

Soque River Watershed Protection Plan

February 2026



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The partners listed below participated in the 2026 update through a combination of coordination meetings, watershed field visits, and review of the draft Watershed Protection Plan (WPP). Stakeholders provided data, technical input, and written feedback on plan sections (e.g., impairments, monitoring, and BMP prioritization), and helped identify implementation opportunities and roles for the updated implementation period.

Chattahoochee Riverkeeper

City of Baldwin

City of Cornelia

City of Demorest

City of Mount Airy

Georgia Department of Natural Resources Wildlife Resources Division

Georgia Environmental Protection Division

Georgia Forestry Commission

Georgia Mountains Regional Commission

Georgia Soil & Water Conservation Commission

Habersham County

Habersham Co. Chamber of Commerce

Habersham / White Co Homebuilders Association

National Resources Conservation Service

North Georgia Technical College

University of Georgia Cooperative Extension

U.S. Forest Service

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Section 1: Introduction

Executive Summary

The Soque River Watershed lies entirely within Habersham County, in northeastern Georgia, and feeds into the Chattahoochee River system. The watershed spans roughly 160 square miles (approximately 102,400 acres) and about 56.3 % of Habersham County lies within the watershed's boundary.

The Soque River is a valuable resource: it provides drinking water supply (notably for Clarkesville), supports aquatic and riparian ecosystems, and offers recreational and scenic benefits for the public. Given its headwater location, the health of the Soque River is critically important to downstream waters, including Lake Lanier, where approximately one-sixth of the lake's water is derived from the Soque River.

However, portions of the Soque and its tributaries have historically failed to meet Georgia water quality standards, particularly for bacterial contamination (fecal coliform / E. coli), and biological impairments, due to excess sediment loading, which has led to an inclusion of segments on Georgia's 303(d) list of impaired waters. The root causes are primarily nonpoint sources related to agricultural runoff, urban stormwater, failing septic systems, and wildlife contributions. In addition, this watershed also has segments currently listed as Supporting (healthy) that need protection from future contamination through strategic planning.

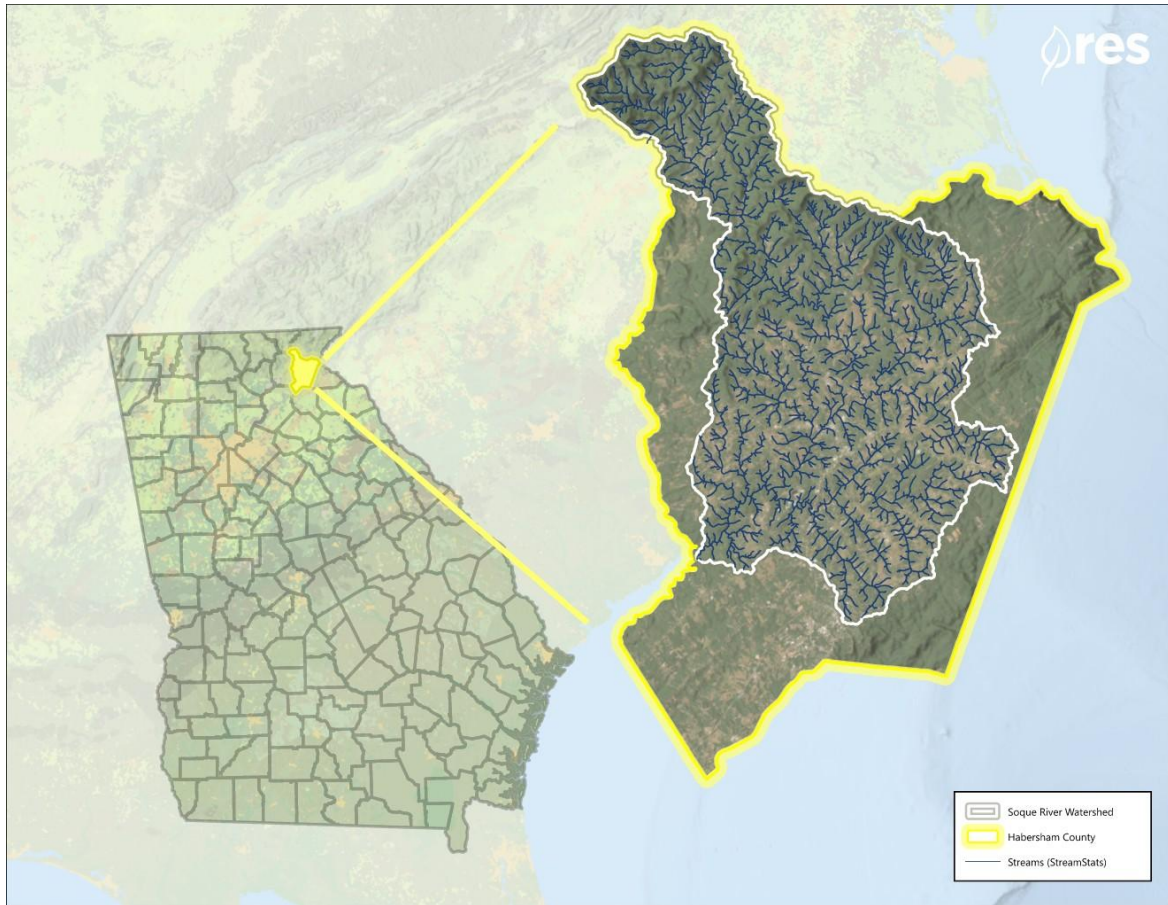


Figure 1. Location of Habersham County and the Soque River Watershed

Introduction & Context

This Watershed-Based Plan is a public-facing document developed for citizens, landowners, local governments, conservation organizations, and state and federal agencies. Its purpose is to present a clear overview of the Soque River Watershed’s current conditions, challenges, and opportunities while outlining a practical path forward that includes measurable corrective management actions. The plan is designed to support the reversing of key impairments and sustaining improvements in both the short and long term. The plan also serves as a foundation for stakeholder engagement, local coordination, and future funding proposals, particularly under the U.S. EPA Section 319 Nonpoint Source Grant Program and other restoration-focused initiatives.

This Watershed Protection Plan is intended to complement and build upon previously created WPPs and existing municipal stormwater planning efforts, including the City of Clarkesville’s Green Infrastructure (GI) Implementation Plan, which provides a practical framework for managing stormwater runoff through green infrastructure practices such as

bioretention, permeable pavement, and targeted retrofit prioritization. Incorporating the principles and lessons learned from Clarkesville’s GI planning and previous WPPs helps ensure consistency between watershed-scale goals and on-the-ground municipal stormwater management, particularly in the most urbanized portions of the watershed.

The Soque River Watershed (Hydrologic Unit Code 0313000102) encompasses approximately 28.5 miles of the main stem of the Soque River, along with numerous tributaries extending across north-central Habersham County, Georgia. Portions of the watershed lie within the Chattahoochee National Forest, where elevations reach approximately 4,430 feet at Tray Mountain. The upper watershed is characterized by steep, forested terrain with limited development, while the lower reaches transition into more intensive land uses, including agricultural, suburban, and urban areas with expanding infrastructure.

Key tributaries to the Soque River include Deep Creek, Hazel Creek, Beaverdam Creek, and Yellowbank Creek. Each subbasin exhibits distinct land use patterns and pollutant sources, making sub-watershed-scale analysis essential for identifying pollutant loading hotspots and prioritizing restoration activities. These tributaries collectively influence the water quality and ecological integrity of the main stem.

Recent datasets from the National Land Cover Database (2019–2021) and the American Community Survey (2020–2023) indicate a continuing shift from forested and agricultural lands toward low-density residential and urban development. Habersham County’s population growth is concentrated around Clarkesville, Demorest, and Cornelia, with corresponding increases in impervious surface area and stormwater runoff potential. These patterns underscore the importance of integrating watershed management into local planning and development processes.

As a headwater system contained entirely within Habersham County, the Soque River Watershed offers a unique opportunity for coordinated management without the complexities of multi-county jurisdiction. The river ultimately contributes to the inflows of Lake Lanier, a critical drinking water reservoir for the Atlanta metropolitan area. Protecting the Soque’s water quality therefore has both local and regional significance for aquatic ecosystem health and downstream water supply reliability.

