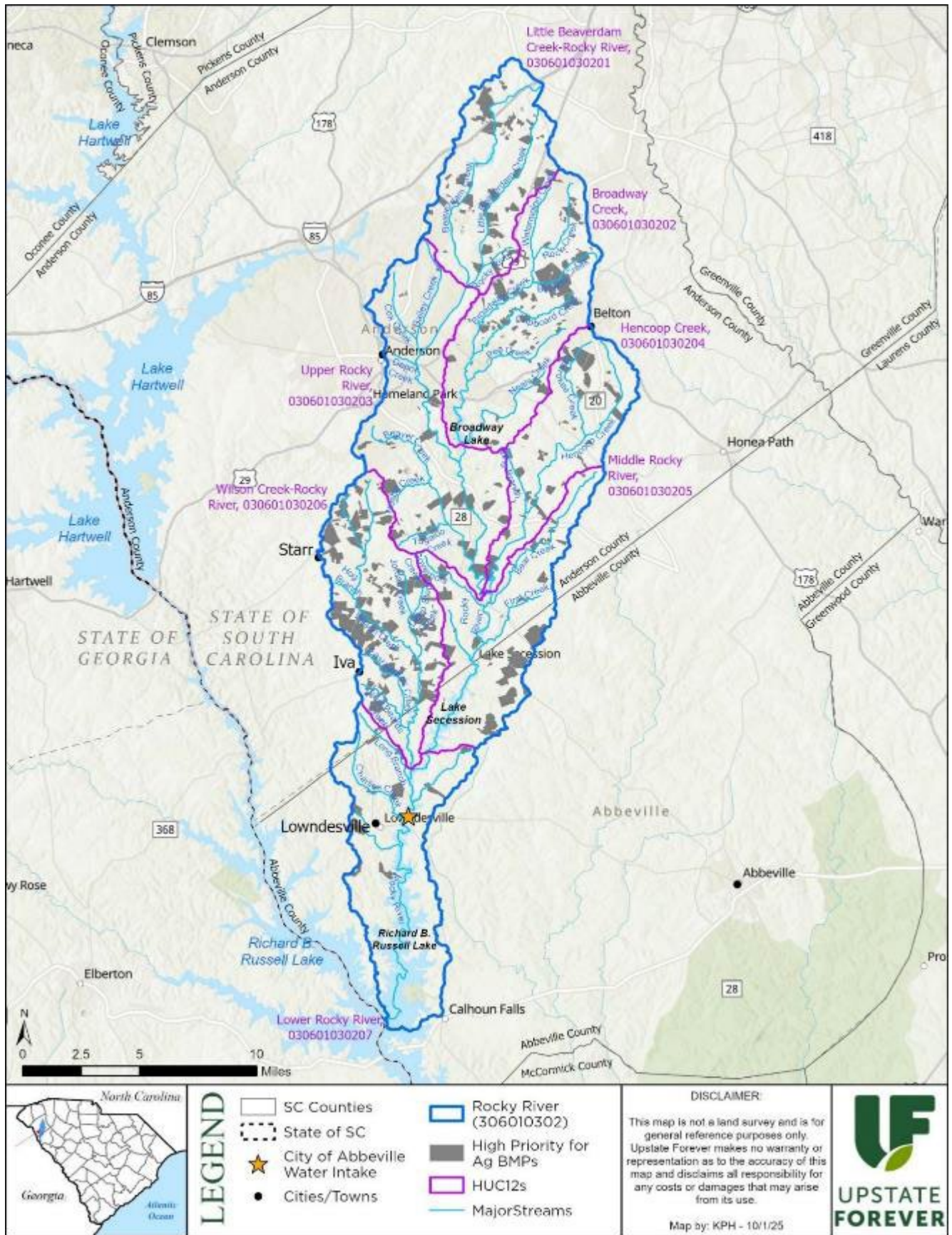


Figure 13. High Priority Areas for Agricultural BMP's

5.3) LAND PROTECTION

While other strategies such as deed restrictions, deed simple purchases, and land donations are beneficial forms of land protection, as a nationally accredited land trust, UF's strategy is to focus specifically on land protection through conservation easements. A conservation easement (CE) is a voluntary contract between a landowner and a qualified land trust which allows the landowner to legally restrict certain land uses from occurring on their property in perpetuity. These agreements are permanent and remain with the land even after it has been sold or willed to heirs. The terms of a conservation easement are individually negotiated and vary greatly depending on the landowner's plans for their property.



Property under conservation easement in the Tyger River Watershed.

5.3.1) Analysis Results

UF conducted an analysis of unprotected land within the watershed to identify high-quality tracts that are most important to conserve and protect from future development as it relates to water quality. The evaluation was based on multiple criteria, including water quality indicators (such as unimpaired waters and stream classifications), existing riparian buffer acreage, the presence of wetlands, proximity to source waters or already protected lands, parcel size, and alignment with priority areas designated by other organizations (including The Nature Conservancy (TNC), the South Carolina Conservation Bank (SCCB), and the South Carolina Office of Resilience (SCOR)). Each parcel was scored using a 30-point system. Based on this analysis, 66 parcels scored between 16 and 22 points and are considered the highest priority for protection within the watershed (Figure 14).

5.3.2) Location Recommendations

The 66 parcels identified as high priority for land protection are dispersed throughout the watershed with concentrations in the Upper Rocky River (030601030203) and Lower Rocky River (030601030207) watersheds (Figure 14). Because land protection is voluntary and dependent upon landowner participation, UF will share lands identified as high priority with UF's Land Conservation team for future outreach efforts.

5.3.3) Expected Load Reductions

Land protection serves as an effective tool to prevent future bacterial, sediment, and nutrient pollution in waterways resulting from land development activities (US EPA, 2025). The estimated pollutant load reductions associated with land protection represent the amount of pollution avoided when land remains undeveloped and significant development is prevented. To estimate these reductions, shown in Table 24, UF calculated the anticipated increase in pollutant loading that would occur if existing forested or agricultural land were converted to high-density developed land (Appendix B).

Table 24. Land Protection to Prevent Pollutant Loads

Pollutant Type	Standard Pollutant Removal/Prevention per BMP
Bacteria (<i>E. coli</i>)	1.18E+10 counts/acre/year
Sediment	0.03 tons/acre/year
Nutrient - Phosphorus	0.48 lbs/acre/year
Nutrient - Nitrogen	2.24 lbs/acre/year

5.3.4) Cost Estimates & Funding

Placing land under a conservation easement can be a significant financial undertaking, often posing a barrier for landowners despite their strong personal and historical connections to their property. Many landowners are motivated to preserve their land through conservation easements but lack the necessary financial means to do so. The cost of placing a conservation easement on a property is highly variable, especially if a survey is needed. To address these challenges, securing cost-share programs and grant funding is essential, enabling landowners to pursue conservation easements without bearing the full financial burden. In addition to helping protect natural resources, conservation easements offer landowners several financial benefits, including federal tax deductions, state tax credits, estate tax advantages, and other financial incentives. Key funding sources such as the SCDES Section 319(h) grant program, the SCCB, and the Anderson Watershed Protection Council often prioritize projects that leverage matching funds, thereby maximizing conservation impact and investment.

Through previous SCDES Section 319(h) grant projects conducted between 2021 and 2025, UF provided an average of \$9,084 per landowner to support the placement of properties under conservation easement. Eligible expenses included due diligence costs such as baseline documentation, conservation bank application fees, land surveys, appraisals, environmental site assessments, and closing costs.

Table 25. Land Protection Cost Estimates

BMP	Estimated Eligible Section 319(h) Expenses	Section 319(h) Cost Share (60%)
Land Protection (Conservation Easement)	\$15,140 (average per easement)	\$9,084 (average per easement)

