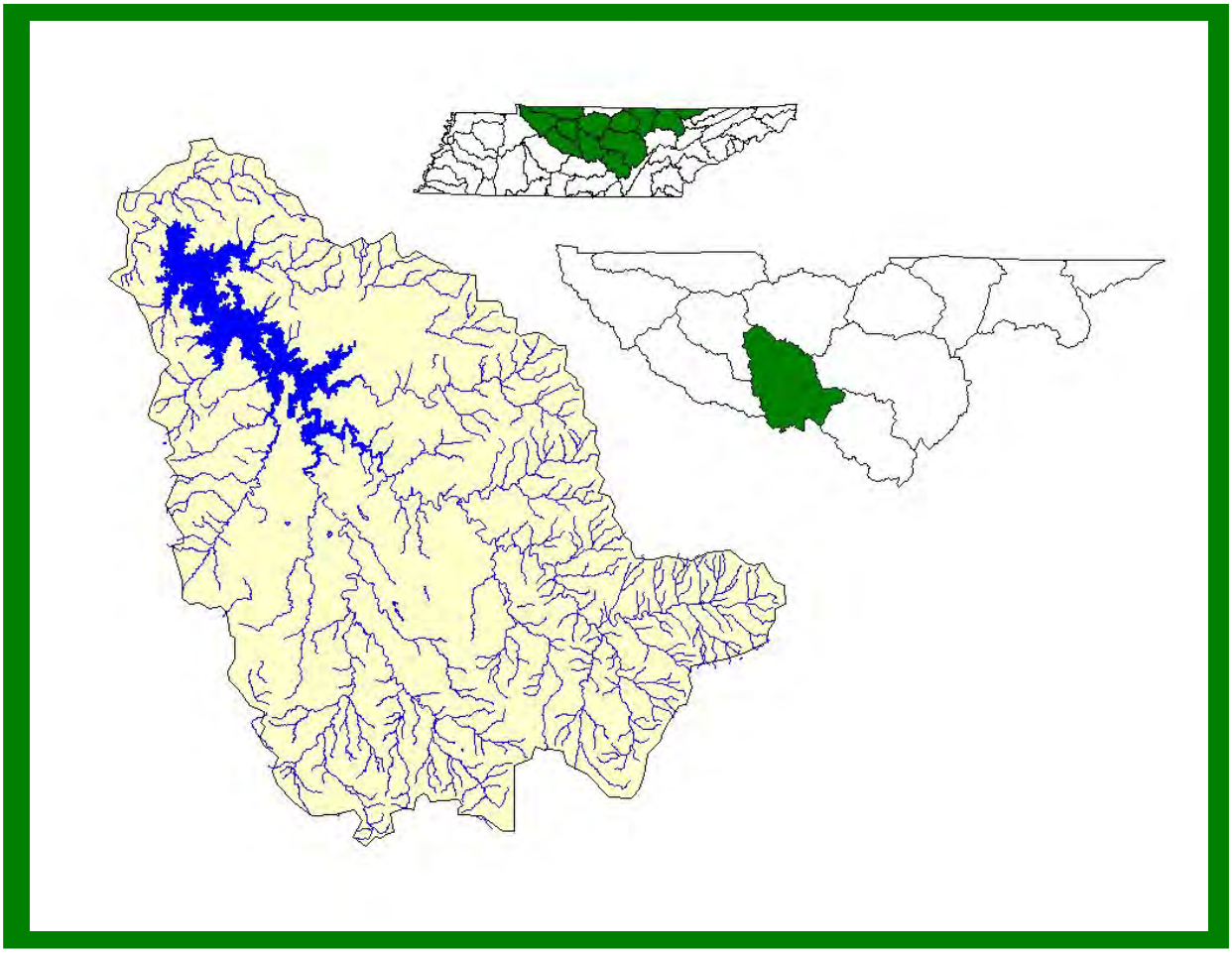
# STONES RIVER WATERSHED (05130203) OF THE CUMBERLAND RIVER BASIN

# WATER QUALITY MANAGEMENT PLAN



**TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION**
**DIVISION OF WATER POLLUTION CONTROL**
**WATERSHED MANAGEMENT SECTION**

2003

# STONES RIVER WATERSHED
# WATER QUALITY MANAGEMENT PLAN

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# GLOSSARY

**1Q20.** The lowest average 1 consecutive days flow with average recurrence frequency of once every 20 years.

**30Q2.** The lowest average 3 consecutive days flow with average recurrence frequency of once every 2 years.

**7Q10.** The lowest average 7 consecutive days flow with average recurrence frequency of once every 10 years.

**303(d).** The section of the federal Clean Water Act that requires a listing by states, territories, and authorized tribes of impaired waters, which do not meet the water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology.

**305(b).** The section of the federal Clean Water Act that requires EPA to assemble and submit a report to Congress on the condition of all water bodies across the Country as determined by a biennial collection of data and other information by States and Tribes.

**AFO.** Animal Feeding Operation.

**Ambient Sites.** Those sites established for long term instream monitoring of water quality.

**ARAP.** Aquatic Resource Alteration Permit.

**Assessment.** The result of an analysis of how well streams meet the water quality criteria assigned to them.

**Bankfull Discharge.** The momentary maximum peak flow before a stream overflows its banks onto a floodplain.

**Basin.** An area that drains several smaller watersheds to a common point. Most watersheds in Tennessee are part of the Cumberland, Mississippi, or Tennessee Basin (The Conasauga River and Barren River Watersheds are the exceptions).

**Benthic.** Bottom dwelling.

**Biorecon.** A qualitative multihabitat assessment of benthic macroinvertebrates that allows rapid screening of a large number of sites. A Biorecon is one tool used to recognize stream impairment as judged by species richness measures, emphasizing the presence or absence of indicator organisms without regard to relative abundance.

**BMP**. An engineered structure or management activity, or combination of these, that eliminates or reduces an adverse environmental effect of a pollutant.

**BOD.** Biochemical Oxygen Demand. A measure of the amount of oxygen consumed in the biological processes that break down organic and inorganic matter.

**CAFO.** Concentrated Animal Feeding Operation.

**Designated Uses.** The part of Water Quality Standards that describes the uses of surface waters assigned by the Water Quality Control Board. All streams in Tennessee are designated for Recreation, Fish and Aquatic Life, Irrigation, and Livestock Watering and Wildlife. Additional designated uses for some, but not all, waters are Drinking Water Supply, Industrial Water Supply, and Navigation.

**DMR.** Discharge Monitoring Report. A report that must be submitted periodically to the Division of Water Pollution Control by NPDES permitees.

**DO.** Dissolved oxygen.

**EPA.** Environmental Protection Agency. The EPA Region 4 web site is http://www.epa.gov/region4/

**Field Parameter.** Determinations of water quality measurements and values made in the field using a kit or probe. Common field parameters include pH, DO, temperature, conductivity, and flow.

**Fluvial Geomorphology.** The physical characteristics of moving water and adjoining landforms, and the processes by which each affects the other.

**HUC-8.** The 8-digit Hydrologic Unit Code corresponding to one of 54 watersheds in Tennessee.

**HUC-10.** The 10-digit NRCS Hydrologic Unit Code. HUC-10 corresponds to a smaller land area than HUC-8.

**HUC-12.** The 12-digit NRCS Hydrologic Unit Code. HUC-12 corresponds to a smaller land area than HUC-10.

**MRLC.** Multi-Resolution Land Classification.

**MS4.** Municipal Separate Storm Sewer System.

**Nonpoint Source (NPS).** Sources of water pollution without a single point of origin. Nonpoint sources of pollution are generally associated with surface runoff, which may carry sediment, chemicals, nutrients, pathogens, and toxic materials into receiving waterbodies. Section 319 of the Clean Water Act of 1987 requires all states to assess the impact of nonpoint source pollution on the waters of the state and to develop a program to abate this impact.

**NPDES.** National Pollutant Discharge Elimination System. Section 402 of the Clean Water Act of 1987 requires dischargers to waters of the U.S. to obtain NPDES permits.

**NRCS.** Natural Resources Conservation Service. NRCS is part of the federal Department of Agriculture. The NRCS home page is http://www.nrcs.usda.gov

**Point Source.** Any discernable, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural storm water discharges and return flows from irrigated agriculture (Clean Water Act Section 502(14)).

**Q Design.** The average daily flow that a treatment plant or other facility is designed to accommodate.

**Reference Stream (Reference Site).** A stream (site) judged to be least impacted. Data from reference streams are used for comparisons with similar streams.

**SBR.** Sequential Batch Reactor.

**Stakeholder.** Any person or organization affected by the water quality or by any watershed management activity within a watershed.

**STATSGO.** State Soil Geographic Database. STATSGO is compiled and maintained by the Natural Resources Conservation Service.

**STORET.** The EPA repository for water quality data that is used by state environmental agencies, EPA and other federal agencies, universities, and private citizens. STORET (Storage and Retrieval of National Water Quality Data System) data can be accessed at http://www.epa.gov/storet/

**TDA.** Tennessee Department of Agriculture. The TDA web address is http://www.state.tn.us/agriculture

**TDEC.** Tennessee Department of Environment and Conservation. The TDEC web address is http://www.tdec.net

**TMDL.** Total Maximum Daily Load. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of the amount to the pollutant's sources. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. The calculation includes a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonal variation in water quality. A TMDL is required for each pollutant in an impaired stream as described in Section 303 of the Federal Clean Water Act of 1987. Updates and information on Tennessee's TMDLs can be found at http://www.tdec.net/wpc/tmdl/

**TMSP**. Tennessee Multi-Sector Permit.

**USGS.** United States Geological Survey. USGS is part of the federal Department of the Interior. The USGS home page is http://www.usgs.gov/.

**WAS.** Waste Activated Sludge.

**Water Quality Standards.** A triad of designated uses, water quality criteria, and antidegradation statement. Water Quality Standards are established by Tennessee and approved by EPA.

**Watershed.** A geographic area which drains to a common outlet, such as a point on a larger stream, lake, underlying aquifer, estuary, wetland, or ocean.

**WET.** Whole Effluent Toxicity.

**WWTP.** Waste Water Treatment Plant

# CHAPTER 1

## WATERSHED APPROACH TO WATER QUALITY

1.1 Background

1.2 Watershed Approach to Water Quality
1.2.A. Components of the Watershed Approach
1.2.B. Benefits of the Watershed Approach

**1.1 BACKGROUND.** The Division of Water Pollution Control is responsible for administration of the Tennessee Water Quality Control Act of 1977 (TCA 69–3–101). Information about the Division of Water Pollution Control, updates and announcements, may be found at http://www.state.tn.us/environment/wpc/index.html, and a summary of the organization of the Division of Water Pollution Control may be found in Appendix I.

The mission of the Division of Water Pollution Control is to abate existing pollution of the waters of Tennessee, to reclaim polluted waters, to prevent the future pollution of the waters, and to plan for the future use of the waters so that the water resources of Tennessee might be used and enjoyed to the fullest extent consistent with the maintenance of unpolluted waters.

The Division monitors, analyzes, and reports on the quality of Tennessee's water. In order to perform these tasks more effectively, the Division adopted a Watershed Approach to Water Quality in 1996.

This Chapter summarizes TDEC's Watershed Approach to Water Quality.

**1.2 WATERSHED APPROACH TO WATER QUALITY.** The Watershed Approach to Water Quality is a coordinating framework designed to protect and restore aquatic systems and protect human health more effectively (EPA841-R-95-003). The Approach is based on the concept that many water quality problems, like the accumulation of pollutants or nonpoint source pollution, are best addressed at the watershed level. In addition, a watershed focus helps identify the most cost-effective pollution control strategies to meet clean water goals. Tennessee's Watershed Approach, updates and public participation opportunities, may be found on the web at http://www.state.tn.us/environment/wpc/wshed1.htm.

Watersheds are appropriate as organizational units because they are readily identifiable landscape units with readily identifiable boundaries that integrate terrestrial, aquatic, and geologic processes. Focusing on the whole watershed helps reach the best balance among efforts to control point source pollution and polluted runoff as well as protect drinking water sources and sensitive natural resources such as wetlands (EPA-840-R-98-001).

Four main features are typical of the Watershed Approach: 1) Identifying and prioritizing water quality problems in the watershed, 2) Developing increased public involvement, 3) Coordinating activities with other agencies, and 4) Measuring success through increased and more efficient monitoring and other data gathering.

Typically, the Watershed Approach meets the following description (EPA841-R-95-003):

- Features watersheds or basins as the basic management units
- Targets priority subwatersheds for management action
- Addresses all significant point and nonpoint sources of pollution
- Addresses all significant pollutants
- Sets clear and achievable goals
- Involves the local citizenry in all stages of the program
- Uses the resources and expertise of multiple agencies
- Is not limited by any single agency's responsibilities
- Considers public health issues

An additional characteristic of the Watershed Approach is that it complements other environmental activities. This allows for close cooperation with other state agencies and local governments as well as with federal agencies such as the Tennessee Valley Authority and the U.S. Army Corps of Engineers, U.S. Department of Agriculture (*e.g.*, Natural Resources Conservation Service, United States Forest Service), U.S. Department of the Interior (*e.g.* United States Geological Survey, U.S. Fish and Wildlife Service, National Park Service). When all permitted dischargers are considered together, agencies are better able to focus on those controls necessary to produce measurable improvements in water quality. This also results in a more efficient process: It encourages agencies to focus staff and financial resources on prioritized geographic locations and makes it easier to coordinate between agencies and individuals with an interest in solving water quality problems (EPA841-R-003).

The Watershed Approach is not a regulatory program or a new EPA mandate; rather it is a decision making process that reflects a common strategy for information collection and analysis as well as a common understanding of the roles, priorities, and responsibilities of all stakeholders within a watershed. The Watershed Approach utilizes features already in state and federal law, including:

- Water Quality Standards
- National Pollutant Discharge Elimination System (NPDES)
- Total Maximum Daily Loads (TMDLs)
- Clean Lakes Program
- Nonpoint Source Program
- Groundwater Protection

Traditional activities like permitting, planning, and monitoring are also coordinated in the Watershed Approach. A significant change from the past, however, is that the Watershed Approach encourages integration of traditional regulatory (point source pollution) and nonregulatory (nonpoint sources of pollution) programs. There are additional changes from the past as well:

| THE PAST | WATERSHED APPROACH |
|---|---|
| Focus on fixed-station ambient monitoring | Focus on comprehensive watershed monitoring |
| Focus on pollutant discharge sites | Focus on watershed-wide effects |
| Focus on WPC programs | Focus on coordination and cooperation |
| Focus on point sources of pollution | Focus on all sources of pollution |
| Focus on dischargers as the problem | Focus on dischargers as an integral part of the solution |
| Focus on short-term problems | Focus on long-term solutions |

***Table 1-1. Contrast Between the Watershed Approach and the Past.***

This approach places greater emphasis on all aspects of water quality, including chemical water quality (conventional pollutants, toxic pollutants), physical water quality (temperature, flow), habitat quality (channel morphology, composition and health of benthic communities), and biodiversity (species abundance, species richness).

1.2.A. Components of the Watershed Approach. Tennessee is composed of fifty-five watersheds corresponding to the 8-digit USGS Hydrologic Unit Codes (HUC-8). These watersheds, which serve as geographic management units, are combined in five groups according to year of implementation.

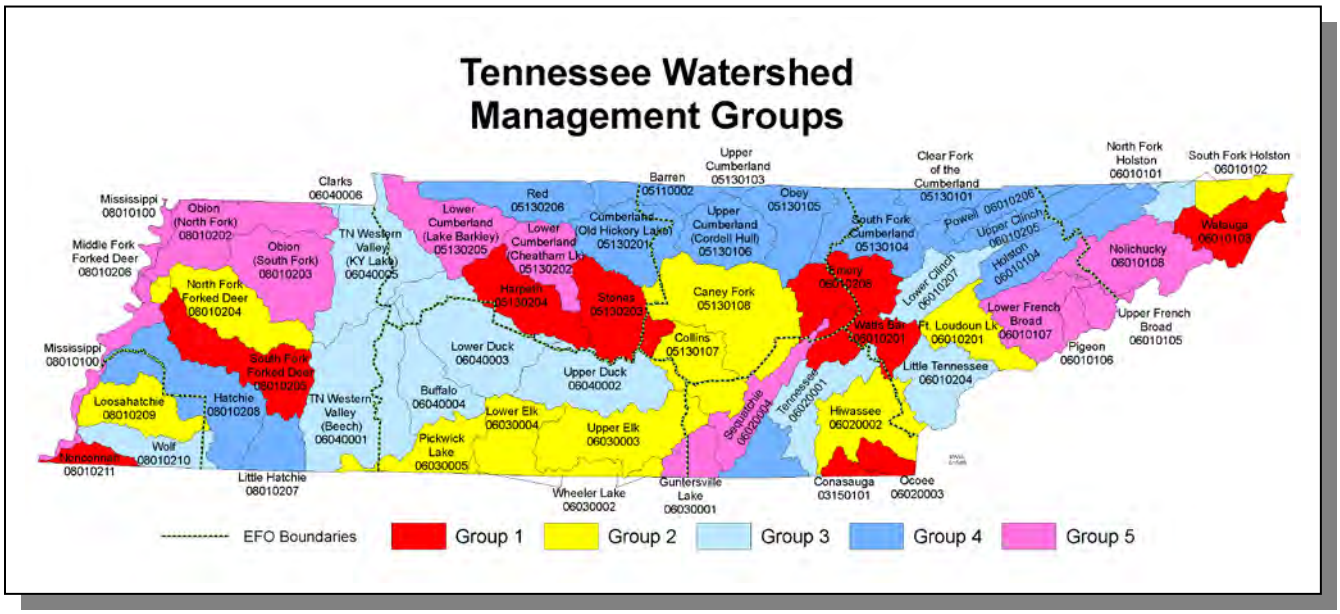



***Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.***

Each year, TDEC conducts monitoring in one-fifth of Tennessee's watersheds; assessment, priority setting and follow-up monitoring are conducted in another one fifth of watersheds; modeling and TMDL studies in another one fifth; developing management plans in another one fifth; and implementing management plans in another one fifth of watersheds.

| GROUP | WEST TENNESSEE | MIDDLE TENNESSEE | EAST TENNESSEE |
|---|---|---|---|
| | | | |
| **1** | Nonconnah<br>South Fork Forked Deer | Harpeth<br>Stones | Conasauga<br>Emory<br>Ocoee<br>Watauga<br>Watts Bar |
| | | | |
| **2** | Loosahatchie<br>Middle Fork Forked Deer<br>North Fork Forked Deer | Caney Fork<br>Collins<br>Lower Elk<br>Pickwick Lake<br>Upper Elk<br>Wheeler Lake | Fort Loudoun<br>Hiwassee<br>South Fork Holston (Upper)<br>Wheeler Lake |
| | | | |
| **3** | Tennessee Western Valley (Beech River)<br>Tennessee Western Valley (KY Lake)<br>Wolf River | Buffalo<br>Lower Duck<br>Upper Duck | Little Tennessee<br>Lower Clinch<br>North Fork Holston<br>South Fork Holston (Lower)<br>Tennessee (Upper) |
| | | | |
| **4** | Lower Hatchie<br>Upper Hatchie | Barren<br>Obey<br>Red<br>Upper Cumberland (Cordell Hull Lake)<br>Upper Cumberland (Old Hickory Lake)<br>Upper Cumberland (Cumberland Lake) | Holston<br>Powell<br>South Fork Cumberland<br>Tennessee (Lower)<br>Upper Clinch<br>Upper Cumberland (Clear Fork) |
| | | | |
| **5** | Mississippi<br>North Fork Obion<br>South Fork Obion | Guntersville Lake<br>Lower Cumberland (Cheatham Lake)<br>Lower Cumberland (Lake Barkley) | Lower French Broad<br>Nolichucky<br>Pigeon<br>Upper French Broad |

***Table 1-2. Watershed Groups in Tennessee's Watershed Approach.***

In succeeding years of the cycle, efforts rotate among the watershed groups. The activities in the five year cycle provide a reference for all stakeholders.

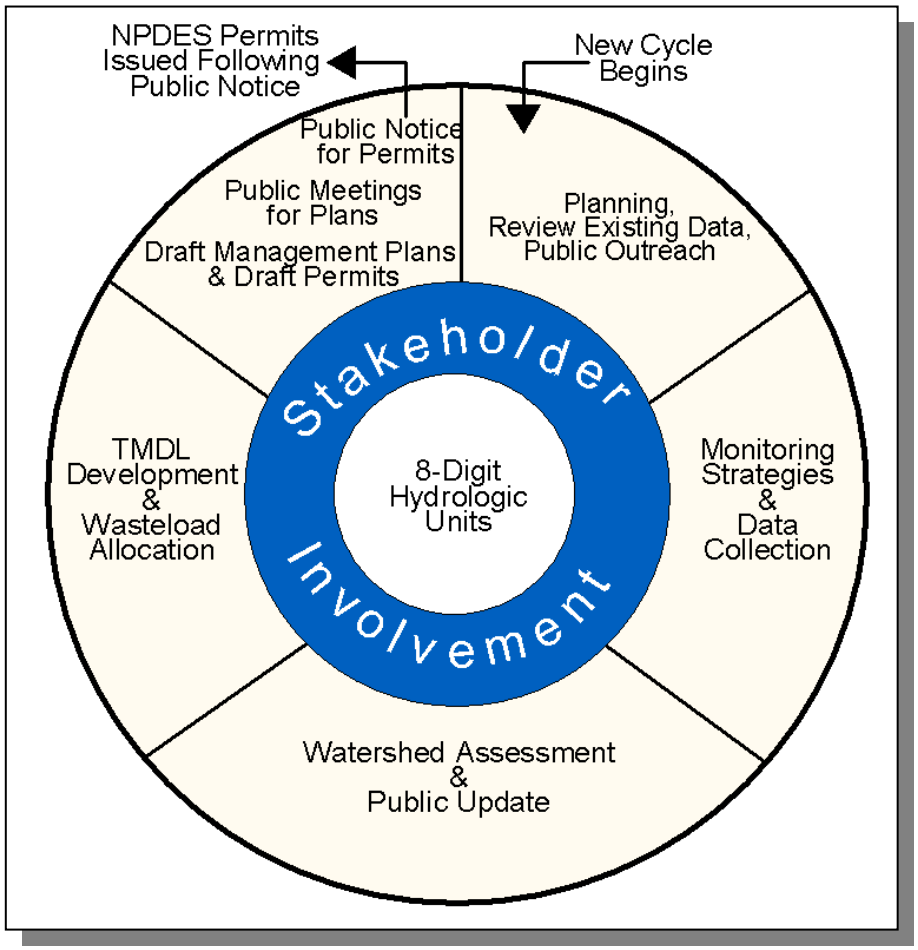



***Figure 1-2. The Watershed Approach Cycle.***

The six key activities that take place during the cycle are:

1. Planning and Existing Data Review. Existing data and reports from appropriate agencies and organizations are compiled and used to describe the current conditions and status of rivers and streams. Reviewing all existing data and comparing agencies' work plans guide the development of an effective monitoring strategy.