The Georgia Environmental Protection Division (EPD) evaluates surface waters under the state’s integrated 305(b)/303(d) reporting framework. Waters not meeting designated uses, such as recreation, fishing, or drinking water supply, are listed under 303(d) and may require the development of Total Maximum Daily Loads (TMDLs) or alternative restoration strategies. The 2024 EPD assessment cycle introduced refined listing methodologies and updated hydrologic boundary definitions.

Previous assessments identified a 29-mile segment of the Soque River as impaired for fecal coliform bacteria. A TMDL was established and subsequently revised to distribute required load reductions among point and nonpoint sources. Since then, targeted best management

practices (BMPs), including bioretention facilities, stormwater retrofits in Clarkesville, and improved agricultural runoff controls, have demonstrated measurable improvements in local water quality. These successes illustrate the effectiveness of collaborative, data-driven interventions and provide a strong foundation for ongoing watershed restoration and protection efforts.

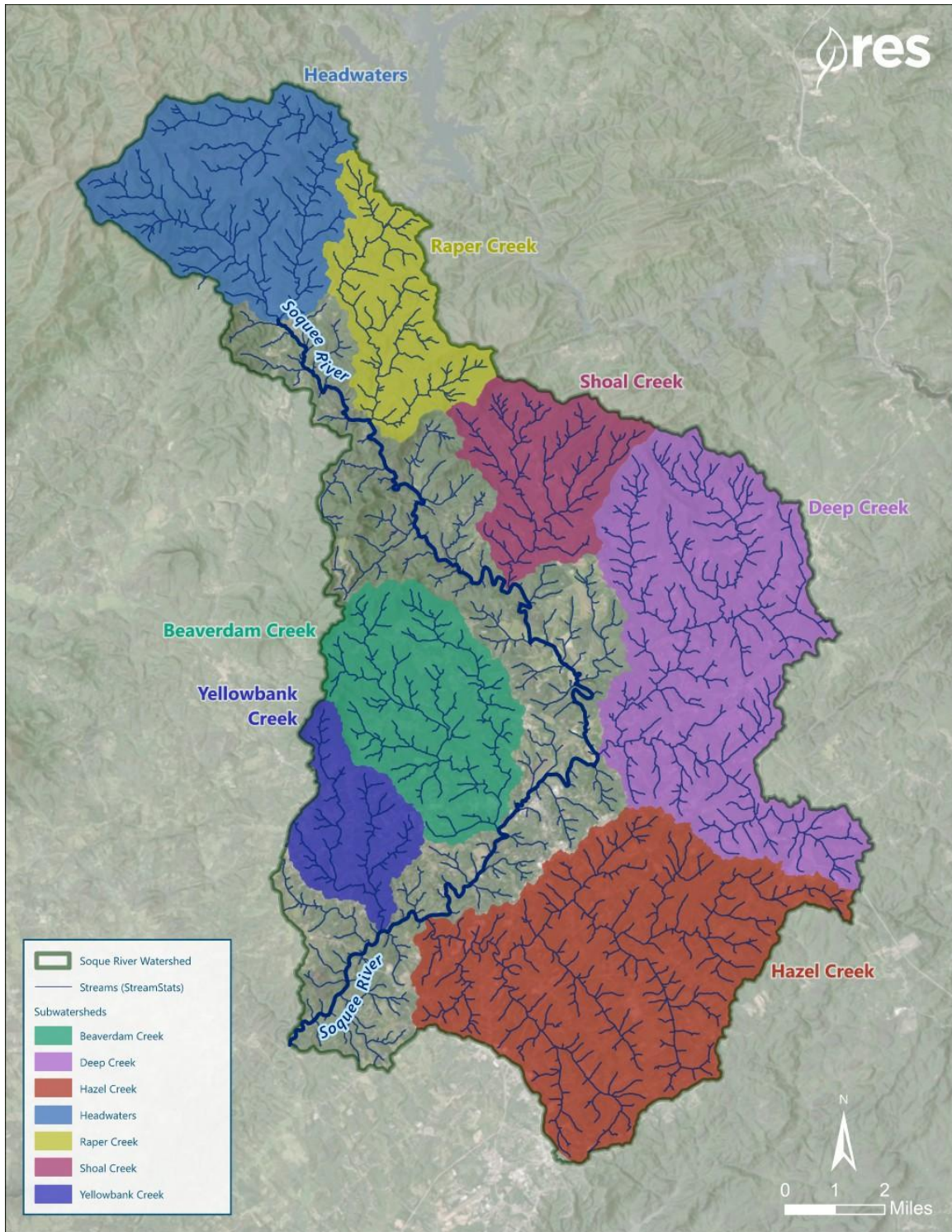


Figure 2. Subwatersheds within the Soque River Watershed

Section 2: Watershed Status and Updates

Land Cover & Land Use

The National Land Cover Database (NLCD) 2019 serves as the primary dataset for assessing land cover within the Soque River Watershed. Land-cover classes were extracted and clipped to the watershed boundary to calculate proportional areas of forest, agriculture, developed lands, wetlands, and impervious surfaces. Where feasible, these results can be compared with earlier NLCD datasets (2001, 2008, and 2017) to quantify temporal changes and identify trends in land-use conversion over the past two decades.

Regional analysis indicates that forest cover remains dominant in the upper headwaters, particularly within the Chattahoochee National Forest and surrounding upland slopes. However, valley and lower-elevation areas show an increasing prevalence of low-density residential development and expanded impervious surface coverage (not allowing fluid to pass through or penetrate; e.g., paved roads, concrete driveways, roofs, sidewalks, etc.). This pattern reflects accelerated encroachment into riparian and agricultural zones, contributing to habitat fragmentation and elevated runoff potential. Commercial and residential expansion has also resulted in lost riparian buffer and wetland areas that previously provided natural filtration and floodwater storage. The proximity of new development to stream corridors underscores the need for continued management practices that preserve vegetative buffers and minimize stormwater-driven pollutant loading.

Table 1. Land Cover Use Analysis

Land Cover / Use Class	Estimated % of Watershed (NLCD 2019)	Comments / Notes	Notes on Imperviousness Estimate*
Deciduous forest	~ 9.3%	Dominant in upper reaches	Very low imperviousness
Evergreen / mixed forest	~ 14.9%	Evergreen + mixed forest	Very low imperviousness
Shrub / scrub / transitional	~ 21.9%	Shrub/Scrub class (CONUS estimate)	Low imperviousness
Pasture / hay	~ 6.2%	Pasture/hay	Minimal imperviousness (mostly pervious)
Cropland / cultivated	~ 16.3%	Cultivated crops	Very low imperviousness
Developed / low intensity	~ 2.68%	Developed, open space (low intensity)	Moderate imperviousness (20-49% cover for this class)

Land Cover / Use Class	Estimated % of Watershed (NLCD 2019)	Comments / Notes	Notes on Imperviousness Estimate*
Developed / med-high intensity	~ 1.40%	Commercial/dense neighborhoods	Higher imperviousness (50-100% cover)
Wetlands / open water	~ 5.26%	Streams, ponds, riparian wetlands	Near zero imperviousness
Bare land / barren	~ 0.97%	Likely minimal in this region	Minimal imperviousness
Impervious Surface (overall)	~ 4-6%		