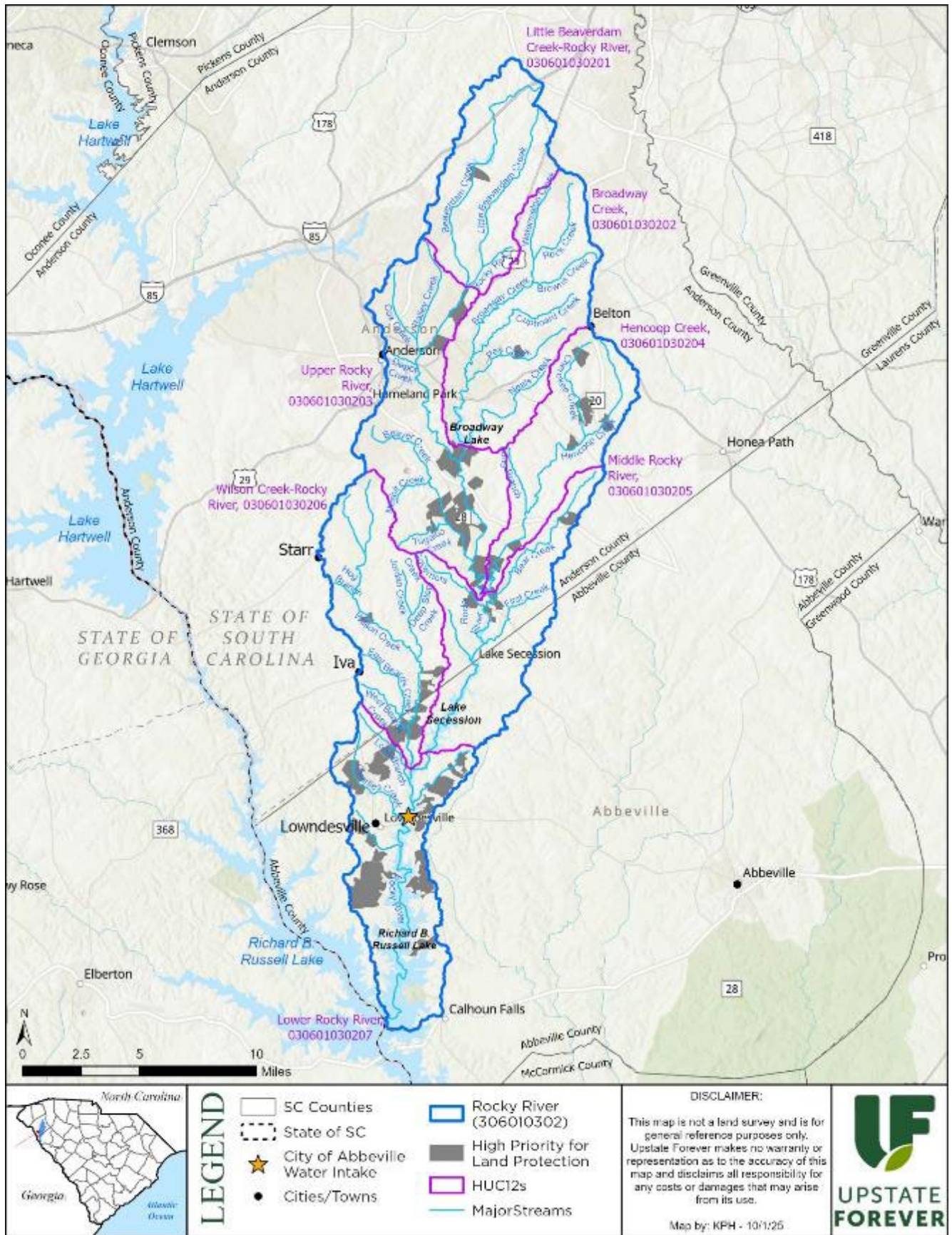


Figure 14. High Priority Areas for Land Protection

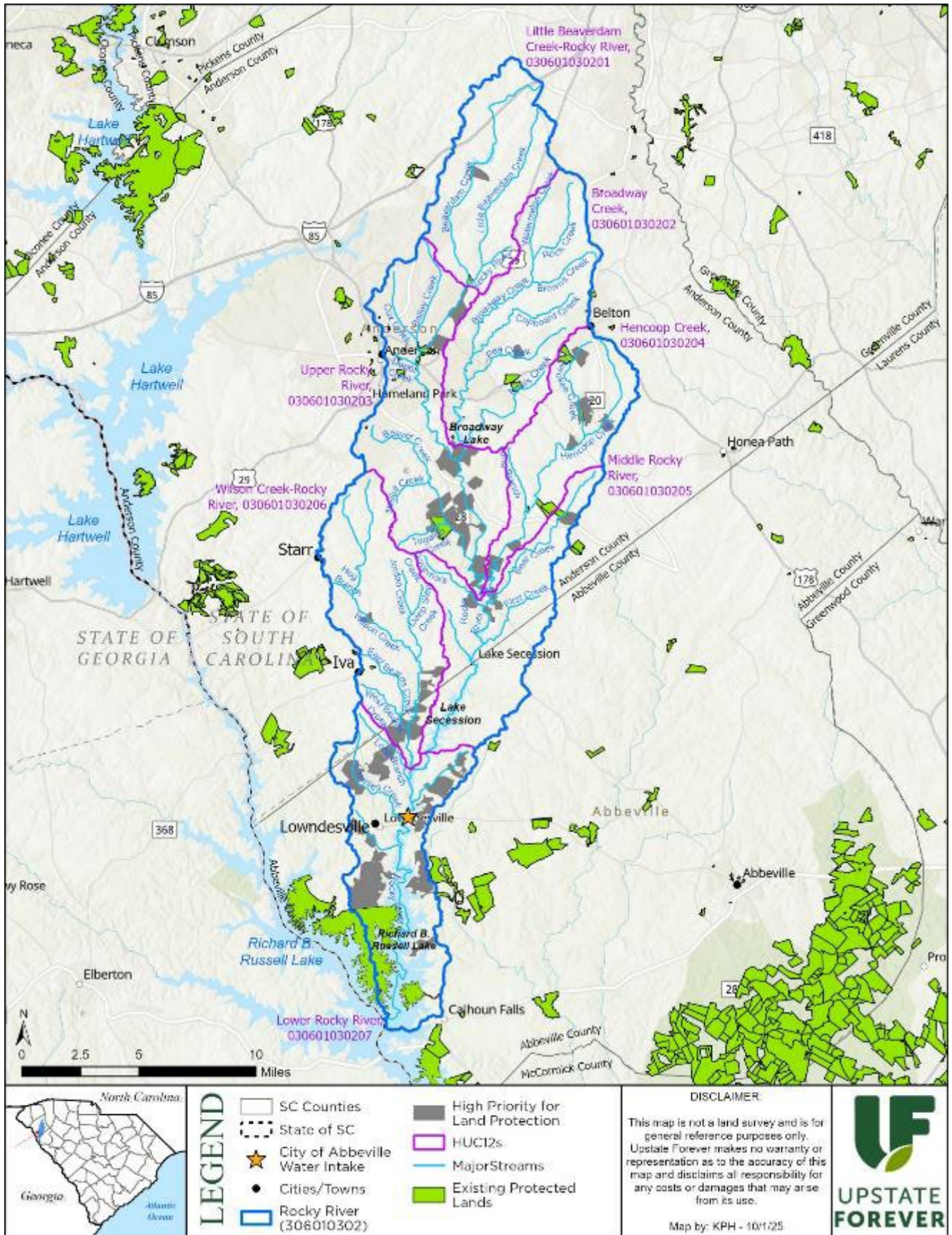


Figure 15. Existing Protected Lands

5.4) RIPARIAN BUFFERS

The purpose of Riparian Buffer BMPs is to improve current riparian buffer areas, increase vegetation coverage and add riparian buffers to sensitive areas. South Carolina Department of Natural Resources (SCDNR) recommends establishing and maintaining riparian buffers as the single most important BMP for the protection of stream and river resources as many provide ecological benefits such as erosion and nonpoint source pollution control and filtration, wildlife habitat, streambank stabilization, and groundwater recharge. Increasing riparian buffer coverage, especially along impaired and/or sensitive streams, can reduce water treatment costs, help mitigate future impairments, and assist with erosion and flood control (SCDNR, 2020).

The following are recommendations for riparian buffer restoration and/or enhancement strategies for the Rocky River Watershed.

Ensure Compliance with the Richard B. Russell Lake Shoreline Management Plan: Construction of the Richard B. Russell dam on the Savannah River was completed in 1983 and the 210-foot-high dam creates a 26,650-acre lake which stretches 30 miles up the Savannah River to Lake Hartwell Dam. The U.S. Army Corps of Engineers (USACE) owns and manages the Richard B. Russell Dam and Lake and has subsequently developed a master plan for the lake (United States Army Corps of Engineers, 2016). According to the USACE the purpose of this shoreline management plan is to:

- Protect and manage the shoreline.
- Promote the safe and healthful use of shoreline by the public.
- Maintain environmental safeguards to ensure a quality resource for use by the public.
- Achieve a balance between permitted private uses and resource protection for public use.

UF recommends maintaining natural vegetation within the buffer zone established by the shoreline management plan and utilizing plants included on the approved plant list to mitigate nonpoint source pollutant loading to Lake Russell.

City/County Riparian Buffer Ordinances: The most cost-effective way to protect riparian buffers long-term is through collaboration with local governments to establish land use regulations requiring buffer zones that limit disturbance and development along waterways. Local governments should develop buffer management plans that coordinate efforts among utilities, industries, and landowners, incorporating state and federal guidance on buffer protection, also considering neighboring municipalities' regulations.

City or county ordinances are an effective means of protecting waterways and riparian areas. Benefits include preventing clear-cutting to stream banks, preserving natural canopy, improving stormwater management, and safeguarding water quality. According to EPA guidance effective buffer ordinances should (US EPA, n.d.):

- Clearly mark buffer boundaries on planning maps
- Restrict vegetation and soil disturbance
- Define buffer width adjustments by slope and waterway type
- Specify allowable uses and provide public education

A study of the Reedy River (2001-2011) showed significant riparian buffer loss, prompting Greenville County to adopt a riparian buffer ordinance in January 2024 requiring 50-foot buffers for small streams (<50 acres) and 100-foot buffers for larger ones (>50 acres) (Greenville County, SC, 2018). Anderson

County followed in May 2025 with a countywide ordinance mandating similar requirements, at least a 50-foot buffer along all WOS for watersheds less than 50 acres, and 100-foot buffers for WOS in watersheds greater than 50 acres. (Anderson County, SC, 2025). UF recommends that Abbeville County and its municipalities adopt similar ordinances to reduce nonpoint source pollution and protect local water quality.

Tree Giveaways: Voluntary participation programs such as tree giveaways are an efficient public education and community involvement tool that can also benefit water quality. Programs like these can be targeted to specific areas, like the Rocky River Watershed, and can be used to encourage landowners to plant trees near streams/shorelines, which will in turn provide water quality benefits by enhancing riparian buffers.

Streambank Stabilization/Protection: As mentioned in [Section 5.2.1](#), streambank and shoreline protection help minimize erosion of streambanks and channels through both structural and vegetative fortification, fencing, plantings, etc. (USDA NRCS, 2020). These practices can be done in many land-cover settings; in an agricultural setting, the goal may be to exclude livestock from a stream or enhance a stream crossing while in an urban setting, the goal may be to minimize the impact of stormwater runoff.

5.4.1) Analysis Results

UF conducted an analysis of land within the watershed to determine which areas would most benefit from riparian buffer restoration/enhancement BMP's. This evaluation was based on multiple criteria, including water quality indicators (such as stream classification and current water quality impairments), existing riparian buffer acreage, high levels of sediment or nutrient export (Furman University, 2017), and proximity to South Carolina Office of Resilience (SCOR) Priority Areas for Flooding Mitigation and the Federal Emergency Management Agency (FEMA) Flood Risk Areas. Each parcel was scored using an 8-point system. Based on this analysis, 389 parcels scored between 6 and 8 points and are considered the highest priority for riparian buffer restoration/enhancement BMPs within the watershed (Figure 16).

5.4.2) Location Recommendations

Concentration of high priority areas for riparian buffer restoration/enhancement is seen along streams throughout the watershed, many of which are upstream of TMDL sites. On the restoration side, UF recommends focusing outreach and structural BMP opportunities in TMDL-sheds to best address current water quality impairments and concerns (Figure 16). Additionally, current and potential conservation easements can play a role in prevention of pollutant loading through enhancement and maintenance of existing high-quality riparian buffers.

