Soque River
Watershed Protection Plan

Prepared by the
Soque River Watershed Partnership

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Partners:

North Georgia Technical College
GA DNR Wildlife Resources Division
City of Cornelia
Habersham Co. Chamber of Commerce
GA Poultry Federation
City of Baldwin
Natural Resources Conservation Service
Fieldale Farms
GA Soil & Water Conservation Commission
Habersham / White Co Homebuilders Association

UGA Cooperative Extension
GA Forestry Commission
U.S. Forest Service
City of Demorest
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Upper Chattahoochee Riverkeeper
City of Mount Airy
Chestatee-Chattahoochee RC&D
GA Mountains RDC

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EXECUTIVE SUMMARY

The Soque River is the northeastern-most tributary of the Chattahoochee River and has a number of beneficial uses both locally and regionally within the State. The river serves as the drinking water source for the City of Clarkesville and tributaries to the river provide water for other localities in Habersham County. Additionally, the river supplies an estimated 1/6 of the inflow to Lake Lanier, the major drinking water reservoir for the City of Atlanta. The Soque is also renowned for the recreational opportunities it provides; primarily fishing. The watershed covers approximately 160 square miles and rests wholly within Habersham County, thus presenting a unique opportunity for watershed protection and management while avoiding jurisdictional conflicts.

As in much of Georgia, rapid population growth in Habersham County is expected to increase the demand for water supplies while adding stressors to aquatic systems. The Georgia Department of Community Affairs documented a 30% increase in the population of Habersham County between 1990 and 2000 (GADCA 2006). Growth estimates by the State Office of Planning and Budget forecast an additional 37% increase in population in the County between 2000 and 2015 (GAOPB 2005). These figures together represent a near doubling of the population of the county in a 25 year span.

The Soque River Watershed Partnership (the Partnership) was formed to take advantage of the opportunity for local protection of water resources and in response to water quality concerns and the anticipated impacts of rapid growth in the watershed. The Partnership is comprised of numerous local and state agencies and organizations and is guided by a Steering Committee of stakeholders and a Technical Advisory Committee of scientific and resource professionals. Partnership formation was driven by a concern for the sustainability of local water supplies and the identification of impaired waters in the watershed.

Recent surveys by the Georgia Environmental Protection Division (GAEPD) and the United States Environmental Protection Agency (USEPA) identified stream segments in the watershed that do not meet state water quality standards. These stream segments have subsequently been placed on the State's 303(d) list of impaired waters. Specifically, two segments of the Soque River (totaling 35 miles) are not supporting designated uses due to violations of the fecal coliform bacteria standard from unspecified non-point source (NPS) pollution. Additionally, two segments of Hazel Creek (totaling nine miles), a tributary to the Soque, are not supporting designated uses due to NPS sediment impacts on instream habitat and biota (GAEPD 2008).

In recognition of these water quality impairments from NPS pollution, the Partnership applied for and received CWA §319(h) funding from the USEPA and administered through GAEPD. The funding was to complete a comprehensive watershed assessment to document current biological, chemical, and physical conditions in the watershed. The data was then used to draft this watershed protection plan for use by citizens and municipalities to make informed decisions about the future use and protection of water resources in the watershed.

INTRODUCTION

The Soque River Watershed comprises 160 square miles, or 57% of the land area of Habersham County (Figure 1). The watershed is unique for its size in that it lies wholly within the boundaries of a single county. This presents a rare opportunity for local resource protection while avoiding jurisdictional conflicts.

The headwaters of the river flow from National Forest lands off of Tray Mountain and run together in the Blue Ridge Physiographic province (Level IV ecoregion 66d – Southern Crystalline Ridges and Mountains) to form the main-stem of the Soque. The river continues down through the Piedmont (Level IV ecoregion 45a – Southern Inner Piedmont) to the confluence with the Chattahoochee River. The Soque is the northeastern most tributary to the Upper Chattahoochee River (8-digit HUC 03130001).

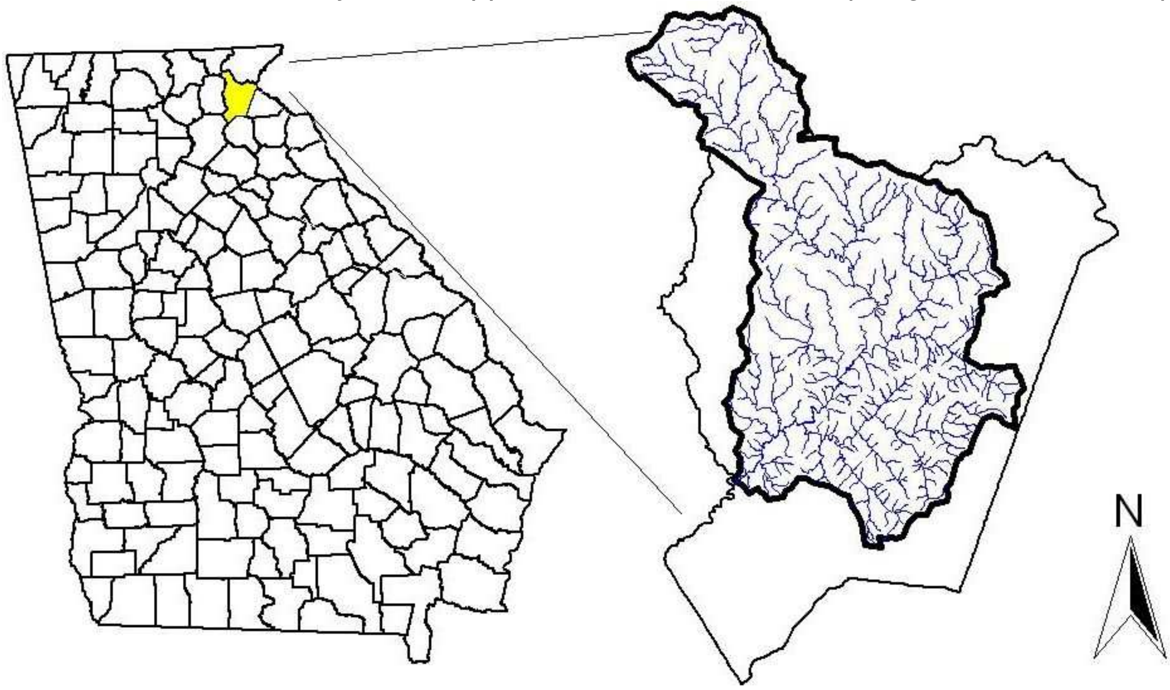


Figure 1. Location of Habersham County and the Soque River Watershed

The river serves as the water supply for the City of Clarkesville. Additionally, Hazel Creek and Camp Creek, tributaries to the Soque, supply water for the City of Cornelia. Other localities in Habersham County, the cities of Demorest and Baldwin, obtain drinking water from the Chattahoochee River below the confluence with the Soque. Municipal water supplies for Mount Airy and Alto come from groundwater wells within the watershed. Nearly every Habersham County resident who drinks water from a public supply drinks at least some water from the Soque River. The river is also important to the local economy. The two biggest sources of revenue in the county are agriculture and tourism – both highly dependant on the river and watershed, both for resource availability (agriculture) and aesthetic beauty (tourism). The Soque is also nationally renowned as a trophy trout stream, a status that requires high quality, clean water.

In response to problems already identified in several stream segments and threats from rapid development and other sources, a broad coalition of groups, known as the Soque River Watershed Partnership (SRWP), joined together to perform a watershed-wide assessment of surface water quality. This assessment was funded by a 319(h) grant awarded to the City of Clarkesville, which began in 2004 and concluded in March 2008. The purpose of that first-round 319 grant-funded project was to gather data needed to complete a Watershed Protection Plan, through which the Partnership can address the highest priority threats to water quality and watershed integrity.

Measures to eliminate pollution sources that have contributed to the designation of four stream segments in the watershed as "Impaired Waters" by the State of Georgia and the USEPA will be the highest priorities in this protection plan (Table 1). A map showing the impaired stream segments in red is also included in Figure 3. The goal of the plan is to implement management strategies to improve water quality in the listed stream segments to the point that they are removed from the list of impaired waters. Other streams and subwatershed areas will also be targeted as high priorities for corrective and protective actions, due to findings of significant water quality problems in those areas. Further, the corrective actions proposed here will carry out portions of the pertinent Total Maximum Daily Load (TMDL) implementation plans (State of Georgia, Recommended Tier 2 TMDL Implementation Plan: Hazel Creek; Recommended Tier 2 TMDL Implementation Plan: Soque River, Georgia Mountains Regional Development Center, 2004).

Table 1. Stream segments not supporting designated uses in the Soque River Watershed

Waterbody	Reach Location	Criterion Violated	Potential Cause	Designated Use	Extent
Soque River	Goshen Creek to SR 17, Clarkesville	Fecal Coliform	Non-point Source Pollution	Fishing	29 miles
Soque River	SR 17, Clarkesville to Chattahoochee	Fecal Coliform	Urban Runoff	Fishing	6 miles
Hazel Creek	Law Creek to Soque River	Biological Impairment – Macroinvertebrate from Sediment	Non-point Source Pollution	Fishing	5 miles
Hazel Creek	Reservoir No. 12 to Law Creek	Biological Impairment – Fish from Sediment	Non-point Source Pollution	Fishing	4 miles

Source: State of Georgia 2008 Draft 305(b)/303(d) List

All watershed protection and management strategies detailed in this plan should be evaluated and adapted to best meet local needs and ensure progress towards the attainment of water quality standards. Furthermore, action should not be limited to the contents of this plan. Other alternatives should be considered as additional information or resources become available.

WATERSHED CONDITIONS

For the purpose of this plan, the Soque River Watershed has been further divided into tributary subwatersheds (Figure 2). This division will enhance the identification, prioritization, and implementation of protection efforts and corrective actions. A summary of landcover for subwatersheds (and for the entire Soque River Watershed) used in this plan is included in Table 2. Subwatersheds will be listed in all tables in the order in which they enter the main-stem of the river from north to south.

Table 2. Area and landcover for subwatersheds of the Soque River

Subwatershed	Area (mi^2)	% Forest*	% Agriculture**	% Urban***
Headwaters	17.3	90.9	5.4	3.1
Raper Creek	9.6	91.2	4.2	3.7
Shoal Creek	9.8	82.9	5.9	6.5
Deep Creek	30.2	57.5	23.6	11.3
Beaverdam Creek	14.6	59.7	23.7	7.5
Hazel Creek	31.9	46.8	24.5	16.3
Yellowbank Creek	6.7	48.3	28.9	7.9
Total Watershed	**159.8**	**64.3**	**18.3**	**9.6**

*** % Forest includes deciduous, evergreen, and mixed forest**
**** % Agriculture includes pasture land, row crops, orchards, and vineyards**
***** % Urban includes low and high intensity residential, industrial, commercial, transportation, and utilities**

Physical, chemical, and biological data collected during the watershed assessment indicate significant relationships among those variables and landcover (Figure 4) in the watershed. For example, high levels of urbanization are strongly correlated with increasing fine sediment in streams and fewer numbers and types of benthic macroinvertebrates that are intolerant of NPS pollution. Conversely, heavily forested areas had less instream sediment and a greater diversity and abundance of stream organisms intolerant of pollution (SRWP, 2008). It is noteworthy that the landcover data used in the assessment are somewhat dated (NARSAL, 2001). It is expected that even more forested and agriculture lands have been converted to developed areas between then and now.

The assessment identified watershed areas and stream segments both in need of continued protection and corrective action. Primary sources of bacteria identified included livestock, humans, and urban runoff (domestic pets and humans). Sediment inputs were primarily attributed to land disturbing activities (improperly managed construction sites), streambank erosion, and dirt roads. NPS management measures will be targeted towards reducing pollutant inputs from these sources.