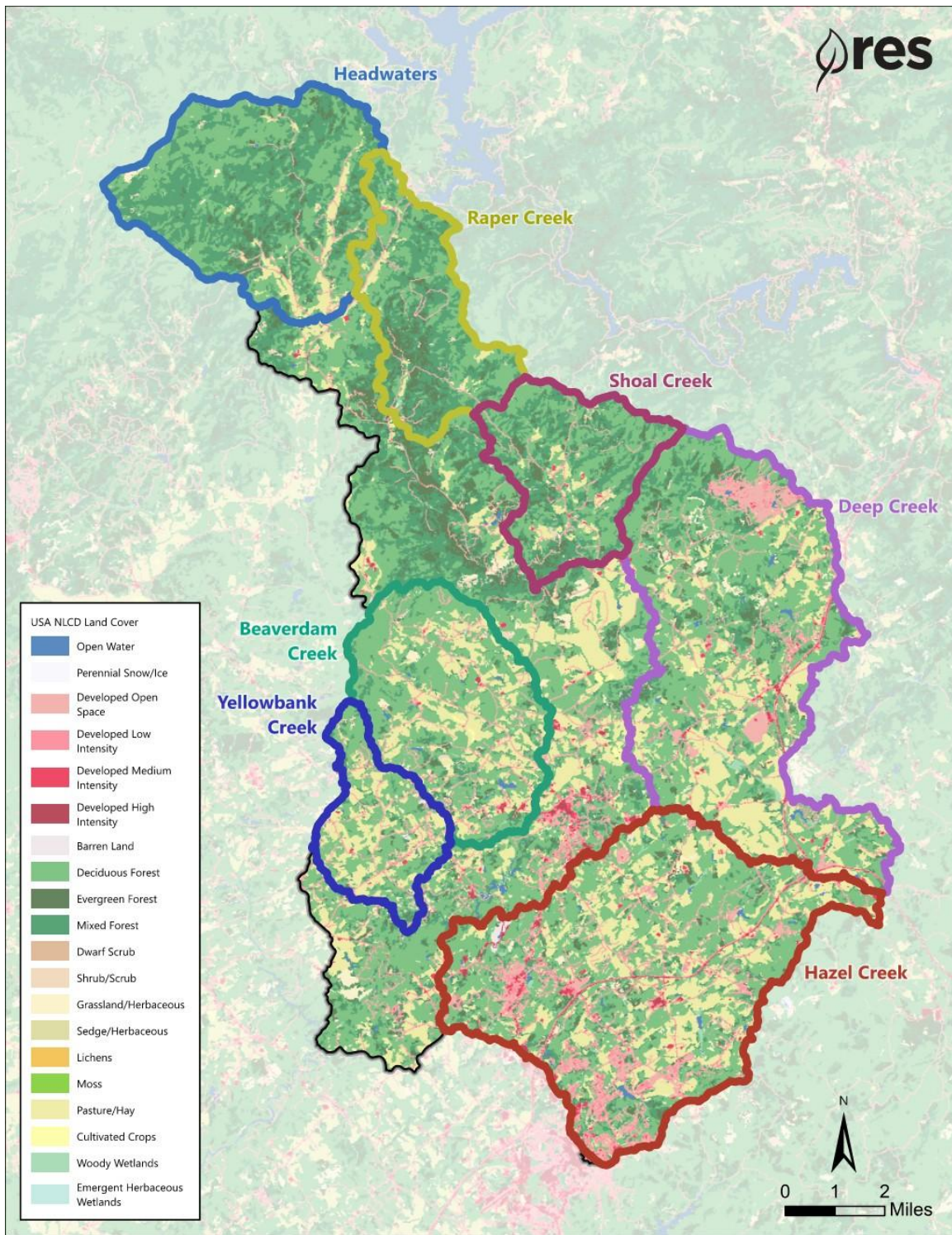


Figure 3. Landcover in the Soque River Watershed

Population & Growth Trends

Table 2. County and Municipal Growth

Metric	Value (Prior Plan)	Value (Current / Latest)	% Change
County population (Habersham)	~43,000	48,957	+13.39%
Population within watershed boundary	~24,600	~28,300	+15.04%
Number of housing units	~10,160	~11,120	+9.5%

Water Quality Status & Impairments

Table 3. Water Statuses

Waterbody	Reach Location	Criterion Violated	Potential Cause	Designated Use	Extent
Soque River	Goshen Creek to Georgia Hwy. 197 just below the mouth of Shoal Creek	Biological Impairment – Fish from Sediment	Non-point Source Pollution	Fishing	11.7 miles
Soque River	Georgia Hwy. 197 just below the mouth of Shoal Creek to Deep Creek	Biological Impairment – Fish from Sediment	Non-point Source Pollution	Fishing	5.9 miles
Soque River	Law Creek to Soque River	Biological Impairment – Fish from Sediment, E. Coli	Non-point Source Pollution	Fishing, Drinking Water	3 miles
Shoal Creek	Nerve Branch to the Soque River	Biological Impairment – Fish from Sediment	Non-point Source Pollution	Fishing	1.8 miles
Deep Creek	SR 17, Clarkesville to Chattahoochee	Biological Impairment – Fish from Sediment	Non-point Source Pollution	Fishing	9 miles

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Hazel Creek	Reservoir No. 12 (off Piney Woods Trail) to Law Creek	Biological Impairment – Fish from Sediment	Non-point Source Pollution	Fishing	4.1 miles
Hazel Creek	Law Creek to Camp Creek	Biological Impairment – Macroinvertebrates from Sediment, E. Coli	Non-point Source Pollution	Fishing, Drinking Water	2.2 miles
Hazel Creek	Camp Creek to Soque River	Biological Impairment – Macroinvertebrates from Sediment	Non-point Source Pollution	Fishing	3.3 miles
Sutton Mill Creek	Beaverdam Creek to the Soque River	Biological Impairment – Fish from Sediment	Non-point Source Pollution	Fishing	0.7 miles
Camp Creek	Cornelia Branch to pond 0.3 miles downstream College Drive	E. Coli	Non-point Source Pollution	Fishing, Drinking Water	2.1 miles
Camp Creek	Headwaters to Tributary 0.1 miles downstream Keller Rd	Trichloroethane (Facility under a corrective action plan)	Non-point Source Pollution	Fishing	1.1 miles
Raper Creek	Chastain Branch to Soque River	Supporting	N/A	Fishing	2.3 miles
Yellowbank Creek	Headwaters to Soque River	Supporting	N/A	Fishing	5.9 miles
Glade Creek	Deep Creek to Deep Creek	Supporting	N/A	Fishing	1.5 miles
Soque River	SR17, Clarkesville to Sutton Mill Creek	Supporting	N/A	Fishing, Drinking Water	0.5 miles
Soque River	Sutton Mill Creek to the Chattahoochee River	Supporting	N/A	Fishing	8.3 miles

Summary: Key Status Takeaways

- Forest and natural cover likely continues to dominate headwaters, buffering water quality, but development pressure in valley/lower subbasins is increasing.
- Population and housing growth concentrated near municipal boundaries increases stormwater and septic system stress in the watershed.
- Georgia EPD 2024 Integrated Report updates require careful comparison to historical listings due to criteria and reach mapping changes.
- Local monitoring data (SRWA, CRK, municipal labs) should be used to refine prioritization where EPD assessments are absent or coarse.
- The status overview above will guide prioritization of BMP deployment, monitoring, and public outreach in the implementation section.

- The SRWA monitoring program collects water quality data for Beaverdam Creek, a tributary to the downstream listed 6-mile segment of the Soque River. Beaverdam Creek is one of the five subwatersheds within the Soque River watershed where monitoring samples have shown high bacterial levels.

Section 3: Water Quality Assessment & Trends

3.1 Overview of 2024 EPD Integrated Report Listings

The 2024 Integrated Report continues to list certain segments of the Soque River and its tributaries as impaired for bacterial and biological indicators. The table below summarizes current impairment listings for reaches/segments located fully or partially within the Soque River watershed.