2. Monitoring. Field data is collected for streams in the watershed. These data supplement existing data and are used for the water quality assessment.

3. Assessment. Monitoring data are used to determine the status of the stream's designated use supports.

4. Wasteload Allocation/TMDL Development. Monitoring data are used to determine nonpoint source contributions and pollutant loads for permitted dischargers releasing wastewater to the watershed. Limits are set to assure that water quality is protected.

5. Permits. Issuance and expiration of all discharge permits are synchronized based on watersheds. Currently, 1700 permits have been issued in Tennessee under the federally delegated National Pollutant Discharge Elimination System (NPDES).

6. Watershed Management Plans. These plans include information for each watershed including general watershed description, water quality goals, major water quality concerns and issues, and management strategies.

Public participation opportunities occur throughout the entire five year cycle. Participation in Years 1, 3 and 5 is emphasized, although additional meetings are held at stakeholder's request. People tend to participate more readily and actively in protecting the quality of waters in areas where they live and work, and have some roles and responsibilities:

- Data sharing
- Identification of water quality stressors
- Participation in public meetings
- Commenting on management plans
- Shared commitment for plan implementation

1.2.B. Benefits of the Watershed Approach. The Watershed Approach fosters a better understanding of the physical, chemical and biological effects on a watershed, thereby allowing agencies and citizens to focus on those solutions most likely to be effective. The Approach recognizes the need for a comprehensive, ecosystem-based approach that depends on local governments and local citizens for success (EPA841-R-95-004). On a larger scale, many lessons integrating public participation with aquatic ecosystem-based programs have been learned in the successful Chesapeake Bay, Great Lakes, Clean Lakes, and National Estuary Programs.

Benefits of the Watershed Approach include (EPA841-R-95-004):

- Focus on water quality goals and ecological integrity rather than on program activities such as number of permits issued.

- Improve basis for management decisions through consideration of both point and nonpoint source stressors. A watershed strategy improves the scientific basis for decision making and focuses management efforts on basins and watersheds where they are most needed. Both point and nonpoint control strategies are more effective under a watershed approach because the Approach promotes timely and focused development of TMDLs.

- Enhance program efficiency, as the focus becomes watershed. A watershed focus can improve the efficiency of water management programs by facilitating consolidation of programs within each watershed. For example, handling all point source dischargers in a watershed at the same time reduces administrative costs due to the potential to combine hearings and notices as well as allowing staff to focus on more limited areas in a sequential fashion.

- Improve coordination between federal, state and local agencies including data sharing and pooling of resources. As the focus shifts to watersheds, agencies are better able to participate in data sharing and coordinated assessment and control strategies.

- Increase public involvement. The Watershed Approach provides opportunities for stakeholders to increase their awareness of water-related issues and inform staff about their knowledge of the watershed. Participation is via three public meetings over the five-year watershed management cycle as well as meetings at stakeholder's request. Additional opportunities are provided through the Department of Environment and Conservation homepage and direct contact with local Environmental Assistance Centers.

- Greater consistency and responsiveness. Developing goals and management plans for a basin or watershed with stakeholder involvement results in increased responsiveness to the public and consistency in determining management actions. In return, stakeholders can expect improved consistency and continuity in decisions when management actions follow a watershed plan.

Additional benefits of working at the watershed level are described in the Clean Water Action Plan (EPA-840-R-98-001), and can be viewed at http://www.cleanwater.gov/action/toc.html.

The Watershed Approach represents awareness that restoring and maintaining our waters requires crossing traditional barriers (point *vs.* nonpoint sources of pollution) when designing solutions. These solutions increasingly rely on participation by both public and private sectors, where citizens, elected officials and technical personnel all have opportunity to participate. This integrated approach mirrors the complicated relationships in which people live, work and recreate in the watershed, and suggests a comprehensive, watershed-based and community-based approach is needed to address these (EPA841-R-97-005).

# CHAPTER 2

## DESCRIPTION OF THE STONES RIVER WATERSHED


2.1. Background

2.2. Description of the Watershed
- 2.2.A. General Location
- 2.2.B. Population Density Centers

2.3. General Hydrologic Description
- 2.3.A. Hydrology
- 2.3.B. Dams

2.4. Land Use

2.5. Ecoregions and Reference Streams

2.6. Natural Resources
- 2.6.A. Designated State Natural Areas
- 2.6.B. Rare Plants and Animals
- 2.6.C. Wetlands

2.7. Cultural Resources
- 2.7.A. Nationwide Rivers Inventory
- 2.7.B. Greenways
- 2.7.C. Interpretive Areas
- 2.7.D. Wildlife Management Area

2.8. Tennessee Rivers Assessment Project


**2.1 BACKGROUND.** The battle of Stones River, fought in 1862, was one of the bloodiest battles of the Civil War. The watershed contains Percy Priest Reservoir, which is popular for recreational boating and fishing.

The Stones River Watershed contains low to moderate gradient streams, with productive, nutrient-rich waters, which result in algae, rooted vegetation, and occasionally high densities of fish. Its streams flow over large expanses of limestone bedrock. Land in the Stones River Watershed is utilized by agriculture, industry, and urbanization.

This Chapter describes the location and characteristics of the Stones River Watershed.

## 2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Stones River Watershed is located in Middle Tennessee and includes parts of Cannon, Davidson, Rutherford, and Wilson Counties.

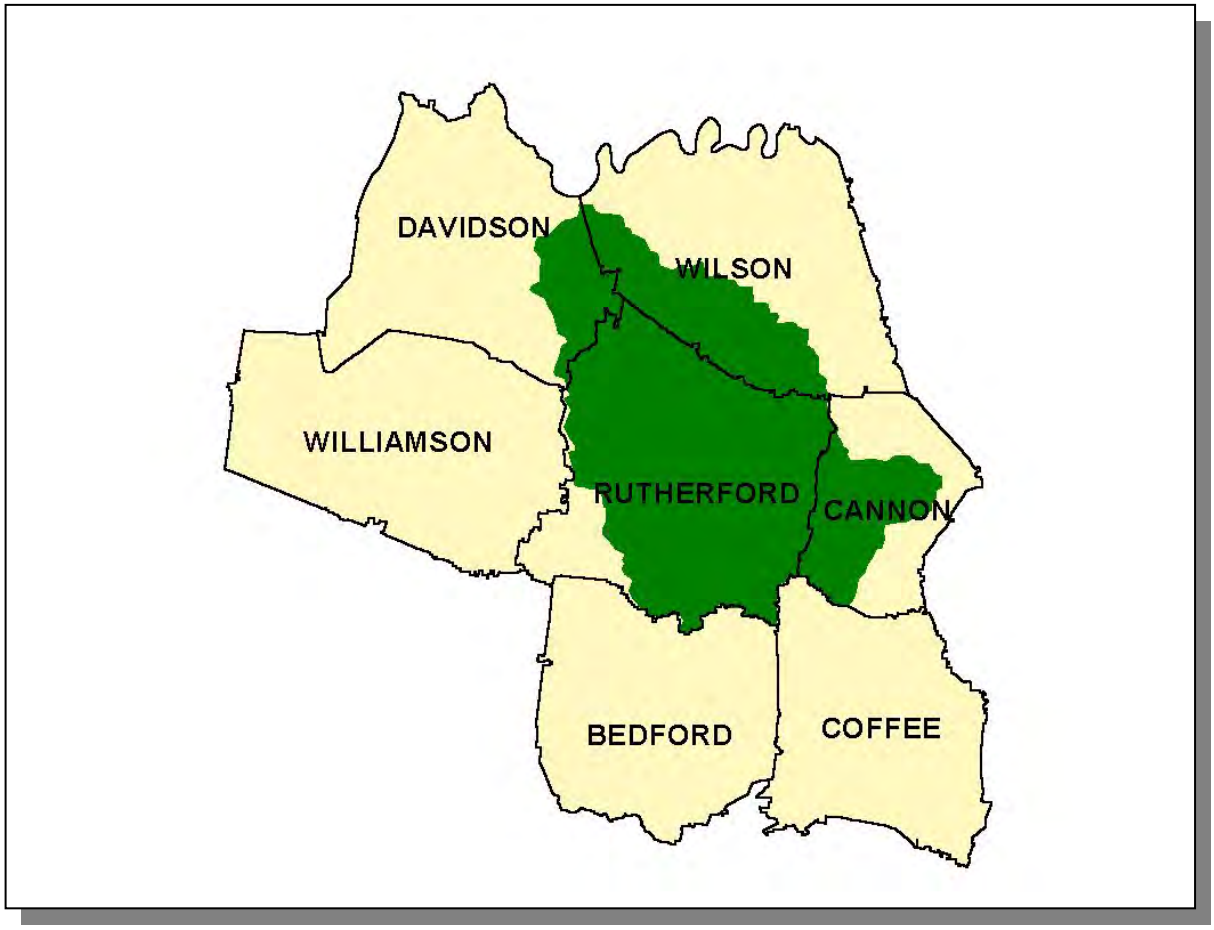



*Figure 2-1. General Location of the Stones River Watershed.*

| COUNTY | % OF WATERSHED IN EACH COUNTY |
|---|---|
| Rutherford | 59.6 |
| Wilson | 18.4 |
| Cannon | 13.7 |
| Davidson | 8.3 |

*Table 2-1. The Stones River Watershed Includes Parts of Four Middle Tennessee Counties.*

2.2.B. Population Density Centers. Two interstates (I-24, I-40) and five state highways serve the major communities in the Stones River Watershed.

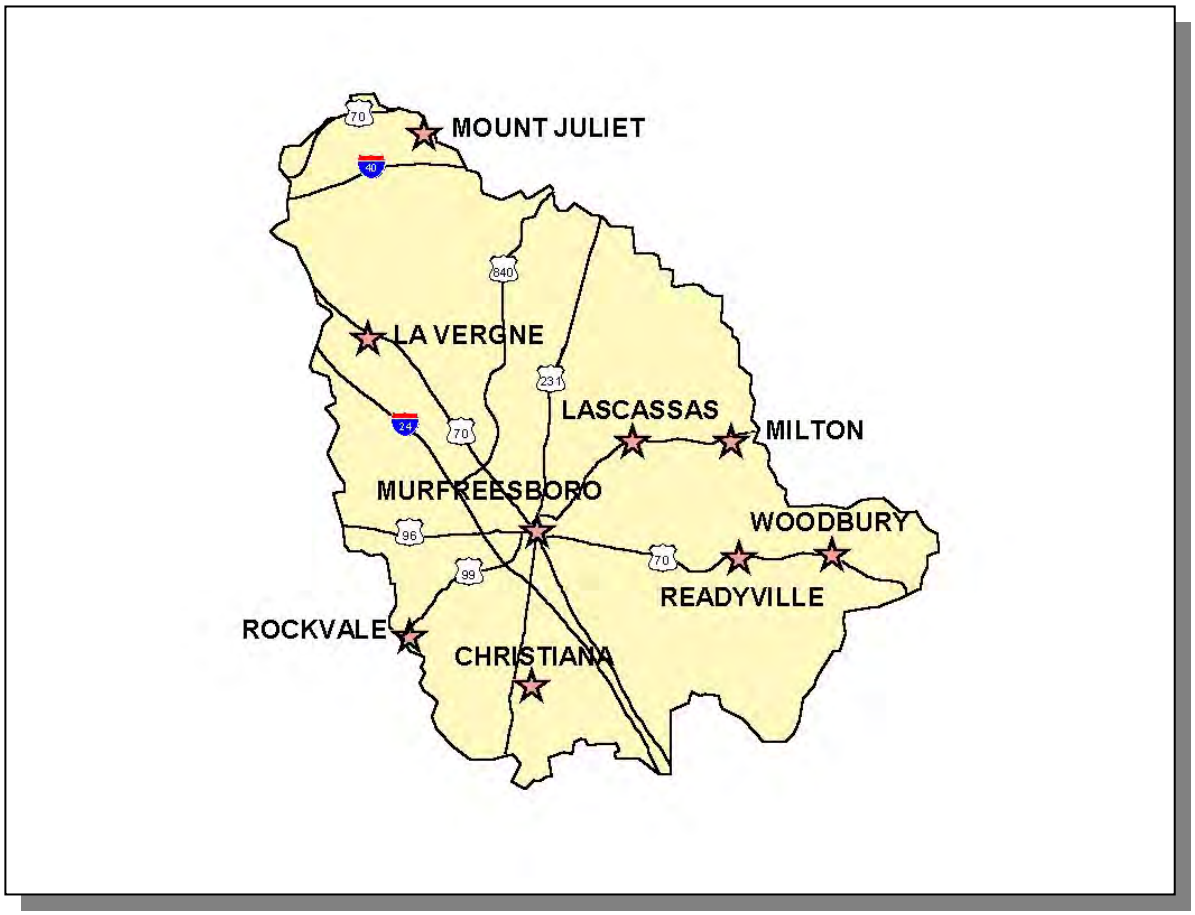



*Figure 2-2. Municipalities and Roads in the Stones River Watershed.*

| MUNICIPALITY | POPULATION | COUNTY |
|---|---|---|
| Murfreesboro* | 44,922 | Rutherford |
| Smyrna | 13,647 | Rutherford |
| LaVergne | 7,499 | Rutherford |
| Mount Juliet | 5,839 | Wilson |
| Woodbury* | 2,287 | Cannon |

***Table 2-2. Municipalities in the Stones River Watershed.*** *Population based on 1990 census (Tennessee Blue Book). Asterisk (*) indicates county seat.*

## 2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Stones River Watershed, designated the Hydrologic Unit Code 05130203 by the USGS, is approximately 921 square miles and drains to the Cumberland River.

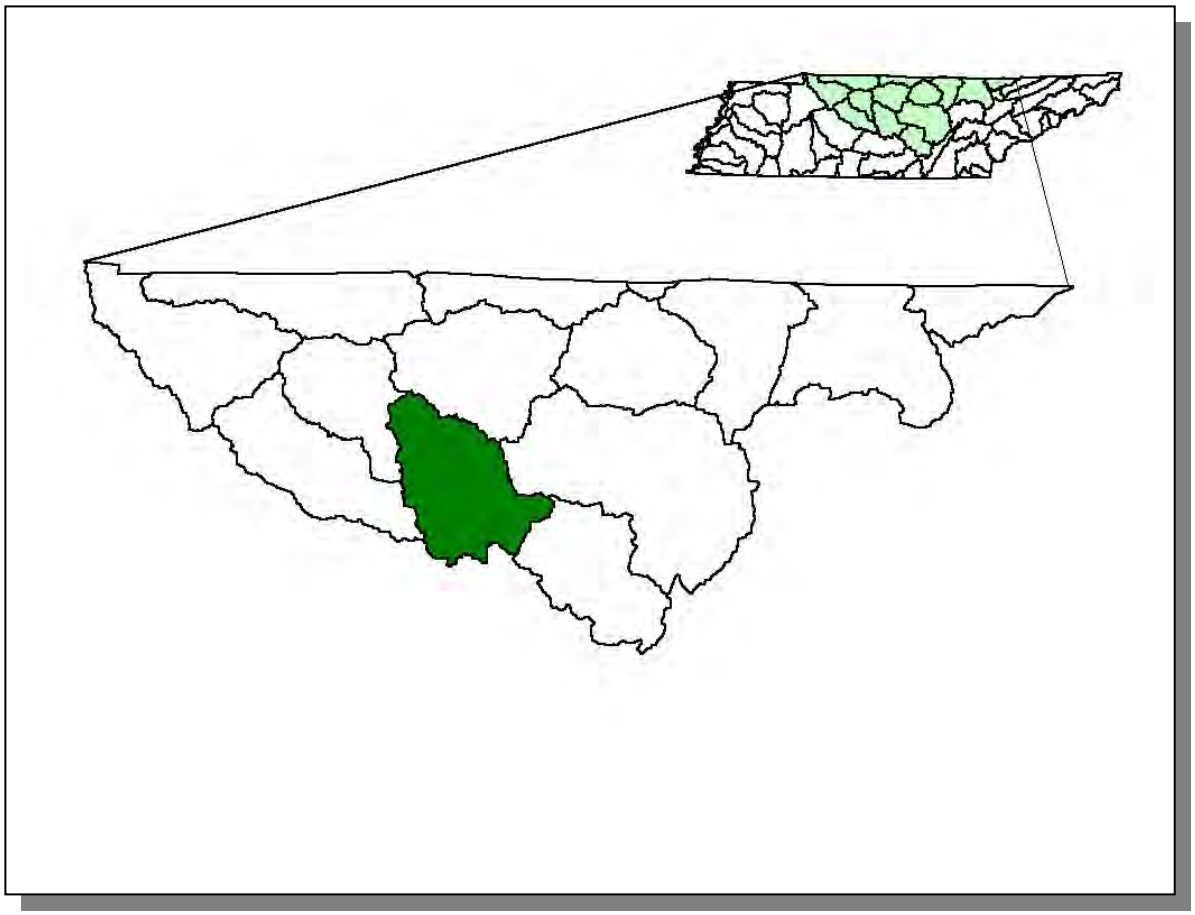


***Figure 2-3. The Stones River Watershed is part of the Cumberland River Basin.***

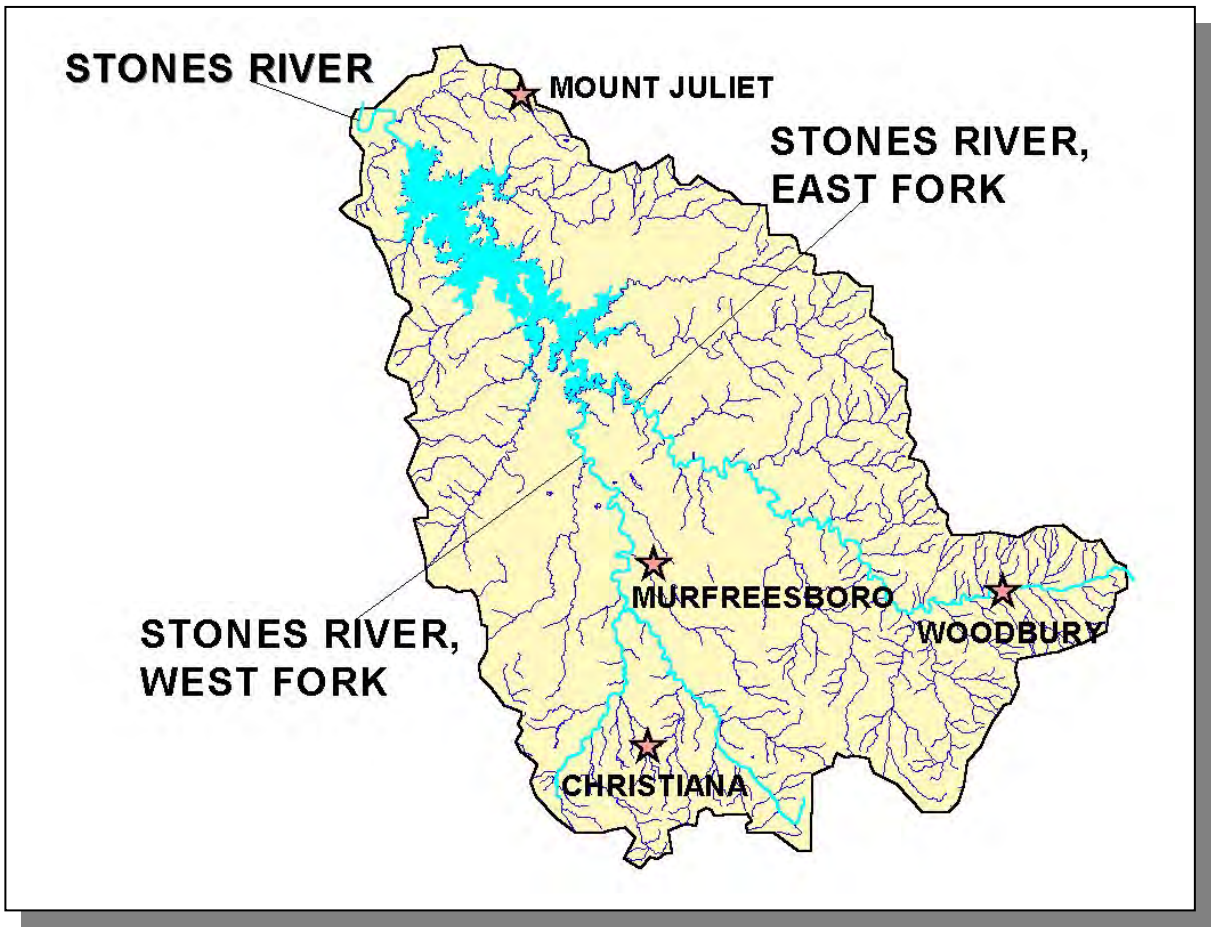



***Figure 2-4. Hydrology in the Stones River Watershed.*** *There are 1,031 stream miles and 22,691 lake acres recorded in River Reach File 3 in the Stones River Watershed. Locations of Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

2.3.B. Dams. There are 13 dams inventoried by TDEC Division of Water Supply in the Stones River Watershed. These dams either retain at least 30 acre-feet of water or have structures at least 20 feet high. Additional dams may be found in the watershed.