UF recommends that riparian buffer restoration and enhancement projects be prioritized both on and off agricultural properties. Agricultural crop lands tend to apply pesticides and herbicides that when washed into waterways can contribute to nutrient impairments. Additionally, other types of working agricultural lands that have livestock often water livestock in streams or ponds or must cross waterways which contributes to streambank destabilization and sediment pollution. Livestock with access to waterways contribute bacterial pollutants to waterways through the direct deposition of fecal matter into the water. In the Rocky River Watershed, it is recommended to encourage riparian buffer enhancements on working agricultural lands to mitigate these types of nonpoint source pollutants by slowing and absorbing them via riparian buffers before they enter rivers and streams. For that reason, refer to [Section 5.2](#) and consider prioritizing riparian buffer enhancement projects on high

priority areas for agricultural projects across the watershed, but most specifically in the Wilson Creek Watershed where there is the highest concentration of high priority agricultural lands.

On the enhancement side, UF recommends working with already protected lands to enhance riparian buffers on those properties. UF’s strategy to accomplish this is to work alongside existing conservation easement holders, identify funding sources, and to enhance riparian buffers on those parcels. To get more information about this and other land management BMPs see [Section 5.6](#). In addition to working on privately owned land, UF recommends working on public properties such as state, county, and city parks and along lake shorelines such as Broadway Lake and Lake Secession. This approach will make it possible to leverage other funding sources and enhance public assets to mitigate flooding and water quality degradation in addition to providing essential wildlife habitat.

5.4.3) Expected Load Reductions

Because riparian buffer enhancements in an agricultural setting are included in the estimated load reductions in [Section 5.2.4](#), estimated load reductions for riparian buffer enhancements are calculated assuming installation in an urban setting. These estimates were developed utilizing PLET and standard numbers provided by SCDES (Appendix A) and refer specifically to LID/Filter/Buffer Strip BMPs.

Table 26. Riparian Buffers to Reduce Pollutant Loads

Pollutant Type	Standard Pollutant Removal/Prevention per BMP
Bacteria (<i>E. coli</i>)	4.49E+09 counts/drainage acre/year
Sediment	0.38 tons/year
Nutrient - Phosphorus	34 lbs/year
Nutrient - Nitrogen	108 lbs/year

5.4.4) Cost Estimates & Funding

Riparian buffer BMP cost estimates are based on information provided by USDA. There are numerous cost-share funding programs available to landowners at the federal, state, and local levels. The USDA NRCS and Farm Service Agency programs administer many voluntary programs that help reduce bacterial loading by establishing riparian buffers, protecting wetlands, and conserving water resources. Based on the 2024 NRCS EQIP rates, an estimated average cost for a riparian buffer BMP project is \$386.66/acre (approximately 75% of full cost) (Formula A), which is roughly \$515.55/acre. There are a variety of federal funding programs available for riparian buffer restoration/enhancement projects such as EQIP, Conservation Stewardship Program, Agricultural Water Enhancement Program, and Section 319(h) funding.

FORMULA A. AVERAGE COST OF RIPARIAN BUFFER BMP PROJECT

Average Cost of Riparian Buffer BMP Project	=	Tree/Shrub Site Preparation	+	Tree/Shrub Establishment
\$386.66/acre	=	\$106.43/acre	+	\$280.23/acre

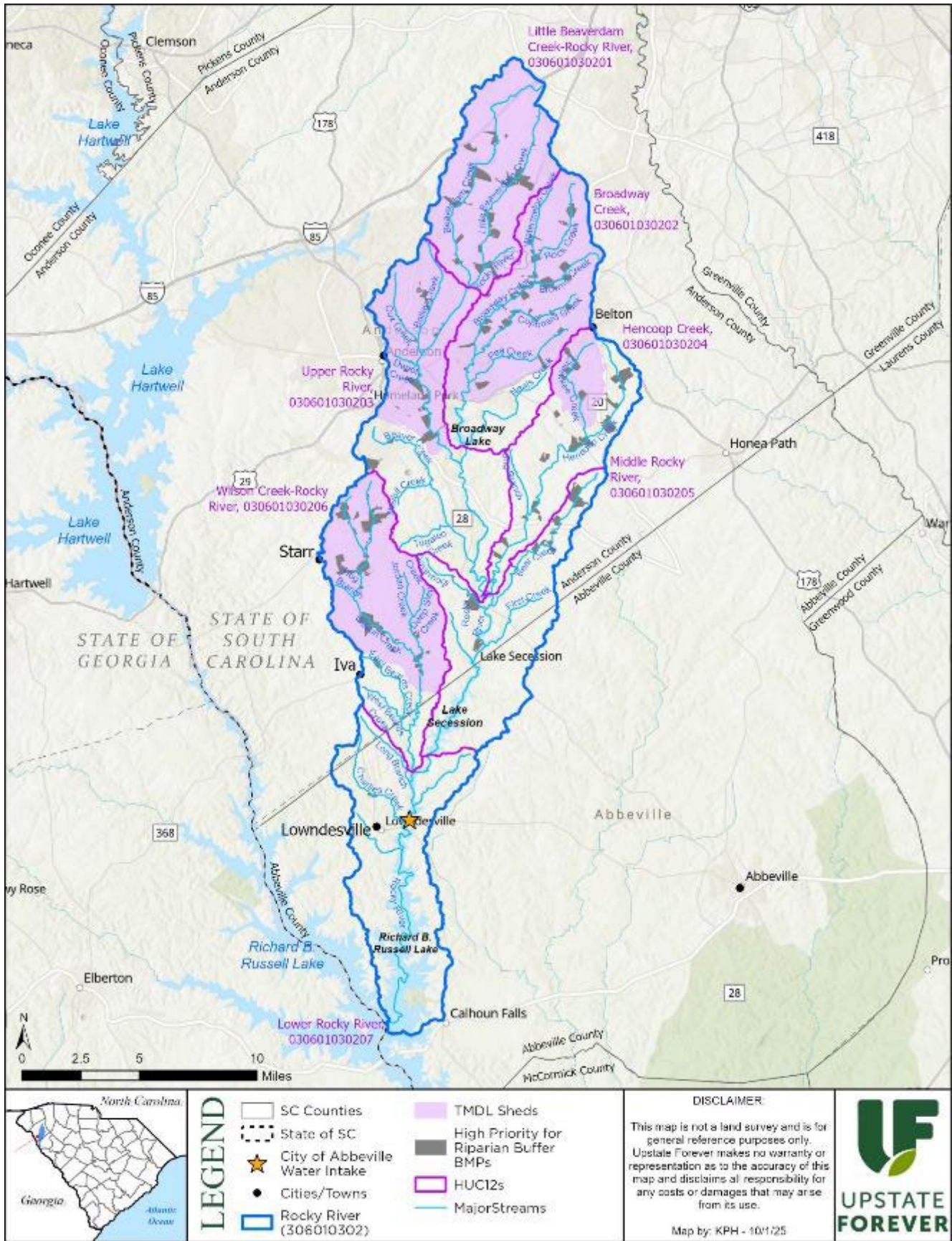


Figure 16. High Priority Areas for Riparian Buffer BMP's

5.5) WILD HOG REMOVAL

Wild hogs are a common invasive species in South Carolina, and within the Rocky River Watershed. This species is known to degrade habitats, outcompete other native species, spread diseases, and contribute significantly to bacterial pollution (SCDNR, 2025). SCDNR estimates that the United States loses \$1.5 billion dollars in agricultural damage annually due to wild hogs (SCDNR, 2025). This WBP recommends the hunting, trapping and removal of wild hog species as a method of decreasing bacteria within the watershed.

Some researchers think that the utilization of single traps is an effective method for wild hog removal; however, this can be problematic if trying to remove an entire sounder (group of hogs) from an area. According to Precision Pest and Wildlife Removal (Precision Pest and Wildlife Removal, 2025), a hog removal service is much more effective for wild hog removal than one-off traps. This is because wild hogs are an incredibly smart species and a typical sounder in the Upstate is generally 12-30 in number. Therefore, when using traps that only catch one hog at a time, the rest of the sounder will learn to avoid the traps, continue to evade capture, and quickly repopulate.

A wild hog removal service involves a company visiting the site to evaluate the population and installing corral traps that can catch the entire sounder simultaneously. Cost estimates for these services range depending on the size of the sounder, land use, and location. According to Precision Pest and Wildlife Removal, a typical cost estimate for this service is \$5,000.

5.5.1) Location Recommendations

Although from 2017, the Wild Hog Distribution in South Carolina map from SCDNR (Figure 17) displays prominent presence of wild hogs in Anderson and Abbeville counties. UF recommends working with agricultural landowners and/or conservation easement holders (through UF's Land Management program) to catch sounders through a wild hog management service. Utilizing contacts UF has made with landowners participating in agricultural BMP projects and land protection will streamline outreach efforts and enhance BMP efficiency as wild hog management would likely be in combination with other BMP practices.

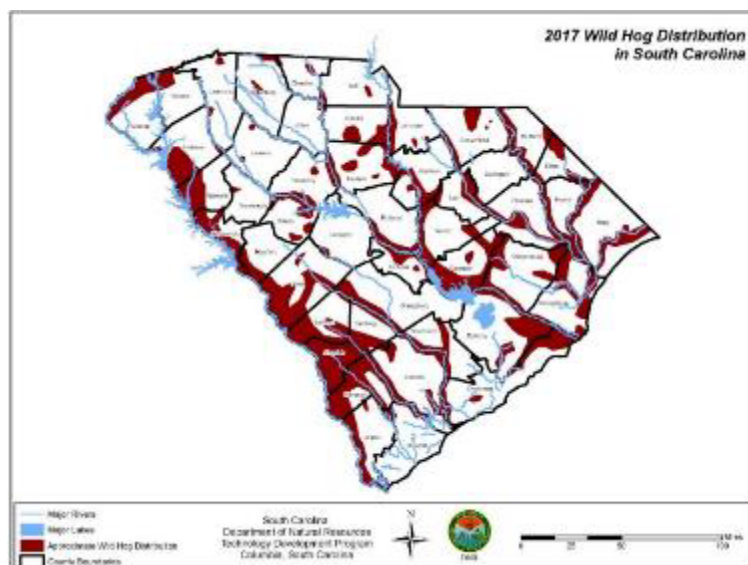


Figure 17. SCDNR's Wild Hog Distribution Map (2017)

5.5.2) Expected Load Reductions & Cost Estimates

Wild hog removal can be used as a tool to reduce bacterial pollution in waterways.