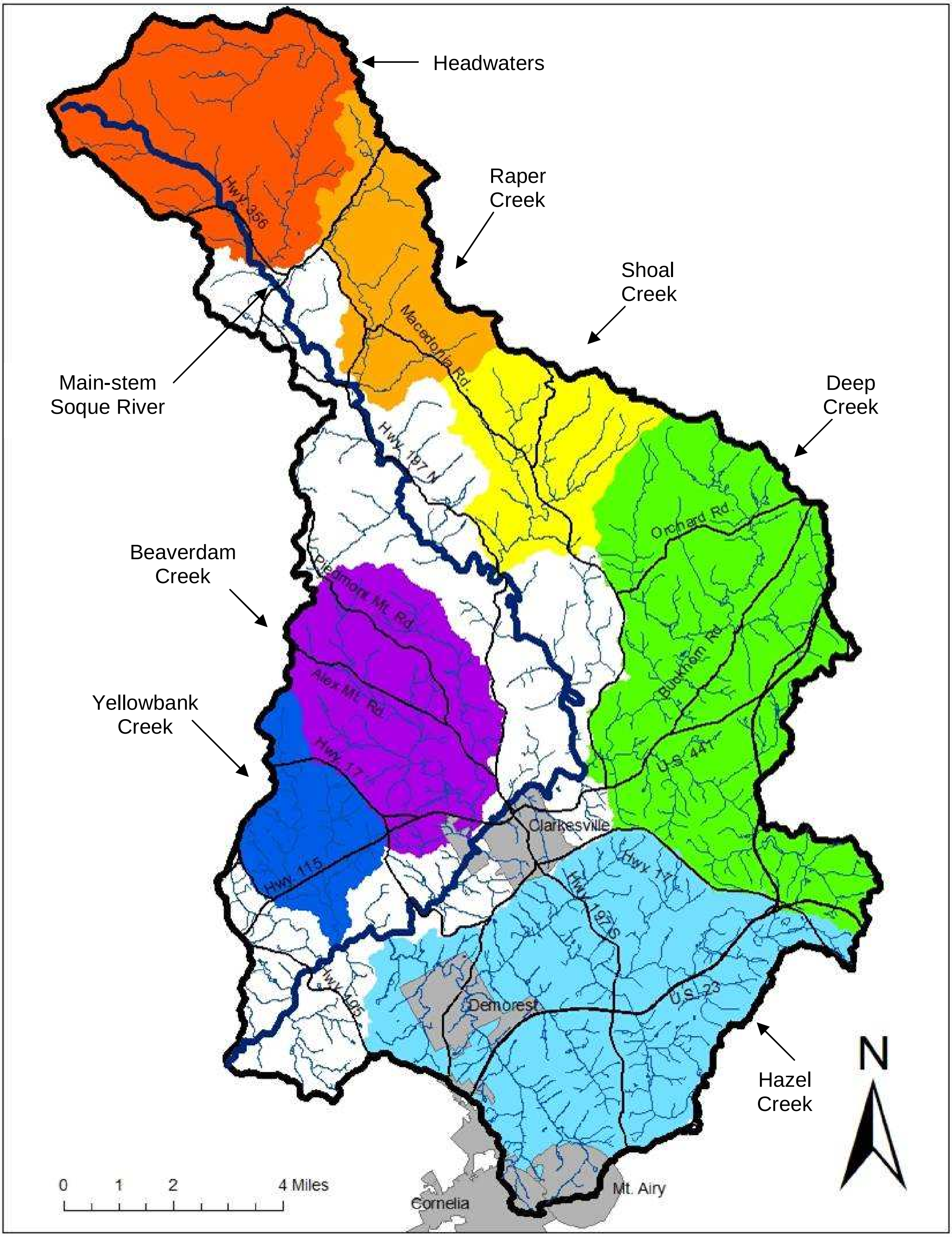


Figure 2. Subwatersheds of the Soque River Watershed

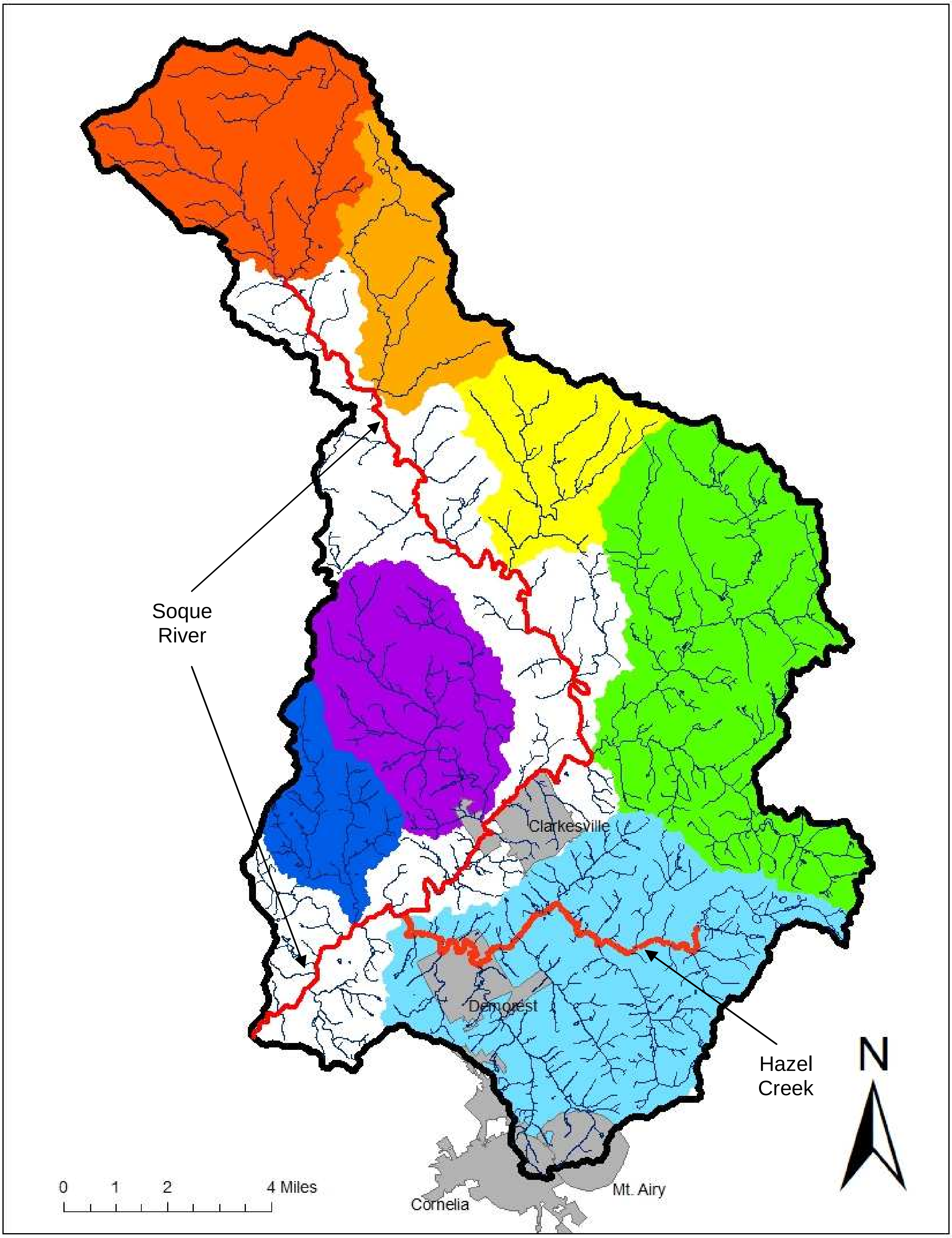


Figure 3. Stream segments not meeting designated uses (impaired)

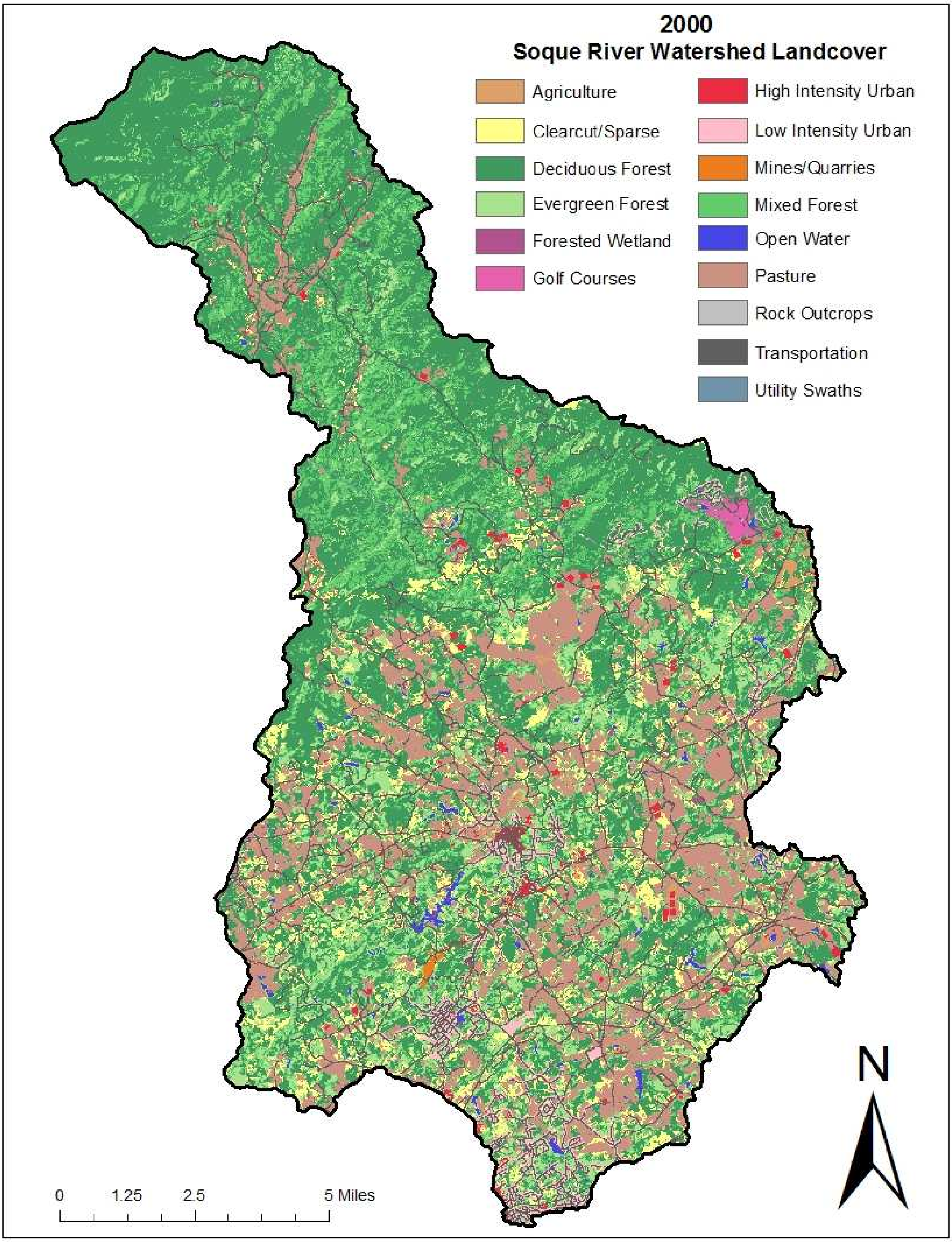


Figure 4. Landcover in the Soque River Watershed

POLLUTANT SOURCES AND CAUSES

Source assessments for this plan focus on fecal coliform bacteria and sediment, the causes of the failure to meet designated uses and water quality standards. Potential pollutant sources were considered and evaluated using data collected during the watershed assessment. Potential sources of bacteria include wildlife, livestock, humans, pets, broken sewer lines and overflows due to rain events, point source discharges (Figure 6), and failing septic systems. Potential sources of sediment include all land disturbing activities, streambank erosion, and dirt roads.

Bacterial samples were taken quarterly at 76 sites in the watershed over a period of two years, and *E. Coli* was used as an indicator organism indicative of the level of bacterial pollution (Figure 5). Tributaries draining to the upstream listed Soque River reach (29 mile segment) include the Headwaters, Raper Creek, Shoal Creek, and Deep Creek. The three remaining major tributaries drain to the downstream listed reach of the Soque (6 mile segment). Data were evaluated using a geometric mean for comparison with USEPA recommended levels for *E. Coli* (126 colony forming units / 100 mL of water) (Table 3). Bacterial load reductions were estimated for each sample point in the subwatershed under consideration and loads were modeled for comparison with actual data. Corrective actions to reduce bacterial inputs will be prioritized using these data.

Table 3. Bacterial sample sites by subwatershed

Subwatershed	Total Sites (n)	# Impaired Sites	% Impaired
Headwaters	8	1	12.5
Raper	9	2	22.2
Shoal	11	7	63.6
Deep	14	8	57.1
Beaverdam	9	7	77.8
Hazel	17	13	76.5
Yellowbank	8	8	100.0
Total Watershed	**76**	**46**	**60.5**

Sediment data (suspended sediment concentration) were collected as baseflow and stormflow throughout the subwatersheds and on the mainstem of the Soque River. Although Hazel Creek is the only stream in the watershed listed for sediment impacts on biota, excessive erosion and sedimentation is a concern throughout the watershed. Sediment loads generally increased from north (more forested) to south (more disturbed) in the watershed (Table 6). Excess sediment has many detrimental effects on aquatic life and increases the cost to treat drinking water. Corrective actions will focus on lands that drain to Hazel Creek, but will also be undertaken where sediment inputs are identified elsewhere. It is understood that education will be necessary for property owners and land disturbers to effectively reduce sediment inputs over time.