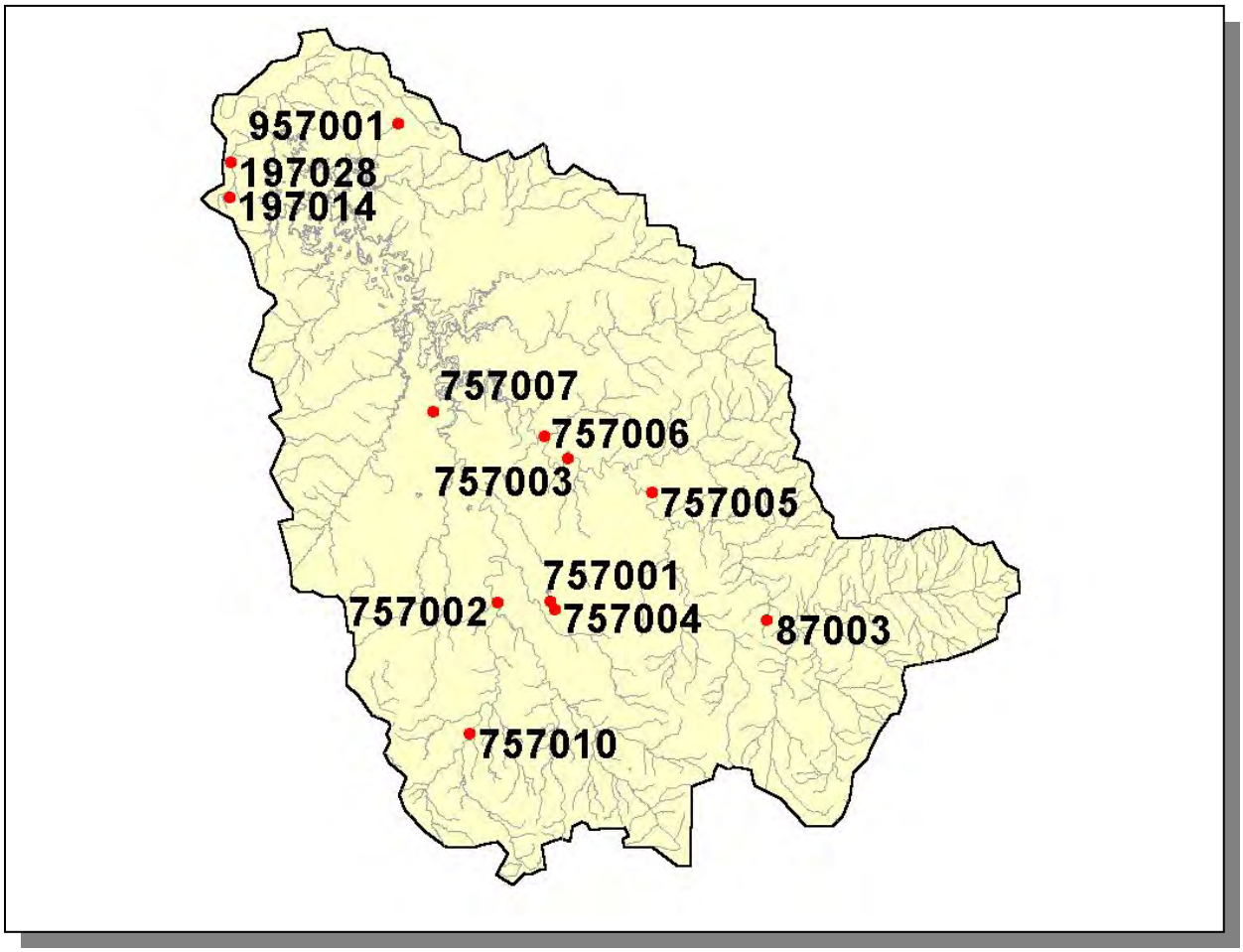



***Figure 2-5. Location of Inventoried Dams in the Stones River Watershed.*** *More information is provided in Stones-Appendix II.*

**2.4 LAND USE.** Land Use/Land Cover information was provided by EPA Region 4 and was interpreted from 1992 Multi-Resolution Land Cover (MRLC) satellite imagery.

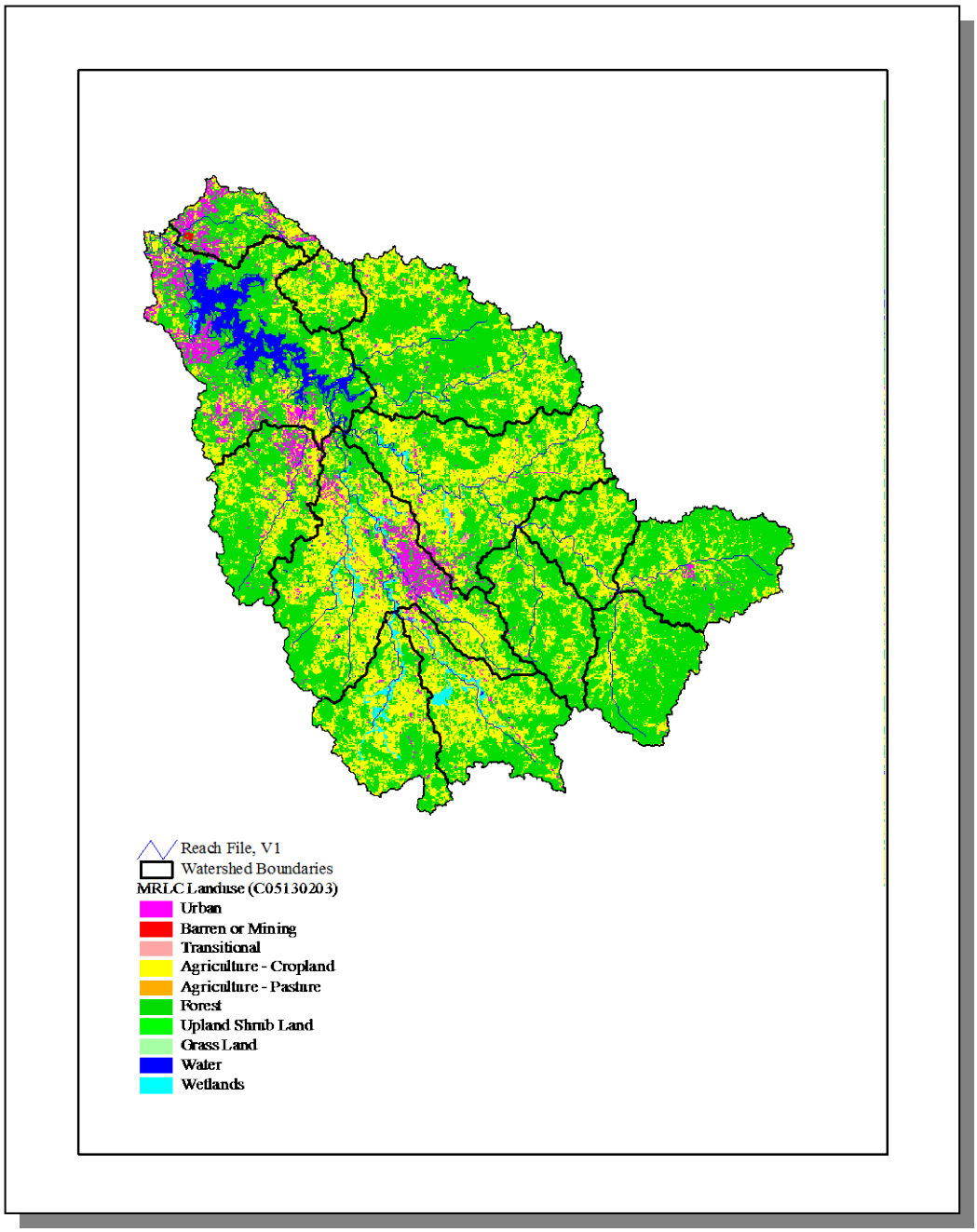



*Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.*

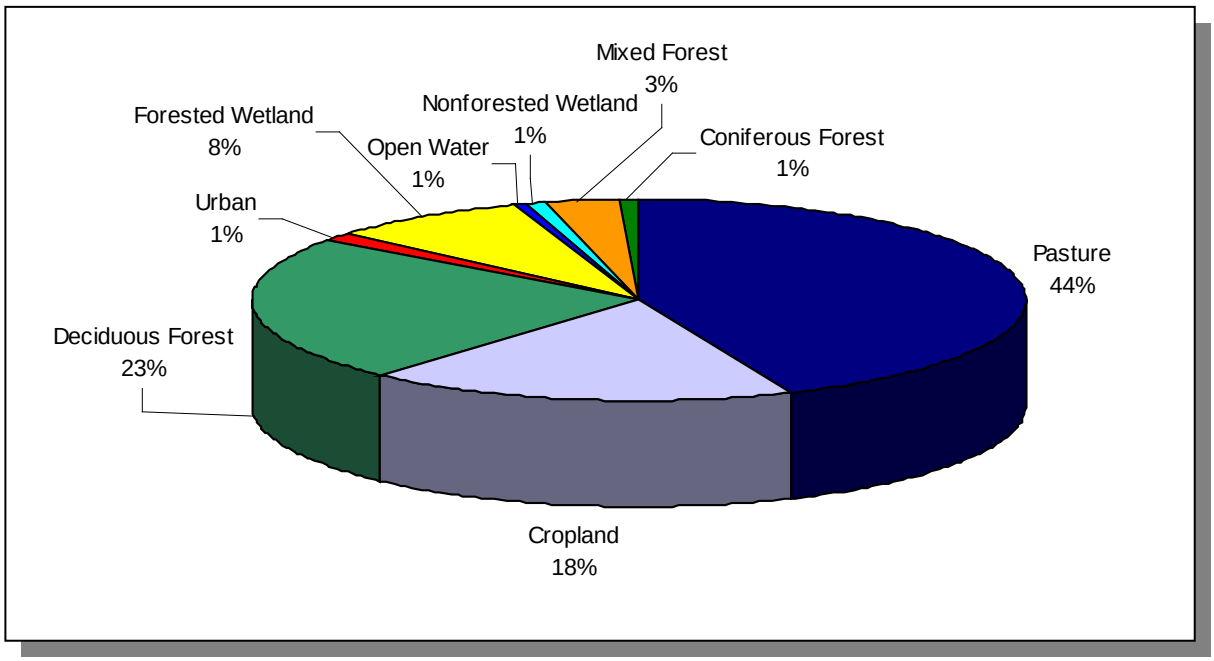



***Figure 2-7. Land Use Distribution in the Stones River Watershed.*** *More information is provided in Stones-Appendix II.*

**2.5 ECOREGIONS AND REFERENCE STREAMS.** Ecoregions are defined as relatively homogeneous areas of similar geography, topography, climate and soils that support similar plant and animal life. Ecoregions serve as a spatial framework for the assessment, management, and monitoring of ecosystems and ecosystem components. Ecoregion studies include the selection of regional stream reference sites, identifying high quality waters, and developing ecoregion-specific chemical and biological water quality criteria.

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Stones River Watershed lies within 1 Level III ecoregion (Interior Plateau) and contains 3 Level IV subecoregions (Griffen, Omernik, Azavedo, 1997):

- Eastern Highland Rim (71g) has more level terrain than the Western Highland Rim (71f), with landforms characterized as tablelands of moderate relief and irregular plains. Mississippian-age limestone, chert, shale, and dolomite predominate, and karst terrain sinkholes and depressions are especially noticable between Sparta and McMinnville. Numerous springs and spring-associated fish fauna also typify the region. Natural vegetation for the region is transitional between the oak-hickory type to the west and the mixed mesophytic forests of the Appalachian ecoregions (68, 69) to the east. Bottomland hardwoods forests were once abundant in some areas, although much of the original bottomland forest has been inundated by several large impoundments. Barrrens and former prairie areas are now mostly oak thickets or pasture and cropland.

- Outer Nashville Basin (71h) is a more heterogeneous region than the Inner Nashville Basin, with more rolling and hilly topography and slightly higher elevations. The region encompasses most all of the outer areas of the generally non-cherty Ordovician limestone bedrock. The higher hills and knobs are capped by the more cherty Mississippian-age formations, and some Devonian-age Chattanooga shale, remnants of the Highland Rim. The region's limestone rocks and soils are high in phosphorus, and commercial phosphate is mined. Deciduous forests with pasture and cropland are the dominant land covers. Streams are low to moderate gradient, with productive nutrient-rich waters, resulting in algae, rooted vegetation, and occasionally high densities of fish. The Nashville Basin as a whole has a distinctive fish fauna, notable for fish that avoid the region, as well as those that are present.

- Inner Nashville Basin (71i) is less hilly and lower than the Outer Nashville Basin. Outcrops of the Ordovician-age limestone are common, and the generally shallow soils are redder and lower in phosphorus than those of the Outer Basin. Streams are lower gradient than surrounding regions, often flowing over large expanses of limestone bedrock. The most characteristic hardwoods within the Inner Basin are a maple-oak-hickory-ash association. The limestone cedar glades of Tennessee, a unique mixed grassland/forest/cedar glades vegetation type with many endemic species, are located primarily on the limestone of the Inner Nashville Basin. The more xeric, open characteristics and shallow soils of the cedar glades also result in a distinct distribution of amphibian and reptile species.

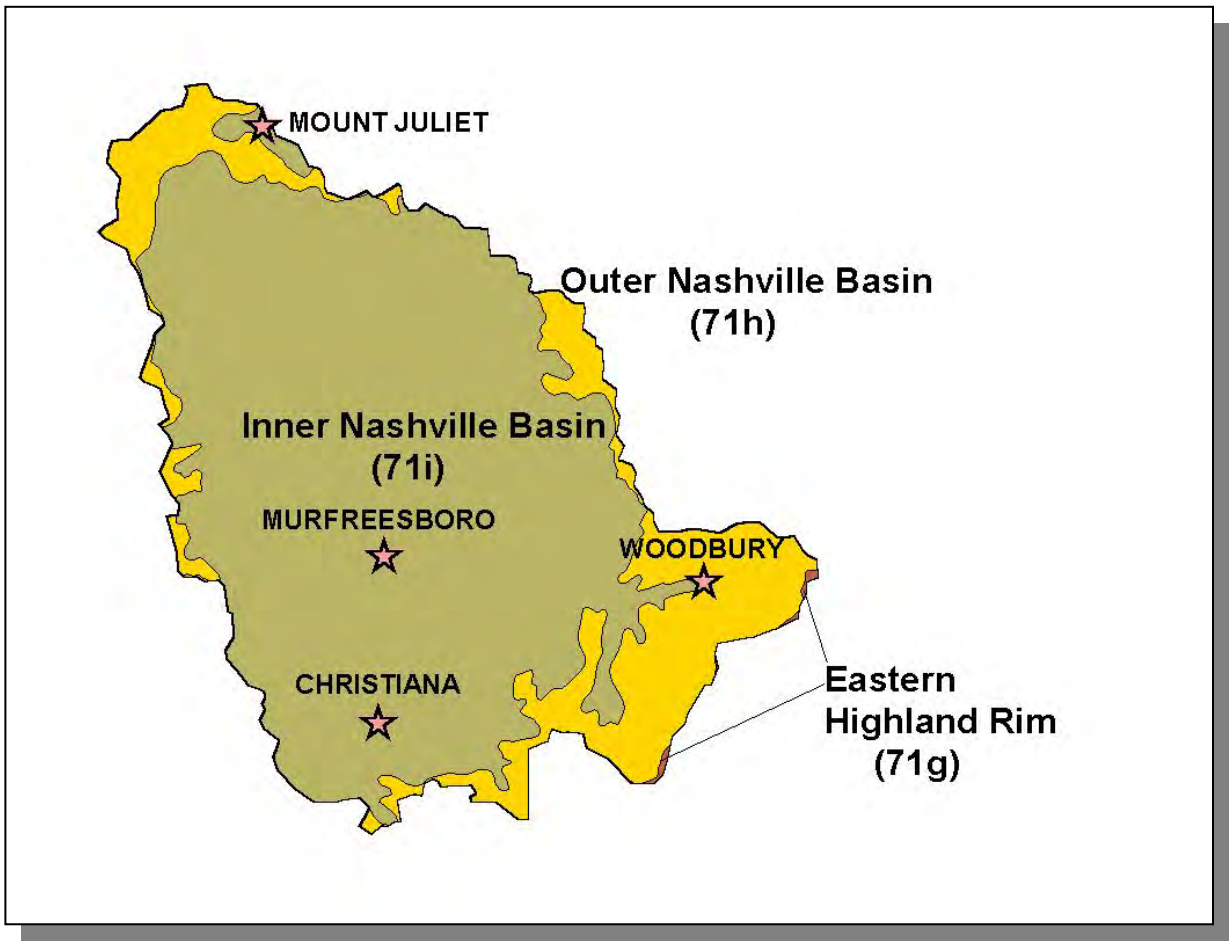



***Figure 2-8. Level IV Ecoregions in the Stones River Watershed.*** *Locations of Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

Each Level IV Ecoregion has at least one reference stream associated with it. A reference stream represents a least impacted condition and may not be representative of a pristine condition.

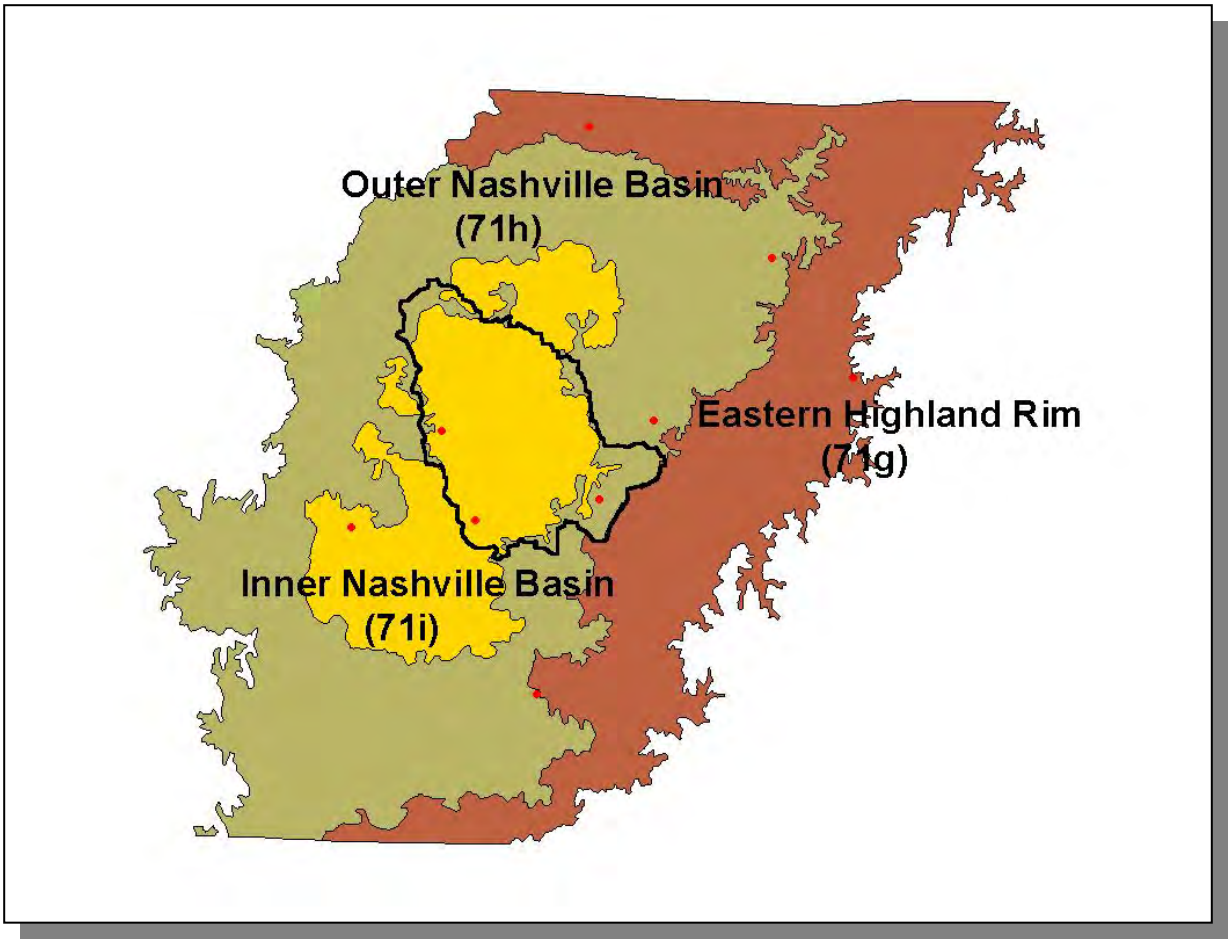



***Figure 2-9. Ecoregion Monitoring Sites in Level IV Subecoregions 71g, 71h, 71i.*** *The Stones River Watershed is shown for reference. More information is presented in Stones-Appendix II.*

## 2.6. NATURAL RESOURCES.

2.6.A. Designated State Natural Areas. The Natural Areas Program was established in 1971 with the passage of the Natural Areas Preservation Act. The Stones River Watershed has 5 Designated Natural Areas:

Fate Sanders Barrens Designated State Natural Area is an isolated community that is populated by rare plant species such as the limestone fame-flower *(Talinum calcaricum)* and the Tennessee milk-vetch *(Astragalus tennesseensis).*

Flat Rock Cedar Glade is considered one of the most important plant conservation sites of its size in Middle Tennessee. Small creek tributaries of flat gravelly wash areas provide specialized habitat for rare plants.