Table 4. Impairment Comparison to Former Plan

Reach / Segment Description	Parameter(s) Impaired	Assessment Category (2024)	Notes / Comparison to 2017 Plan
Soque River (3 reaches)	Bacteria (E. Coli), Biological Impairment – Fish from Sediment	Not Supporting	No change from 2017 assessment
Deep Creek tributary	Biological Impairment – Fish from Sediment	Not Supporting	Not in 2017 plan
Hazel Creek (3 reaches)	Biological Impairment – Fish from Sediment, Biological Impairment – Macroinvertebrates from Sediment, E. Coli	Not Supporting	No change from 2017 assessment
Shoal Creek	Biological Impairment – Fish from Sediment	Not Supporting	Not in 2017 plan
Sutton Mill Creek	Biological Impairment – Fish from Sediment	Not Supporting	Not in 2017 plan
Camp Creek (2 reaches)	Biological Impairment – Fish from Sediment, Trichloroethane	Not Supporting	Listed in 2024 assessment; not in 2017 plan

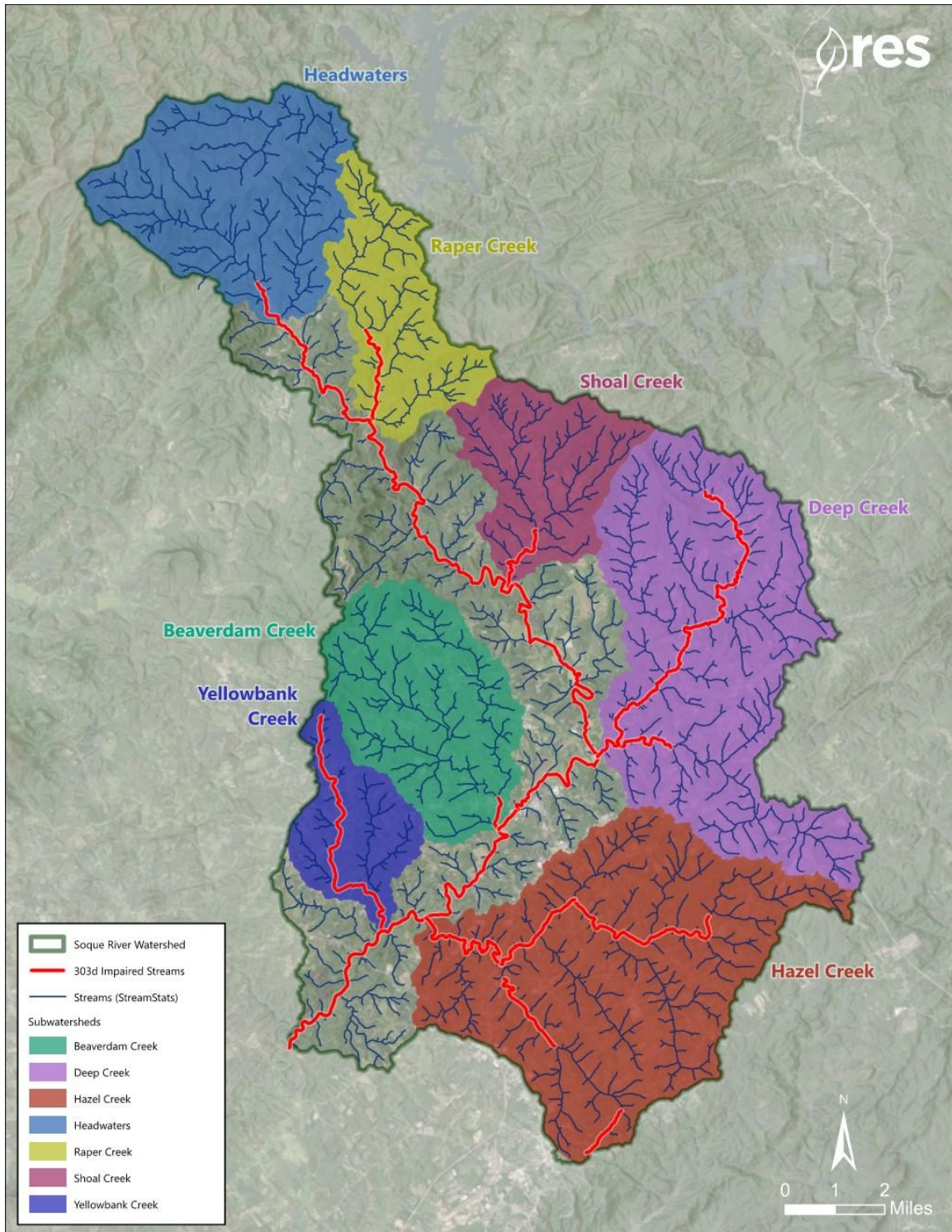


Figure 4. Stream segments not meeting designated uses (impaired)

3.2 Historical Comparison and Trend Analysis

Comparing the 2008, 2017, and 2024 Integrated Reports shows that bacterial impairment remains the primary concern, with persistent exceedances in lower and mid-reaches. Long-term trend data collected by SRWA and partners indicate seasonal variation, with elevated bacteria concentrations during summer and after major rainfall events.

A shift in assessment criteria complicates direct numeric comparison, but normalized E. coli data suggest partial improvement in several sub-watersheds since implementation of agricultural and stormwater BMPs.

3.2.1 Subwatershed Summary of Improving Reaches/Segments

Available monitoring and assessment information indicates improving trends in select locations following implementation of targeted BMPs. Table 4a summarizes these improving reaches/segments by subwatershed,

Table 4a. Improving Reaches Since Past Plan

SRWA Monitoring Locations	Evidence of improvement	Primary data source	Notes
Clarksville main stem (SRWA Site 3 area)	Local monitoring indicates improving E. coli conditions during portions of the monitoring record.	SRWA local monitoring (2012-2024)	Improvement is most apparent outside wet-weather peaks; continued corrective actions recommended.
Upper Soque / Headwaters	Generally below thresholds with stable conditions, indicating sustained protection in headwater areas.	SRWA local monitoring (2015-2024)	Protection-focused measures remain important to prevent future degradation.
Targeted BMP areas (multiple subwatersheds)	Multiple implemented agricultural and stormwater BMPs have been associated with measurable improvements in local water quality.	SRWA + partner implementation tracking	Use continued monitoring to confirm trends and attribute improvements to specific projects.

3.3 Summary of Local Monitoring Data

Local monitoring stations have been established by SRWA, CRK, and partner agencies to supplement EPD assessments. These data provide finer spatial and temporal resolution and can identify emerging trends or BMP effectiveness.

Table 5. Local Monitoring Data

Station / Location	Parameter(s) Monitored	Monitoring Period	Observations / Trends
SRWA Site 1 – Upper Soque	E. coli, Nutrients	2015–2024	Generally below thresholds; stable trend.
SRWA Site 3 – Clarkesville	E. coli, Turbidity	2012–2024	Elevated summer counts; gradual improvement.
CRK Site – Hazel Creek	E. coli, Nitrate	2010–2023	Variable; spikes after rainfall.
SRWA Site – Beaverdam Creek	E. coli, Turbidity	2015–2024	Local monitoring data exist for this tributary; periodic elevated bacteria have been observed. Continued monitoring is recommended to refine trends and support BMP targeting.

3.4 Key Findings

- Bacterial impairment remains the leading cause of non-attainment of state designated use (fishing, drinking water, recreation across multiple reaches).
- Headwater forested areas maintain excellent water quality, emphasizing the importance of conservation.
- Local monitoring confirms that targeted BMPs implemented since 2015 are producing

measurable improvements in certain sub-watersheds.

- Additional data collection is recommended for Beaverdam and Yellowbank Creeks to confirm trends and support potential restoration efforts.

- Although pathogens (E. coli) remain a critical water quality concern, sediment and nutrient loading represent equally important stressors in the Soque River watershed. Multiple stream segments are listed as biologically impaired due to sediment, indicating that excess fine sediment and associated habitat degradation are limiting aquatic life support. Nutrients, particularly soil-bound phosphorus transported with sediment, further exacerbate biological stress by contributing to algal growth and altered dissolved oxygen dynamics. Addressing stormwater-driven sediment and nutrient delivery is therefore essential to achieving full attainment of designated uses.

Section 4: Pollutant Sources & Loadings

4.1 Overview of Source Categories

Pollutant sources in the watershed can be grouped into the following categories:

- Agricultural runoff – livestock access to streams, pasture runoff, manure management.
- Urban stormwater – impervious surface runoff, construction erosion, and vehicle-related contaminants. Contributes to Sediment loadings, resulting in biological impairments to fish and macroinvertebrates.
- Failing septic systems– improperly maintained systems near waterways.
- Wildlife – natural background bacteria loads.
- Forestry operations – limited impact but possible sedimentation from unpaved access roads. Contributes to Sediment loadings, resulting in biological impairments to fish and macroinvertebrates.