Table 27. Wild Hog Removal to Decrease Bacterial Loads

Pollutant Type	Standard Pollutant Removal per Hog Removal	Standard Pollutant Removal per Sounder (18 Hogs)
Bacteria (<i>E. coli</i>)	3.17E+12 counts/year	5.70E+13 counts/year

*This calculation is based on concentrations for livestock hogs. However, due to limited literature on this topic, it is assumed that bacterial concentrations would be similar.

Funding sources such as SCDES Section 319(h) grant program and Anderson Watershed Protection Council prioritize properties with matching fund sources to leverage local monies with state and federal funding sources.

Table 28. Wild Hog Removal Cost Estimates

BMP	Estimated Cost
Wild Hog Removal Service	\$5,000.00 (Avg. cost for 18 hogs)

5.6) LAND MANAGEMENT

In addition to protecting land via conservation easement, UF provides opportunities to UF easement holders to actively restore their land through our Land Management Program. This voluntary program, established in 2022, offers technical and financial support to address common threats like erosion, invasive species, and habitat degradation. This expanded approach to stewardship enhances the conservation value of a protected parcel by focusing not just on the number of acres protected, but on the health and resilience of those landscapes over time.

The Land Management Program at UF works with a robust conservation network in the Upstate of South Carolina to connect landowners with the most current information and resources needed to target priority land management activities. Potential restoration efforts are primarily focused on riparian buffer enhancement and restoration, grassland habitat, and forest health. Common restoration projects include native plantings, invasive plant species removal, and streambank repair.

Land management projects such as invasive plant species removal, native plantings, and riparian buffer enhancements are essential to protecting and restoring water quality. First, without proper riparian/vegetative buffers along waterways, there is no barrier to slow and absorb pollutants rolling off impervious surfaces via stormwater during rainfall events. Additionally, invasive plant species intrinsically degrade water quality through the following mechanisms.

- **Nutrient Cycling:** Invasive species can alter nutrient cycling patterns, leading to increased nutrient runoff and eutrophication, which harms native aquatic species (Chelcy Ford Miniat, 2021).
- **Disruption of Ecosystems:** Invasive plant species outcompete native species for resources, disrupt food webs, and reduce biodiversity. Invasive species accomplish this through rapid reproduction rates, resource competition (sunlight, water, nutrients, etc.), and habitat alteration. The outcome often impacts water quality overall (Chelcy Ford Miniat, 2021).

5.6.1) Location Recommendations

Rocky River Nature Park: The Rocky River Nature Park, located in the Upper Rocky River Watershed, is a citizen-led, nonprofit group that collaborates with the City and County of Anderson, Anderson University, and other community partners to provide green space and protect essential wetlands. UF stewards this property and leverages community volunteer workdays to assist in establishing native wildflower and grass species such as shallow sedge, river oats, swamp milkweed, and lizard's tail. UF recommends continuing to work within this property to remove invasive species, install critical plantings, and enhance streambank areas.



Native plantings installed at the Rocky River Nature Park (left) and volunteers that assisted (right).

King-Masters Tract: The King-Masters Tract is a 217-acre easement held and stewarded by UF located in the Hencoop Creek and Middle Rocky River watersheds. This property has been under conservation easement since 2006, and the landowner has expressed interest in improving his land with land management practices. Specifically, this landowner is interested in invasive species removal, native plantings, and streambank repair. Bear Creek runs directly through this property with the monitoring site SV-331 downstream. In addition to these primary land management practices, the landowner also has interest in agricultural BMPs and wild hog removal.

Other Land Management Opportunities: In addition to the conservation easements listed above, four other protected properties and six other projects are already identified for land protection with UF. Consequently, there is much more opportunity to work with UF's land management program to install other enhancement projects across the watershed in the future.

5.6.2) Funding Sources

UF has had success with applying for and utilizing funds from the U.S. Fish and Wildlife Service (USFWS) for habitat restoration work. Funding from USFWS has been utilized to restore private lands with significant ecological value that support threatened, endangered or at-risk species. UF's land management work has focused on wetland restoration, grassland habitat enhancement, and improved forest management.

Other funding sources such as the SCDES Section 319(h) grant and the Anderson County Watershed Protection Council are also potential funding sources for future land management projects in the watershed. For more information about this Council, see [Section 2.5.2](#).

5.7) WETLAND RESTORATION & ENHANCEMENT

Wetlands provide many natural ecosystem services such as water filtration, acting as pollutant sinks, wildlife habitat, erosion control, and flood management (US EPA, 2025). Wetlands act as natural carbon sinks and are one of the most important ecological systems for mitigating the impacts of climate (Zhang, et al., 2025). Wetlands naturally capture sediment and, in this watershed, where sediment is believed to be a significant contributor to bacteria survival, addressing sediment-full wetlands is a critical water quality improvement project. It is already known that wetlands in agricultural landscapes have shorter topographical lives than wetlands in grasslands (Gleason & Euliss, 1998). In the most severe cases, anthropogenic activities expedite sediment inputs to wetlands, and this capturing of nutrient-laden sediment can instead become a source of pollution to waterways (Gleason & Euliss, 1998).

Wetlands that have been impacted or inundated are likely no longer providing multitudes of important ecological functions and water quality benefits. Restoring impacted, low quality, and inundated wetlands is ecologically beneficial and can reduce the costs of water treatment, flood management, and pollution control by providing these services naturally. With urban lands accounting for nearly 19% of land coverage in this watershed and development in Anderson County, wetland restoration and mitigation strategies could help decrease higher volumes of runoff and sedimentation occurring from increased development activities.

Factors that can measure the difference between high functioning wetlands and impacted wetlands include the following:

- Ratio of vegetated areas to open water,
- Number of plant species (or the diversity of plant species),
- Biomass (production of plant material per unit area),
- The amount of organic matter in soil,
- Range of water-level fluctuation,
- Sedimentation rate.

These factors can be used to design a protocol specific for SC Piedmont wetland characterization that would help prioritize restoration funds (Turner & Swenson, 1994).

Sackett v. EPA Ruling: In 2023, the Sackett v. EPA ruling changed the federal landscape for wetland protections across the U.S. This ruling resulted in an update to the Clean Water Act (CWA) that restricted protections of wetlands to just those that are connected to a waterbody via a surface water connection (Sacket v. EPA, 2023). This change removed protections at the federal level for wetlands that do not maintain a surface water connection and are therefore referred to as “isolated wetlands”. In the Rocky River Watershed, 4.3% (209.5 acres) of wetlands are considered “isolated” wetlands and are therefore not protected under the CWA.

Wetland Mitigation Banking: According to NRCS, wetland mitigation banking is the “restoration, creation or enhancement of wetlands for the purpose of compensating for unavoidable impacts to wetlands at another location,” commonly utilized by developers to offset wetland impacts (USDA NRCS, 2025). In the Rocky River Watershed there are 4,873.4 acres of wetlands, 730.4 (15%) of which are classified as modified beaver, partially drained/ditched, farmed, diked/impounded, managed, or excavated). Although the NLCD data classifies only 3,449.25 acres of land as wetlands (Table 2 and Figure 2), more exist on lands classified as forest, open water, grasslands, and pasture/hay, as reflected in data from the National Wetlands Inventory (US Fish and Wildlife Service (USFWS), 2025).

Constructed/Artificial Wetlands: Constructed, artificial wetlands are those manually installed where wetland functions can be created to provide treatment of wastewater, stormwater runoff, or other waterflows. Such systems are artificial ecosystems with hydrophytic vegetation for the biological treatment of water (USDA NRCS, 2022). Constructed/artificial wetlands can be especially helpful in an agricultural setting or in areas with high volume of stormwater runoff.

Preservation & Buffer Enhancement: Preserving high-quality existing wetlands through conservation easements or establishment/ preservation of buffer zones are strategies to utilize in unmodified/high-quality wetland areas. Critical area plantings (permanent vegetation) are utilized in areas of high erosion rates and can reduce erosion and stabilize streambanks, shorelines, and slopes. The upper extent of the watershed has some hilly landscapes that can be prone to sedimentation and would benefit from critical area plantings and riparian buffer protection/establishment. Finding high-quality wetlands in the upper reaches of the watershed could serve as significantly beneficial mitigation projects utilizing land protection strategies or establishing buffer zones around prone waterways.

5.8) FORESTRY

According to the South Carolina Forestry Commission (SCFC), forests contribute over \$23.2 billion annually to the economy of South Carolina and provide employment to over 100,000 South Carolinians (South Carolina Forestry Commission (SCFC), 2022). In the Rocky River Watershed, forested lands are the predominant land cover (44%), and forest management is a major consideration for water quality protection. Almost all forested lands in the watersheds are privately owned. Healthy, well managed forests produce clean water while improper forest management can lead to sedimentation, nutrient losses, and harmful effects on freshwater ecology (Shah, et al., 2022).

As mentioned in [Section 4.2](#) and [Section 4.3](#), forests and forest activities currently contribute an estimated 18% of sediment loading and 24% of nutrient loading in the watershed. There are a variety of forestry BMPs that are detailed in the SCFC's South Carolina BMPs for Forestry Manual (South Carolina Forestry Commission (SCFC), 2021) that address sediment and nutrient concerns. Some practices include prescribed burning, stream crossings, road stabilization, streamside management zones, SCFC BMP exams, reduced fertilizer and pesticide use, and forestry easements.



Forested wetlands in Rocky River Nature Park.

5.8.1) Location Recommendations

Concentration of high priority areas for forestry BMPs is seen along streams throughout the watershed, mostly adjacent to streams and particularly just upstream of Lake Secession (Figure 18). UF recommends working with SCFC to encourage healthy and well-maintained forests through both BMP installation and courtesy exams. Additionally, SCFC offers forestry management plans which UF recommends landowners utilize to maximize the conservation values of their properties.