Sunnybell Cedar Glade is a large undisturbed cedar glade named for the large population of sunnybells (*Schoenolirion croceum).*

Vesta Cedar Glade is a site adjacent to the Cedars of Lebanon State Forest containing grassy cedar barrens slopes as well as *Echinacea tennesseensis.*

Walterhill Floodplain, a 100-year-old deposit of silt loam soils, is habitat for the largest known population of the Stones River mustard/bladderpod (*Lesquerella Stonensis).*

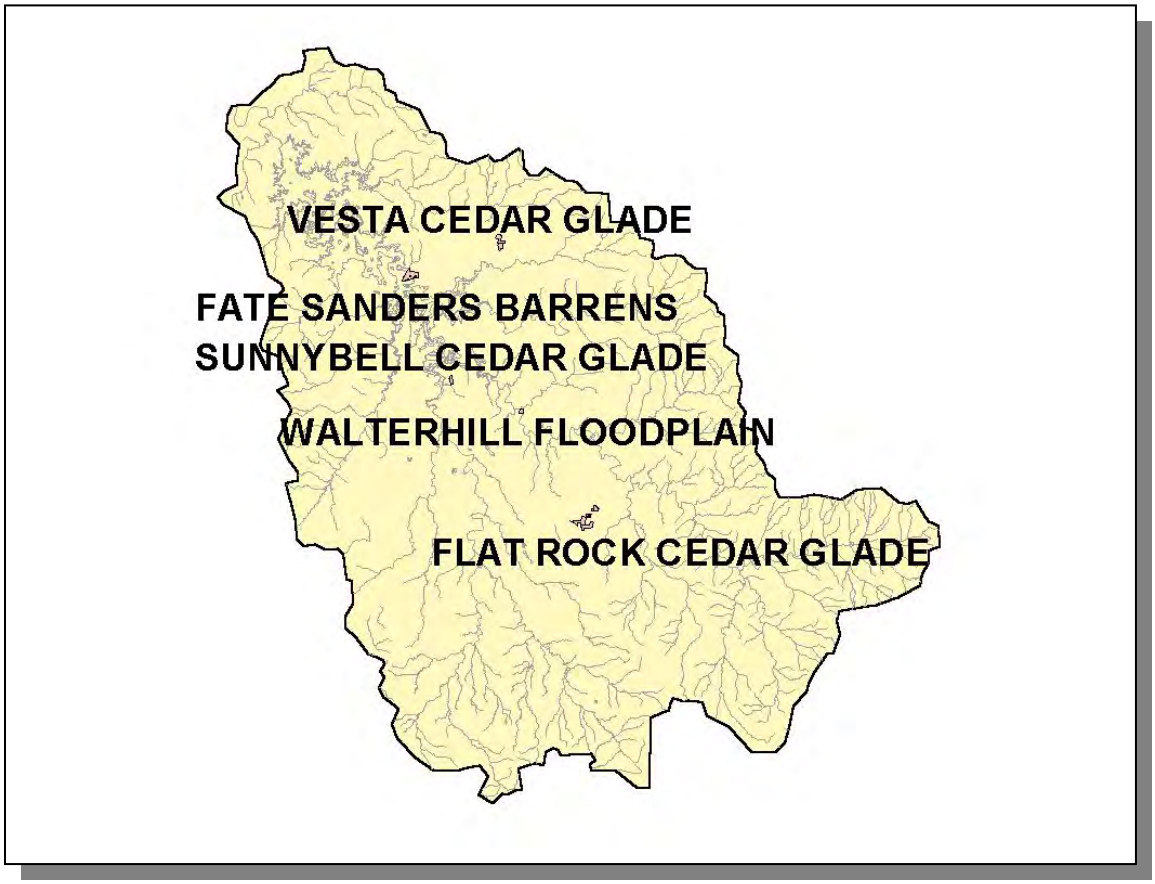



***Figure 2-10. There are 5 Designated State Natural Areas in the Stones River Watershed.***

2.6.B. Rare Plants and Animals. The Heritage Program in the TDEC Division of Natural Heritage maintains a database of rare species that is shared by partners at The Nature Conservancy, Tennessee Wildlife Resources Agency, the US Fish and Wildlife Service, and the Tennessee Valley Authority. The information is used to: 1) track the occurrence of rare species in order to accomplish the goals of site conservation planning and protection of biological diversity, 2) identify the need for, and status of, recovery plans, and 3) conduct environmental reviews in compliance with the Federal Endangered Species Act.

| GROUPING | NUMBER OF RARE SPECIES |
|---|---|
| Crustaceans | 1 |
| Insects | 0 |
| Mussels | 3 |
| Snails | 1 |
| | |
| Amphibians | 2 |
| Birds | 6 |
| Fish | 8 |
| Mammals | 2 |
| Reptiles | 2 |
| | |
| Plants | 44 |
| | |
| **Total** | **69** |

***Table 2-3. There are 69 Documented Rare Plant and Animal Species in the Stones River Watershed. Additional rare plant and animal species may be present.***

Additionally, in the Stones River Watershed, there are 8 rare fish species, 1 rare snail species, 3 rare mussel species, and 1 rare crustacean species.

| SCIENTIFIC NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS |
|---|---|---|---|
| *Etheostoma cinercum* | Ashey darter | | D |
| *Etheostoma luteovictum* | Redband darter | | D |
| *Etheostoma microlepidum* | Finescale darter | | D |
| *Etheostoma tippecanoe* | Tippecanoe darter | | D |
| *Lagochila lacera* | Harelip sucker | | D |
| *Notropis rupestris* | Bedrock shiner | | D |
| *Percina phoxocephala* | Slenderhead darter | | D |
| *Typhylichthys subterraneus* | Southern cavefish | | D |
| *Leptoxis subglobosa umbilicata* | Umbilicate rocksnail | | |
| *Epioblasma florentina florentina* | Yellow blossom | E | E |
| *Epioblasma florentina walkeri* | Tan riffleshell | E | E |
| *Pegias fabula* | Little wing pearlymussel | E | E |
| *Cambarus williami* | Brawley's Fork crayfish | | |

***Table 2-4. Rare Aquatic Species in the Stones River Watershed****. Federal Status: E, Listed Endangered by the U.S. Fish and Wildlife Service. State Status: E, Listed Endangered by the Tennessee Wildlife Resources Agency; D, Deemed in Need of Management by the Tennessee Wildlife Resources Agency.*

2.6.C. Wetlands. The Division of Natural Heritage maintains a database of wetland records in Tennessee. These records are a compilation of field data from wetland sites inventoried by various state and federal agencies. Maintaining this database is part of Tennessee's Wetland Strategy, which is described at http://www.state.tn.us/environment/epo/wetlands/strategy.zip.

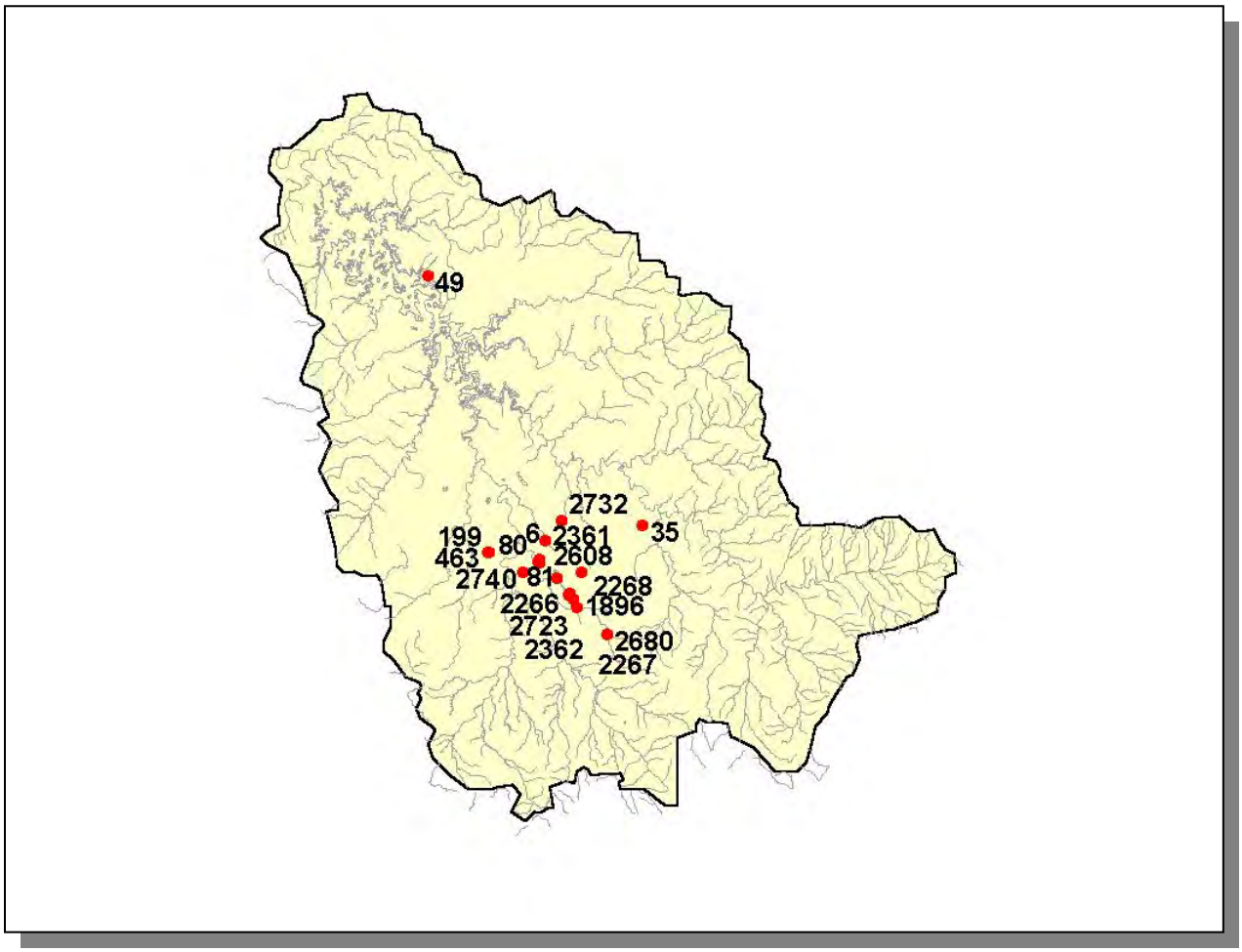



***Figure 2-11. Location of Wetland Sites in TDEC Division of Natural Heritage Database in Stones River Watershed. There may be additional wetland sites in the watershed.*** *More information is provided in Stones-Appendix II.*

## 2.7. CULTURAL RESOURCES.

2.7.A. Nationwide Rivers Inventory. The Nationwide Rivers Inventory, required under the Federal Wild and Scenic Rivers Act of 1968, is a listing of free-flowing rivers that are believed to possess one or more outstanding natural or cultural values. Exceptional scenery, fishing or boating, unusual geologic formations, rare plant and animal life, cultural or historic artifacts that are judged to be of more than local or regional

significance are the values that qualify a river segment for listing. The Tennessee Department of Environment and Conservation and the Rivers and Trails Conservation Assistance branch of the National Park Service jointly compile the Nationwide Rivers Inventory from time to time (most recently in 1997). Under a 1980 directive from the President's Council on Environmental Quality, all Federal agencies must seek to avoid or mitigate actions that would have an adverse effect on Nationwide Rivers Inventory segments.

The most recent version of the Nationwide Rivers Inventory lists portions of six streams in the Stones River Watershed:

Cripple Creek. Popular rocky, scenic float stream.

Overall Creek. Popular canoe stream in rural setting supports game fishery.

Stones River. Excellent fishing stream in pastoral setting.

Stones River, East Fork. Excellent scenic canoeing stream, several recorded historical sites, limestone outcropping.

Stones River, Middle Fork. Pastoral float and fishing stream with forested banks.

Stones River, West Fork. Excellent scenic canoeing stream.

| RIVER | SCENIC | RECREATION | GEOLOGIC | FISH | WILDLIFE | HISTORIC | CULTURAL |
|---|---|---|---|---|---|---|---|
| Cripple Creek | X | X | X | | X | | |
| Overall Creek | | X | | X | X | | |
| Stones River | X | X | | X | X | X | X |
| Stones River, East Fork | X | X | X | X | X | X | X |
| Stones River,Middle Fork | X | X | | X | X | X | |
| Stones River, West Fork | X | X | | X | X | X | |

***Table 2-5. Attributes of Streams Listed in the Nationwide Rivers Inventory.***

Additional information may be found online at http://www.ncrc.nps.gov/rtca/nri/tn.htm

2.7.B. Greenways. Murfreesboro Parks and Recreation has completed an 10-mile extension of the Stones River Greenway, a tree-shaded trail for walking/cycling. This paved path runs alongside beautiful woods and winds along the river.

2.7.C. Interpretive Areas. Some sites representative of the cultural heritage are under state or federal protection:

- Stones River National Battlefield, site of a Civil War battle, contains the Hazen Brigade Monument, the oldest Civil war monument still in its original position
- Cannonsburg Pioneer Village, a living museum of early Southern life, built to commemorate the U.S. Bicentennial in 1976

2.7.D. Wildlife Management Area.

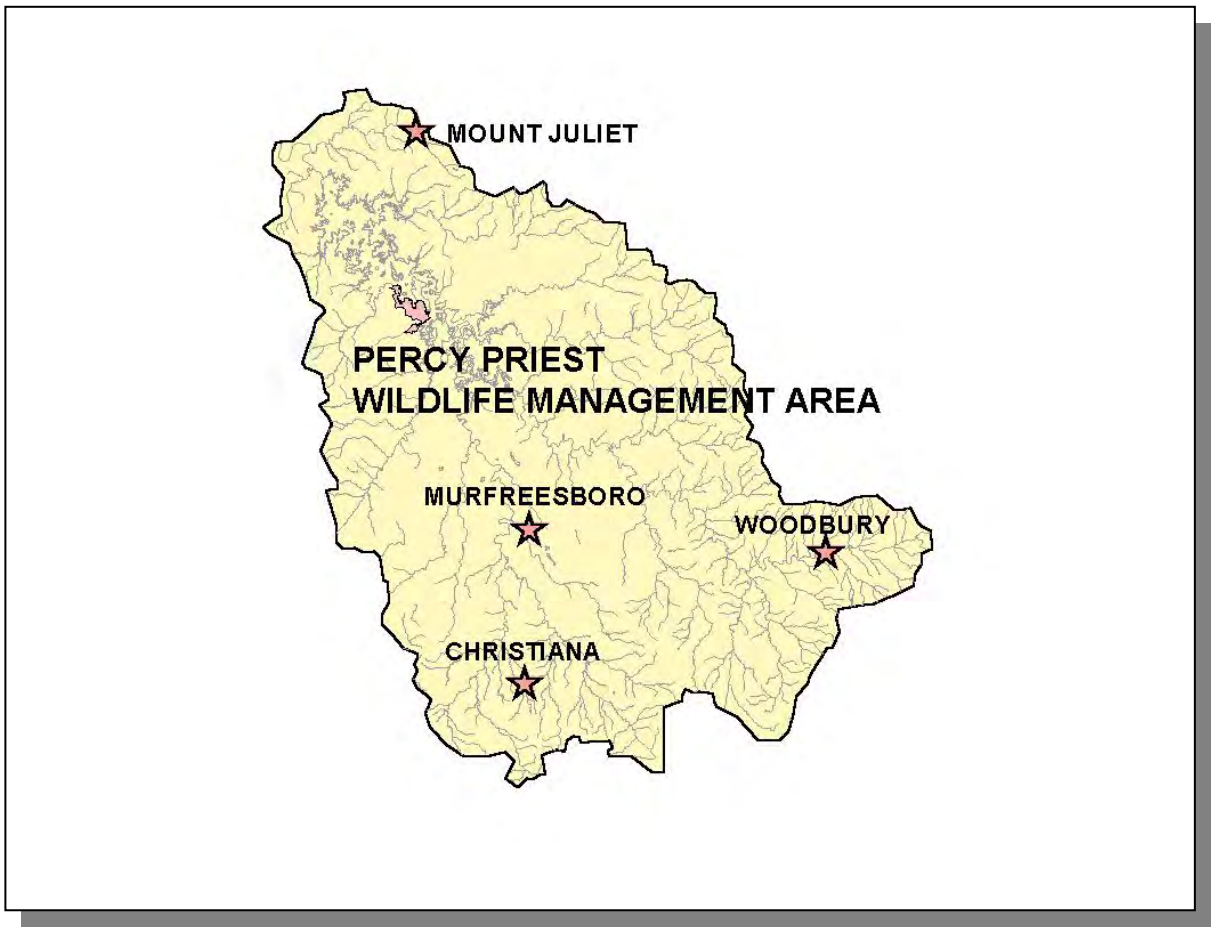



***Figure 2-12. TWRA Manages Percy Priest Wildlife Management Area in the Stones River Watershed.*** *Locations of Christiana, Murfreesboro, Smyrna, and Woodbury are shown for reference.*

**2.8. TENNESSEE RIVERS ASSESSMENT PROJECT.** The Tennessee Rivers Assessment is part of a national program operating under the guidance of the National Park Service's Rivers and Trails Conservation Assistance Program. The Assessment is an inventory of river resources, and should not be confused with "Assessment" as defined by the Environmental Protection Agency. A more complete description can be found in the Tennessee Rivers Assessment Summary Report, which is available from the Department of Environment and Conservation and on the web at:

http://www.state.tn.us/environment/wpc/riv

| STREAM | NSQ | RB | RF | STREAM | NSQ | RB | RF |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| Big Springs Creek | 3 | | | Long Creek | 3 | | |
| Bradley Creek | 3 | 3 | 2,3 | Lytle Creek | 3 | 3 | |
| Brawleys Fork East Stones River | 2 | | 2 | McCrory Creek | 3 | | |
| Carson Fork East Stones River | 3 | | | Middle Fork Stones River | 3 | 3 | |
| Cripple Creek | 2 | 3 | | Overall Creek | 3 | 3 | |
| Dry Creek (Hurricane) | 3 | | | Puckett Creek | 3 | | |
| Dry Creek (Sinking) | 4 | | | Reed Creek | 1 | | |
| Dry Fork West Stones River | 1 | | | Rock Springs Hart Branch Stones River | | | |
| Dry Fork Branch Bradley Creek | 4 | | | Rockhouse Branch East Fork Stones River | 2 | | |
| East Fork Stones River | 2,3 | 1,2,3 | 1 | Short Creek | 3 | | |
| Fall Creek | 2 | | | Sinking Creek | 3 | | |
| Florida Creek | 3 | | | Stewart Creek | 4 | | |
| Goat Creek | 2 | | | Stoners Creek | 3 | | |
| Henry Creek | 2 | | | Stones River | 1 | 2 | |
| Hollis Creek | 2 | | | West Fork Stones River | 2 | 2 | |
| Hurricane Creek | 3 | | | | | | |

***Table 2-6. Stream Scoring from the Tennessee Rivers Assessment Project.***

Categories: NSQ, Natural and Scenic Qualities
RB, Recreational Boating
RF, Recreational Fishing

Scores: 1. Statewide or greater Significance; Excellent Fishery
2. Regional Significance; Good Fishery
3. Local Significance; Fair Fishery
4. Not a significant Resource; Not Assessed as a fishery

# CHAPTER 3

## WATER QUALITY ASSESSMENT OF THE STONES RIVER WATERSHED


3.1 Background

3.2 Data Collection
- 3.2.A. Ambient Monitoring Sites
- 3.2.B. Ecoregion Sites
- 3.2.C. Watershed Screening Sites
- 3.2.D. Special Surveys

3.3 Status of Water Quality
- 3.3.A. Assessment Summary
- 3.3.B. Use Impairment Summary

3.4 Fluvial Geomorphology


**3.1 BACKGROUND.** Section 305(b) of The Clean Water Act requires states to report the status of water quality every two years. Historically, Tennessee's methodologies, protocols, frequencies and locations of monitoring varied depending upon whether sites were ambient, ecoregion, or intensive survey. Alternatively, in areas where no direct sampling data existed, water quality may have been assessed by evaluation or by the knowledge and experience of the area by professional staff.

In 1996, Tennessee began the watershed approach to water quality protection. In the Watershed Approach, resources—both human and fiscal—are better used by assessing water quality more intensively on a watershed-by-watershed basis. In this approach, water quality is assessed in year three, following one to two years of data collection. More information about the Watershed Approach may be found at http://www.state.tn.us/environment/wpc/wshed1.htm.

The assessment information is used in the 305(b) Report (The Status of Water Quality in Tennessee) and the 303(d) list as required by the Clean Water Act.

The 305(b) Report documents the condition of the State's waters. Its function is to provide information used for water quality based decisions, evaluate progress, and measure success.

Tennessee uses the 305(b) Report to meet four goals (from 2000 305(b) Report):

1. Assess the general water quality conditions of rivers, streams, lakes and wetlands

2. Identify causes of water pollution and the sources of pollutants

3. Specify waters which have been found to pose human health risks due to elevated bacteria levels or contamination of fish

4. Highlight areas of improved water quality

EPA aggregates the state use support information into a national assessment of the nation's water quality. This aggregated use support information can be viewed at EPA's Surf Your Watershed site at:

http://www.epa.gov/OW/resources/9698/tn.html

The 303(d) list is a compilation of the waters of Tennessee that are water quality limited and fail to support some or all of their classified uses. Water quality limited streams are those that have one or more properties that violate water quality standards. Therefore, the water body is considered to be impacted by pollution and is not fully meeting its designated uses. The 303(d) list does not include streams determined to be fully supporting designated uses as well as streams the Division of Water Pollution Control cannot assess due to lack of water quality information. Also absent are streams where a control strategy is already in the process of being implemented.

Once a stream is placed on the 303(d) list, it is considered a priority for water quality improvement efforts. These efforts not only include traditional regulatory approaches such as permit issuance, but also include efforts to control pollution sources that have historically been exempted from regulations, such as certain agricultural and forestry activities. If a stream is on the 303(d) list, the Division of Water Pollution Control cannot use its regulatory authority to allow additional sources of the same pollutant(s).

States are required to develop Total Maximum Daily Loads (TMDLs) for 303(d)-listed waterbodies. The TMDL process establishes the maximum amount of a pollutant that a waterbody can assimilate without exceeding water quality standards and allocates this load among all contributing pollutant sources. The purpose of the TMDL is to establish water quality objectives required to reduce pollution from both point and nonpoint sources and to restore and maintain the quality of water resources.

The current 303(d) List is available on the TDEC homepage at http://www.state.tn.us/environment/water.htm and information about Tennessee's TMDL program may be found at http://www.state.tn.us/environment/wpc/tmdl.htm.