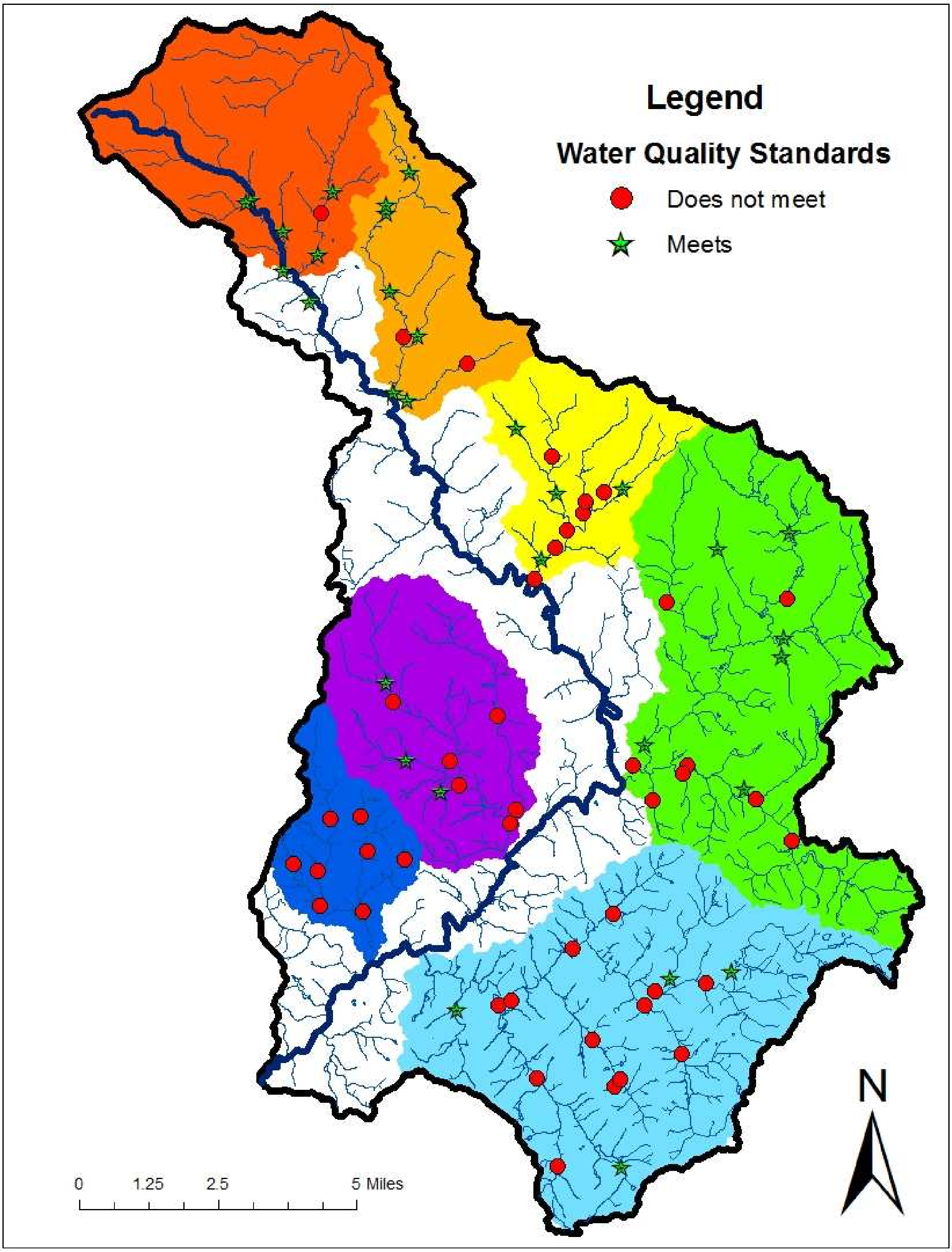


Figure 5. Bacterial sample locations

POLLUTANT LOAD REDUCTIONS

Pollutant load reduction estimates needed to meet water quality standards for fecal coliform bacteria and suspended sediment were modeled, calculated and compared with field collected data to refine prioritization of corrective actions. Necessary load reductions will be discussed as pollutant specific. However, it is anticipated that management and protection strategies will address both bacteria and sediment in many instances.

BACTERIA

Fecal coliform bacteria data for the entire Soque River Watershed were modeled using the Bacteria Source Load Calculator (Virginia Tech, 2007), which requires user defined inputs for potential pollutant sources. These input data were gathered from the Georgia Department of Natural Resources Wildlife Resources Division (wildlife), University of Georgia Cooperative Extension (livestock), Habersham County Health Department (septic systems), and the Georgia Department of Community Affairs (human population). Fecal coliform production loadings from various sources are found in Table 4. It is assumed that the agricultural and wildlife contributions are higher in more forested and agricultural areas of the watershed and that urban contributions (humans and pets) are more significant in rapidly developing areas with more impervious surfaces.

Table 4. NPS fecal coliform production loadings – entire Soque River Watershed

Source	Loading	% of total
Agriculture	$4.88Ex10^{15}$	49.1
Wildlife	$7.36Ex10^{14}$	7.2
Human	$2.21Ex10^{15}$	22.2
Pet	$2.10Ex10^{15}$	21.0

Model results do provide a starting point to prioritize management decisions. In this case, more specific watershed data are available from the watershed assessment. To further refine the available control measures and corrective action locations, field collected data were analyzed by subwatershed. The results of needed load reduction percentages, based on bacteriological sample data, are included in Table 5. Maps prioritizing remedial sites by subwatershed, and associated load reductions needed for each site, may be found in Appendix A.

Table 5. Bacterial load reductions needed to meet water quality standards by subwatershed

Subwatershed	# Impaired Sites	Range (% Reduction)	Mean (% Reduction)
Headwaters	1	63.4 (one site)	63.4
Raper	2	7.0 – 78.6	42.8
Shoal	7	6.4 – 84.6	46.8
Deep	8	34.6 – 87.9	53.5
Beaverdam	7	26.5 – 90.4	59.3
Hazel	13	8.9 – 86.0	54.3
Yellowbank	8	13.9 – 92.6	68.1
Total watershed	**46**	**6.4 – 92.6**	**60.5**

SEDIMENT

Sediment load reductions were derived using data from a recent United States Department of Agriculture Study (USDA, 2006). In that study, the Chattahoochee River at Cornelia, below the confluence with the Soque River, was estimated to yield 147.6 tons/year/mi^2. Using that value for the Soque River Watershed, and accounting for landcover variables, it is possible to estimate the contribution of the subwatersheds in this study to the overall load. A breakdown of suspended sediment yield and load estimates by subwatershed is included in Table 6. According to the Hazel Creek TMDL Implementation Plan, the sediment load in that subwatershed needs to be reduced by 60% to meet unimpaired standards for habitat and biota (GMRDC, 2004a). Due to existing and potential future landcover variables, it is anticipated that some subwatersheds will require less attention (Headwaters, Raper, and Shoal) while others will need extensive management and protection measures (Hazel and Yellowbank particularly) to reduce sediment loads to acceptable levels.

Table 6. Suspended sediment yield and load by subwatershed

Subwatershed	Yield (tons/year/ mi^2)	Load (tons/year)
Headwaters	104.8	1813
Raper	104.8	1006
Shoal	115.1	1128
Deep	165.3	4992
Beaverdam	159.4	2327
Hazel	202.2	6450
Yellowbank	196.3	1315
Whole watershed	**147.6**	**23586**

Additionally, sediment load reductions were calculated for planned BMPs using the EPA's Region V Model. This program contains calculations for five different BMP categories; gully stabilization, bank stabilization, agricultural fields, feedlots, and urban runoff. The model is based on the Universal Soil Loss Equation (USLE). The USLE estimates soil loss in tons/year. These predictive estimates are based on factors that cause soil loss and rainfall runoff. Assumptions and methodologies used for the Region V Model inputs are included below:

1) The three most common classes of BMPs to be installed will be bank stabilization, agricultural fields, and urban runoff. Estimated load reductions will be calculated for these practices.
2) The rainfall factor, **R**, quantifies rainfall energy and intensity. The R factor used for this model was obtained from the Georgia Soil and Water Conservation Commission's Manual for Erosion and Sediment Control (GSWCC, 2002). The R factor for Habersham County (and the entire Soque River Watershed) is **300**.
3) The soil erodibility factor, **K**, depends on soil type. Descriptions of major soil associations in the Soque River Watershed may be found in Appendix B. The K factors for the majority of soils in watershed priority areas have values ranging from .13 - .38. An average K factor value of **.26** will be used to calculate load reductions for the model.

4) The topographic factor, **LS**, accounts for length and steepness of land slope. This value is site specific and will have to be determined on a case by case basis at specific BMP locations. Slopes in the Soque River Watershed range from 0-60%. Many of the BMP practices will be installed adjacent to streams on floodplain terraces (within 100 feet of stream channels) with slopes towards the lower end of this range. For load reduction calculations, an average of 12% slope steepness and 100 foot slope length will be used. The resulting LS factor for the model will be **1.80** (GSWCC, 2002).
5) The cover or crop management factor, **C**, depends on ground cover present. The C factor for continuous fallow condition is 1.00. Any ground cover present reduces the C factor value. Because row crop agriculture in minimal in the watershed, most BMPs will be installed on grazing pasture land for beef cattle. The default C factor value used to calculate load reductions for Habersham County is **.20**, but will be adjusted to represent cover for specific BMP locations.
6) The practice support factor, **P**, represents the ratio of soil loss with a specific management practice versus up-and-down slope farming. P factors are only used in USLE calculations for row crop agriculture. For all other land uses, the P value is always 1.00 (GSWCC, 2002). Because row crop agriculture is minimal in the watershed, a P factor value of **1.00** will be used to model load reductions.
7) For urban runoff calculations, total suspended solids (TSS), will be used as a proxy to estimate sediment load reductions in the Hazel Creek watershed. Acreage of landcover types in the Hazel Creek drainage area are derived from the 2000 Landcover Map of Georgia (NARSAL, 2001). It is anticipated that load reductions will be similar in other parts of the Soque River Watershed where urban BMPs are installed (depending on landcover). It is also expected that the reduction in sediment will also lead to reductions in other urban runoff constituent pollutants including BOD, COD, lead, copper, zinc, TDS, and nutrients (phosphorus and nitrogen).
8) All targeted priority BMP installation sites are subject to landowner cooperation.

Table 7. Farm project load reductions

Best Management Practice	Sediment Load Reduction (tons/year)
Cattle exclusion	338
Streambank protection	108
Critical area planting	188
Filter strips	6

Table 8. Urban runoff load reductions – Hazel Creek Watershed

Best Management Practice	Sediment Load Reduction (TSS lbs/year)
Vegetated filter strips	3,925,606
Grass swales	3,495,403
Infiltration device	5,054,890
Settling basin	4,382,698
Infiltration basin	4,033,157
Porous pavement	4,839,789

BMPs to be installed during the three year Soque River Watershed Protection Plan implementation grant period are included in the next section, NPS Management Measures. It is assumed that additional BMPs will need to be designed, installed, and maintained within the 10-15 years following the implementation grant to meet needed load reductions and water quality standards, particularly for sediment affected areas. A list of proposed BMPs for long term implementation is included in Table 10 in the Implementation Schedule section of this document.

NPS MANAGEMENT MEASURES

Achievement of the estimated load reductions needed to attain water quality standards and promote the integrity of aquatic life will require multiple concurrent resource protection and management strategies. Specific projects will be considered on a case by case basis among the subwatersheds with the highest priority needs. The goal of this plan is to implement measures to greatly reduce or eliminate pollutant sources resulting in progress towards attainment of desired water quality standards. Many of these best management practices (BMPs) will be designed, installed, and maintained as part of a system of measures to control pollutants – not as stand alone practices. As priority sites are identified for protection and corrective action, site-specific conditions will be evaluated and recommendations made to best control pollutants by cost-effective measures in that particular situation.

A number of specific sites were identified during the watershed assessment that require attention to reduce pollutant loads (Figures 6 and 7). As part of the upcoming Clean Water Act § 319(h) implementation grant, entitled *Soque River Watershed Protection Plan Implementation*, the Partnership will begin addressing these sites and adapt strategies as new data and information become available to achieve desired goals. Specific project activities at these sites over the next three year grant period are included below.

<u>Bacterial Pollution Control</u> – Through our monitoring program, we have measured high bacterial levels in each of five subwatersheds within the Soque watershed. These include: Beaverdam Creek, Deep Creek, Shoal Creek, Yellowbank Creek, and Hazel Creek. The Deep Creek and Shoal Creek subwatersheds feed the Soque River in the 29 mile segment listed for fecal coliform bacteria pollution. The other three are tributaries to the River in the downstream listed 6 mile segment. By taking bacterial samples from 8 to 17 sites within each subwatershed (dependant upon subwatershed size and access), we have narrowed down the potential areas of impact on stream quality from pathogens in each area. Upstream of each site with consistently high bacterial counts, we have begun identifying specific causes for the contamination. In many of these cases, we know that cattle in streams and cattle stream crossings are contributing to water quality problems. We also are seeking to identify failing residential drain fields and other possible sources of fecal coliform bacteria in each targeted watershed area. We will continue to identify even more specific sites likely contributing these types of pollution. We plan to identify a number of sites in each of these subwatersheds where we can work with landowners to do one of two measures. For farms, we will install fencing and alternative water sources to get cattle out of streams and improve or eliminate stream crossings. Fencing will also allow for the reestablishment of stream buffers to filter pollutants from overland runoff. For residential sites with failing or problem drain fields, we will make repairs or replace system components to eliminate leakage to surface waters.

The upstream listed segment of the Soque River is drained by 4 major subwatersheds, two of which contribute relatively little to total bacterial loading (Headwaters and Raper Creek). Therefore, we will concentrate our efforts for the upstream segment in the two remaining subwatersheds, Shoal Creek and Deep Creek. In the Shoal Creek subwatershed, we have already identified a farm where we will work with owners to provide fencing and alternative water supplies. We have also identified two more with whom we intend to work on similar projects. As the Shoal Creek drainage is relatively small and contains a very large percentage of national forest land, we believe these projects could eliminate the bacterial problem identified there, to the extent possible. In the Deep Creek subwatershed, which is a much larger area and includes another relatively large tributary named Glade Creek, we plan to address at least 5 farm and/or septic tanks projects. As stated above, we have pinpointed the specific portions of this drainage that contribute to the high bacterial levels and have begun to identify landowners with whom we can work. We expect that these projects in the subwatersheds that drain to the upstream listed portion of the Soque River can eliminate much of the bacterial pollution that contributed to its listing and could allow its removal upon completion.