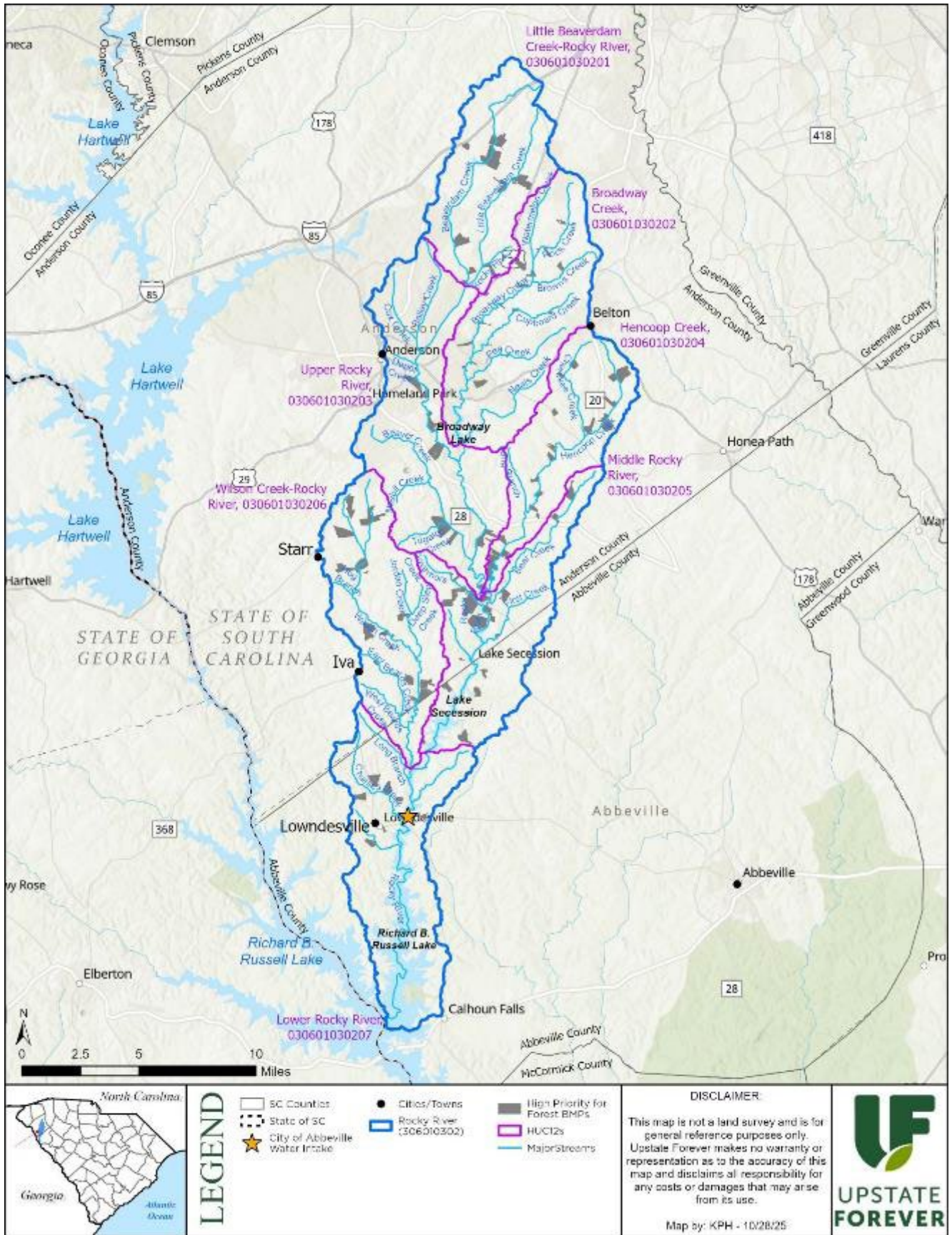


Figure 18. High Priority Areas for Forestry BMPs.

5.9) SUMMARY OF BMP RECOMMENDATIONS

Although total restoration of the watershed would be ideal, this plan focuses on incremental pollutant load reduction/prevention. The implementation of WBPs in South Carolina most often utilize Section 319(h) grants through SCDES and cannot exceed 36 months; recommendations are based on the feasible implementation of BMPs in a 36-month implementation phase. Table 29 shows a summary of the recommended BMPs described in Sections 5.1-5.6 and provides a guide to where BMP implementation will best achieve pollutant load reduction/prevention. Because all recommended BMPs and priority locations are subject to landowner participation, these location recommendations should be utilized as a strategy for landowner outreach and not a requirement for participation.

Table 29. Summary of BMP Location Recommendations

BMP Category	Summary of BMP Location Recommendations
Septic Repairs/Replacements	<p>Priority 1: Broadway Creek (030601030202) and Hencoop Creek (030601030204)</p> <p>Priority 2: Wilson Creek (030601030206) and Middle Rocky River (Wilson Creek (030601030205))</p> <p>Priority 3: Little Beaverdam Creek-Rocky River (030601030201) and Upper Rocky River (030601030203)</p>
Agricultural BMPs	Wilson Creek-Rocky River watershed (030601030206)
Land Protection	Upper Rocky River (030601030203) and Lower Rocky River (030601030207) watersheds
Riparian Buffer BMPs	<p>Agricultural properties: Wilson Creek (030601030206)</p> <p>Upper reaches of the watershed that are TMDL-sheds and are essential for downstream flood resilience: Broadway Creek (030601030202), Little Beaverdam Creek-Rocky River (030601030201) and Upper Rocky River (030601030203)</p>
Wild Hog Management	Work in tandem with agricultural landowners and existing/potential conservation easement holders
Supplemental BMPs	
Land Management	Conservation easements that are protected and in progress
Wetland Restoration/Enhancement	Conservation easements that are protected and in progress
Forestry	Encourage foresters to work with SCFC to install BMPs, develop forestry management plans, and utilize courtesy BMP exams, especially directly above Lake Secession

As shown in Table 14, a bacterial reduction/prevention of 1.39E+15 counts/year (*E. coli*) is needed per the TMDL (Section 4.1.3). Table 30 outlines the approximate number of BMPs recommended to achieve incremental bacterial and nutrient load reductions in a 36-month timeframe. These estimations were derived using the standard annual bacteria removal/prevention rates for each BMP multiplied by the suggested number of BMPs in the watershed to attain the necessary reductions. The recommended load reduction/prevention for bacteria, sediment, and nutrients would be reached with the implementation

of the following septic, agricultural, land protection, riparian buffer, and wild hog removal projects over the course of each 36-month implementation phase. Together, these implementation projects would achieve a 22% reduction of the needed bacterial loading removal identified in the TMDL (Section 4.1.3).

Table 30. Annual Load Reductions and Recommended BMPs in the Rocky River

BMP	# Of Projects	Bacteria Load Reduction (counts/year) (<i>E. coli</i>)	Sediment load Reduction (tons/year)	Nutrient Load Reduction (lbs/year)
Septic Repair/Replacement	45	9.50E+11		533.37
Agricultural BMP Bundle	10	4.03E+13	738.40	5,148.80
Land Protection	100 acres	1.18E+12	3.24	271.48
Riparian Buffer BMPs	2	8.99E+09	0.75	284
Wild Hog Removal	72 hogs (4 sounders)	2.61E+14		
Total		3.04E+14	742.39	6,237.65

The total anticipated costs for implementing the recommended BMPs for the Rocky River Watershed is \$527,811.09 (Table 31) per 36-month phase. Based on the SCDES cost-share rate of 60%, the grant request to complete one phase is estimated to be \$310,222.67 for BMP projects. While estimates are based upon SCDES cost-share rates, grant funding is not guaranteed and subject to availability. It is estimated that at least four phases will be needed to achieve all bacterial reductions needed to satisfy the TMDL, costing approximately \$2,111,244.36 in total.

Table 31. Rocky River Watershed Project Implementation Cost Estimates Phase 1

BMP	Average Cost	Recommended Projects	Estimated Cost	SCDES Cost Share (60%)
Septic Repair/Replacement	\$6,500	45	\$292,500	\$175,500
Agricultural BMP Bundle	\$17,400	10	\$174,000	\$104,400
Land Protection (CEs)	\$15,140	1-2 easements	\$30,280	\$18,168
Riparian Buffer BMPs	\$515.55/acre	2	\$1,031.09	\$154.67
Wild Hog Removal	\$5,000	72 (4 sounders)	\$30,000	\$12,000
Total			\$527,811.09	\$310,222.67

6) WATERSHED RESILIENCY

The watershed faces growing climate-related risks due to a mix of environmental conditions and development pressures. With topography ranging from 380-970 feet above MSL, varied runoff and drainage dynamics can amplify flood vulnerability during intense storms. When these risks are paired with soils that have permeability K-factors between 0.02-0.28, it indicates that some areas readily absorb water while others are more prone to erosion and surface flow. Therefore, conditions are likely to worsen under heavier rainfall patterns. Land cover is still largely forested (44%), with agriculture (30%) and urban areas (19%) making up nearly half the landscape, but development is expanding, especially in the City of Anderson area at the top of the watershed. The increase of pervious surfaces as development continues also increases downstream vulnerability, potentially impacting sensitive drinking water sources. Considering the watershed's current landscape and the threat of development, there is a heightened need for watershed resiliency strategies that reduce erosion, mitigate flooding, and protect water quality in the face of changing climate conditions.

6.1) RISKS TO THE ROCKY RIVER WATERSHED

Climate events and natural hazards bring threats of flooding, drought, rising temperatures, more severe storms, and more. FEMA's National Risk Index estimates that the Anderson and Abbeville Counties are at higher risk for monetary loss due to ice storms and strong winds (Federal Emergency Management Agency (FEMA), 2025). Specifically, for the Rocky River Watershed, it will be essential to protect against this risk, given the estimated increase in development and population growth in northern portions of this watershed near the City of Anderson. These risks could lead to higher pollutant loads of bacteria, sediment, and nutrients if runoff increases from more frequent and severe storms. Additionally, protective measures on lands currently serving as mitigation to climate risks are important to consider. This plan mentions many BMPs that will be effective tools in planning for climate resiliency and can be used as a framework to address these concerns. Smart growth—an approach that uses development and conservation strategies to protect public health, strengthen natural systems, and build more attractive, economically resilient communities (US EPA, 2025)—combined with an integrated water, wastewater, and watershed plan will position the Rocky River Watershed for greater environmental, economic, and community resilience.