This chapter provides a summary of water quality in the Stones River Watershed, and summarizes data collection, assessment results and a description of impaired waters.

**3.2 DATA COLLECTION.** Comprehensive water quality monitoring in the Stones River Watershed was conducted in 1998. Data were collected from 91 sites and were from one of four types of site: 1)Ambient, 2)Ecoregion, 3)Watershed or 4)Aquatic Resources Alteration Permit (ARAP) inspection sites.

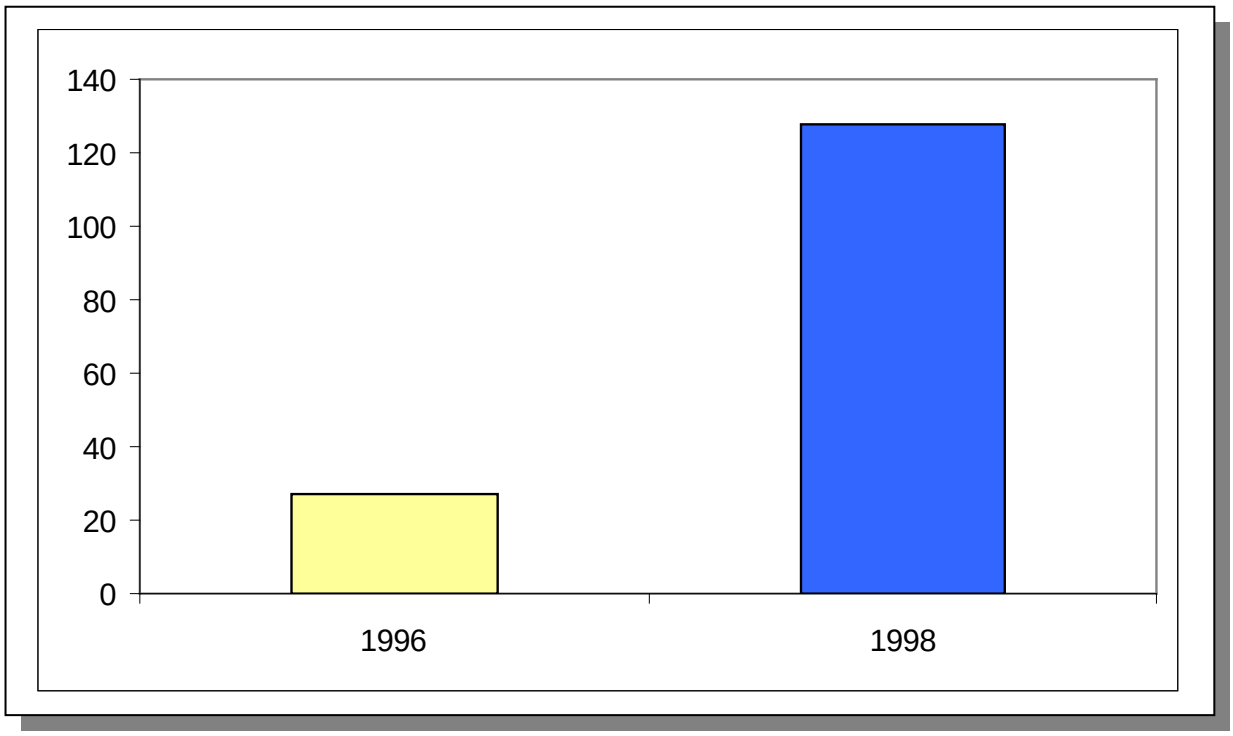



***Figure 3-1. Number of Sampling Events Using the Traditional Approach (1996) and Watershed Approach (1998) in the Stones River Watershed.***

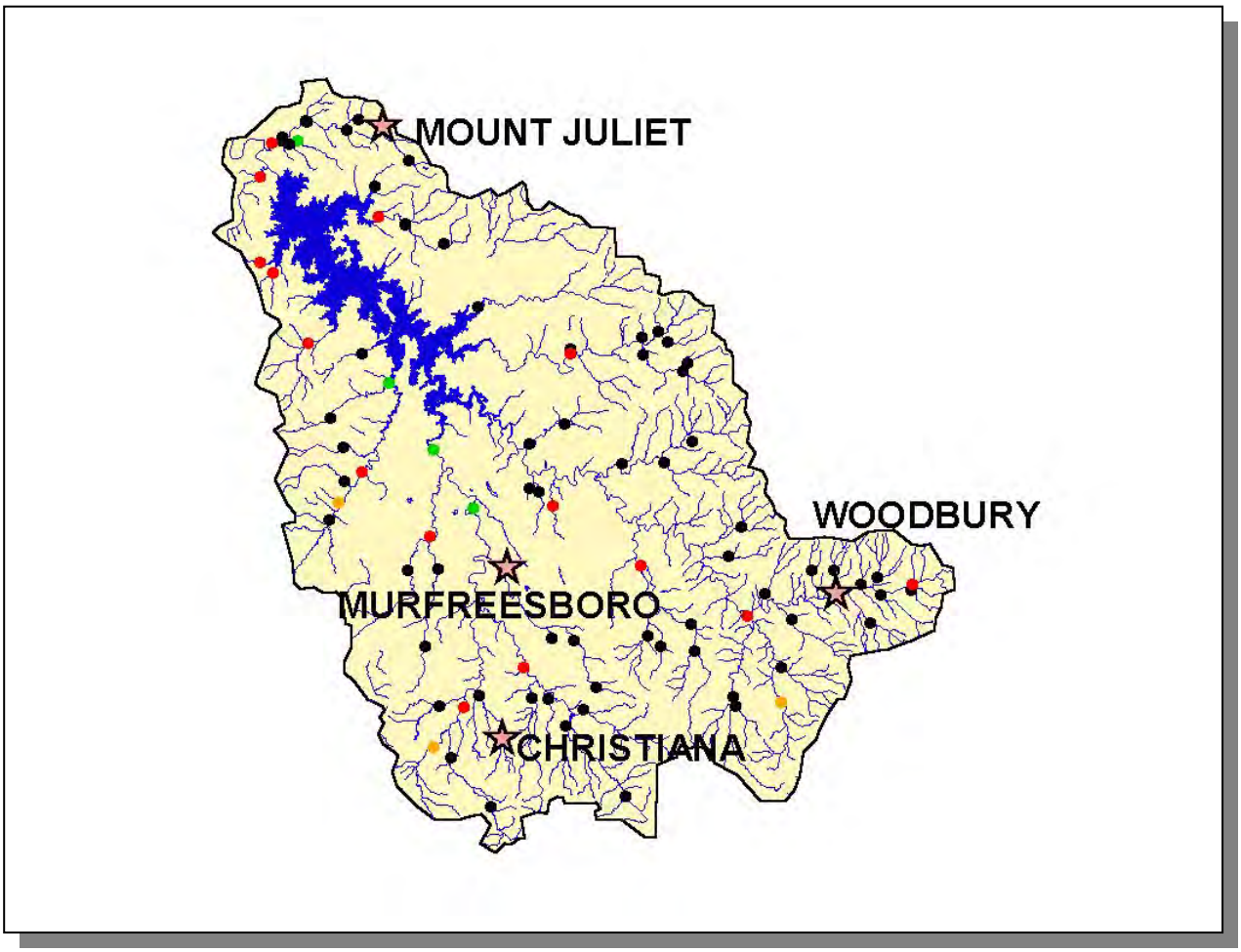



***Figure 3-2. Location of Monitoring Sites in the Stones River Watershed.*** *Red, Watershed Monitoring Sites; Black, Observational Data Sites; Orange, Rapid Bioassessment Sites; Green, Ambient Monitoring Sites. Locations of Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

| TYPE OF SITE | NUMBER OF SITES | TOTAL NUMBER OF SAMPLING EVENTS | | |
|---|---|---|---|---|
| | | CHEMICAL ONLY | BIOLOGICAL ONLY | BIOLOGICAL + CHEMICAL (FIELD PARAMETERS) |
| | | | | |
| AMBIENT | 4 | 20 | | |
| ECOREGION | 3 | 12 | | 12 |
| WATERSHED | 84 | | 14 | 70 |
| | | | | |
| **TOTALS** | **91** | **32** | **14** | **82** |

***Table 3-1. Monitoring Sites in the Stones River Watershed During the Data Collection Phase of the Watershed Approach.***

In addition to the 128 sampling events, over 55 citizen complaints, 2 occurrences involving dead fish (fish kills) and 5 responses to toxic spills were investigated.

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Assistance Center-Nashville Water Pollution Control staff (this is in addition to samples collected by water and wastewater treatment plant operators). Samples are analyzed by the Tennessee Department of Health, Division of Environmental Laboratory Services. Ambient monitoring data are used to assess water quality in major bodies of water where there are NPDES facilities and to identify trends in water quality. Water quality parameters measured in the Stones River Watershed are provided in Stones-Appendix IV.

Data from ambient monitoring stations are entered into the STORET (Storage and Retrieval) system administered by EPA. Some ambient monitoring stations are scheduled to be monitored as watershed sampling sites.

3.2.B. Ecoregion Sites. Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plants and animals. The delineation phase of the Tennessee Ecoregion Project was completed in 1997 when the ecoregions and subecoregions were mapped and summarized (EPA/600/R-97/022). There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee (see Chapter 2 for more details). The Stones River Watershed lies within 1 Level III ecoregion (Interior Plateau) and contains 3 subecoregions (Level IV):

- Eastern Highland Rim (71g)
- Outer Nashville Basin (71h)
- Inner Nashville Basin (71i)

Ecoregion reference sites are chemically monitored using methodology outlined in the Division's Chemical Standard Operating Procedure (Standard Operating Procedure for Modified Clean Technique Sampling Protocol). Macroinvertebrate samples are collected in spring and fall. These biological sample collections follow methodology outlined in the Tennessee Biological Standard Operating Procedures Manual. Volume 1: Macroinvertebrates and EPA's Revision to Rapid Bioassessment Protocols for use in Streams and Rivers.

Ecoregion stations are scheduled to be monitored as Watershed sampling sites.

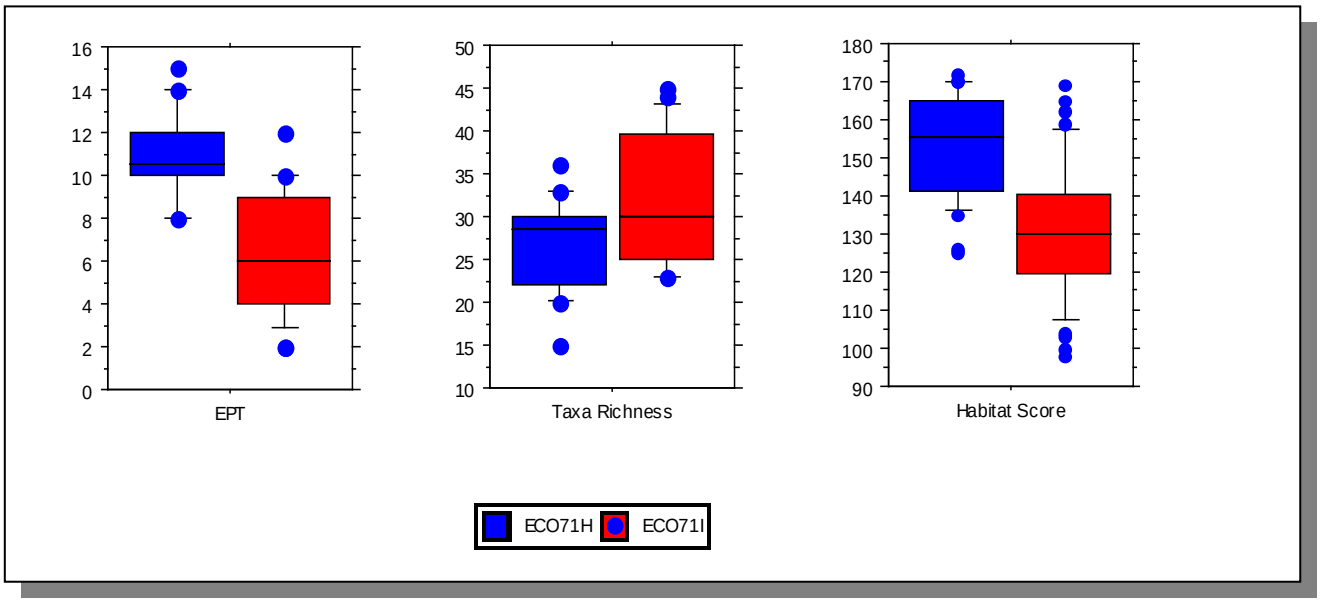



***Figure 3-3. Benthic Macroinvertebrate and Habitat Scores for Stones River Ecoregion Sites.*** *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as points. EPT and Taxa scores are number of genus observed; habitat score is calculated as described in EPA 841-D-97-002*

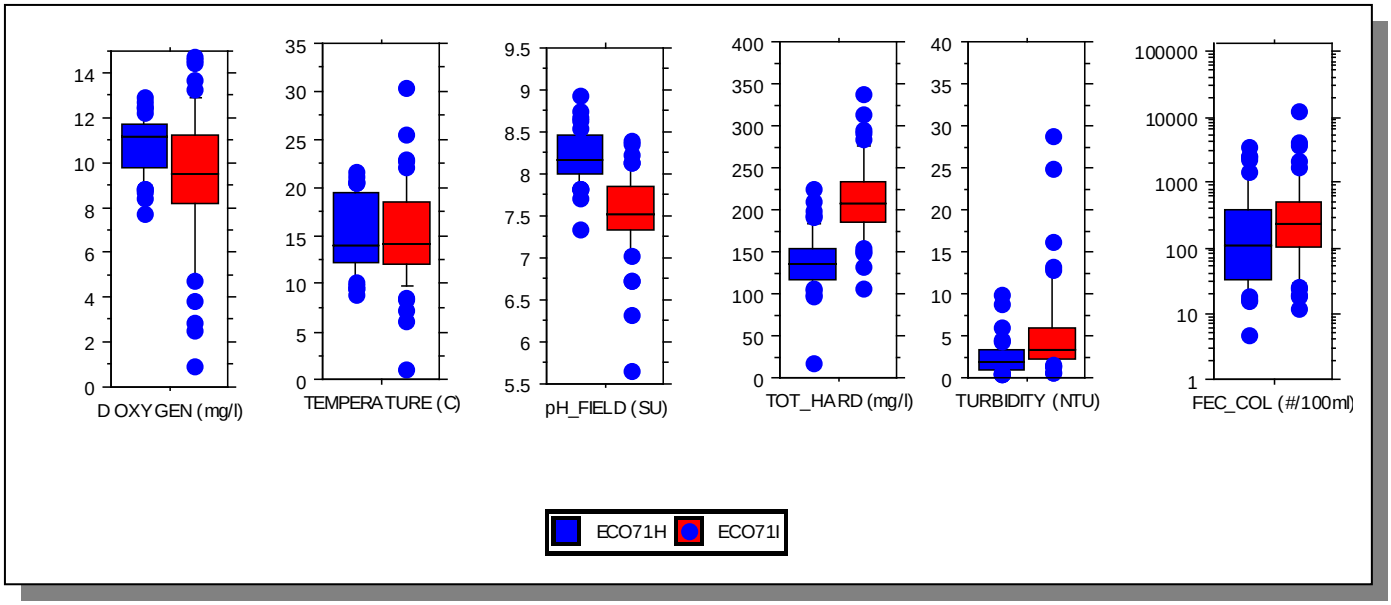



***Figure 3-4. Select Chemical Data Collected in Stones River Watershed Ecoregion Sites.*** *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as points.*

3.2.C. Watershed Sites. Activities that take place at watershed sites are benthic macroinvertebrate biological stream surveys, physical habitat determinations and/or chemical monitoring. Following review of existing data, watershed sites are selected in Year 1 of the watershed approach when preliminary monitoring strategies are developed. Additional sites may be added in Year 2 when additional monitoring strategies are implemented.

A Biological Reconnaissance (BioRecon) is used as a screening tool to describe the condition of water quality, in general, by determining the absence or presence of clean water indicator organisms, such as EPT (Ephemeroptera [mayflies], Plecoptera [stoneflies], Trichoptera [caddisflies]). Factors and resources used for selecting BioRecon sites are:

- The current 303(d) list,
- HUC-11 maps (every HUC-11 is scheduled for a BioRecon)
- Land Use/Land Cover maps
- Topographic maps
- Locations of NPDES facilities
- Sites of recent ARAP activities

An intensive multiple or single habitat assessment involves the monitoring of a station over a fixed period of time. Intensive surveys (Rapid Bioassessment Protocols) are performed when BioRecon results warrant it.
The 2000 305(b) report describes two ways to select sites to sample for water quality: targeted and probabilistic. The Division of Water Pollution Control has designed and is currently conducting a probabilistic water quality study of subecoregion 71i (Inner Nashville Basin). Chemical, physical and biological data is being collected and analyzed at approximately 50 randomly selected sites.

Probabilistic monitoring will be evaluated as a tool for future monitoring efforts in Tennessee. Additional information may be found in the 2000 305(b) Report.

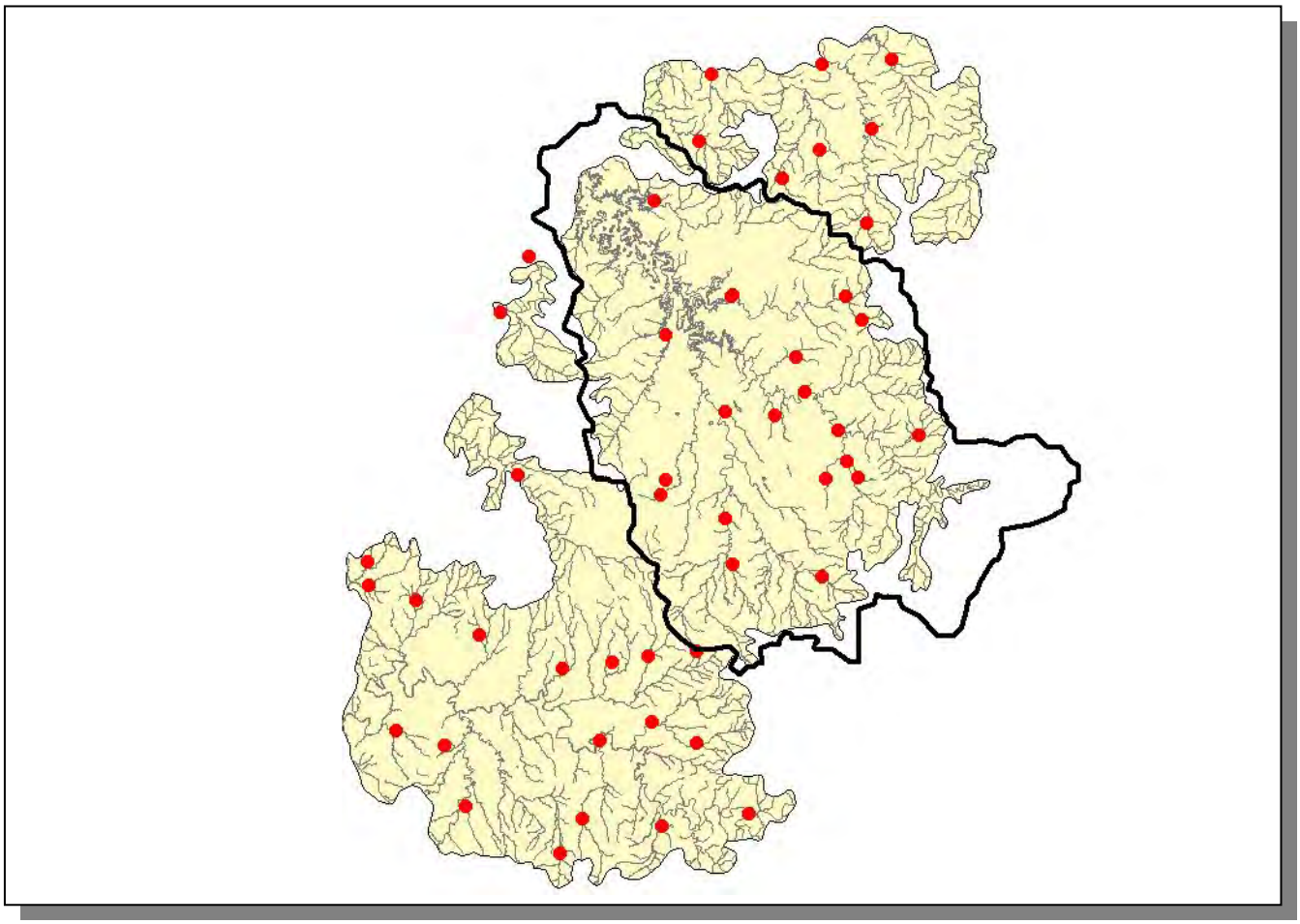


***Figure 3-5. Probabilistic Monitoring Sites in Subecoregion 71i.*** *Stones River Watershed is shown for reference. More information is provided in Stones-Appendix III.*

3.2.D. Special Surveys. These investigations include:

- ARAP in-stream investigation
- Time-of-travel dye study
- Sediment oxygen demand study
- Lake eutrophication study
- Fluvial geomorphology

These special surveys are performed when needed.

**3.3. STATUS OF WATER QUALITY**. Overall use support is a general description of water quality conditions in a water body based on determination of individual use supports. Use support determinations, which can be classified as monitored or evaluated, are based on:

- Data less than 5 years old (monitored)
- Data more than 5 years old (evaluated)
- Knowledge and experience of the area by technical staff (evaluated)
- Complaint investigation (monitored, if samples are collected)
- Other readily available Agencies' data (monitored)
- Readily available Volunteer Monitoring data (monitored, if certain quality assurance standards are met)

All available data are considered, including data from TDEC Environmental Assistance Centers, Tennessee Department of Health (Aquatic Biology Section of Laboratory Services), Tennessee Wildlife Resources Agency, National Park Service, Tennessee Valley Authority, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Geological Survey, U.S. Forest Service, universities and colleges, the regulated community and the private sector.

The assessment is based on the degree of support of designated uses as measured by compliance with Tennessee's water quality standards.