The major subwatersheds draining to the lower listed segment of the Soque (Yellowbank, Beaverdam, and Hazel Creeks) each have a number of bacterial problems and certainly contribute to the failure to meet water quality standards of the Soque's lower reaches. Therefore, we will complete farm and/or drain field projects in these subwatersheds also. The Yellowbank drainage is the smallest of these three but shows some of the highest bacterial counts in our sampling and we will target at least 4 sites in this area. Beaverdam Creek's drainage is somewhat larger, but we believe that addressing 4 additional sites there can have a significant affect on the problems in that subwatershed. Hazel Creek subwatershed is large and very heavily impacted. As described below, we will also be addressing sediment inputs to Hazel Creek and those projects will likely include bacterial pollution reductions also. In addition to those two projects, we plan to address at least 3 more aimed particularly at fecal coliform pollution sources, for a total of 5 in the Hazel Creek area. Overall then, we propose to complete at least 20 corrective actions in these 5 subwatersheds to eliminate sources of fecal contamination in the Soque River and its tributaries.

<u>Sediment Pollution Control</u> – In the portion of the Hazel Creek drainage that contributes to the segment listed as an "impaired" water body, we propose to install measures to stabilize stream banks and then reestablish vegetative buffer zones along the streams. We have identified a number of potential sites already, including ones on Little Hazel Creek, Law Creek, and an unnamed tributary adjacent to the Law Creek drainage. In some of these areas there is major bank instability and sloughing of dirt into the stream channel during higher flows. We will install tree revetments, tree plantings or other measures as appropriate for each of two sites in this subwatershed to alleviate these sources. Armored reinforcement of the banks (such as rip-rap) will be used only as a last resort, and will be integrated as much as possible with vegetative solutions. We will work with technical experts from County government, the NRCS, USEPA, and others to design these installations to be most effective and sustainable. We will also do plantings, using native plant species wherever possible, to reestablish adequate buffer zones along these stream segments. Silvicultural activities, while not widespread in Habersham County, should be considered as a potential source of sediment. All such activities should be conducted in accordance with G*eorgia's Best Management Practices for Forestry* (Georgia Forestry Commission, 1999).

<u>Stormwater Management Measures</u> – Also in the Hazel Creek drainage area, we will identify at least two sites where we can work with land owners to install rain gardens

and/or storm water management measures. These measures will slow runoff and lessen the drastic impacts from increased magnitudes and frequencies of runoff events that have resulted from greater urbanization and impervious cover. Stormwater BMPs are targeted first towards reducing and preventing pollutants associated with runoff and then with treating or filtering the stormwater to reduce NPS pollutants delivered to streams.

The BMPs listed below are grouped according to the target pollutant for reduction, however, it is anticipated that a number of management practices will result in the effective reduction of both fecal coliform bacteria and suspended sediment loadings. These BMPs will be used to address the target area "hot spots" identified during the watershed assessment. In addition to these target pollutants, control and management measures to address stormwater runoff are included as options. Decreasing the volume of this runoff from urbanizing areas is expected to reduce the concentration of target (and many other) pollutants delivered to streams as well as lessen excessive erosion that comes with periodic high flows associated with increasing area of impervious surfaces. Descriptions of various BMPs that may be used to control or eliminate pollutant sources are included below and were obtained from four primary sources and are all based on Natural Resources Conservation Service (NRCS) Practice Standards:

1) Georgia Soil and Water Conservation Commission *Best Management Practices for Georgia Agriculture*, 2007
2) U.S. Environmental Protection Agency *National Management Measures to Control Nonpoint Source Pollution from Urban Areas*, 2005
3) U.S. Environmental Protection Agency *National Management Measures to Control Nonpoint Source Pollution from Agriculture*, 2003
4) Georgia Soil and Water Conservation Commission *Field Manual for Erosion and Sediment Control in Georgia, 4th edition,* 2002.

FECAL COLIFORM BMPs

Alternative Water Sources – includes using troughs and tanks to provide livestock with watering sources away from streams to reduce direct fecal coliform contribution and associated erosion. This measure is often used in conjunction with exclusion fencing.

Exclusion Fencing – provides barriers to prohibit livestock from freely entering streams. Allows for periodic "turning out" of animals to graze in the vegetated buffer for short periods of time thus controlling areas where fecal loadings are present.

Critical Area Planting – establishes permanent vegetation (preferably native plant material) in highly erodible areas to reduce sediment and filter bacteria. Critical area plantings may reduce sediment runoff by as much as 75%.

Riparian Herbaceous Cover – uses grasses, forbs, and trees directly on banks to protect wildlife habitat, provide wildlife habitat, and to stabilize streambanks and channels.

Riparian Forest Buffers – uses trees, shrubs, and grasses to filter surface runoff prior to entering streams. This practice can reduce sediment loads in surface runoff by 50-75%.

Filter Strips – are vegetated areas between cropland, grazing land, or disturbed areas and surface waters to protect water quality. Filter strips may remove as much as 50-80% of nutrients and sediment from surface runoff.

Stream Crossings – provide a stable streambed and reduce erosion where livestock must access streams.

Nutrient Management – assists growers and producers in improving farm management and litter or manure application strategies.
Animal Waste Storage – include composters and stack houses for manure and litter storage. Proper composting reduces viable bacteria and nutrient concentrations.

Septic System Repair – reduces fecal coliform loads where on-site sewage disposal systems are not properly designed, installed, or maintained.

Sewer Inspections – can prevent and detect bacterial loading from broken pipes or overflowing manholes. This practice includes the removal of storm drains that are hooked to sanitary sewers which may overwhelm the capacity of the sewer during periods of heavy rains resulting in overflows.

SEDIMENT BMPs

Heavy Use Area Protection – reduces sediment and bacterial runoff by protecting areas with heavy livestock traffic such as troughs and feeding areas.

Pasture and Hayland Planting – prevents soil erosion by establishing native vegetation (preferable) or introduced forages in fields or pastures.

Grassed Waterways – are natural channels to slow the flow of water, remove excessive sediment and nutrients, and prevent gully erosion.

Field Borders – are permanently vegetated buffers around pastures to reduce soil erosion.

Conservation Cover – is the establishment of permanent vegetative cover to prevent erosion and protect water quality on retired agricultural land.

Prescribed Grazing – manages grazing animals for long term benefits; promotes vegetative quality and quantity and reduces erosion.

Streambank and Shoreline Protection – stabilizes and protects streambanks to reduce erosion and prevent water quality degradation.

Stream Channel Stabilization – strengthens or stabilizes the bed or bottom of the channel in very specific instances when normal protection and riparian buffers are inadequate to protect water quality.

Tree/Shrub Establishment – slows runoff and allows for increased infiltration of runoff, thus reducing pollutant concentrations.

STORMWATER BMPs

Many urban stormwater BMPs are available and should be considered on a site specific case by case basis (USEPA, 2005). The importance of proper site design and consideration of new construction is vital, however there are also things that can be done in already developed areas to minimize and treat runoff. There are two broad categories of stormwater BMPs that will be considered under this plan: 1) BMPs that prevent runoff, and 2) BMPs that treat stormwater to remove potential pollutants before they reach streams. There are many excellent publications and resources available on BMP selection, installation, and maintenance. The measures indicated here are not exhaustive. Additional research is recommended to refine this menu of selections.

Runoff Prevention BMPs – are the most effective measures to control NPS pollution. It is much easier to prevent pollution than to address problems where pollution has already occurred. These measures are aimed at preventing runoff and subsequent pollutant transport and include:

Impervious surface reductions – through street and parking lot design and the use of new technologies like permeable pavement and green roofs.

Construction practices – to ensure that grading and clearing are done appropriately and that a system of BMPs is considered prior to development. This includes measures for mass grading, sequencing development, and maintaining the proper site specific BMPs.

Soil erosion control on exposed soils – using mulches, blankets and mats, vegetative measures, structural methods, inlet protection, silt fence, check dams, and temporary sedimentation basins or traps (GSWCC, 2002).

Stormwater Treatment BMPs – are designed to remove pollutants carried in runoff before they reach surface waters and include:

Infiltration systems –promote rainfall infiltration prior to runoff. These measures include basins, trenches, and rain gardens. When more water soaks in, less runs off (and fewer pollutants are delivered to streams).

Filtration systems – to remove excess pollutants from stormwater runoff by bioretention, filter strips, and maintenance of stream buffers.

Retention and Detention systems –retain pollutants and detain stormwater for release more slowly over time. These measures can help reduce stormwater volume and pollutant concentration and help prevent harmful effects of stormwater on aquatic life.

Table 9. BMPs for short term (3 year) implementation

Best management practice	Estimated number needed	Critical area affected
Cattle exclusion	10	50 – 75 head per BMP = 500-750 livestock excluded; @ 5000 linear ft. streambank protected
Streambank protection	4	100 ft. x 25 ft. each BMP = 2500 ft^2 each BMP = 10,000 ft^2
Filter strips	3	1 acre each BMP = 3 acres
Heavy use areas	2	¼ acre each BMP = ½ acre
Critical area planting	1	5 acres
Stormwater demonstrations	2	½ acre each BMP = 1 acre
Streambank restoration	2	2500 ft. each BMP = 5000 linear ft.

Other BMPs from the suite of options on the preceding pages will be evaluated for use and installation on a case by case basis. Many of the BMP selections will be site specific and will depend on property owner cooperation and project priorities. The short term implementation plan above will be amended as appropriate to meet the needs of property owners and further progress towards attainment of water quality goals.

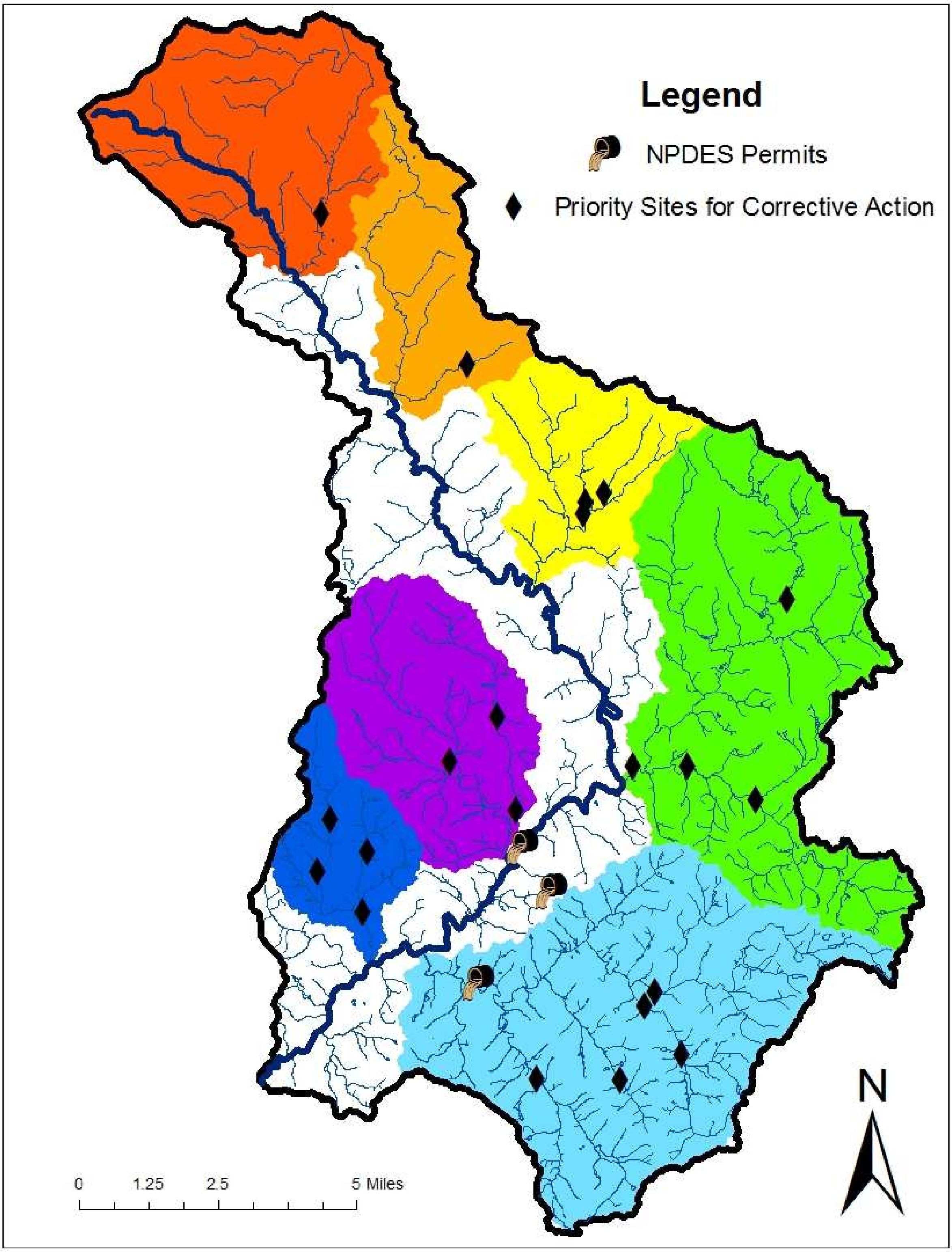


Figure 6. NPDES permitted discharges and priority sites for corrective action (bacterial)