In addition to understanding the threats of climate variability, it is essential to consider how freshwater systems change and how aquatic species are impacted. In many cases, aquatic species may need to relocate to find suitable habitats, and access to rivers, lakes, and wetlands, that are well connected, have physical diversity, and are in good condition. The Nature Conservancy's (TNC) Resilient River Explorer approximates this information by determining a waterway's Freshwater Resilience. The component metrics that TNC uses to approximate Freshwater Resilience include percent impervious surface cover, floodplain, riparian, and watershed naturalness, cumulative water quality index, functional connectivity, biodiversity, habitat fragmentation, and flow alteration (The Nature Conservancy (TNC), 2025)

According to these analyses, the Rocky River Watershed appears to have slightly below average Freshwater Resilience in the upper section of the watershed, and average Freshwater Resilience in the middle and lower sections of the watershed. Below average Freshwater Resilience in the northern section of the watershed is linked to the connectivity and flow alterations that are caused by two impassable dams: the Broadway and Buttress dams. In the middle section of the watershed, the watershed is classified as Freshwater Resilient and Connected Network 2 & 5 Class. This means that, according to this analysis, if these portions of the watershed were to gain protection, it would

significantly increase the long-term resilience of this watershed. However, until aquatic connectivity and flow alterations are addressed, there is the potential for more negatively significant impacts to the biological diversity and community over time.

6.2) ADDRESSING RISKS WITH POLICY AND PARTNERSHIPS

Addressing climate risks at a community-wide level begins with effective and strong partnerships with local municipalities, government entities, community groups, and landowners. Continuing to engage with the LHPCW will be of utmost importance during the implementation of this plan. The group consists of utilities, local governments and municipalities, universities, conservation groups, and other local partnerships all meeting together monthly to tackle water quality protection, restoration, and advocacy in the Lake Hartwell area. While this watershed drains into Richard B. Russell Lake (south of Lake Hartwell), continuing to engage in local partnerships such as this one can help pull together invaluable resources such as shared communications and outreach efforts, local knowledge, and community engagement.

Looking beyond the regional partnerships, engaging in the state water plan, river basin councils, and WaterSC are essential activities. UF staff have been involved with and remain active in the Upper Savannah River Basin Council and WaterSC (a state committee dedicated to developing a state water plan for SC) (SCDES, 2025). Engaging at the local, regional, and state levels are fundamental activities for ensuring resiliency across this watershed.

6.3) ADDRESSING RISKS WITH STRUCTURAL BMPS

Prioritizing the investment of funding in strategic locations addresses current water quality concerns as well as watershed resiliency. Structural BMPs addressing watershed resiliency include septic tank repairs and replacements, agricultural BMPs, riparian buffer restoration and enhancement, wild hog management, and wetland restoration. Additionally, practices such as land protection, while not considered structural, can help to mitigate the impact of large weather events by reducing the amount of developable land, keeping high-quality lands intact and providing benefits such as flooding mitigation, and erosion prevention and control.

6.4) ADDRESSING RISKS WITH OUTREACH AND EDUCATION

Empowering citizens with knowledge and resources to effect positive change is an important aspect of integrating resilience and climate change considerations in watershed planning. Long-term protection of the Rocky River Watershed will require the engagement of the whole community that resides, enjoys, and works in this watershed. All BMP recommendations should include public engagement, and outreach to reinforce community values towards the conservation of natural resources along with a strengthened personal responsibility to reduce non-point source pollution. Strategies include:

- Post-BMP maintenance packets sent to landowners who install structural BMPs such as septic systems and agricultural BMPs
- Septic System Education
- Land protection informational meetings
- Land management of existing conservation easements to enhance conservation values
- Community Science Water Quality Monitoring with SC AAS

6.5) INTEGRATING THE SC STRATEGIC STATEWIDE RESILIENCE & RISK REDUCTION PLAN

SCOR developed a statewide resilience plan in 2023 that identifies major flood risks around the state and potential losses that could occur because of extreme weather events. The plan also provides resilience strategies for local governments to implement in their communities to mitigate potential flood risks (South Carolina Office of Resilience (SCOR), 2023). Strategies included in the resilience plan that overlap with those listed in this watershed plan include:

- Coordinate watershed-based resilience planning and projects
- Incorporate resilience into planning, land use, and other regulatory processes
- Maintain natural flood protection through conservation

The SC Resilience Plan paired with the findings of this watershed plan provides a strong case of support for future funding opportunities to implement elements of this plan and safeguard against extreme climatic events.

7) PUBLIC OUTREACH & EDUCATION

The protection and restoration of the Rocky River Watershed require the engagement of the community that resides, recreates, and earns a living in this watershed. The goal of this WBP is to use a multi-pronged approach to our education and outreach strategy that will reach landowners who are interested in learning how to improve their property and recommend practices to reduce water quality impairments in the watershed.

7.1) OUTREACH TO LANDOWNERS & GENERAL PUBLIC

This WBP recommends that education and outreach to landowners in the watershed about water quality concerns take place through a combination of distributed educational materials and direct contact and outreach. These strategies are further detailed for each BMP category in Table 32.

Educational Materials and Outreach Events- Recommended distribution methods for educational materials include direct mailings, social media postings, and regular communications with community partners (i.e., drinking water and wastewater utilities). These efforts could include any or all the following: informational postcards/circulars distributed to homeowners and businesses via Homeowners Association (HOA) volunteers, mail, etc.; educational posts on HOA and partner websites/social media platforms; and/or information dissemination by partner drinking water utilities and local governments. Outreach events are another way to engage residents and to make new connections within a project area. Popular examples of these types of events include volunteer workdays, tabling events, workshops, and stakeholder meetings.

Targeted Outreach - Targeted outreach to landowners within the watershed could take the form of direct mailings, phone calls, solicit feedback from specific community groups through digital platforms, and public informational meetings on BMP topics relevant to local landowners. In addition to working with committed community partners, collaborating with local and state resources to expand outreach capacity is highly recommended. For example, direct mailings to homeowners with older homes, especially those adjacent to drinking water sources, would likely benefit from information about proper septic tank maintenance and could help homeowners identify septic tank failures or leaks. Targeted outreach should be done based on the recommendations for BMPs in [Section 5.8](#).

Table 32. Public Outreach Strategy per BMP

Strategy	Goal	Target Audiences	Key Messages	Outreach Methods	Potential Partners
Septic System Repair & Replacement	Reduce bacteria pollution by improving septic system maintenance and access to repair/replacement resources	Homeowners, HOAs, septic contractors, wastewater providers, utility staff, municipal and county staff	<ul style="list-style-type: none"> Failing systems pollute waterways and threaten human health Sewage backups and groundwater contamination can occur Systems need inspection every 3-5 years 	<ul style="list-style-type: none"> Targeted mailings Brochures/displays at public facilities and offices Local newsletters Social media and websites 	Clemson Extension, Rocky River Nature Conservancy, regional utilities, local governments, conservation groups, Upstate Forever, University of Georgia 4-H
Agricultural BMPs	Support farms in adopting practices that protect water quality, reduce erosion, and preserve working lands	Landowners, agricultural operations, Farm Bureaus, SC Cattlemen's Association, Carolina Farm Stewardship Association	<ul style="list-style-type: none"> Keep livestock out of waterways to protect herds and water quality Riparian buffers reduce runoff Apply fertilizers/pesticides properly Livestock can erode streambanks. 	<ul style="list-style-type: none"> Targeted mailings Displays at NRCS and local offices BMP cost-share info via newsletters/websites Coordinate with NRCS/EQIP and 319(h) 	Soil & Water Conservation Districts, NRCS, Clemson Extension, Rocky River Nature Conservancy, utilities, local governments, Upstate Forever
Land Protection	Use conservation easements to prevent future pollution while preserving habitat and rural land uses.	Landowners/homeowners, SC Cattlemen's Association, Carolina Farm Stewardship Association	<ul style="list-style-type: none"> Easements allow traditional use with tax benefits Agreements restrict development while allowing farming, grazing, and timbering 	<ul style="list-style-type: none"> Targeted mailings Website and newsletter content Public outreach meetings 	Soil & Water Conservation Districts, NRCS, Clemson Extension, Rocky River Nature Conservancy, local governments, SC DNR, land trusts, forestry groups, Upstate Forever

8) IMPLEMENTATION, MILESTONES, & MEASURABLE GOALS

Following approval and adoption of a WBP, funding can be pursued through a variety of funding channels. Utilizing the process and subsequent guidance from SCDES Section 319(h) Nonpoint Source Implementation Grant process, each implementation phase should be 30-36 months (3 years) in length. This approach will help achieve incremental improvements to water quality. In [Section 4.1.3](#), it was determined that an incremental bacterial reduction for each 3-year implementation phase is most achievable. In [Section 5.8](#), the recommended BMPs for each 3-year phase would cost approximately \$310,222.66 in federal cost-share funding. This section specifies the recommended implementation timeline, milestones, and measurable goals that will help to achieve the implementation goals detailed throughout this WBP.

8.1) IMPLEMENTATION MILESTONES

The implementation of BMPs is largely dependent on landowner participation and available funding sources. Predicting landowner preferences and participation levels can be difficult. Therefore, it is suggested to evaluate the WBP implementation successes throughout each phase and adjust goals and expectations accordingly. This ensures that reduction goals can be met effectively within the allocated timeframe. For example, adjustments to the Public Outreach and Education Strategy may be needed if participation is lower than expected. Regular BMP evaluation is critical to note issues before, during, and after construction. Table 33 suggests milestones for the BMP implementation, public outreach, and methods for ensuring each phase meets recommended reduction goals.