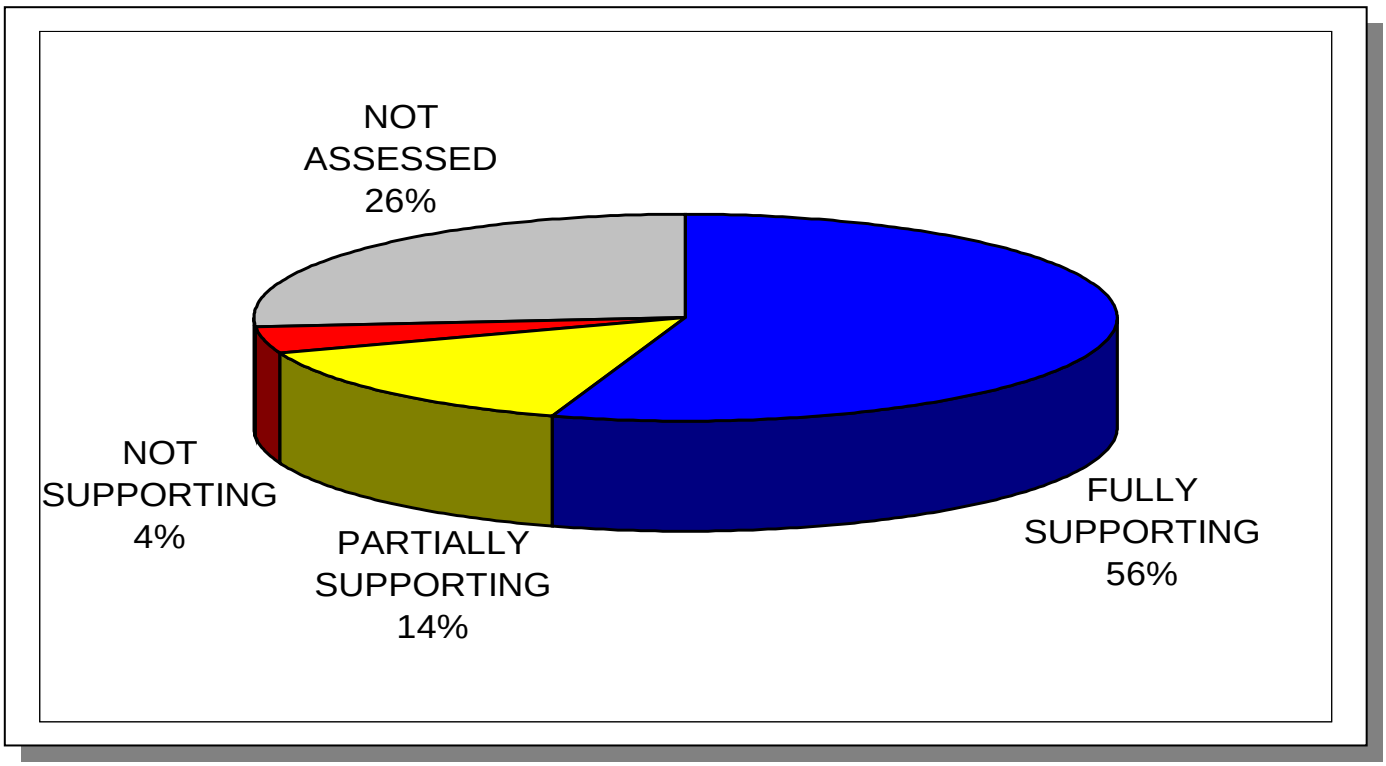



***Figure 3-6. Water Quality Assessment for Rivers and Streams in the Stones River Watershed.*** *Assessment data (stream miles) are based on the 2000 Water Quality Assessment.*

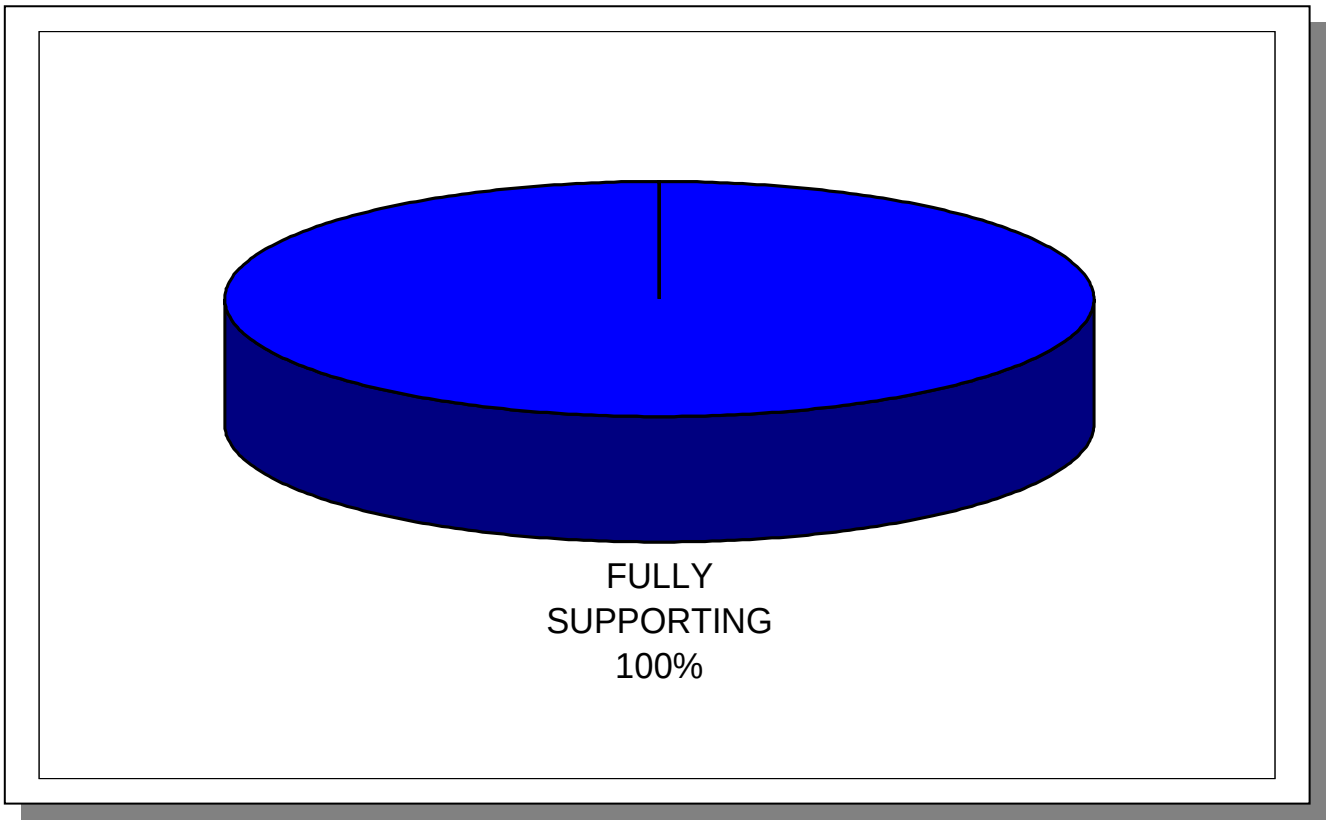



***Figure 3-7. Water Quality Assessment for Lakes in the Stones River Watershed.*** *Assessment data (stream miles) are based on the 2000 Water Quality Assessment. More information is provided in Stones-Appendix III.*

3.3.A. Assessment Summary.

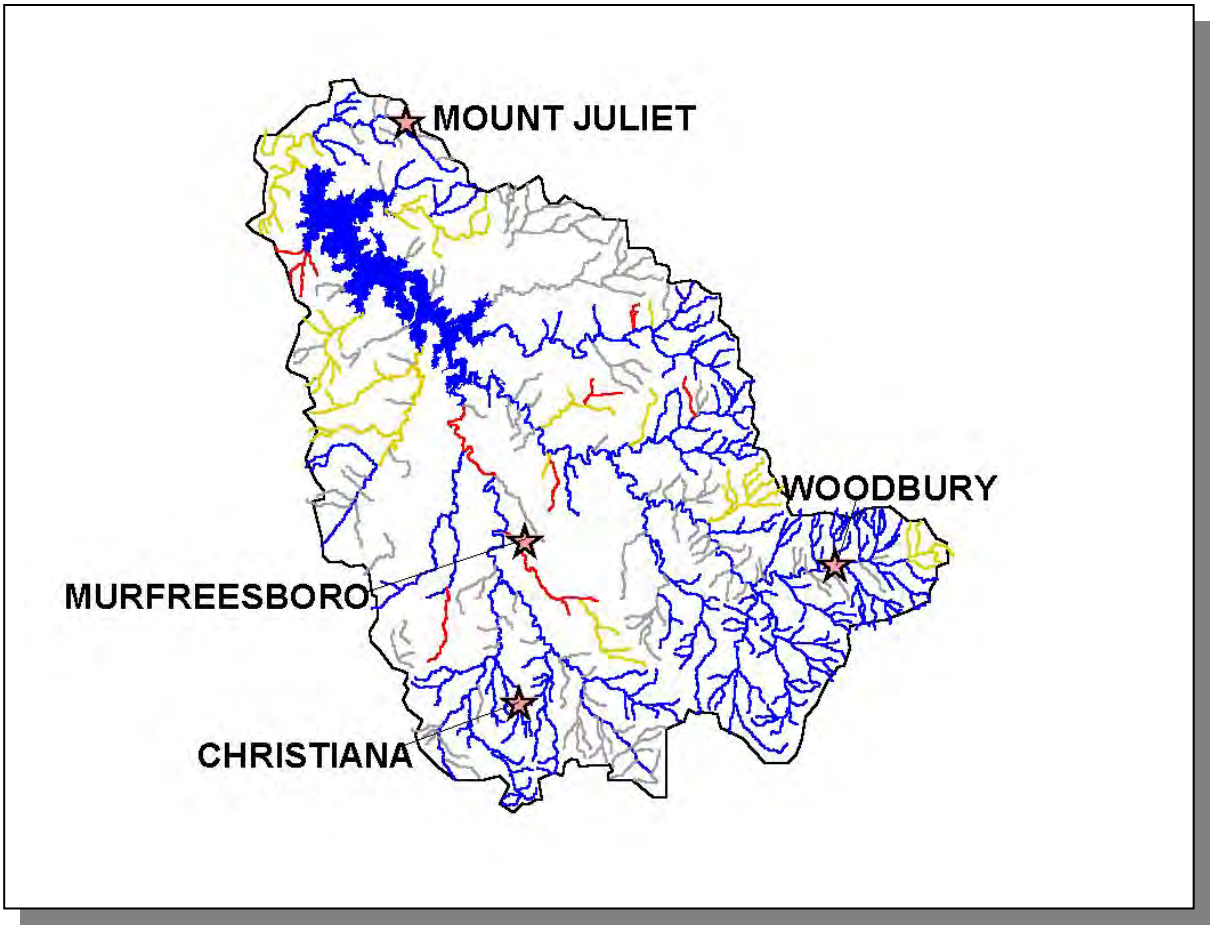



***Figure 3-8a. Overall Use Support Attainment in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference. More information is provided in Stones-Appendix III.*