While individual pollutant sources are identified by land use and activity, stormwater runoff is the dominant delivery mechanism transporting bacteria, sediment, and nutrients to surface waters throughout the watershed. Increased impervious cover, compacted soils, and altered drainage networks accelerate runoff volumes and velocities, resulting in more frequent and intense pollutant delivery during storm events. These storm-driven processes are closely linked to the biological impairments documented on Georgia’s 303(d) list, particularly those associated with sediment stress on fish and macroinvertebrate communities

Streambank erosion and unpaved or dirt roads are significant contributors to sediment loading within the watershed. Actively eroding banks deliver chronic sediment inputs during both baseflow and storm conditions, while dirt roads and stream crossings generate episodic but high-magnitude sediment pulses during rainfall events. Sediment originating from these sources frequently carries soil-bound phosphorus, particularly in agricultural areas, amplifying nutrient loading impacts downstream

Pollutant and sediment loads modeled with EPA’s STEPL tool and Region 5 Model, with supporting data from Georgia Department of Natural Resources Wildlife Resources Division (wildlife), University of Georgia Cooperative Extension (livestock), United States Department of Agriculture (agriculture) Habersham County Health Department (septic systems), and Georgia Department of Community Affairs (human population).

4.2 Sub-basin Source Matrix

Table 6. Pollutant Sources

Sub-basin	Agricultural	Urban / Stormwater	Septic	Wildlife / Natural	Overall Relative Contribution

Upper Soque	Low	Low	Low	Moderate	Low
Clarkesville Reach	Moderate	High	High	Moderate	High
Deep Creek	High	Moderate	Moderate	Moderate	High
Hazel Creek	Moderate	Moderate	High	Moderate	High
Beaverdam Creek	Moderate	Low	Moderate	High	Moderate

Relative contribution categories in Table 6 are based on normalized, modeled annual loading potential by source type within each sub-basin: Low = 0-20%; Moderate = >20-40%; High = >40%.

4.3 Estimated Pollutant Loadings

Table 7. Pollutant Loading Estimates (Entire Soque Watershed)

Pollutant	Primary Source(s)	Estimated Annual Load	Load Reduction on Goal (%)	Notes
Bacteria (E. coli / Enterococci)	Livestock (manure runoff, pasture access), Failing septic systems, Urban stormwater outfalls	$\approx 1.08 \times 10^{16}$ (cfu/year)	40 %	Most critical for recreation use attainment; primary concern in Soque main stem and Beaverdam Creek; reductions achievable through fencing, septic repair, and stormwater retrofits.
Sediment (TSS)	Streambank erosion, unpaved roads, construction sites, pasture runoff	$\approx 24,260$ tons/yr	25 %	Sediment degrades macroinvertebrate habitat (Hazel Creek TMDL reach). BMPs: stabilization, riparian

				buffers, unpaved road improvements.
Nutrients (Total P)	Pasture fertilizer, livestock, septic seepage, urban stormwater	≈8,100 kg TP/year	30 %	TP load contributes to algal growth and oxygen demand in main stem; BMPs: nutrient management, septic maintenance.

Table 8. Suspended Sediment Yield and Load by Subwatershed

Subwatershed	Yield (tons/yr/mi ²)	Load (tons/yr)
Headwaters	101.7	1,759
Raper	102.7	986
Shoal	115.1	1,128
Deep	171.9	5,192
Beaverdam	164.2	2,397
Hazel	212.3	6,772
Yellowbank	200.2	1,341
Whole Watershed	151.8	24,260

Table 9. NPS fecal coliform production loadings – entire Soque River Watershed

Source	Loading (cfu/year)	% of total
Agriculture	5.32×10^{15}	49.1
Raper	7.36×10^{14}	6.8
Shoal	2.45×10^{15}	22.6
Deep	2.33×10^{15}	21.5
Total	1.08×10^{16}	100

4.4 Key Findings

- Agricultural and septic system sources continue to represent the highest bacterial load potential.
- Urbanized areas around Clarkesville contribute proportionally high stormwater pollutant loads despite small area.
- Nonpoint sources dominate total load; no major point sources are currently permitted within the watershed.
- Load reduction strategies should prioritize BMPs in Clarkesville, Deep Creek, and Hazel Creek sub-basins.

Section 5: Management Measures & Best Practices

5.1 Management Goals and Objectives

The overarching goal is to achieve water quality conditions in the Soque River and its tributaries that fully support designated uses (fishing, recreation, and drinking water).

Specific objectives include:

- Reduce bacteria loading to meet EPD criteria for recreation use (benchmark: achieve a 40% reduction watershed-wide by Year 10, with improving trends at priority monitoring stations).
- Reduce sediment and nutrient loading from agricultural and urban sources (benchmark: reduce sediment by 25% and total phosphorus by 30% by Year 10 in targeted sub-basins).
- Protect and restore riparian buffers, wetlands, and headwater streams (benchmark: restore at least 15 acres of riparian buffer by Year 8 and protect priority wetlands/headwaters from further loss).
- Improve public awareness and stewardship of watershed resources (benchmark: conduct ≥ 3 public outreach events per year and reach ≥ 250 participants per year).
- Establish a long-term monitoring and adaptive management framework (benchmark: maintain a minimum of 5 monitoring stations, publish annual monitoring summaries, and complete a comprehensive 5-year progress report).

5.2 Recommended Management Measures

Recommended BMPs are grouped by land-use category. Cost estimates reflect EPA and NRCS national averages adjusted for regional implementation (2023 USD).

Agricultural Best Management Practices

Table 10. BMPs and their Associated Costs

BMP Type	Primary Pollutant Targeted	Typical Cost Range (per unit)- '25 Estimate	Implementation Notes
Livestock exclusion fencing	Bacteria, Sediment	\$2.50–\$4.00 per linear foot	Install along streambanks to prevent direct livestock access; pair with alternative watering systems.
Stream crossing stabilization	Sediment	\$1,000–\$5,000 per site	Gravel or hardened crossings to minimize erosion.

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Nutrient management planning	Nutrients (N, P)	\$15-\$40 per acre	Incorporate soil testing and targeted fertilizer application.
Cover crops / conservation tillage	Sediment, Nutrients	\$35-\$100 per acre	Reduce erosion and improve soil infiltration.
Riparian buffer restoration (native vegetation)	Bacteria, Sediment, Nutrients	\$2,000-\$8,000 per acre	Target degraded riparian zones adjacent to agricultural lands.