Table 33. Implementation Milestones

Action Items for each 36-Month Phase			Years		
			1	2	3
BMPs to meet load reduction requirements	Septic BMPs	Send out targeted mailings to priority landowners and septic contractors	x		
		Circulate information about available funding and program details through attending/conducting meetings, social media, public displays, project partners, etc.	x		
		Facilitate 45 septic system repairs/replacements and/or connections to sewer infrastructure	x	x	x
	Agricultural BMPs	Coordinate with NRCS to identify EQIP projects within the watershed and contact eligible landowners	x		
		Circulate information about available funding and program details through attending/conducting meetings, social media, public displays, project partners, etc.	x		
		Facilitate 10 agricultural BMP projects	x	x	x
	Land Protection	Send out targeted mailings to priority landowners	x		
		Coordinate a landowner outreach event		x	x
		Protect (at minimum) 100 acres of land through 1+ Conservation Easements		x	x
	Riparian Buffers	Work with local governments on strengthening riparian buffer ordinances	x	x	x
		Complete 2 riparian buffer enhancement projects		x	x
	Wild Hog Management	Work in tandem with agricultural landowners and existing/potential conservation easement holders to identify any wild hog management concerns		x	
Coordinate wild hog removal (4 sounders) with landowners				x	
Supplemental BMPs	Land Management	Contact existing conservation easement holders about eligible projects in coordination with UF's Land Management team	x		
	Wetland Restoration/Enhancement	Encourage wetland restoration/enhancement efforts on existing/potential conservation easements	x	x	x
	Forestry	Encourage foresters to work with SCFC to install BMPs, develop forestry management plans, and utilize courtesy BMP exams, especially directly above Lake Secession	x	x	x

8.2) TRACKING BMP SUCCESS

To ensure the longevity and success of BMP projects, tracking BMP installation information, outreach initiatives, and ensuring landowners have access to BMP maintenance materials will be important. Specifically, it is essential to track the number and size of each BMP completed, to calculate the estimate load reductions for each installed BMP, and to evaluate and watch ongoing monitoring data to see if there are measurable improvements to water quality (SC AAS, SCDES data, etc.) ([Section 3.4](#)). In addition, post-BMP materials could be distributed to landowners including a survey, fact sheets about BMP maintenance, and a thank you letter for participating in the program. Asking landowners to complete a survey would help determine how to improve the cost-share program. The distribution of BMP maintenance fact sheets to participating landowners will help to ensure the BMP is properly maintained. Materials to consider sending to landowners in a post-BMP packet include:

- [SCDES Septic Maintenance Record Sheet](#) (SCDES, 2024)
- Link to Clemson University Extension’s website “[Be Septic Safe](#)” and relevant materials (Clemson University, 2025)
- Coordinating with local NRCS offices and Conservation Districts to provide information on maintenance of agricultural BMPs

Examples of questions to include in the post-BMP participation survey include:

- How did you hear about this grant program?
- What types of projects did you install on your property?
- How would you rate the grant application process?
- What aspect, if any, of the grant process did you find most difficult?
- How long did the grant process take from start to finish?
- How likely would you be to recommend this grant program to others?
- Did this grant program increase your awareness of water quality issues in your community?
- Do you have any questions or comments to help us improve this grant program?
- Would you be willing to provide a testimonial about your experience?

9) SUMMARY OF RECOMMENDATIONS & CONCLUSION

Watershed Summary - This watershed-based plan (WBP) includes seven Hydrological Unit Code (HUC)-12 watersheds totaling more than 169,790 land acres and 7,626 acres of lakes (Broadway Lake, Lake Secession, and portions of Richard B. Russell Lake). The watershed is in Anderson and Abbeville counties with the primary land uses being forest, agriculture, and urban lands. The estimated population of the watershed is approximately 64,671 people, or roughly 32,336 households. The City of Abbeville operates a drinking water intake and protection area on Richard B. Russell Lake, providing 6,000 customers with drinking water in the Abbeville County area. Additionally, the Starr Iva Water and Sewer District operate within the watershed, providing water and sewer services to over 10,000 people in Anderson and Abbeville counties.

This WBP addresses bacterial, sediment, and nutrient pollution concerns through strategies that efficiently reduce and/or prevent nonpoint source pollutant runoff from contaminating nearby waters and drinking water sources. Projects and strategies detailed in this plan serve to improve water quality and reduce the potential burden of increased drinking water treatment costs on local drinking water utilities.

Pollutants and Sources - A TMDL was developed by SCDES (formerly SCDHEC) in 2004 for several waterways within the watershed ([Section 4.1](#)). There is a total of seven water quality monitoring stations included in the approved TMDL on the following waterbodies: Rocky River (SV-031, SV-041), Cherokee Creek (SV-043), Cupboard Creek (SV-139, SV-140), Broadway Creek (SV-141), and Wilson Creek (SV-347). According to the TMDL, bacterial pollution in the watershed can be attributed to both point and nonpoint sources, including wastewater effluent, agricultural uses, urban runoff, and wildlife.

Pollutant Load Reductions -The TMDL estimates an existing nonpoint load of $2.04E+15$ counts/year (*E. coli*) and that a total reduction of $1.39E+15$ counts/year (*E. coli*) (68%) is needed to meet water quality standards for bacteria. Although no water quality monitoring stations indicate elevated levels of nutrients or sediment, this watershed is prime for significant development over the next 20 years. As such, this WBP proactively addresses potential sources of nutrients and sediment attributed to urbanization, agricultural activities, erosion, and inadequate riparian buffers.

Recommendations to Reduce Pollutant Loads - In [Section 5](#), a suite of BMPs are recommended to address bacterial, nutrient, and sediment pollution reduction and prevention (Table 34). Based on results from a GIS-based land prioritization analysis for each category, recommendations for the most effective locations for each BMP category were made to most efficiently remove/prevent pollutant loads.

Table 34. Summary of BMP Recommendations

BMP Category	Summary of BMP Location Recommendations
Septic Repairs/Replacements	<p>Priority 1: Broadway Creek (030601030202) and Hencoop Creek (030601030204)</p> <p>Priority 2: Wilson Creek (030601030206) and Middle Rocky River (Wilson Creek (030601030205)</p> <p>Priority 3: Little Beaverdam Creek-Rocky River (030601030201) and Upper Rocky River (030601030203)</p>
Agricultural BMPs	Wilson Creek-Rocky River watershed (030601030206)
Land Protection	Upper Rocky River (030601030203) and Lower Rocky River (030601030207) watersheds
Riparian Buffer BMPs	<p>Agricultural properties: Wilson Creek (030601030206)</p> <p>Upper reaches of the watershed that are TMDL-sheds and are essential for downstream flood resilience: Broadway Creek (030601030202), Little Beaverdam Creek-Rocky River (030601030201) and Upper Rocky River (030601030203)</p>
Wild Hog Management	Work in tandem with agricultural landowners and existing/potential conservation easement holders
Land Management	Conservation easements that are protected and in progress
Wetland Restoration/Enhancement	Conservation easements that are protected and in progress
Forestry	Encourage foresters to work with SCFC to install BMPs, develop forestry management plans, and utilize courtesy BMP exams, especially directly above Lake Secession

Cost Estimates and Implementation - In [Section 4.1.3](#), it was determined that implementing projects incrementally to address bacterial reduction goals is most realistic given funding and resources. Because of this, UF recommends the following projects in 3-year phases. This suite of projects will achieve a 22% bacterial load reduction, and the total anticipated costs is \$527,811.09 (Table 35) per 3-year phase. It is estimated that at least four phases will be needed to achieve all bacterial reductions needed to satisfy the TMDL, costing approximately \$2,111,244.36 in total.

Table 35. Rocky River Watershed Project Implementation Cost Estimates

BMP	Average Cost	Recommended Projects	Estimated Cost	SCDES Cost Share (60%)
Septic Repair/Replacement	\$6,500	45	\$292,500	\$175,500
Agricultural BMP Bundle	\$17,400	10	\$174,000	\$104,400
Land Protection (CEs)	\$15,140	1-2 easements	\$30,280	\$18,168
Riparian Buffer BMPs	\$515.55/acre	2	\$1,031.09	\$154.67
Wild Hog Removal	\$5,000	72 (4 sounders)	\$30,000	\$12,000
Total			\$527,811.09	\$310,222.67

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APPENDIX A. STANDARD NUMBERS FROM SCDES

The information in this Appendix is provided by SCDES (12/11/2015)

STANDARD NUMBERS FOR POLLUTANT LOADING FROM ANIMALS

ESTIMATED POLLUTANT LOADS FROM FAULTY SEPTIC SYSTEMS

- Bacteria: $2.76 \times 10^6/\text{hr} \times 24 \times 365 = 2.4176 \times 10^{10}$ per household
- Nitrogen: 31.1lb/yr (*load from one septic tank, per the StepL septic input page*)
- Phosphorus: 12.2 lbs/yr

ESTIMATED POLLUTANT LOADS FROM CATTLE

These numbers assume direct input to stream(s) from cattle with stream access, and year-round spring deposition rate (*reference 5*)

- Bacteria 5.4×10^8 bacteria/day/cow * 365 = 1.97×10^{11} /yr/cow (*reference 5*)
- Phosphorus: 0.004lbs/day/cow * 365 = 0.73 lbs/yr/cow
- Nitrogen: 0.005lbs/day/cow * 365 = 1.83 lbs/yr/cow (*reference 5*)

ESTIMATED POLLUTANT LOADS FROM DOGS

- 4.09×10^9 bacteria/day

ESTIMATED FECAL COLONIES

These numbers are in lbs/animal/day (*reference 4*)

- Chicken (layers): 1.36×10^8
- Turkey: 9.3×10^7
- Hogs: 1.08×10^{10}
- Horse: 4.20×10^8

LIVESTOCK EQUIVALENTS

These numbers compare mass of waste produced per day, in PBCE (pasture beef cow equivalents)

- Beef Cow: 1
- Dairy Cow: 2.6
- Horse: 1.1
- Hog: 0.24
- Sheep: 0.04
- Goat: 0.04
- Camel: 0.5
- Llama: 0.5
- Dog: 0.01

ANNUAL FECAL COLIFORM BACTERIAL LOADING FOR LIVESTOCK ANIMALS

The table below shows the amount of FC bacteria available for deposit on the watershed per individual animal per year (100 % does **not** wash off). (*reference 10*)

Livestock	CFU*/year	Reference
Cow	1.97x10 ¹²	Metcalf and Eddy, 1991
Horse	1.53x10 ¹¹	ASAE, 1998
Hog	3.63x10 ¹²	Metcalf and Eddy, 1991; ASAE 1998
Sheep	1.10x10 ¹³	Metcalf and Eddy, 1991; ASAE 1998
Hen	4.61x10 ¹⁰	Calculated from fecal waste of chicken (cfu/year) multiplied by hen:chicken mass ratio
Goat	1.10x10 ¹³	(Assumed same as sheep)
Chicken	1.39x10 ¹¹	Metcalf and Eddy, 1991; ASAE 1998

*CFU = Colony Forming Units

STANDARD NUMBERS FOR POLLUTANT LOADING FROM LAND USE

ANNUAL POLLUTANT LOADS BY LAND USE

Annual pollutant loads by land use (kg/ha-yr) are listed in the table below (*reference 11*).