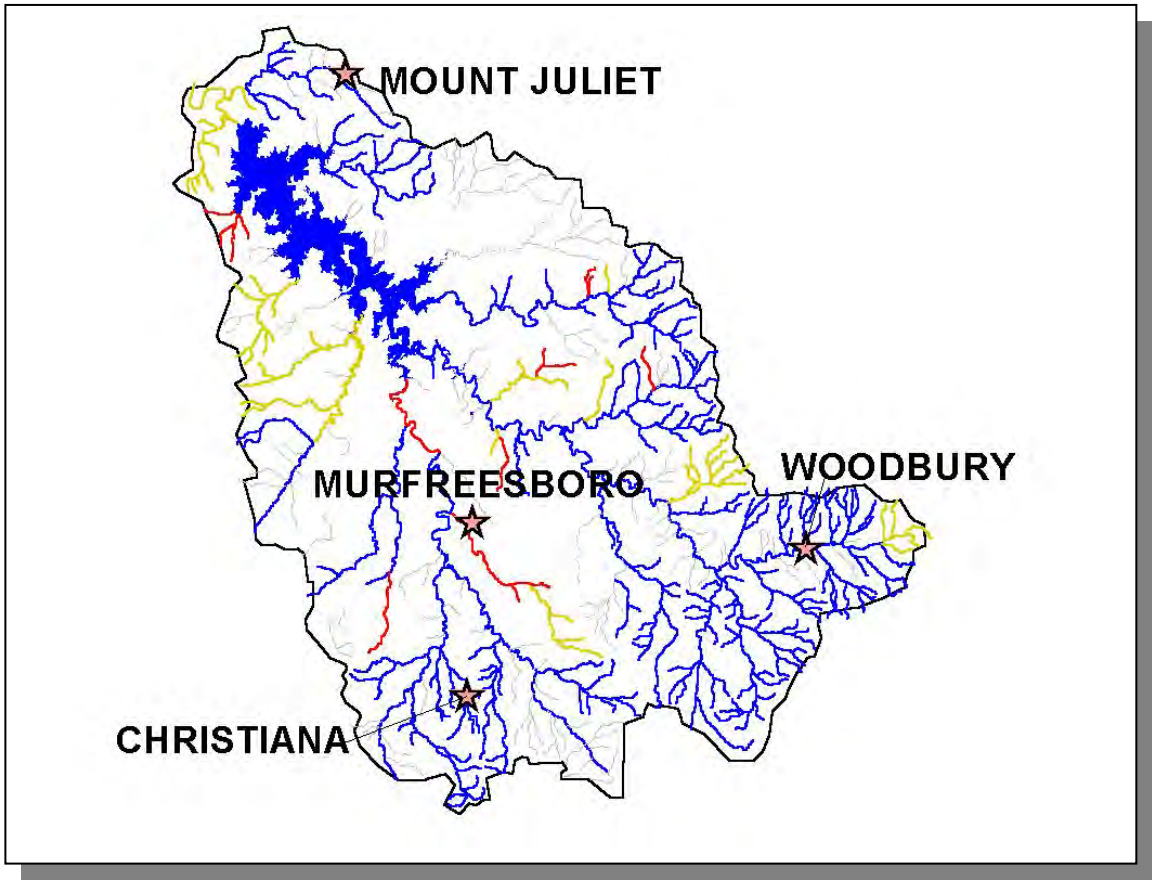



***Figure 3-8b. Fish and Aquatic Life Use Support Attainment in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

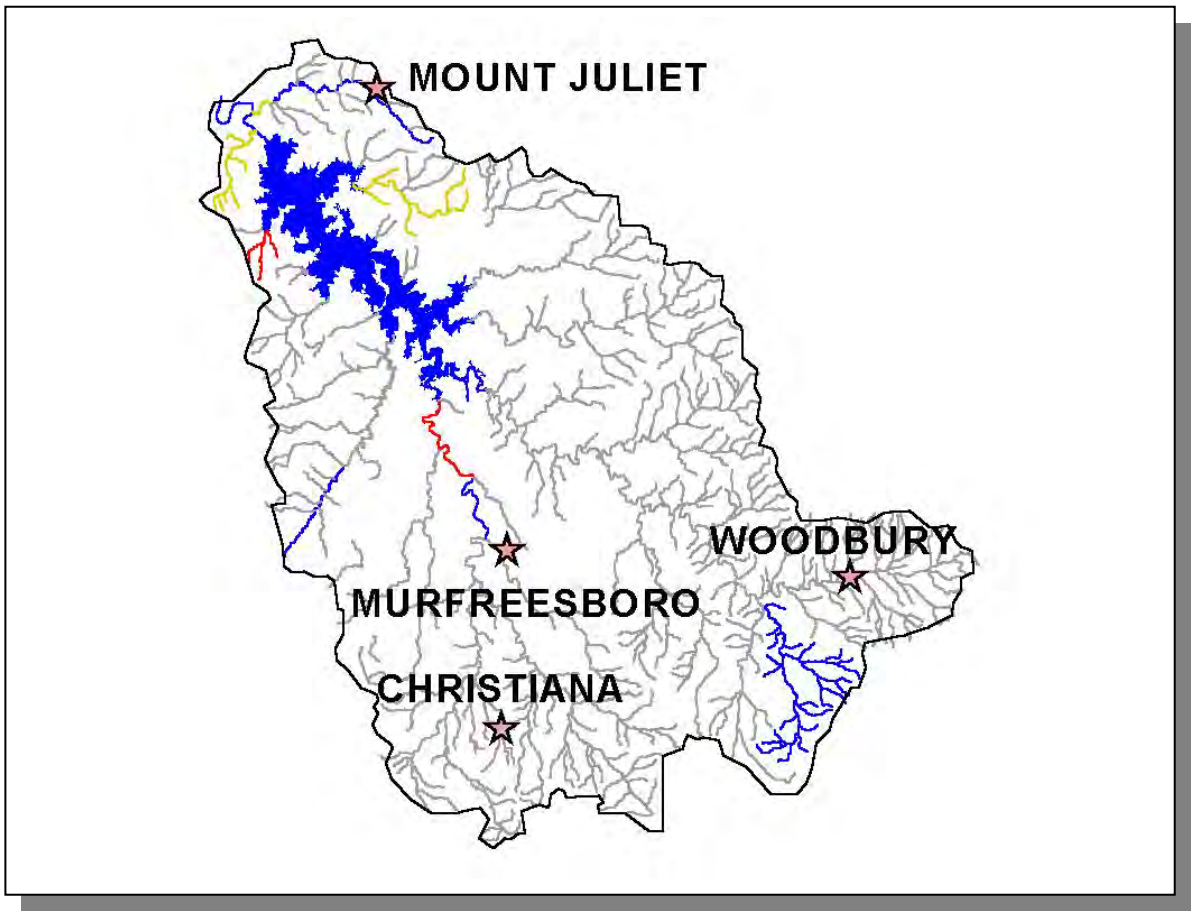



***Figure 3-8c. Recreation Use Support Attainment in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

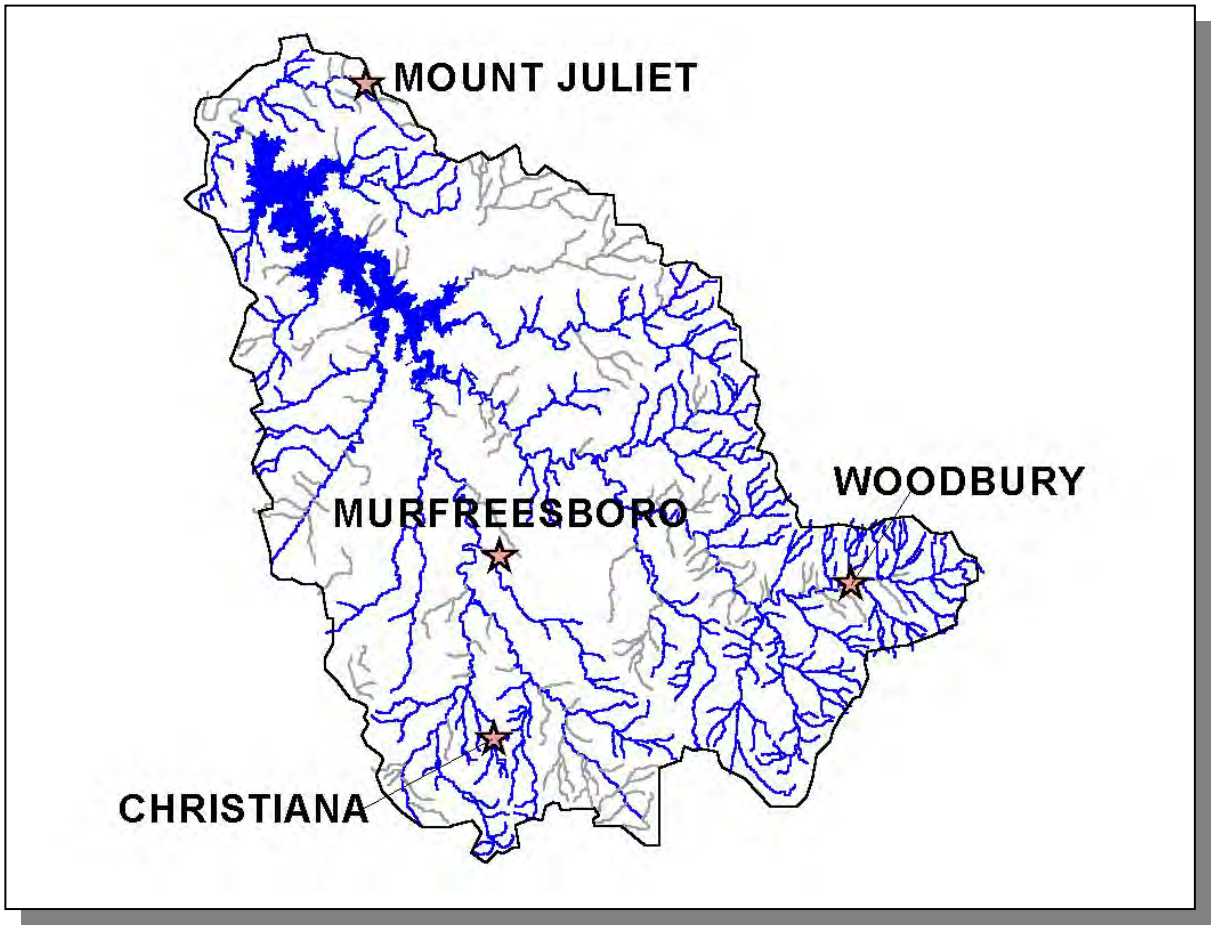



***Figure 3-8d. Irrigation Use Support Attainment in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

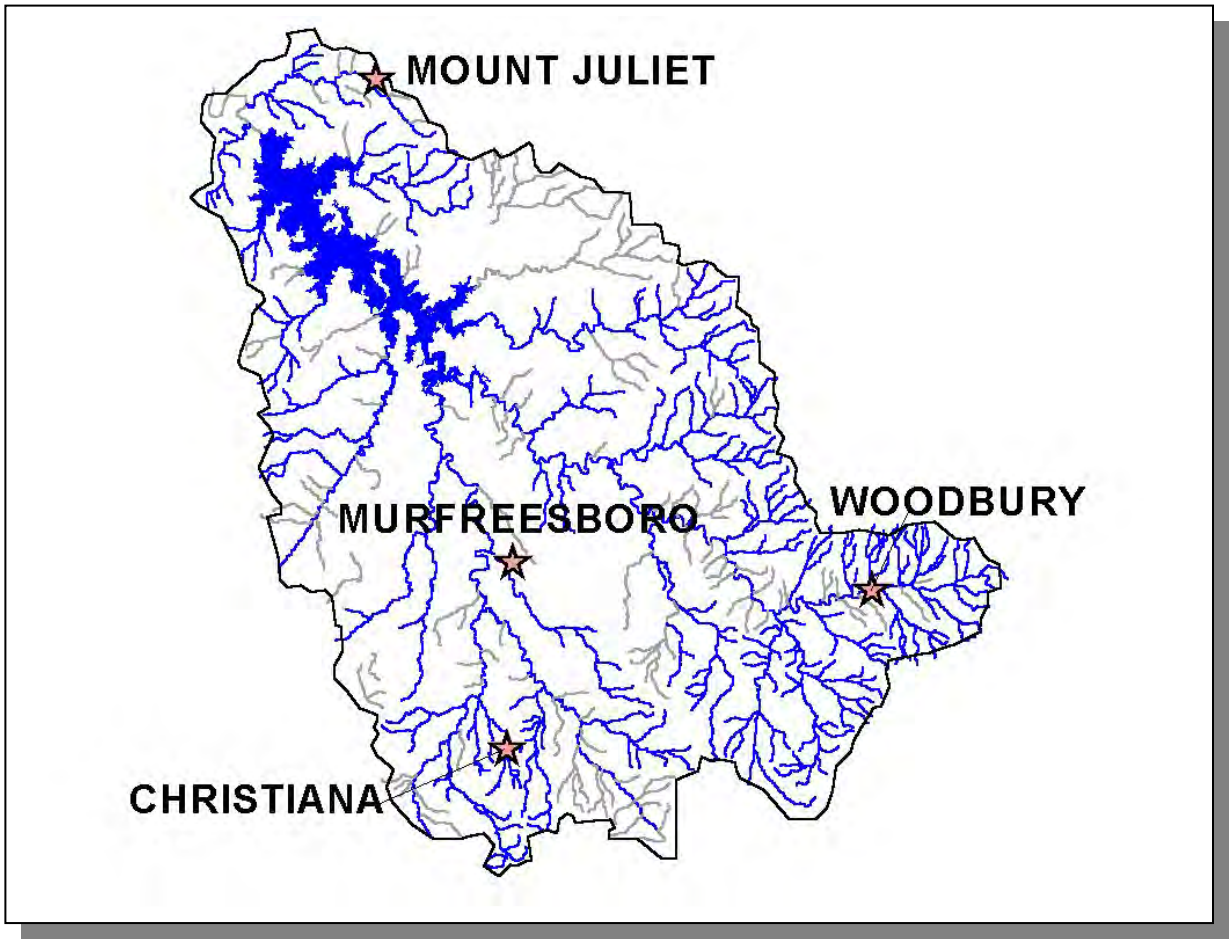



***Figure 3-8e. Livestock Watering and Wildlife Use Support Attainment in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

## 3.3.B. Use Impairment Summary.

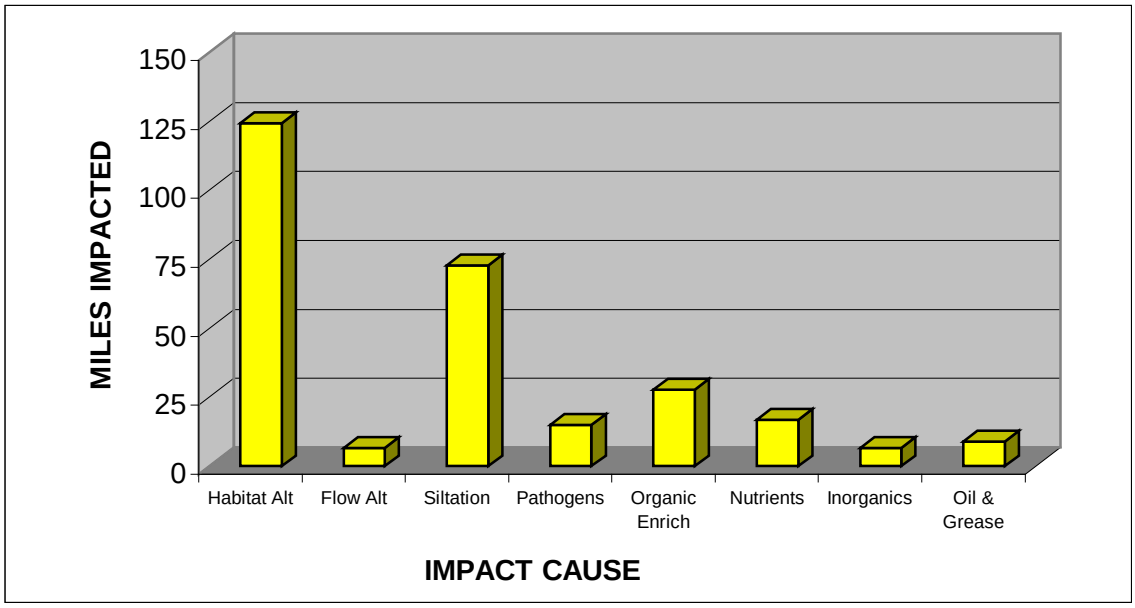



***Figure 3-9. Total Impacted Miles by Cause in the Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

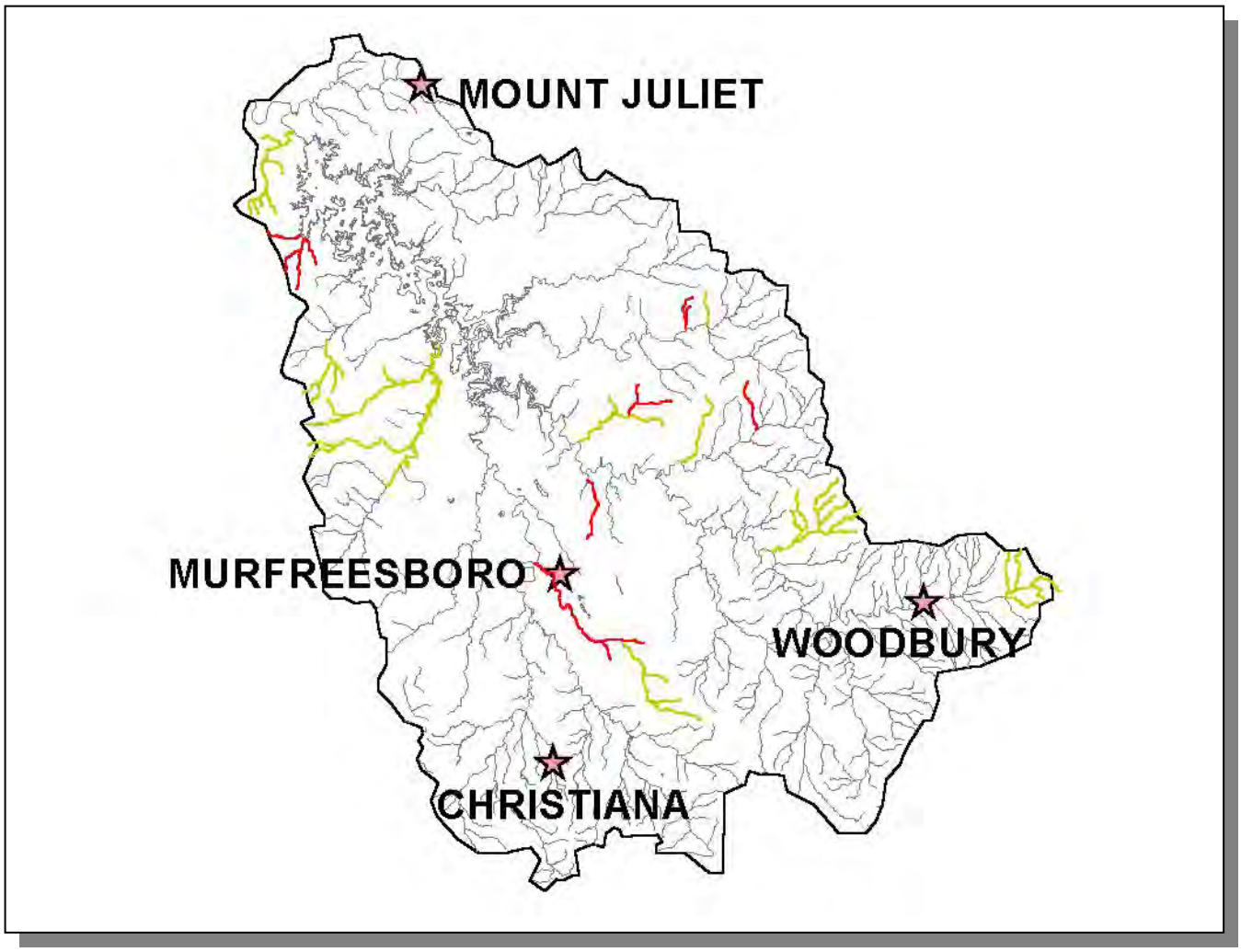



***Figure 3-10a. Stream Impairment Linked to Habitat Alterations in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference. More information is provided in Stones-Appendix III.*

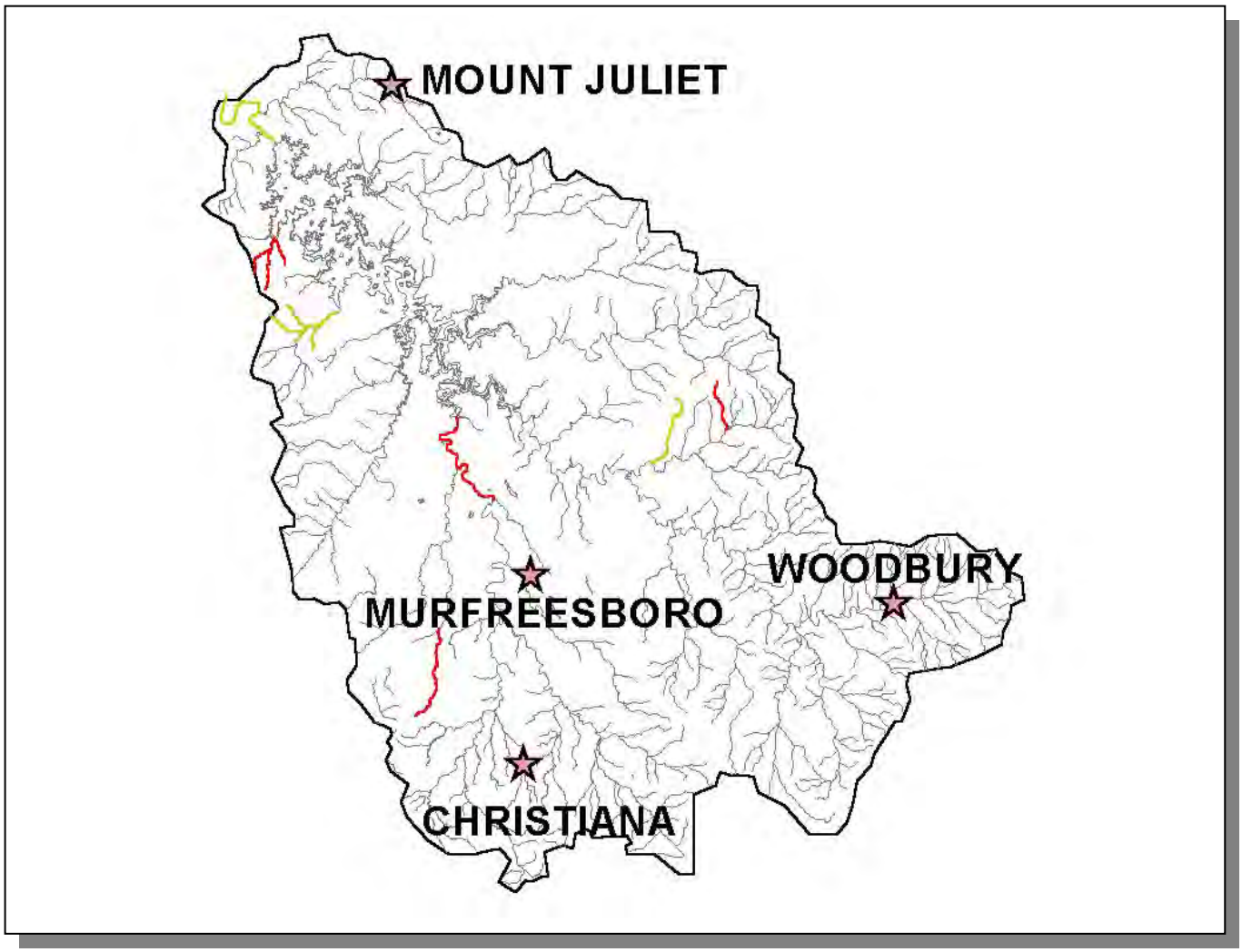



***Figure 3-10b. Stream Impairment Linked to Organic Enrichment/Low Dissolved Oxygen Levels in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference. More information is provided in Stones-Appendix III.*

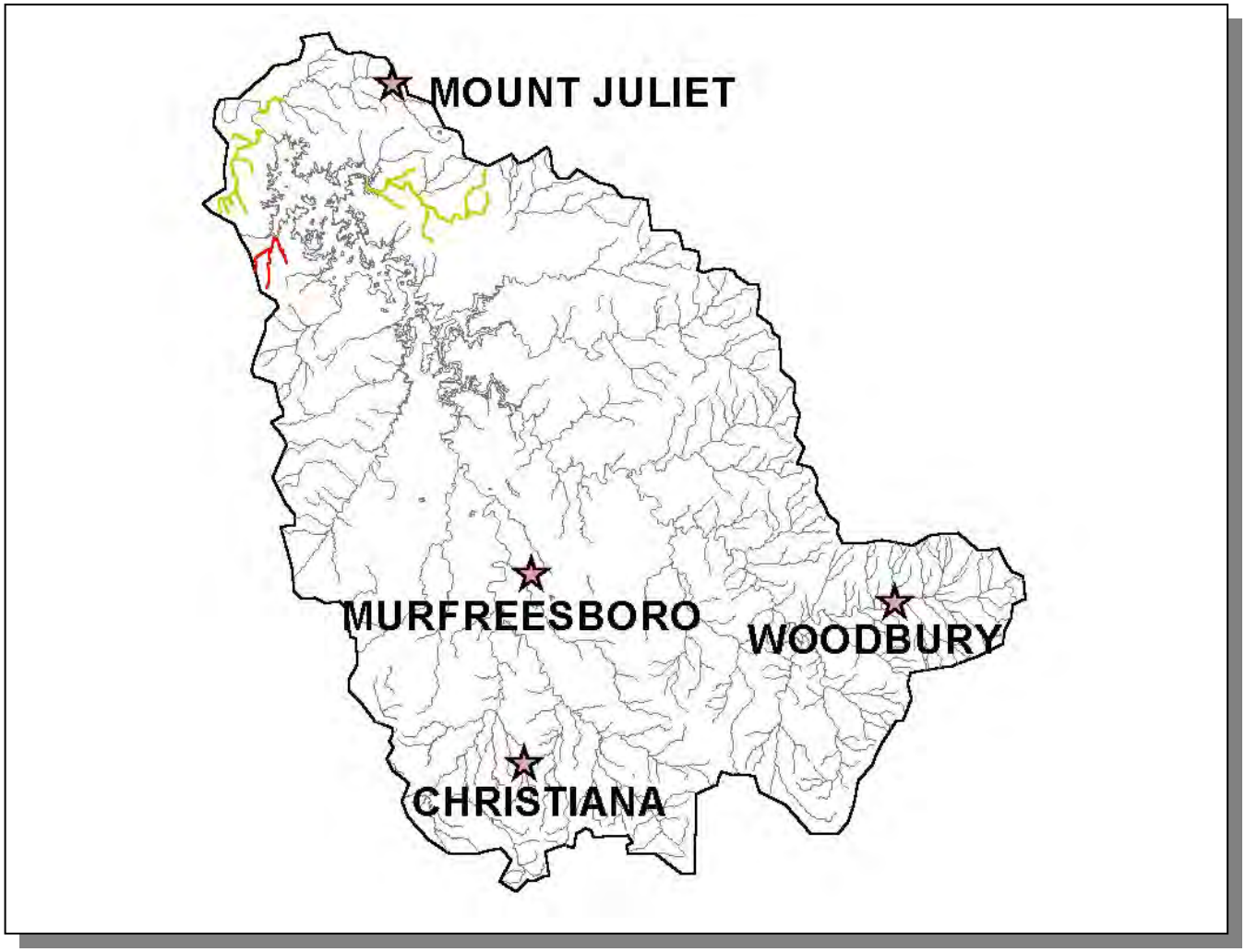



***Figure 3-10c. Stream Impairment Linked to Pathogen Presence in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference. More information is provided in Stones-Appendix III.*

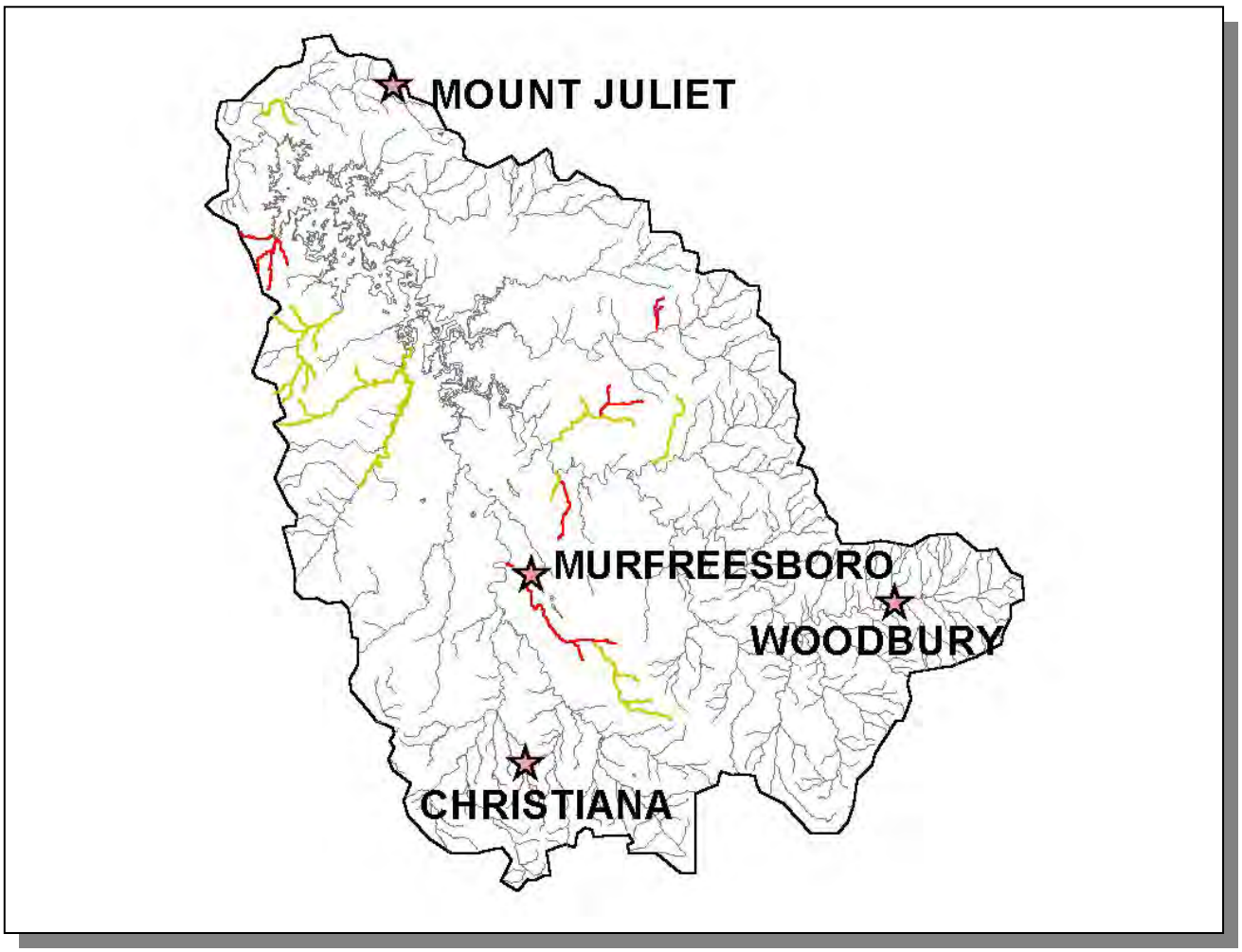



***Figure 3-10d. Stream Impairment Linked to Siltation in the Stones River Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

The listing of impaired waters that do not support designated uses (the 303(d) list) is traditionally submitted to EPA every two years. A copy of the most recent 303(d) list may be downloaded from: http://www.state.tn.us/environment/water.htm

In the year 2002 and beyond, the 303(d) list will be compiled by using EPA's ADB (Assessment Database) software developed by RTI (Research Triangle Institute). The ADB allows for more detailed segmentation of waterbodies. While this results in a more accurate description of the status of water quality, it makes it difficult when comparing water quality assessments with and without using this tool. A more meaningful

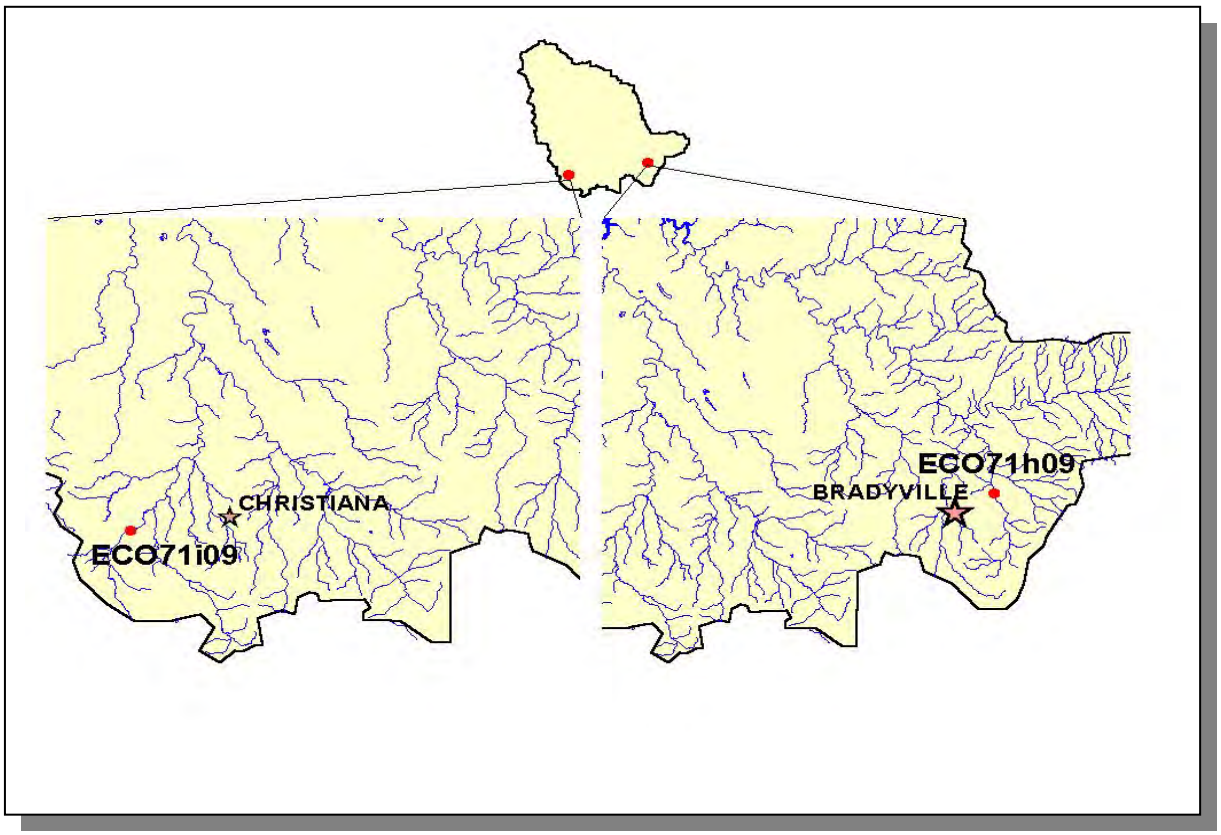
comparison will be between assessments conducted in Year 3 of each succeeding five-year cycle.