Figure 5. Livestock Exclusion Fencing and Riparian Buffer Restoration

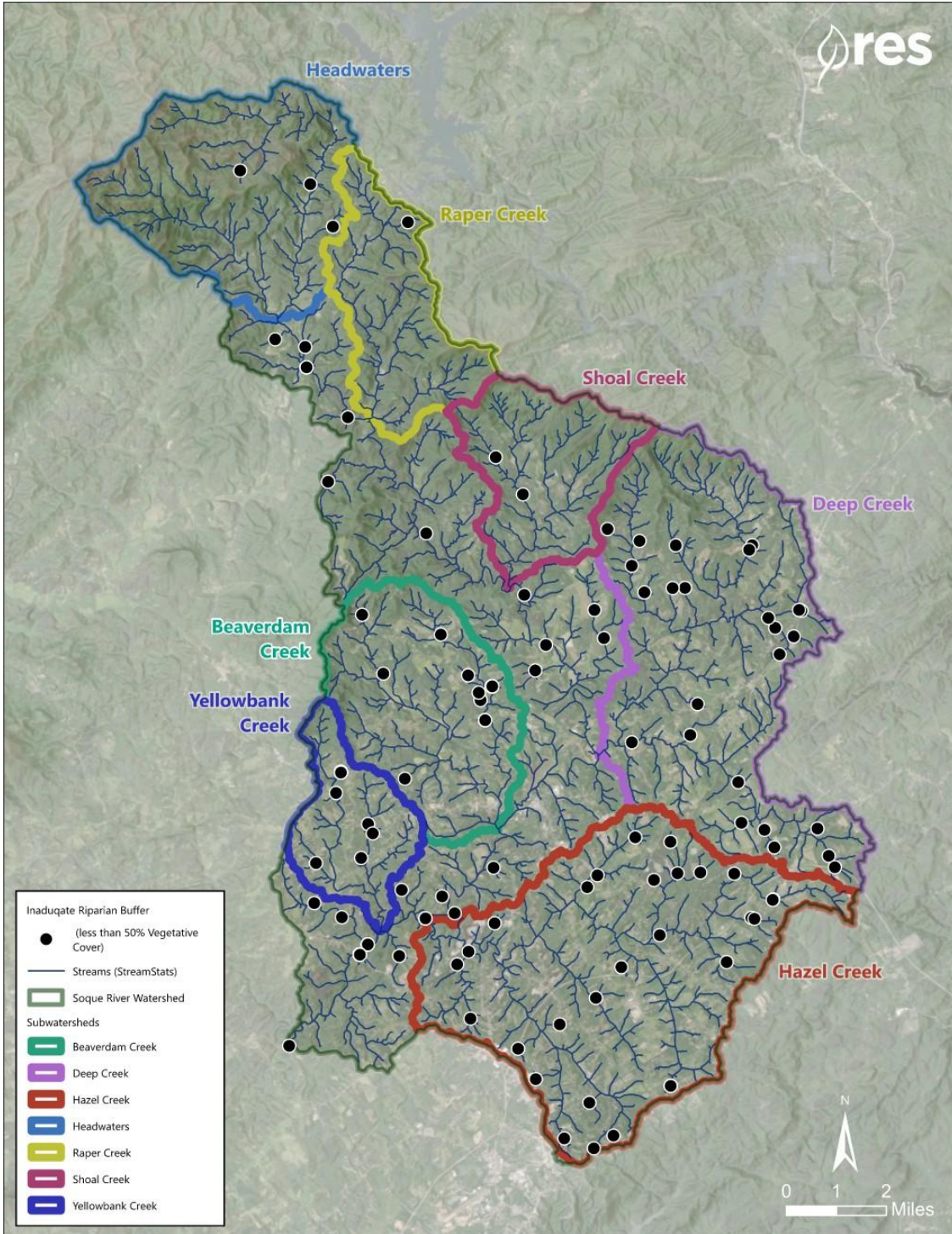


Figure 6. Riparian Enhancement Sites

Urban / Stormwater Best Management Practices

Table 11. BMP Summaries

BMP Type	Primary Pollutant Targeted	Typical Cost Range (per unit)- Land cost not included	Implementation Notes
Bioretention / Rain Garden	Bacteria, Nutrients, Metals	\$10-\$20 per sq. ft.	Retrofit parking lots, parks, and municipal properties.
Permeable pavement	Runoff volume, Sediment	\$8-\$15 per sq. ft.	Suitable for sidewalks, low-traffic areas.
Stormwater detention / retention pond retrofits	Sediment, Nutrients	\$20,000-\$60,000 per acre-ft	Enhance existing systems for water quality treatment.
Street sweeping program	Sediment, Nutrients	\$100-\$200 per curb-mile annually	Reduce sediment and nutrient accumulation in urban areas.



Figure 7. Examples of Bioretention BMPs and a Permeable Pavement System

Septic System Improvements

Table 12. Septic Improvements and Costs

BMP Type	Primary Pollutant Targeted	Typical Cost Range (per unit)	Implementation Notes
Septic system inspection and pump-out	Bacteria, Nutrients	\$300–\$500 per system	Encourage every 3–5 years through outreach and incentive programs.
System repair / replacement	Bacteria, Nutrients	\$4,000–\$12,000 per system	Prioritize near impaired reaches and shallow soils.
Cluster or community systems	Bacteria, Nutrients	\$15,000–\$30,000 per connection	Consider for small developments near sensitive areas.

Forestry and Riparian Practices

Table 13. Forestry BMPs and Costs

BMP Type	Primary Pollutant Targeted	Typical Cost Range (per unit)	Implementation Notes
Forest road stabilization	Sediment	\$2,000–\$5,000 per mile	Gravel surfacing, outsloping, and water bars.
Streamside management zones (SMZ)	Sediment, Temperature	Variable	Maintain 50–100 ft buffers; Georgia Forestry Commission standards.
Reforestation / riparian planting	Sediment, Nutrients	\$1,500–\$4,000 per acre	Target eroding or denuded riparian zones.

Public Education and Outreach

Table 14. Educational BMPs and Costs

Program / Activity	Target Audience	Approximate Cost Range	Implementation Notes
Watershed awareness campaign- Handbook (To be produced specifically for Soque River Watershed)	General public	\$2,500-\$7,500 per campaign	Outreach via schools, local media, and events.
Septic maintenance workshops	Homeowners	\$1,000-\$3,000 per event	Partner with county health department.
Farmer field days / BMP demonstrations	Agricultural producers	\$2,000-\$5,000 per event	Highlight cost-share programs (NRCS EQIP, GA EPD 319).
Municipality BMP Handbook- Awareness Campaign (To be produced specifically for Soque River Watershed)	Municipalities	\$2,500-\$7,500 per campaign	Partner with municipalities within watershed

5.3 Prioritization Framework

BMP implementation should be prioritized based on pollutant reduction potential, cost-effectiveness, feasibility, and geographic location. Sub-basins with the highest pollutant loading (Clarksville Reach, Deep Creek, and Hazel Creek) are recommended as initial focus areas.

Potential streambank restoration and stabilization sites will be identified using a combination of GIS-based screening and field verification. Initial screening may include analysis of riparian buffer gaps, proximity to impaired stream segments, stream slope, channel confinement, and adjacent land use. These indicators are expected to be strongly positively correlated with streambank erosion severity. Priority sites will be those where active erosion coincides with inadequate riparian buffers and documented biological or

sediment impairments, allowing restoration efforts to achieve both water quality and habitat benefits.

Table 15. Improvement Prioritization

Sub-basin	Primary Pollutant(s)	BMP Category	Relative Priority	Lead Partners
Clarkesville Reach	Bacteria, Stormwater	Urban / Septic	High	City of Clarkesville, SRWA
Deep Creek	Bacteria, Sediment	Agricultural	High	Farm Bureau, NRCS, GA EPD
Hazel Creek	Bacteria	Agricultural / Septic	High	County Health Dept., SRWA
Beaverdam Creek	Sediment	Forestry	Medium	GFC, Private Landowners

5.4 Summary of Expected Outcomes

Implementation of these BMPs is expected to reduce bacteria loads by 40–50 %, sediment loads by 20–30 %, and nutrient loads by 25–35 % in target sub-basins over a 10-year period, per updated modeling. Restored riparian buffers, improved septic systems, and urban retrofits will enhance habitat conditions, improve water clarity, and promote public engagement.

Section 6: Implementation Plan & Schedule

6.1 Implementation Framework

Implementation will occur through coordinated actions among the Soque River Watershed Association (SRWA), Habersham County, municipal governments (Clarkesville, Demorest, Cornelia), the Georgia Environmental Protection Division (EPD), the Natural Resources Conservation Service (NRCS), and community partners. The SRWP will serve as the primary coordinator, ensuring integration among agricultural, urban, septic, and outreach components.

Implementation phases are structured as follows:

- Short-term (Years 1–3): Focus on high-priority BMP installations, data collection, and public outreach.
- Mid-term (Years 4–6): Expand BMP coverage, initiate monitoring-based adaptive adjustments, and pursue new funding.
- Long-term (Years 7–10): Continue maintenance, evaluate performance, and pursue restoration of impaired reaches.