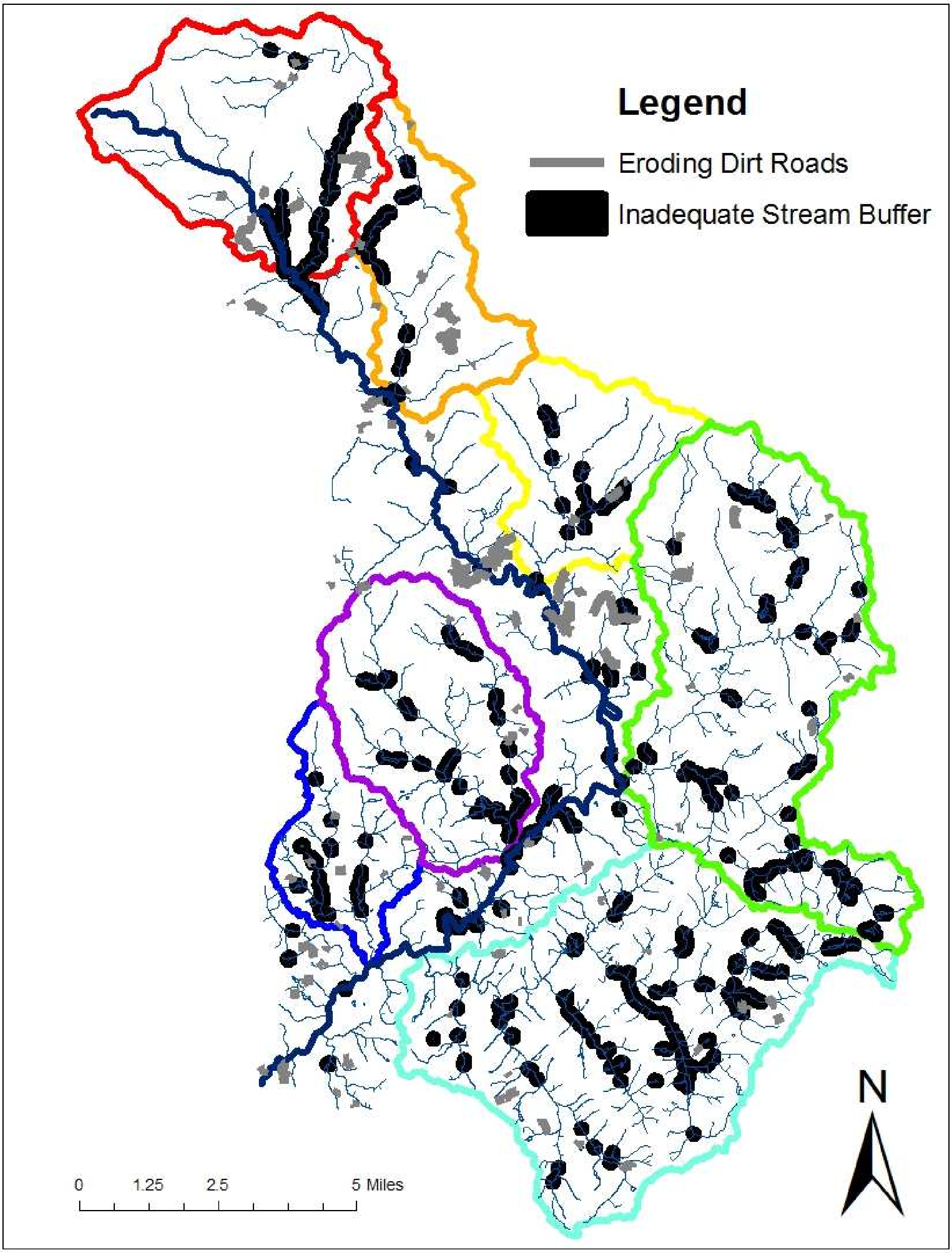


Figure 7. Priority sites for corrective action (Sediment – dirt roads and streambank erosion)

EDUCATIONAL COMPONENT

Public education about water quality threats and methods of resource protection are an essential component of this plan. The educational component will include measures aimed at increasing public awareness of water quality problems and providing solutions. Specific attention will be paid to working with middle school aged children to increase their knowledge of water related issues. Additionally, homeowners will be targeted and encouraged to take control of their stormwater to reduce runoff and increase infiltration. Examples and demonstrations of simple BMPs for residential stormwater will be provided to encourage their implementation. Specific components of the educational program will include:

- Articles about water quality issues in Partnership member newsletters and the local newspaper
- Continued work with GA Cooperative Extension and the 4-H program on water related curriculum and homeowner BMPs
- Classroom and lab activities with children in the local school system
- Speaking engagements with local community and civic groups
- Purchase of an EnviroScape to demonstrate principles of non-point source pollution in schools and for civic groups
- Additions to the Partnership website with educational links for teachers to serve as a clearinghouse of water quality information
- A yearly field day for all Habersham County 6th graders with 8-10 stations covering different aspects of water quality (e.g. macroinvertebrates, chemistry, fish, buffer zones, importance of clean water etc.)
- A summer day camp for 7th and 8th graders who show an interest in the environmental sciences (based on recommendations from local science teachers). Potential activities include tours of water treatment facilities, trips to local farms to look at agricultural BMPs, field work with water chemistry and aquatic biology/ecology, estimating stream discharge etc.
- Public meetings to inform citizens about Partnership activities
- Fact sheets about BMPs that highlight successes
- Increased participation in Adopt-a-Stream (AAS) by local school, civic, and neighborhood groups. The SRWP Watershed Coordinator will become a certified AAS trainer and promote the program locally.
- Storm drain stenciling to increase awareness of the direct connections between runoff and surface waters
- Watershed signage and map programs funded by the Soque River Watershed Association to increase awareness of the watershed concept

IMPLEMENTATION SCHEDULE

Implementation of this plan will begin with the *Soque River Watershed Protection Plan Implementation* 319(h) grant in April 2008. This grant will run for a period of three years. Interim milestones for the grant are included in the next section. A revised implementation schedule will be developed during the grant period to reflect knowledge gained from additional monitoring. Sites for corrective action will be continually re-prioritized as problems are addressed and new information becomes available. Table 10 includes estimates of additional BMPs and associated costs that will likely need to be implemented during the 10-15 years following this implementation grant in order to meet water quality goals and designated uses.

Table 10. Additional BMPs for long term (10-15 year) implementation

Best management practice	Estimated number needed	Estimated cost
Cattle exclusion	35 Sites	$ 4,000 per site = $140,000
Streambank protection	25,000 ft^2	$1,000 per 100 linear feet = $250,000
Filter strips	150 acres	$350 per acre = $52,500
Heavy use areas	8 sites	$7,000 per site = $56,000
Critical area planting	125 acres	$2500 per acre = $312,500
Streambank restoration	20,000 linear feet	$5,000 per 1000 linear feet = $100,000
Buffer zone re-establishment	25 sites	$1,500 each = $37,500

INTERIM MILESTONES

MILESTONE	STARTING DATES	COMPLETION DATES
Execute contract with the Georgia Environmental Protection Division.	1/08	3/08
Sign Interagency Agreement Between SRWA, NGTC, and City of Clarkesville	1/08	3/08
Hire Contract Worker to Assist with Technical and Procedural Items with Corrective Actions	4/08	5/08
Corrective Actions Aimed at Bacterial Pollution – Farm Projects and Drainfields (20)	4/08	12/10
Stream bank stabilization and buffer zone restoration and enhancement projects (2)	4/08	12/10
Maintain and Improve Partnership Web Site	4/08	3/11
Environmental Field Day educational event for 6th Graders	4/08	4/10
Water Quality Monitoring Around Corrective Action Sites in Accordance With Existing QAPP	4/08	3/11
Steering Committee Meetings (2/year)	4/08	3/11
On-site Stormwater Management Measures Installed (2)	6/08	12/09
First Public Meeting	6/08	8/08
Submit semi-annual report for GRTS update (each February 28th and August 31st) Submit annual load reductions each August 31st.	8/08	3/11
Environmental Summer Camp for 7th & 8th Graders	7/09	7/10
Publish BMP Fact Sheets	9/08	1/11
Workshop and Brochure On Homeowner Stormwater Management Solutions	1/10	7/10
Second Public Meeting	8/10	1/11
Submit final project close-out report to the GAEPD and the USEPA for review and approval	3/11	3/11

MONITORING PLAN

All monitoring will be in accordance the Soque River Watershed Partnership Quality Assurance Project Plan (QAPP) used for the watershed assessment (approved by USEPA and GAEPD in January 2005). The QAPP contains Standard Operating Procedures for field data collection and laboratory analyses to ensure the quality of the data. In addition to data collected during the watershed assessment, it is suggested that fish data be added to the biological information already available.

Routine monitoring for sediment and bacteria will continue and we will work to refine "hot spot" locations for corrective action. The goal is to ensure that BMPs are implemented in places where they will result in water quality improvements and progress towards attainment of water quality standards and designated uses. In all cases where BMPs are installed or management measures implemented, both pre- and post- activity monitoring will occur (upstream/downstream). We will evaluate and assess physical, chemical and biological variables, as applicable, to monitor trends in stream habitat, water quality, and the biotic community. Parameters evaluated will include:

- Suspended sediment concentration
- *E. coli* bacteria levels
- Macroinvertebrate community structure and function
- Dissolved oxygen
- Stream temperature
- pH
- Conductivity
- Turbidity
- Quality of riparian habitat
- Quality of instream habitat

Additionally, fecal coliform bacteria analysis by a certified water/wastewater treatment operator from the City of Clarkesville will commence during the 2nd and 3rd years of the project. Special attention will be paid to stream segments currently listed for fecal coliform impairment. Samples will be collected and analyzed in accordance with GAEPD protocols for data acceptability for the 305(b)/303(d) list.

ADDITIONAL RECOMMENDATIONS

In addition to the specific implementation activities mentioned in this document, a number of local measures are available and recommended to enhance water quality protection. Many of these recommendations may be addressed thorough proper enforcement of existing laws and regulations (e.g. the Georgia Erosion and Sediment Control Act). The current draft Comprehensive Plan for Habersham County and associated localities contains a number of sections that deal with natural resource protection. The Comprehensive Plan should be used as a guide, in conjunction with this Watershed Protection Plan, for making decisions about the use and protection of water (and other natural) resources in the watershed and county. If not currently addressed, it is also recommended that municipalities investigate the possibility of local ordinances, guidelines, or mechanisms for:

- Mass grading
- Stream buffer protection
- Stormwater management
- Performance based zoning
- Protection of sensitive ecosystems and water supply watersheds
- Farmland preservation
- Water conservation and increased efficiency
- Limiting impervious surfaces
- Greenspace
- Slope restrictions for development
- Transferable development rights
- Land acquisition
- Conservation easements

Consideration in implementing local water quality and quantity protections must also be given to the Comprehensive Statewide Water Management Plan that recently passed as a resolution in the Georgia Legislature. Additional recommendations for citizens and localities will be added as applicable for the term of implementation of this grant and beyond. Model ordinances to address some of the issues above are available through the River Basin Center at the University of Georgia's Institute of Ecology (www.rivercenter.uga.edu). Additional codes and ordinances are available at www.stormwatercenter.net and www.municode.com. It is also recommended that the SRWP seek lessons learned from other watershed partnerships across the state and nation (e.g. the partnership to develop and implement the Etowah Habitat Conservation Plan). Finally, it is recommended that Habersham County and associated municipalities pursue funding, via the 319(h) grant program or some other mechanism, to increase staff dedicated to erosion and sediment control enforcement and educational opportunities for land disturbance permittees.

TECHNICAL AND FINANCIAL ASSISTANCE NEEDED

Funding for three years of implementation of the Soque River Watershed Protection Plan has been secured via a Clean Water Act § 319(h) grant administered through GAEPD. A project budget for the first three years of implementation is included in Tables 11 and 12. It is important that the work started during this time be continued over a longer period in order to meet the CWA goal to "restore and maintain the chemical, physical, and biological integrity" of surface waters in the Soque River Watershed. The total amount of funding needed to meet these goals is unknown at this time. The initial three year implementation will provide insight as to how much capital may be needed to meet and maintain the pollutant load reductions necessary to meet water quality standards. The SRWP will investigate additional sources of funding to achieve these goals (included below). More grant possibilities will be considered and researched during the implementation phase from available sources.

POTENTIAL FUNDING OPPORTUNITIES

<u>Flood Hazard Mitigation and Riverine Ecosystem Restoration Program</u> – U.S. Army Corps of Engineers – is a watershed based program to mitigate flood hazards and restore riverine ecosystems.

<u>Southeast Aquatic Resources Partnership</u> – provides funding for habitat plans for aquatic organisms.

<u>Partners for Fish and Wildlife Habitat Restoration Program</u> – U.S. Fish and Wildlife Service – provides technical and financial assistance to private landowners to restore or improve native habitats for fish and wildlife (may be used to restore riparian buffers and degraded wetlands).

<u>Five Star Restoration Program</u> – USEPA – provides challenge grants for restoration projects involving partnerships.

<u>River Network Partner Grants</u> – River Network – may be applied for by conservation groups (Soque River Watershed Association) to help build a volunteer base to implement protection and management strategies.

<u>Watershed Assistance Grants</u> – USEPA via River Network – to provide small grants to local watershed partnerships for organizational development.

<u>Water Protection and Conservation Grants</u> – Turner Foundation – to protect surface and groundwater from contamination

<u>Watershed Protection and Flood Prevention Program</u> – U.S. Department of Agriculture (USDA) – provides technical and financial assistance for watershed protection, water supply, water quality, erosion and sediment control, and fish and wildlife habitat enhancement.