Land Use		TSS	TP	TN	FC
Road	Minimum	281	0.59	1.3	7.10E+07
	Maximum	723	1.5	3.5	2.80E+08
	Median	502	1.1	2.4	1.80E+08
Commercial	Minimum	242	0.69	1.6	1.7E+09
	Maximum	1,369	0.91	8.8	9.50E+09
	Median	805	0.8	5.2	5.60E+09
Single Fam Residential Low density	Minimum	60	0.46	3.3	2.80E+09
	Maximum	340	0.64	4.7	1.6E+10
	Median	200	0.55	4	9.30E+09
Single Fam Residential High Density	Minimum	97	0.54	4	4.50E+09
	Maximum	547	0.76	5.6	2.6E+10
	Median	322	0.65	5.8	1.5E+10
Multi Fam Residential	Minimum	133	0.59	4.7	6.30E+09
	Maximum	755	0.81	6.6	3.6E+10
	Median	444	0.7	5.6	2.1E+10
Forest	Minimum	26	0.1	1.1	1.20E+09
	Maximum	146	0.13	2.8	6.80E+09
	Median	86	0.11	2	4.00E+09
Grass	Minimum	80	0.01	1.2	4.80E+09
	Maximum	588	0.25	7.1	2.7E+10
	Median	346	0.13	4.2	1.60E+10
Pasture	Minimum	103	0.01	1.2	4.80E+09
	Maximum	583	0.25	7.1	2.70E+10
	Median	343	0.13	4.2	1.60E+10

LAND USE POLLUTANT LOAD CONVERSIONS

- Conversion from kg to lbs: multiply by 2.2
- Conversion from hectares to acres: multiply by 0.404
- To get lbs/ac/yr, multiply values in the above table by 0.45 then 0.404
- To get number of bacteria/acre-year, multiple values in the table above by 0.404

CROPLAND FECAL COLIFORM LOADING

These numbers show cropland FC loading per unit area (lbs/ha) (*reference 9*)

- No manure 9.50E+10
- Poultry litter applied 6.50E+12
- Dairy litter applied 1.75E+12

BACTERIA IN RUNOFF BY LAND USE

These numbers show average concentration of bacteria in runoff by land use (per 100 ml)

- Bacteria (*reference 8*)
 - Urban: 2.40E+04 8429
 - Forest: 204
- AgCrop (surface) (*reference 9*)
 - No manure applied: 1.30E+04
 - Poultry litter applied: 5.70E+05
 - Dairy manure applied: 2.30E+05
 - AgPasture: 2375

APPENDIX A. REFERENCES

1. STEP_L model (now PLET)
2. Watershed Characterization System References Tab, Septics Tab per Horsley and Whitten 1999
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4. EPA-841-B-03-004 ASAE 1998 ASAE Standards 45 edition Standards Engineering Practices Data pp 646 (With EPA Region IV input)
5. University of California Extension Fact Sheet No 25. Manure Loading into Streams from Direct Fecal Deposits
6. <http://dnrweb.dnr.state.md.us/watersheds/surf/bmp/swbmp.asp>
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APPENDIX B. CALCULATING LOAD REDUCTIONS AND PREVENTIONS

CALCULATING AGRICULTURAL LOAD REDUCTIONS

Agricultural BMPs are often done in combination and referred to as “agricultural BMP bundles”. Load reduction calculations for agricultural BMP bundles within the Rocky River Watershed were developed based on the average pollutant load reductions associated with 7 projects completed in Three & Twenty Creek Section 319(h) Implementation Phases 1 & 2 (2020-2025). Projects included livestock exclusion fencing, alternative watering sources, and heavy use protection areas. Because load reduction calculations for an agricultural BMP project are contingent on geographical features, size of a parcel, and projects completed, this average calculation for a watershed that is immediately adjacent to the Rocky River Watershed is the best way to estimate potential load reductions for this project area.

Project types	Average Bacteria Reduction (CFU/year)	Average Sediment Reduction (tons/year)	Average Nitrogen Reduction (lbs/year)	Average Phosphorus Reduction (lbs/year)
Vegetative buffer strips, forested riparian buffer, heavy use protection, alternative water supply, fencing	4.03E12 CFU/year	73.84 tons/year	418.19 lbs/year	96.69 lbs/year

CALCULATING LOAD PREVENTIONS THROUGH LAND PROTECTION

The estimated pollutant load reductions associated with land protection represent the amount of pollution avoided when land remains undeveloped and significant development is prevented. To estimate these reductions, UF calculated the anticipated increase in pollutant loading that would occur if existing forested or agricultural land were converted to high-density developed land. This analysis did not consider other land cover categories such as wetlands, scrub land, herbaceous/sedge lands, open water, etc. To do this, UF utilized the acreage of properties that were identified in the land prioritization analysis (Section 5.3.1) as high priority for protection. Additionally, standard numbers from Appendix A were utilized to identify the changes in loading based on land cover. An example is shown below.

HIGH PRIORITY (HP) LANDS FOR PROTECTION IN HUC-30601030201

Total Acreage of HP Lands	Agricultural Land Acreage on HP Lands	Forested Land Acreage on HP Lands	Acreage of Other Land Cover Types (not used for analysis)
2,919.82	2,142	508	269.82

ANNUAL POLLUTANT LOADS BY LAND USE (APPENDIX A)

Indicator	Standard	Number* (lbs/acre)
TSS	Single Family High Density	286.19
	Forest	76.44
	Ag	304.86

*These numbers were converted from KG/HA-YR to LBS/AC-YR (see Appendix A)

STEP 1: Calculate Total Acreage Conversion to Single Family High Density

Total Acreage of HP Lands		Single Family High Density (lbs/yr)		If Converted to Single-Family High-Density LU (lbs/yr)
2,919.82	x	286.19	=	835,624.36

Convert to tons:

If Converted to Single-Family High-Density LU (lbs/yr)		Conversion to tons/year		If Converted to Single-Family High-Density LU (tons/yr)
835,624.36	x	0.0005	=	417.81

STEP 2: Calculate existing loading from agricultural land

Total Acreage of Ag Lands		Ag Land Loading (lbs/yr)		Current Ag Land Loading (lbs/yr)
2,142	x	304.86	=	653,003.04

Convert to tons:

If Converted to Single-Family High-Density LU (lbs/yr)		Conversion to tons/year		If Converted to Single-Family High-Density LU (tons/yr)
653,003.04	x	0.0005	=	326.50

STEP 3: Calculate Existing Loading from Forested Land

Total Acreage of Forested Lands		Forest Land Loading (lbs/yr)		Current Forest Land Loading (lbs/yr)
508	x	76.44	=	38,863.93

Convert to tons:

If Converted to Single-Family High-Density LU (lbs/yr)		Conversion to tons/year		If Converted to Single-Family High-Density LU (tons/yr)
38,863.93	x	0.0005	=	19.43

STEP 4: Calculate estimated additional loading if forested lands and ag lands were converted to developed land

Step 1		Step 2		Step 3		Total TSS Prevented if all HP Acreage Protected (tons/yr)
417.81	-	(326.50)	+	19.43)	=	71.88

STEP 5: Convert to a per acreage estimate

Step 4		Total Acreage of HP Lands		Total TSS Prevented per acre of Land Protected (tons/acre/year)
71.88	/	2,919.82	=	0.025

This calculation was done for every HUC-12 subwatershed for TSS (sediment), TP and TN (nutrients), and *E. coli* (bacteria) and summed. The results of these calculations are reflected in [Section 5.3.3](#). This calculation was developed in partnership with SCDES. Although PLET provides estimates, it only considers the conversion of forest lands to developed lands; UF wanted to also include agricultural land considerations since a vast majority of our watersheds include higher percentages of agricultural land cover. Agricultural lands are also a priority for land protection within our organization.

CALCULATING RIPARIAN BUFFER LOAD REDUCTIONS

- Open PLET and choose the number of HUC-10 watersheds
 - Choose your weather station based on which county with most acreage in the watersheds
 - Under urban lands, enter the total amount of urban lands for each watershed that is on high priority buffer parcels (this will need to be pulled from GIS once the analysis is complete)
 - Modify urban acreage percentages to reflect [for each watershed]:
 - Commercial = medium and high intensity development
 - Single Family = low intensity development
 - Open Space = open space
 - Every other urban land use should be zero, and the total % area should equal 100
- Under the BMPs tab, select the Urban BMP tool
 - For each watershed:
 - Click commercial and choose “LID/Filter/Buffer Strips”; the BMP drainage area will automatically populate based on the percentages you entered in. Click apply. Click OK on the confirmation window.
 - Repeat the same process for each of the urban land use types you’ve entered for each watershed; so, if you entered commercial, single family, and open space for two watersheds, you would do this a total of 6 times (3 for each type of urban land use for each watershed).
 - Exit when done
- Go to total load tab and get your loads for sediment and nutrients. This will give you the average amount of sediment and nutrients expected for each riparian buffer BMP project installed.