Implementation Schedule Overview

Table 16. Implementation Schedule

Action / Measure	Responsible Entity	Timeline	Estimated Cost Range	Potential Funding Sources
Agricultural BMPs (fencing, nutrient mgmt., buffers)	SRWP, NRCS, Farmers	Years 1–5	\$250,000–\$400,000	NRCS EQIP, EPA 319, State Ag Grants
Urban stormwater retrofits (bioretention, permeable pavement)	City of Clarkesville, County Public Works	Years 2–6	\$250,000–\$400,000	EPA 319, GADOT LMIG, Local Capital Funds
Septic repair / replacement program	Habersham County Health Dept.	Years 1–8	\$100,000–\$250,000	EPA 319, Homeowner Match, USDA RD

Public education & outreach campaign	SRWP, GFC, County Extension	Years 1-10	\$5,000-\$15,000 per year	EPA 319, Private Sponsors
Riparian restoration & reforestation	SRWP, Landowners, NRCS	Years 3-10	\$150,000-\$250,000	USFS, EPA 319, Private Foundations

6.2 Estimated Funding Summary

Total estimated implementation cost over the 10-year planning horizon is approximately \$1.0-\$1.3 million, with a projected 60 % external funding (EPA Section 319 and other grants) and 40 % local and in-kind match contributions. Table 17 summarizes expected allocations by category.

Table 17. Funding Summary

Category	Estimated Total Cost	Local / Match Share	Grant / External Share
Agricultural BMPs	\$350,000	\$140,000 (40%)	\$210,000 (60%)
Urban / Stormwater Retrofits	\$400,000	\$160,000 (40%)	\$240,000 (60%)
Septic System Improvements	\$175,000	\$70,000 (40%)	\$105,000 (60%)
Riparian & Forestry Projects	\$200,000	\$80,000 (40%)	\$120,000 (60%)
Education & Outreach	\$75,000	\$30,000 (40%)	\$45,000 (60%)

6.3 Roles and Responsibilities

Successful implementation requires coordination among multiple agencies, organizations, and stakeholders. The table below identifies primary and supporting roles for each major activity category.

Table 18. Role Breakdown

Entity / Partner	Primary Role(s)	Key Responsibilities
Soque River Watershed Association (SRWA)	Project Coordination	Lead overall implementation, reporting, and stakeholder coordination.
Habersham County Health Department	Septic Management	Administer inspection and repair program; maintain public records.
Natural Resources Conservation Service (NRCS)	Agricultural BMP Implementation	Technical support, and verification.
City of Clarkesville	Urban BMPs / Stormwater	Design and construct stormwater retrofits and bioretention systems.
Georgia EPD	Oversight / Funding	Approve 319 funding, track load reduction progress, and review reports.
Private Landowners	Participation / Stewardship	Install and maintain BMPs on private property.

6.4 Milestones and Performance Indicators

Milestones provide measurable targets to track progress over the 10-year planning horizon. Performance indicators will guide adaptive management and ensure accountability.

Table 19. Performance Indicators

Milestone / Performance Measure	Target Year	Indicator / Metric	Evaluation Method
Install 10 miles of livestock exclusion fencing	Year 3	Linear feet installed	Field verification, photo documentation
Complete 25 septic system repairs or replacements	Year 5	Systems upgraded	Health Dept. records

Retrofit 5 stormwater facilities in Clarkesville	Year 6	Projects completed	Engineering reports
Restore 15 acres of riparian buffers	Year 8	Acres restored	GIS monitoring, field visits
Achieve 40% bacteria load reduction in Deep Creek	Year 10	Load estimate reduction	Monitoring data comparison

6.5 Adaptive Management and Reporting

The plan will be implemented adaptively, with progress reviews conducted annually by SRWP and partners. Water quality and implementation metrics will be compiled into annual reports and a comprehensive 5-year reassessment. Adjustments will be made to BMP priorities, funding allocations, and outreach focus as needed based on monitoring results.

Section 7: Monitoring, Evaluation & Reporting

7.1 Monitoring Goals and Objectives

The primary goal of the monitoring program is to evaluate the effectiveness of implemented management practices in reducing pollutant loads and improving water quality. Specific objectives include:

- Track water quality trends for key parameters (bacteria, nutrients, sediment).
- Evaluate performance of BMPs and load reduction effectiveness.
- Identify emerging or persistent problem areas requiring additional intervention.
- Support potential restoration of impaired reaches under Georgia’s 305(b)/303(d)

Integrated Report.

- Inform adaptive management and public communication.

7.2 Monitoring Design

Monitoring will be designed to capture spatial and temporal variability across the watershed. Stations will be located to represent headwaters, mid-reaches, and downstream integration points, as well as key tributaries (Deep Creek, Hazel Creek, Beaverdam Creek).

Table 20. Future Monitoring

Monitoring Station	Waterbody / Location	Type of Monitoring	Purpose / Objective	Responsible Party
SRWA-01	Upper Soque (above Clarkesville)	Water Quality (Core Parameters)	Reference condition site for trend comparison.	SRWA
SRWA-02	Deep Creek	Water Quality + Flow	Track bacterial loading from agricultural areas.	SRWA / NRCS
SRWA-03	Hazel Creek	Water Quality + Biological	Assess nutrient and habitat conditions.	CRK / SRWA
SRWA-04	Clarkesville Mainstem	Water Quality + Flow	Measure cumulative urban/stormwater effects.	City / SRWA
SRWA-05	Beaverdam Creek	Water Quality	Evaluate rural residential and septic impacts.	SRWA / County

7.3 Monitoring Parameters and Frequency

Parameters and sampling frequencies are selected to align with Georgia EPD and recommendations for watershed plans. Sampling will occur more frequently during the first three years to establish baseline conditions, then adjusted based on observed trends. For monitoring to count towards restoring streams, a SQAP must be developed and implemented.

Targeted monitoring will be conducted at multiple locations along E. coli-listed stream segments to better isolate pollutant sources and prioritize corrective actions. This approach may include upstream/downstream bracketing, wet-weather sampling, and increased sampling density in high-priority reaches. Results will be used to refine project selection, support adaptive management decisions, and guide efforts to reduce or eliminate identified bacterial sources.

Table 21. Monitoring Standards

Parameter	Type	Suggested Frequency	Method / Standard Reference
E. coli / Enterococci	Bacteriological	Monthly (May–Oct), quarterly (Nov–Apr)	To be determined through the development of an approved SQAP
Total Nitrogen (TN)	Nutrient	Quarterly	To be determined through the development of an approved SQAP
Total Phosphorus (TP)	Nutrient	Quarterly	To be determined through the development of an approved SQAP
Turbidity / TSS	Sediment / Physical	Monthly	To be determined through the development of an approved SQAP
Dissolved Oxygen, pH, Temperature, Conductivity	Field Parameters	Monthly	To be determined through the development of an approved SQAP

Flow / Discharge	Hydrologic	Continuous or event-based	To be determined through the development of an approved SQAP
Macroinvertebrate community	Biological	Annually (spring)	To be determined through the development of an approved SQAP

7.4 Data Management and Reporting

All monitoring data will be stored in a centralized database maintained by SRWP. Data will be formatted according to EPA and EPD standards for submission to the Georgia Adopt-A-Stream or Water Quality Portal when applicable. Quality assurance protocols will include calibration records, duplicate samples (10%), and field blanks (5%) for analytical verification.

Annual summary reports will be prepared and shared publicly via the SRWP website, local government meetings, and partner newsletters. Reports will summarize water quality trends, BMP installation progress, and updated pollutant load estimates. A comprehensive five-year progress report will be developed to support plan updates and potential re-application for Section 319 funding.

Reporting Schedule

Table 22. Reporting Schedule

Report Type	Frequency	Content Summary	Responsible Entity
Annual Monitoring Summary	Annually (Q1)	Data results, trend graphs, BMP updates.	SRWP
Five-Year Comprehensive Report	Every 5 years	Full data analysis, load modeling, implementation progress.	SRWP
BMP Implementation Fact Sheets	As needed	Project highlights, before/after photos, cost data.	SRWP / Partners

7.5 Adaptive Management and Communication

Adaptive management ensures continuous improvement of watershed protection activities. Results from monitoring and reporting will be used to reassess management priorities, modify BMP designs, and guide funding applications. Key components include:

Soque River Watershed Protection Plan (2026 Update)

- Annual review meetings among SRWP, local governments, and partners to evaluate progress.
- Public reporting via online dashboards, newsletters, and community meetings.
- Revision of plan priorities based on measured pollutant reduction effectiveness and stakeholder feedback.