<u>Georgia Wetlands and Stream Trust Fund</u> – to preserve wetlands or streams that need protection.

National Integrated Water Quality Program – USDA – to improve water quality through research, education, and extension activities.

Environmental Quality Incentives Program – USDA – for agricultural BMPs will help meet water quality goals.

Farm Bill Programs – USDA – include the Conservation Reserve Program and the Wetlands Reserve Program where farmers are paid to set aside environmentally sensitive lands from production.

Wildlife Habitat Incentives Programs – USDA - is a voluntary program for landowners to implement applicable wildlife habitat practices.

Technical Assistance to Develop and Implement Conservation Programs – USDA – to assist landowners in planning, designing, implementing, monitoring, and evaluating fish and wildlife habitat development projects in Georgia.

Local Funding – from municipalities to partner with local conservation and civic organizations for specific projects.

In addition to funding, the continued support of SRWP members is vital to the success of this project. Key elements of the technical assistance needed from partners are included in Table 13.

Table 11. Three year implementation project budget

Item	Object Class Category	319(h) Grant Funds	Non-Federal Matching Funds	Total
A.	**PERSONNEL:**			
	City of Clarkesville: One (1) City Clerk – 0.08 FTE ($38.6K/year) for 3 years (financial administration)	2,000	7,264	9,264
	One (1) City Manager – 0.05 FTE ($44.5K/yr) for 3 years (landowner relations, workshops, education)	0	6,675	6,675
	One (1) Water Works Superintendent – 0.05 FTE ($35.2K/yr) 3 years - (workshops, education, technical assistance)	0	5,280	5,280
	UGA Cooperative Extension Service: One (1) Natural Resources Agent – 0.2 FTE ($38K/yr) for 3 years (landowner relations, workshops, education, technical assistance)	0	30,400	30,400
	Chestatee-Chattahoochee RC&D: One (1) Project Manager – 0.05 FTE ($36,400K/yr) for 2 years (Technical advice, assistance, educational events)	0	3,640	3,640
	Habersham County: One (1) Inspector – 0.05 FTE ($35K/yr) for 3 years (technical advice, assistance, educational events)	0	5,250	5,250
	North Georgia Technical College: One (1) Horticulture Instructor – 0.05 FTE ($45K/yr) for 3 years (assistance with riparian plantings, streambank stabilization, educational events)	0	6,750	6,750
	One (1) Fisheries Instructor – 0.05 FTE ($38K/yr) for 3 years (technical assistance, monitoring assistance)	0	5,700	5,700
B.	**FRINGE BENEFITS:**			
	City of Clarkesville: One (1) City Clerk – 0.08 FTE – 33% for 3 years	0	3,057	3,057
	One (1) City Manager – 0.05 FTE – 33% for 3 years	0	2,203	2,203
	One (1) Water Works Superintendent - 0.05 FTE – 33% for 3 years	0	1,742	1,742
	UGA Cooperative Extension Service: One (1) Natural Resources Agent – 0.2 FTE – 33% for 4 years	0	10,030	10,030
	Chestatee-Chattahoochee RC&D: One (1) Project Manager – 0.05 FTE – 33% for 4 years	0	1,201	1,201
	Habersham County: One (1) Inspector – 0.05 FTE – 33% for 4 years	0	1,733	1,733
	North Georgia Technical College: One (1) Horticulture Instructor - 0.05 FTE – 33% for 3 years	0	2,228	2,228
	One (1) Fisheries Instructor - 0.05 FTE – 33% for 3 years	0	1,881	1,881
C.	**TRAVEL:** SRWA Ex. Director (100 miles/month @ $0.485/mile) (Site visits, educational events, public meetings)	0	1,746	1,746
D.	**EQUIPMENT:** N/A	0	0	0
E.	**SUPPLIES:** Newsletter Supplies	0	1,200	1,200

F.	**CONTRACTUAL:**			
	Soque River Watershed Association: Project Management Personnel: One (1) Project Manager – 0.4 FTE ($38K) for 3 yrs (project management and coordination)	37,620	7,980	45,600
	Chestatee-Chattahoochee RC&D: Technical Assistance Personnel: One (1) Project Consultant – 0.3 FTE ($33.3K) for 1 year (consultation and technical assistance with BMP installation and landowner relations)	9,990	0	9,990
	Laboratory Services: Pollutant Source Sample Analysis (bacterial ribotyping)	6,000	0	6,000
	Corrective Actions :			
	Bacterial Control (20 @ $9,000 each)	180,000	120,000	300,000
	Streambank Stabilization, Buffers (2 @ 15,000)	30,000	20,000	50,000
	Residential Stormwater Management (2 @ 5,000)	10,000	6,667	16,667
G.	**CONSTRUCTION**	N/A	N/A	N/A
H.	**OTHER:**			
	Interagency Agreement with North Georgia Technical College (Table 12)	170,476	29,143	199,619
	Printing:			
	Stormwater Management Brochure - (1,000 copies)	0	2,000	2,000
	Corrective Action Fact Sheets (1,000 copies)	0	2,000	2,000
	Educational Programs:			
	Enviroscape Display	1,200	0	1,200
	Field Day and Summer Camp Transportation and Supplies	0	4,421	4,421
	Volunteer Time at Events, Educational and Corrective Actions	0	8,000	8,000
I.	**TOTAL DIRECT CHARGES:** [Sum of A-H]	447,286	298,191	745,477
J.	**INDIRECT CHARGES:**	0	0	0
K.	**TOTAL:** [Sum of I and J]	447,286	298,191	745,477

Table 12. Budget for interagency agreement with North Georgia Technical College

Item	Object Class Category	319(h) Grant Funds	Non Federal Matching Funds	Total
A	Personnel:			
	One (1) Watershed Coordinator – 1.00 FTE ($40K/yr) 3 years - coordinate corrective actions, monitoring, educational efforts.	120,000	0	120,000
B	Fringe Benefits:			
	One (1) Watershed Coordinator – 1.00 FTE – 33% 3 years	40,000	0	40,000
C	Travel:			
	Watershed Coordinator (600 miles/month @ $0.485/mile)	10,476	1,969	12,445
D	Equipment:			
	Laptop Computer and Software	0	1,500	1,500
	GIS Software and Equipment (Arcview, Plotter)	0	1,500	1,500
	Monitoring Equipment: ISCO samplers (on loan) ($450 month) for 2 years	0	10,800	10,800
	Lab Equipment	0	1,000	1,000
E	Supplies:			
	Office supplies	0	1,350	1,350
	Field Supplies (nets, notebooks, waders, tape measure)	0	1,150	1,150
F	Contractual:	0	0	0
G	Construction:	N/A	N/A	N/A
H	Other:			
	Office Space for Watershed Coordinator (150 sq ft $1.36/sq.ft + internet access = $204/month for three years)	0	7,344	7,344
	Local telephone ($25/month)	0	530	530
	Conference Facilities (Public Meetings, Workshops)	0	2,000	2,000
I	Total Direct Charges: (Sum of A-H)	170,476	29,143	199,619
J	Indirect Charges:	N/A	N/A	N/A
K	Total: (Sum of I and J)	170,476	29,143	199,619

Table 13. Roles and responsibilities of participating partner organizations

Organization	Responsibilities
City of Clarkesville	Serve as lead organization. Formation of memoranda of agreement and interagency contracts with other parties. Financial administration of grant funds. Provide support for public information efforts, assist with site identifications and landowner contacts, contributions to matching funds, participation on Steering Committee
Soque River Watershed Association	Project manager and chair of Partnership Steering Committee. Development of educational and informational materials and workshops. Spokesperson for Partnership. Supervise and work with Watershed Coordinator in completion of day-to-day project tasks.
North Georgia Technical College	Provide personnel administration for Watershed Coordinator and office space, lab facilities, meeting rooms for Partnership use. Provide technical expertise and assistance.
UGA Cooperative Extension	Provide technical assistance and connections with farmers. Conduct and participate in educational programs and public meetings.
Chestatee-Chattahoochee RC&D	Provide technical assistance and consulting for corrective actions and project management issues.
Natural Resources Conservation Service	Provide technical assistance on corrective actions.
Cities of Cornelia, Demorest, Baldwin, and Mt. Airy	Provide support for public information efforts, assist with site identifications and landowner contacts, contributions to matching funds, participation on Steering Committee
Habersham County	Provide support for public information efforts, technical assistance, landowner contacts, contributions to matching funds, participation on Steering Committee.
Homebuilders Assoc. and Habersham County Chamber of Commerce	Provide support for public information efforts, contacts and assistance with businesses and landowners, contributions to matching funds, participation on Steering Committee.
Fieldale Farms and Georgia Poultry Federation	Provide support for public information efforts, contacts with farmers, contributions to matching funds, technical advice, and participation on Steering Committee.
Upper Chattahoochee Riverkeeper, Piedmont College	Provide support for public information efforts, technical and scientific advice and assistance, participation on Steering Committee.
GA DNR Wildlife Resources Div., GA Forestry Comm., GA Soil and Water Cons. Comm., Upper Chattahoochee Soil & Water Cons. Dist., GA Mountains RDC, U.S. Forest Service	Provide support for public information and educational programs, technical advice and assistance, data and research sharing, participation on Steering Committee.

CRITERIA FOR SUCCESS

The ultimate success of this project will be judged by our ability to implement management and protection strategies that result in documented water quality improvements in impaired and other stream segments. The goal is water quality improvement in stream segments on the 303(d) list so that they will meet Georgia's water quality standards and subsequently be removed from that list. Other qualitative and quantitative measures will also be used to track the successful implementation of this plan.

Qualitative measures of success for the plan include:

- Successful completion of project milestones
- Attendance at SRWP Steering Committee Meetings
- Publication of BMP fact sheets
- Publication of homeowner stormwater management brochures
- Attainment of educational component goals
- Adoption of applicable local codes and ordinances
- Commitments of additional funding for further BMP and educational projects

Quantitative measures of success for the plan include:

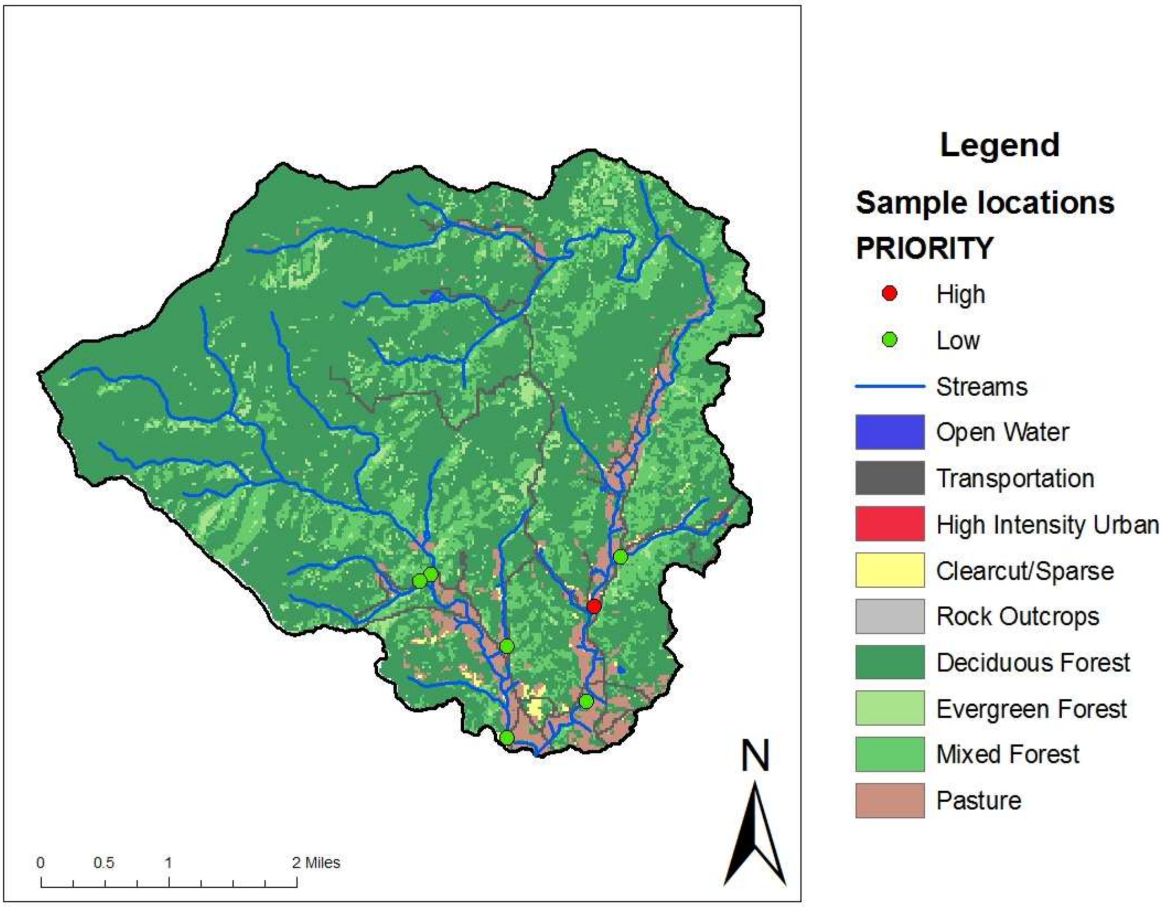
- Measureable improvements in applicable water quality parameters from pre and post BMP installation monitoring
- Measurable improvements in riparian and instream habitats, as evaluated by standardized scoring criteria from the Quality Assurance Project Plan
- Increases in diversity, abundance, and ecological health index scores of macroinvertebrates at BMP locations
- Tracking numbers of students participating in Adopt-a-Stream programs, water quality field days, and water quality summer day camps
- Tracking workshops, speaking engagements, and demonstrations for local schools and civic groups

Progress towards these goals will be documented and reported to GAEPD in semi-annual reports. Goals will be refined and updated as the project moves forward and new data and information are obtained.