Effective communication will maintain stakeholder engagement, ensure transparency, and demonstrate accountability to funding partners and the public.

Section 8: Public Outreach & Stakeholder Engagement

8.1 Outreach Goals and Objectives

Outreach and engagement are designed to foster a long-term culture of watershed stewardship and public awareness. Key objectives include:

- Increase public understanding of watershed processes and nonpoint source pollution.
- Encourage voluntary adoption of BMPs by landowners and developers.
- Promote participation in monitoring and cleanup activities.
- Build partnerships among agencies, organizations, and citizens.
- Support implementation of the watershed plan through education, outreach, and incentives.

8.2 Stakeholder Coordination Framework

The Soque River Watershed Association (SRWA) will lead stakeholder coordination. A multi-sector advisory group will guide implementation, composed of representatives from local governments, agricultural interests, non-profits, schools, and citizens. Meetings will occur quarterly during active implementation and semiannually thereafter.

Table 23. Stakeholders and Responsibilities

Stakeholder Group	Primary Role	Example Responsibilities
Soque River Watershed Association (SRWA)	Lead Coordination	Organize outreach events, manage communication, track participation metrics.
Habersham County Government	Policy & Support	Integrate watershed goals into planning and zoning ordinances.
City of Clarkesville	Urban BMP Implementation	Support stormwater education and demonstration projects.
Farm Bureau & NRCS	Agricultural Outreach	Promote cost-share programs and on-farm BMP adoption.
Schools / Colleges	Education & Youth Engagement	Integrate watershed curriculum, lead stream cleanups.
Local Nonprofits & Faith Groups	Volunteer Mobilization	Host events, recruit participants, share communications.

8.3 Public Engagement Strategy

The engagement strategy combines direct outreach, education, and media to reach residents, businesses, schools, and landowners. Engagement will emphasize transparency, inclusivity, and measurable outcomes. Activities are categorized into education, participation, and communication programs.

Table 24. Public Engagement

Outreach Activity	Target Audience	Frequency / Goal	Example Materials / Tools
Community Workshops	Residents, Homeowners	2 per year	Presentations, Q&A, printed guides
Watershed Festival / Soque River Day	General Public	Annual event	Booths, live demonstrations, partner exhibits
Septic Maintenance Campaign	Homeowners	Ongoing (biannual reminders)	Postcards, videos, service directory
Landowner BMP Education	Homeowners	Ongoing (biannual reminders)	Pamphlet, presentations
Farmer Field Days	Producers, Ag Advisors	1-2 per year	On-farm BMP tours, cost-share handouts
Classroom Presentations	Students (Grades 4-12)	Each school year	Posters, stream model, teacher kits
Volunteer Stream Cleanups	Community volunteers	Quarterly	Trash bags, gloves, signage, social media promotion

8.4 Communication Tools and Methods

Communication efforts will employ both traditional and digital platforms to maximize reach and accessibility. A dedicated SRWP webpage will serve as the central hub for updates, event announcements, and data visualization dashboards. Social media and email newsletters will be used to maintain consistent engagement.

Table 25. Communication Tools

Communication Tool	Purpose	Recommended Frequency
SRWP Website	Host plan documents, updates, and data dashboards.	Continuous / Updated quarterly
Email Newsletter	Share news, events, and funding opportunities.	Quarterly
Social Media (Facebook, Instagram)	Promote BMPs and highlight success stories.	Weekly posts
Press Releases	Announce milestones or major projects.	As needed
Printed Materials (Brochures, Fact Sheets)	Distribute at events and municipal offices.	Annual updates

8.5 Evaluation and Metrics

Evaluation metrics will be used to measure the effectiveness of outreach and engagement activities. Metrics include quantitative participation counts and qualitative assessments of awareness and behavior change. Data will be compiled annually and included in monitoring and implementation reports.

Table 26. Evaluation

Metric	Target / Goal	Evaluation Method	Reporting Frequency
Number of outreach events held	≥ 3 per year	Event attendance logs	Annual
Community participation in volunteer programs	≥ 250 participants per year	Sign-in sheets, online registration	Annual
Social media reach / engagement	10% increase annually	Platform analytics	Quarterly
Septic maintenance awareness	25% of homeowners reached in 5 years	Survey and tracking	Biennial

Student engagement	500 students per year	School participation records	Annual
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8.6 Summary

Sustained public engagement and stakeholder collaboration are essential to achieving long-term watershed protection. By maintaining consistent communication, celebrating visible successes, and offering meaningful opportunities for participation, the Soque River Watershed Association will build the trust, capacity, and shared ownership necessary for continued success.

Section 9: Plan Maintenance & Updates

9.1 Purpose of Plan Maintenance

The purpose of plan maintenance is to provide a structured process for evaluating progress toward watershed goals, incorporating new data, and revising management strategies as conditions change. Regular updates maintain eligibility for state and federal funding and ensure stakeholder engagement remains active and informed.

9.2 Review and Update Schedule

The plan will be reviewed annually and formally updated every five years, with the oversight of the SWRA. The update schedule is designed to correspond with data availability, funding cycles, and programmatic reporting requirements established by Georgia EPD and the U.S. EPA.

Table 27. Project Review

Review Type	Frequency	Purpose / Activities
Annual Internal Review	Every year	Assess progress on BMP implementation, outreach, and monitoring results; identify any corrective actions.
Five-Year Comprehensive Update	Every 5 years	Reevaluate watershed conditions, update data sets (NLCD, Census, EPD listings), revise goals, and reprioritize management measures.
Ten-Year Strategic Renewal	Every 10 years	Conduct full plan revision to incorporate emerging technologies, new regulations, and updated modeling data.

9.3 Data Integration and Management

New data from monitoring, land cover updates, and implementation tracking will be incorporated into plan revisions. SRWP will maintain a centralized GIS and data repository that compiles monitoring results, BMP locations, and load reduction estimates. This system will enable visualization of progress and facilitate more accurate modeling during updates.

9.4 Adaptive Management Framework

Adaptive management is central to plan maintenance, allowing continuous improvement based on monitoring feedback, stakeholder input, and evolving best practices. Each review cycle will include an assessment of BMP performance, pollutant reduction outcomes, and community engagement effectiveness.

Table 28. Adaptive Management

Adaptive Element	Description	Trigger for Adjustment	Responsible Party
Water Quality Targets	Adjust reduction goals or monitoring design.	Trends show insufficient improvement or new impairments appear.	SRWP / EPD
BMP Implementation	Modify type, location, or maintenance schedules.	Monitoring shows low BMP performance or maintenance issues.	SRWP / NRCS / City
Public Outreach	Refocus engagement strategy.	Declining participation or feedback indicates outreach gaps.	SRWP / County Partners
Funding Strategy	Seek alternative or supplemental sources.	Reduced funding availability or new grant opportunities arise.	SRWP / Local Gov.

9.5 Institutional Sustainability

Sustaining watershed management efforts over time requires stable leadership, funding, and community involvement. The SRWP will continue to act as the central coordinating entity, supported by its member organizations, local governments, and partner agencies. Long-term institutional sustainability will be achieved through diversification of funding, expansion of volunteer programs, and integration of watershed protection into local planning frameworks.

Table 29. Future Project Endeavors

Sustainability Strategy	Implementation Approach	Example / Partner
Funding Diversification	Apply for multi-source funding (319, NRCS, foundations).	EPA, GA EPD, Trout Unlimited
Capacity Building	Train volunteers and municipal staff for long-term BMP maintenance.	SRWP, County Extension
Policy Integration	Incorporate watershed priorities into local land-use and zoning ordinances.	County / City Planners
Partnership Expansion	Engage businesses and civic groups in sponsorship or volunteer programs.	Local Chamber of Commerce

9.6 Summary

Plan maintenance and updates will ensure that the Soque River Watershed Protection Plan remains effective, responsive, and science-based. Through ongoing data integration, adaptive management, and sustained partnerships, SRWP and its collaborators will maintain progress toward long-term water quality restoration and protection objectives.

Section 10: References

10.1 References

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