APPENDIX A -
PRIORITIZATION OF BACTERIAL SITES BY SUBWATERSHED

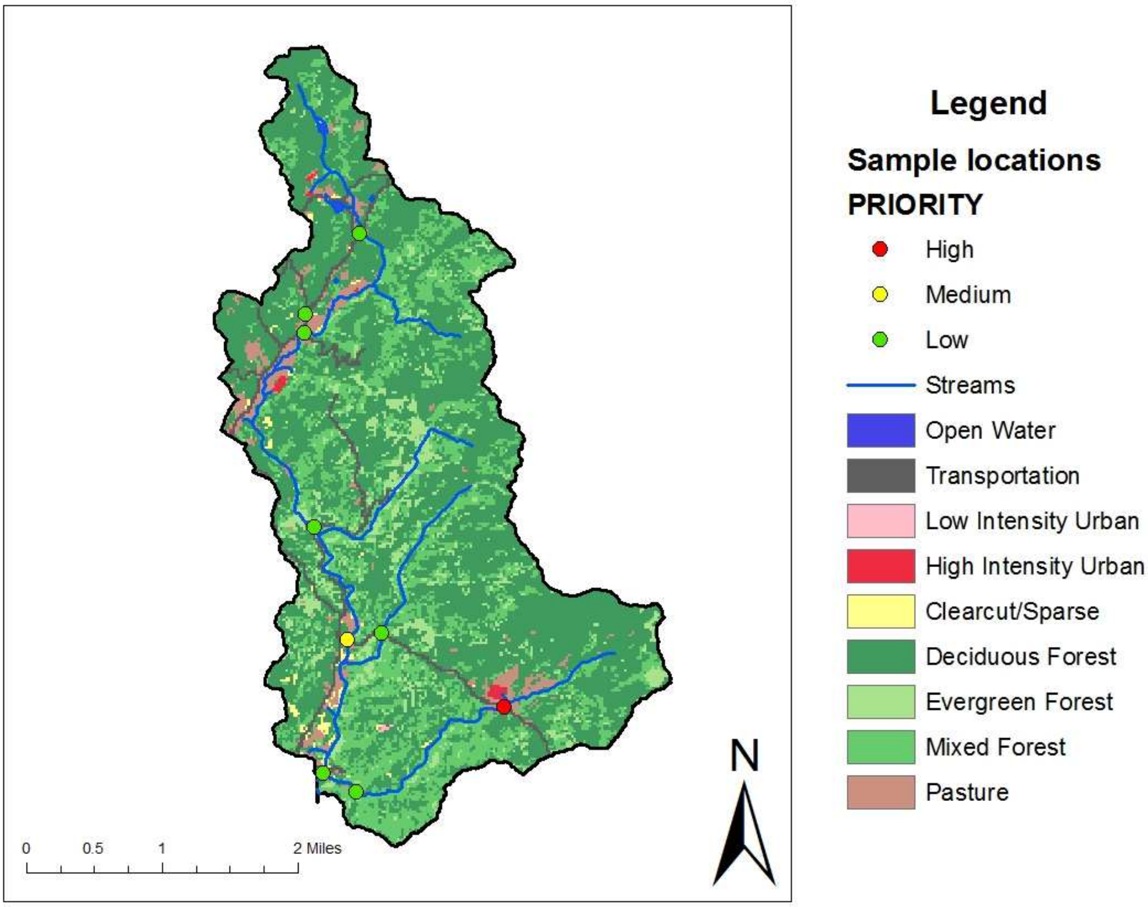
Headwaters

Site #	Latitude	Longitude	Priority	Geometric Mean	% Reduction Needed
HW-7	34.77568	-83.60438	High	344	-63.4
HW-1	34.75254	-83.60712	Low	95	N/A
HW-8	34.78147	-83.60085	Low	82	N/A
HW-2	34.76055	-83.61593	Low	79	N/A
HW-5	34.77808	-83.62849	Low	54	N/A
HW-6	34.77089	-83.61629	Low	48	N/A
HW-3	34.76493	-83.60508	Low	36	N/A
HW-4	34.77891	-83.62691	Low	21	N/A



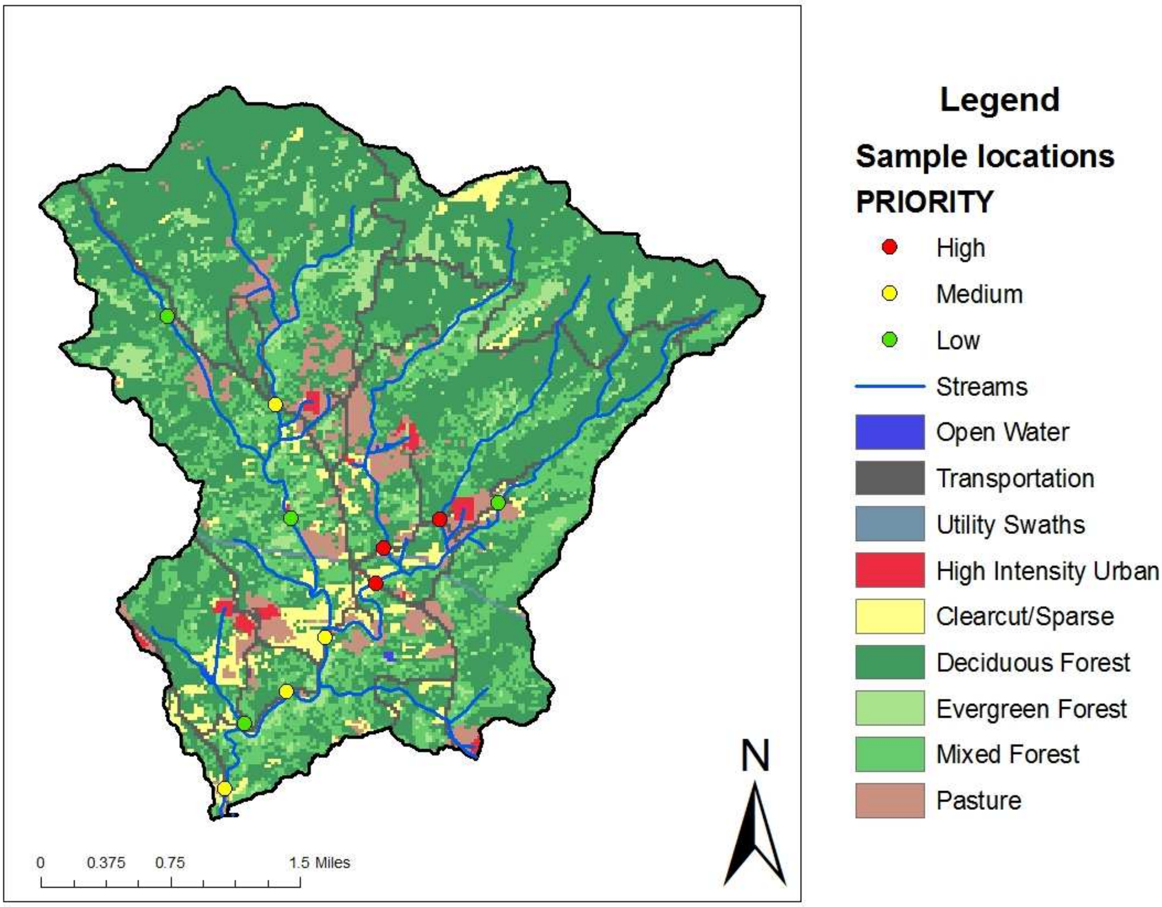
Raper Creek

Site #	Latitude	Longitude	Priority	Geometric Mean	% Reduction Needed
RC-5	34.73713	-83.55660	High	590	-78.6
RC-3	34.74386	-83.57721	Medium	136	-7.0
RC-9	34.77854	-83.58364	Low	112	N/A
RC-2	34.72755	-83.57546	Low	112	N/A
RC-8	34.78730	-83.57689	Low	89	N/A
RC-1	34.72955	-83.57991	Low	64	N/A
RC-7	34.77651	-83.58381	Low	42	N/A
RC-4	34.74461	-83.57280	Low	23	N/A
RC-6	34.75573	-83.58185	Low	18	N/A



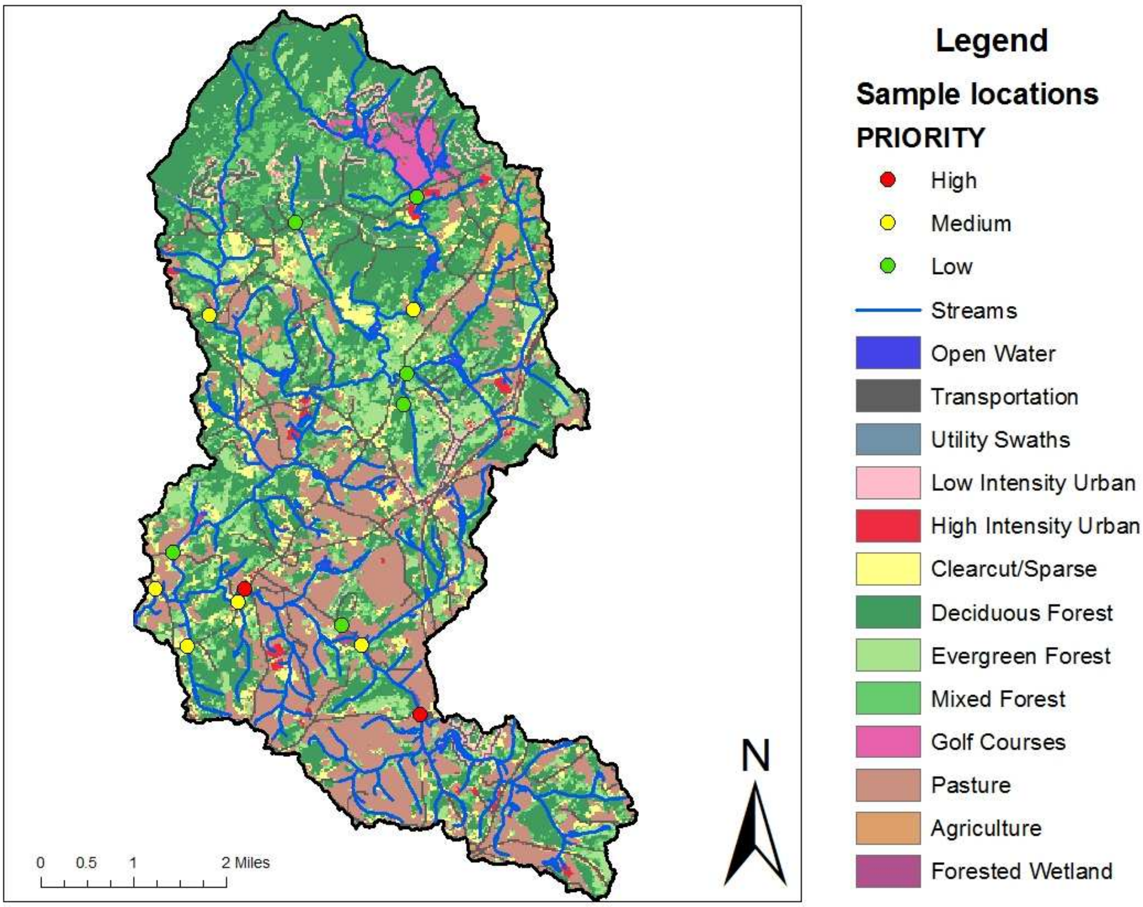
Shoal Creek

Site #	Latitude	Longitude	Priority	Geometric Mean	% Reduction Needed
SC-5	34.69875	-83.51876	High	818	-84.6
SC-7	34.70429	-83.51241	High	429	-70.6
SC-6	34.70177	-83.51809	High	322	-60.8
SC-10	34.71354	-83.52939	Medium	238	-46.9
SC-1	34.68115	-83.53358	Medium	192	-34.4
SC-4	34.69414	-83.52383	Medium	166	-24.0
SC-3	34.68950	-83.52755	Medium	135	-6.4
SC-9	34.70406	-83.52760	Low	102	N/A
SC-11	34.72074	-83.54065	Low	100	N/A
SC-8	34.70575	-83.50653	Low	43	N/A
SC-2	34.68668	-83.53181	Low	9	N/A



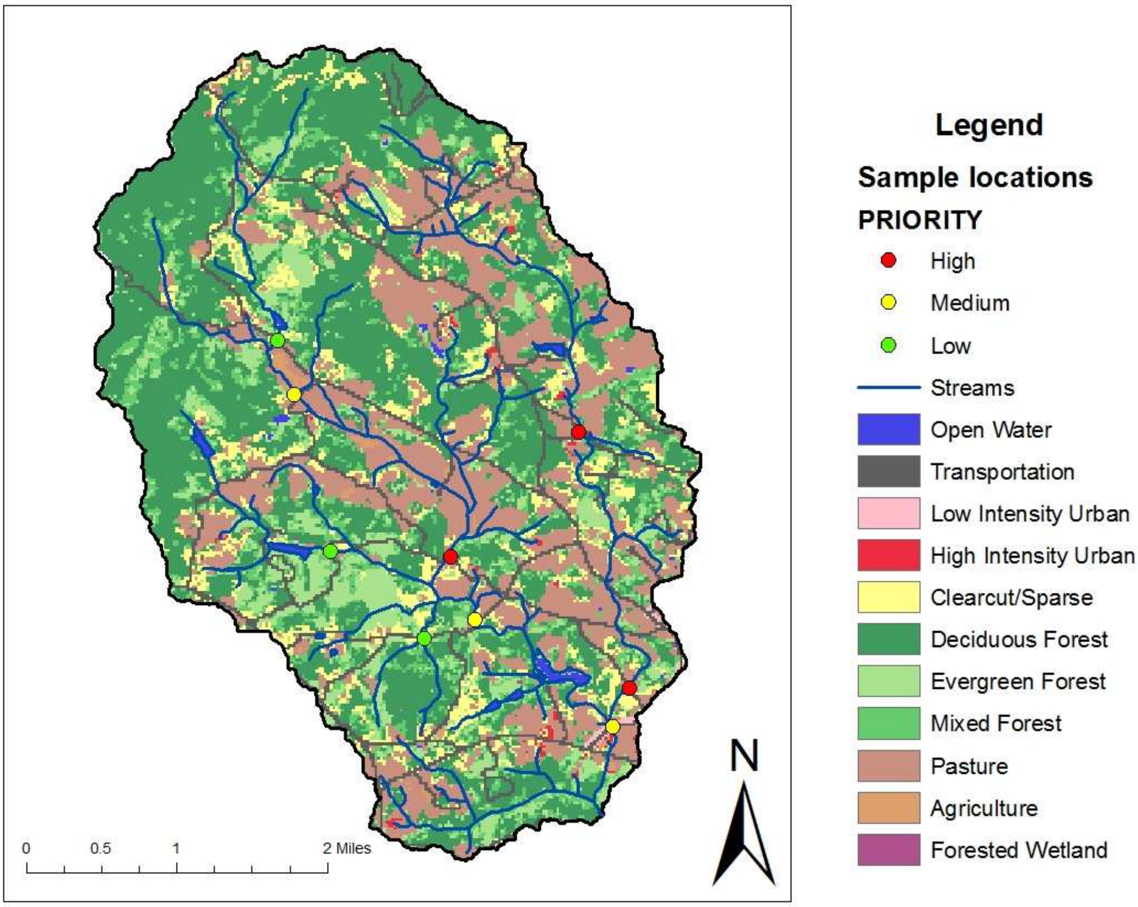
Deep Creek

Site #	Latitude	Longitude	Priority	Geometric Mean	% Reduction Needed
DC-3	34.63335	-83.48392	High	1044	-87.9
DC-8	34.61430	-83.45016	High	456	-72.4
DC-1	34.63298	-83.50100	Medium	283	-55.5
DC-11	34.67756	-83.45335	Medium	279	-54.8
DC-4	34.62402	-83.49449	Medium	235	-46.3
DC-14	34.67596	-83.49185	Medium	207	-39.1
DC-5	34.63124	-83.48518	Medium	201	-37.3
DC-7	34.62486	-83.46170	Medium	193	-34.6
DC-2	34.63869	-83.49767	Low	105	N/A
DC-6	34.62798	-83.46548	Low	89	N/A
DC-9	34.66271	-83.45475	Low	81	N/A
DC-10	34.66762	-83.45425	Low	55	N/A
DC-13	34.69074	-83.47604	Low	38	N/A
DC-12	34.69517	-83.45335	Low	36	N/A



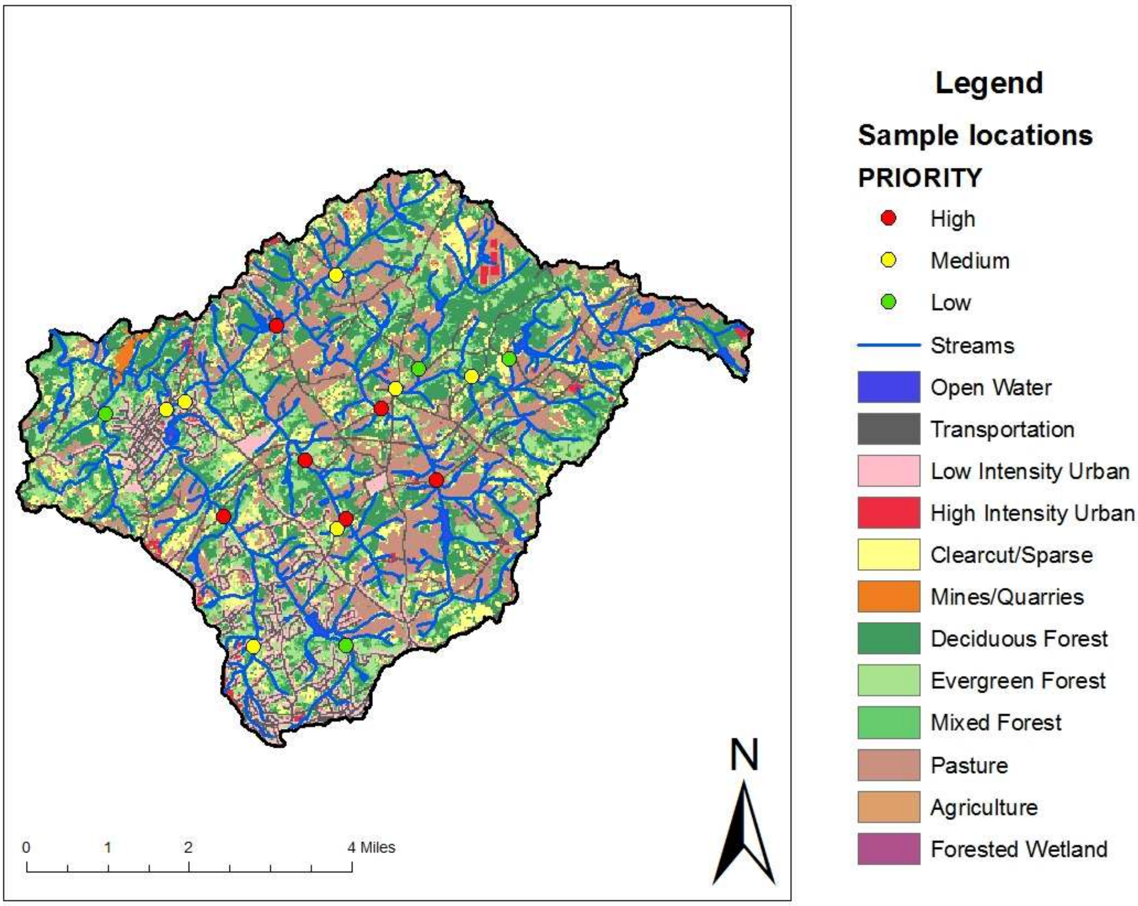
Beaverdam Creek

Site #	Latitude	Longitude	Priority	Geometric Mean	% Reduction Needed
BDC-9	34.64516	-83.54446	High	1310	-90.4
BDC-5	34.63288	-83.55904	High	411	-69.3
BDC-2	34.62067	-83.53782	High	381	-66.9
BDC-7	34.64812	-83.57767	Medium	262	-51.8
BDC-3	34.62681	-83.55591	Medium	258	-51.0
BDC-1	34.61690	-83.53964	Medium	171	-26.5
BDC-8	34.65322	-83.57987	Low	73	N/A
BDC-4	34.62492	-83.56186	Low	52	N/A
BDC-6	34.63306	-83.57304	Low	17	N/A



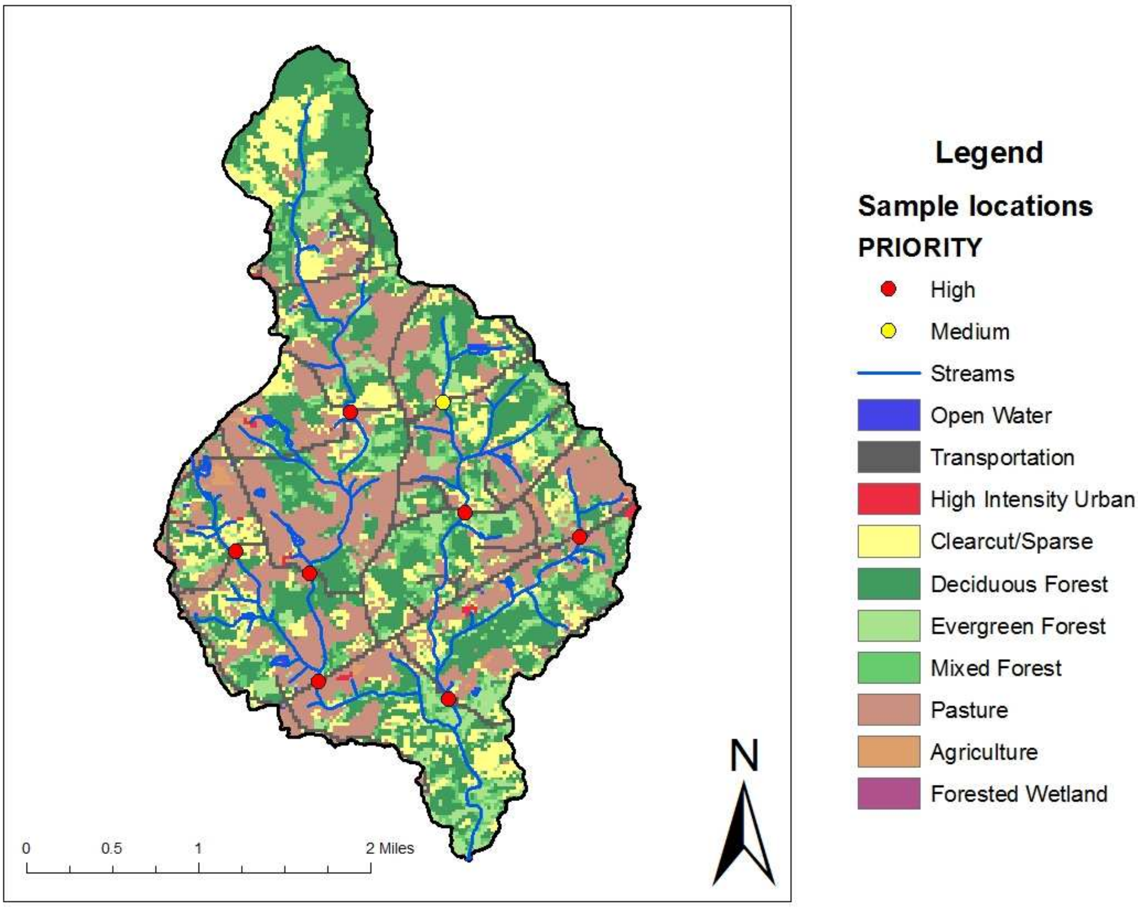
Hazel Creek

Site #	Latitude	Longitude	Priority	Geometric Mean	% Reduction Needed
HC-10	34.55784	-83.48325	High	904	-86.0
HC-11	34.57032	-83.49551	High	864	-85.4
HC-9	34.55055	-83.50247	High	581	-78.3
HC-4	34.55045	-83.52892	High	386	-67.4
HC-5	34.56071	-83.51167	High	328	-61.6
HC-16	34.58467	-83.51852	High	317	-60.3
HC-3	34.57069	-83.53781	Medium	273	-53.8
HC-14	34.57648	-83.47617	Medium	258	-51.0
HC-8	34.54874	-83.50429	Medium	257	-50.8
HC-17	34.59401	-83.50600	Medium	239	-47.3
HC-2	34.56922	-83.54169	Medium	203	-38.0
HC-12	34.57407	-83.49241	Medium	153	-17.6
HC-7	34.52743	-83.52171	Medium	138	-8.9
HC-6	34.52800	-83.50169	Low	92	N/A
HC-1	34.56822	-83.55486	Low	50	N/A
HC-13	34.57769	-83.48761	Low	32	N/A
HC-15	34.57985	-83.46817	Low	11	N/A



Yellowbank Creek

Site #	Latitude	Longitude	Priority	Geometric Mean	% Reduction Needed
YBC-6	34.61691	-83.59628	High	1713	-92.6
YBC-1	34.59296	-83.58551	High	635	-80.1
YBC-5	34.60871	-83.58430	High	621	-79.7
YBC-4	34.60321	-83.59998	High	567	-77.8
YBC-3	34.60489	-83.60764	High	427	-70.5
YBC-2	34.59411	-83.59888	High	423	-70.2
YBC-8	34.60692	-83.57258	High	313	-59.8
YBC-7	34.61791	-83.58687	Medium	146	-13.9



APPENDIX B - MAJOR SOIL ASSOCIATIONS IN THE SOQUE RIVER WATERSHED

Soil association	Description	Slope range
Madison-Halewood	Well-drained, moderately deep, gently sloping to steep soils on uplands; derived from quartz mica schist and mica schist	2-60%
Cecil-Madison	Well-drained, moderately deep and deep, gently sloping to steep soils on ridgetops and side slopes; derived from gneiss and micaceous schist	2-60%
Congaree-Chewacla-Buncombe	Well-drained to somewhat poorly drained soils on flood plains	0-6%

From USDA Soil Conservation Service, Soil Survey Habersham County Georgia, July 1963.

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