**3.4. FLUVIAL GEOMORPHOLOGY.** Stream width, depth, and cross-sectional dimensions at bankful discharge are key parameters used in characterizing the shape and stability of rivers. Characterization of streams using the fluvial geomorphic stream classification system, which allows prediction of stream stability and physical evolution, is a valuable management tool (Rosgen, 1996).

A fluvial geomorphic curve illustrates relationships between drainage area, bankful dimensions of width, depth and cross-sectional area, and bankful discharge of stream systems that are in dynamic equilibrium. It is a tool to evaluate and predict the physical impacts of channel modifications, flow alterations, and other watershed changes, as well as determining appropriate physical parameters for stream and riparian restoration. Regional curves have been developed and applied in various regions of the country since the mid-1970's (Dunne and Leopold, 1978).

There are several benefits to using regional curves:

- Serving as a valuable regional-specific database for watershed management
- Providing an unbiased, scientific evaluation of the environmental impacts of proposed ARAP and other permitted activities
- Providing a scientific foundation for evaluating and documenting long-term geomorphic and hydrologic changes in the region
- Quantifying environmental impacts
- Suggesting the best approach to restore streams that have been modified




***Fgure 3-11. Fluvial Sampling Sites in the Stones River Watershed for Construction of Fluvial Regional Curve.*** *Fluviasl sampling sites are at Carson Fork (35° 42' 70" N, 86° 27' 55" W) and West Fork Stones River (35° 42" 10" N, 86° 07' 50" W) Ecoregion Reference Sites. The cities of Bradyville and Christiana are shown for reference.*

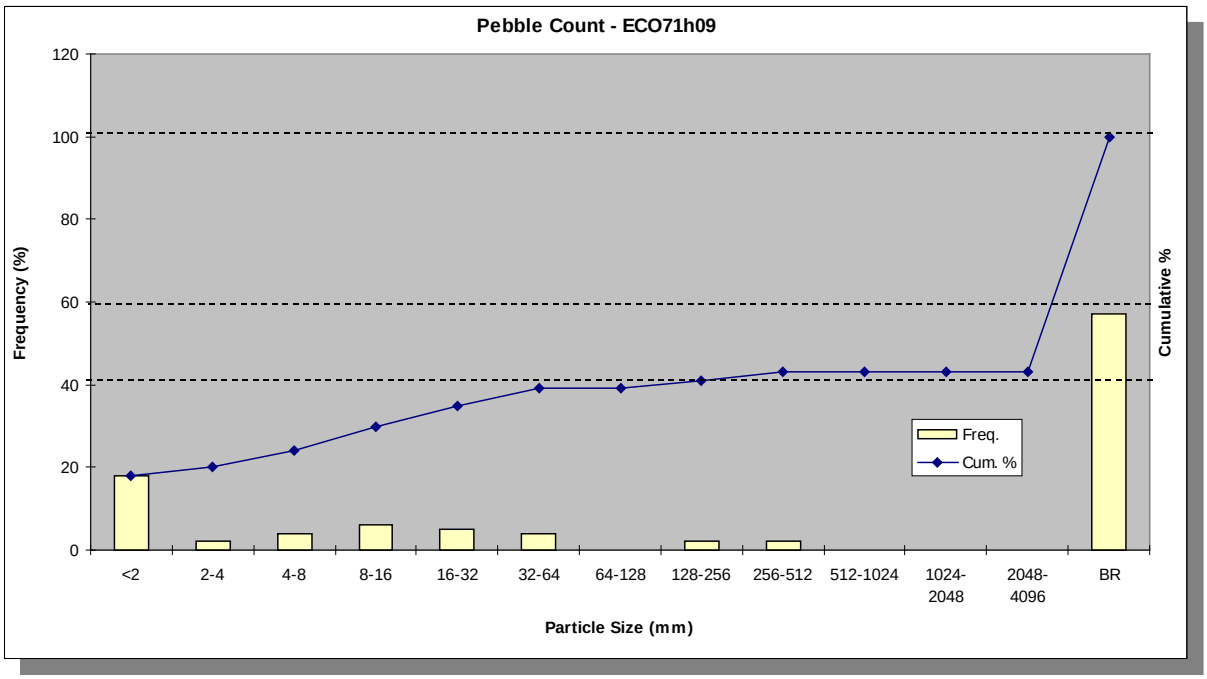



***Figure 3-12. Particle Count Histogram and Cummulative Frequency Plot for West Fork Stones River Ecoregion Reference Site.***

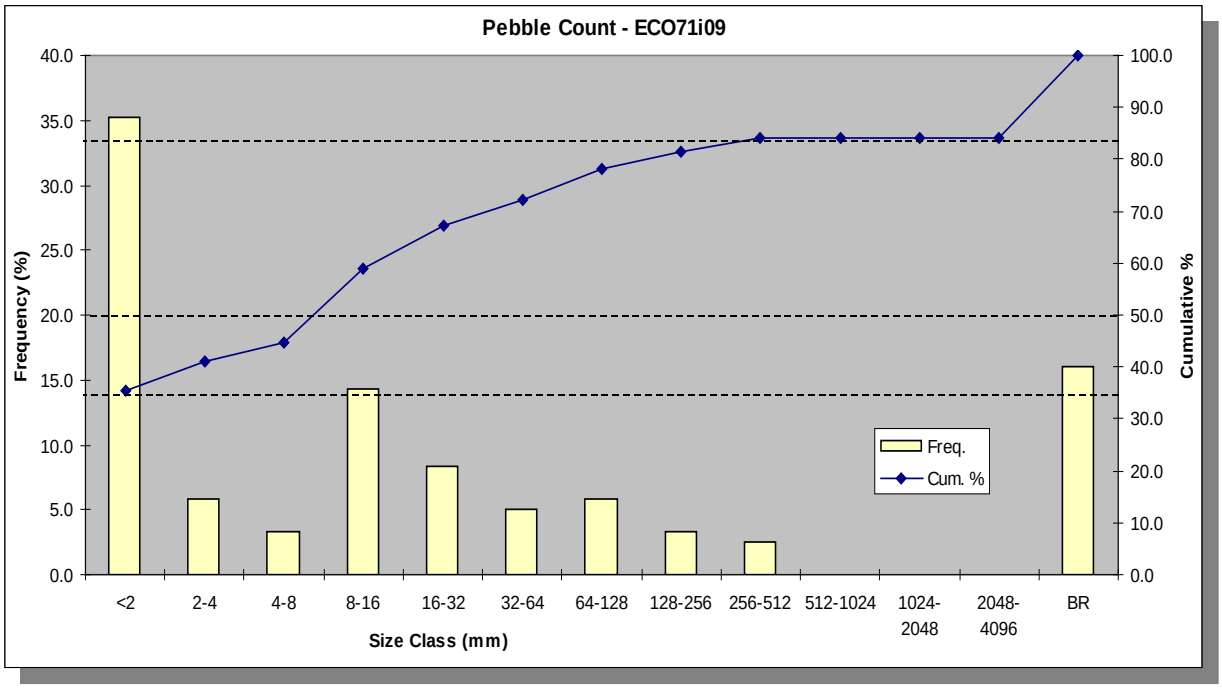



***Figure 3-13. Particle Count Histogram and Cumulative Frequency Plot for Carson Fork, Ecoregion Reference Site in Cannon County.***

Ultimately, a regional curve will be created that illustrates the relationship between bankful width and drainage area.

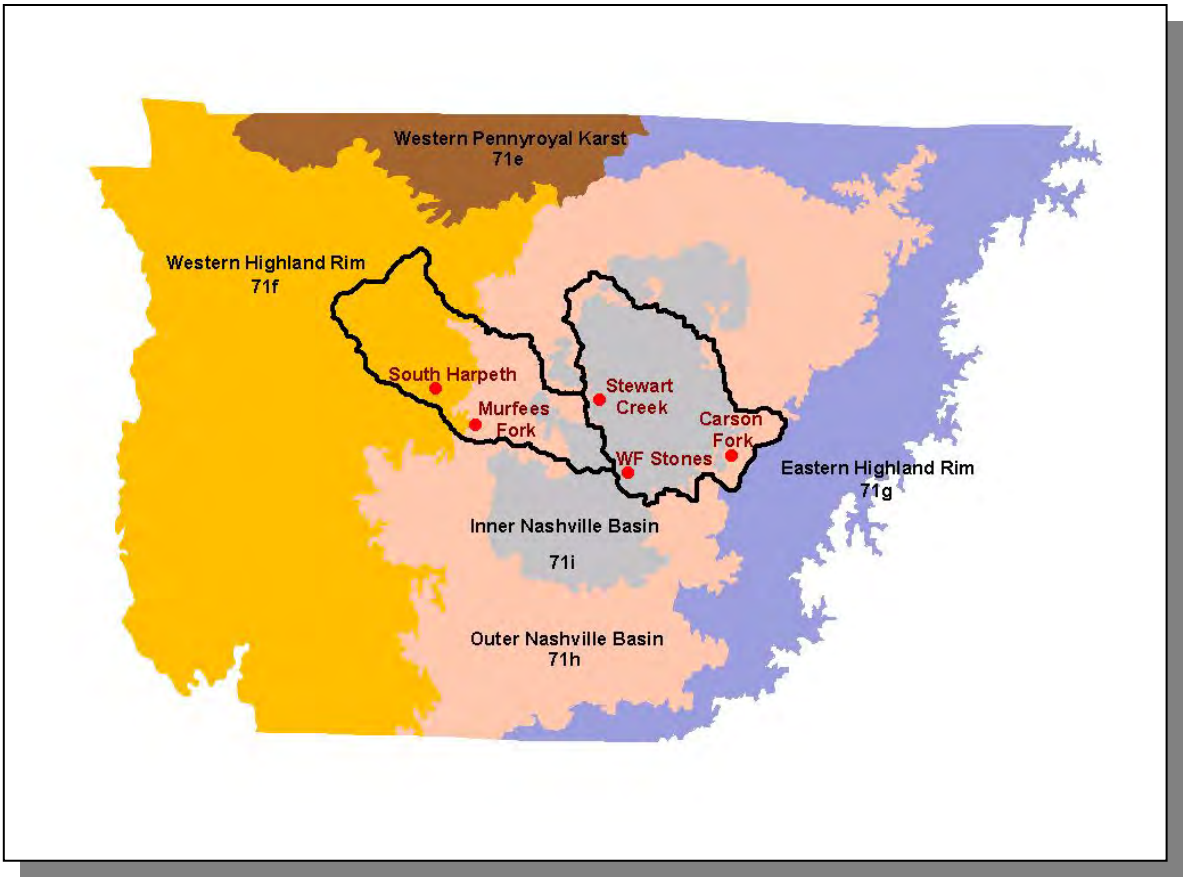



***Figure 3-14. Particle Count Sampling Sites in Ecoregion 71.*** *Harpeth and Stones River Watershed boundaries are shown for reference.*

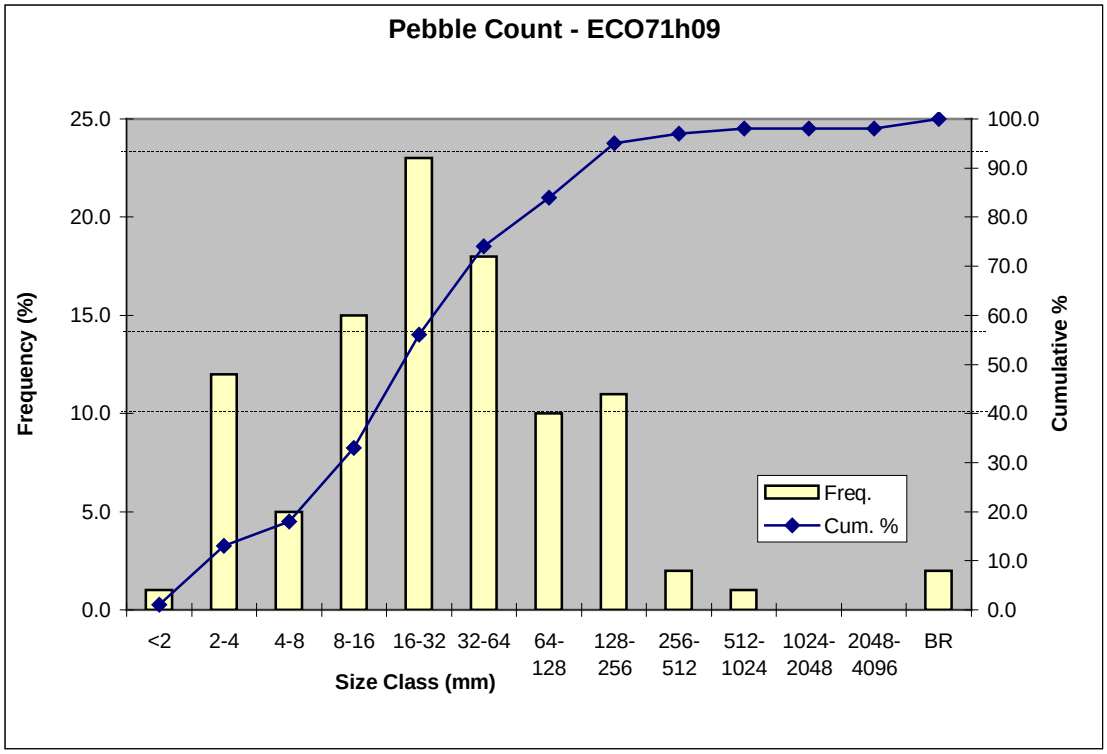



***Figure 3-16a. Particle Count Histogram and Cummulative Frequencey Plot for Carson Fork Fluvial Sampling Site (River Mile 5.4).*** *BR, Bed Rock. Data were collected on August 31,1998.*

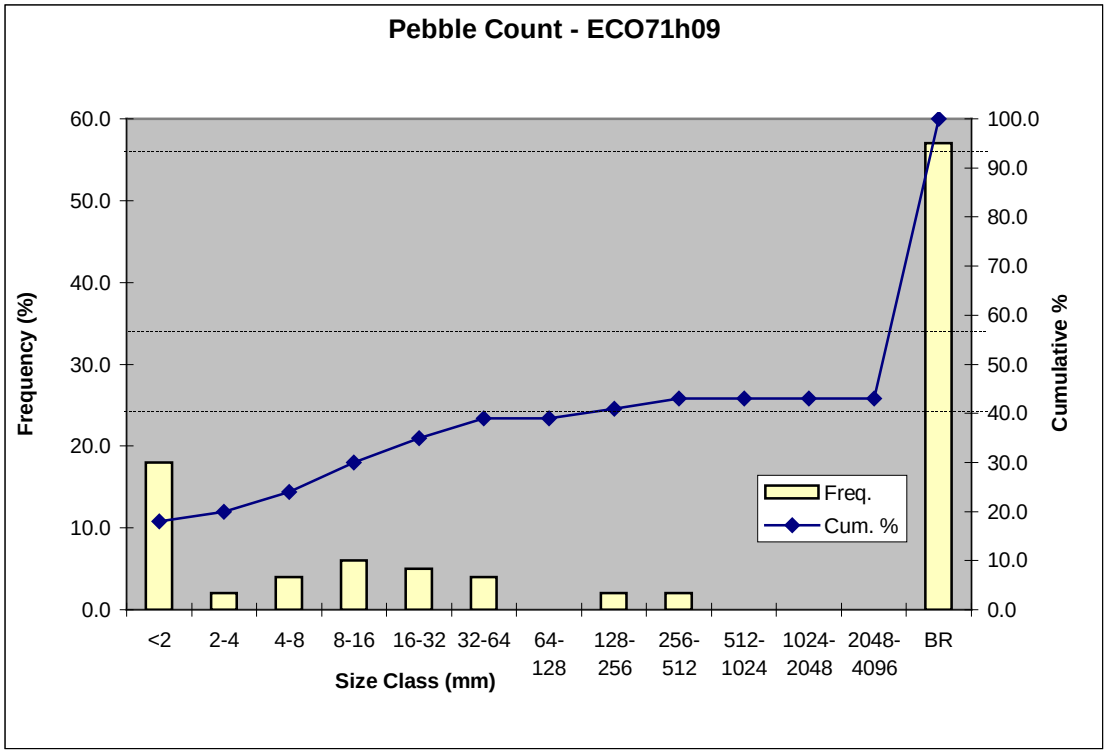



***Figure 3-16b. Particle Count Histogram and Cummulative Frequencey Plot for Carson Fork Fluvial Sampling Site (River Mile 5.4).*** *BR, Bed Rock. Data were collected on June 11,1999.*

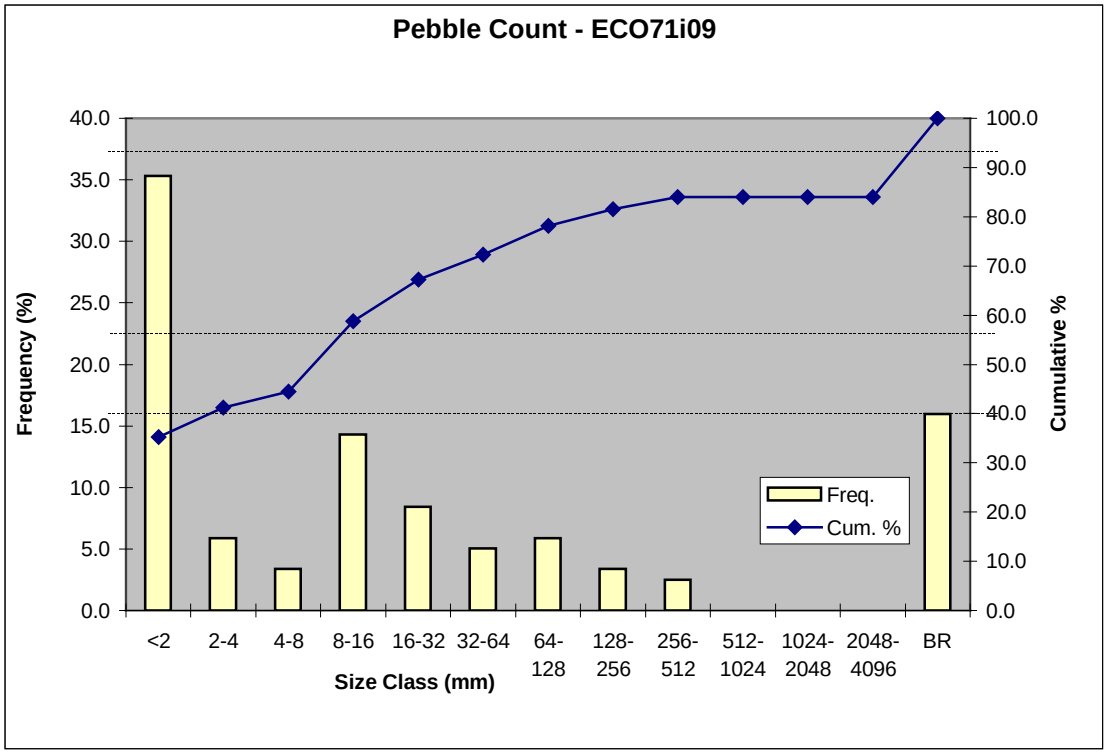



***Figure 3-17a. Particle Count Histogram and Cummulative Frequencey Plot for West Fork Stones River Fluvial Sampling Site (River Mile 32.3).*** *BR, Bed Rock. Data were collected on October 1,1997.*

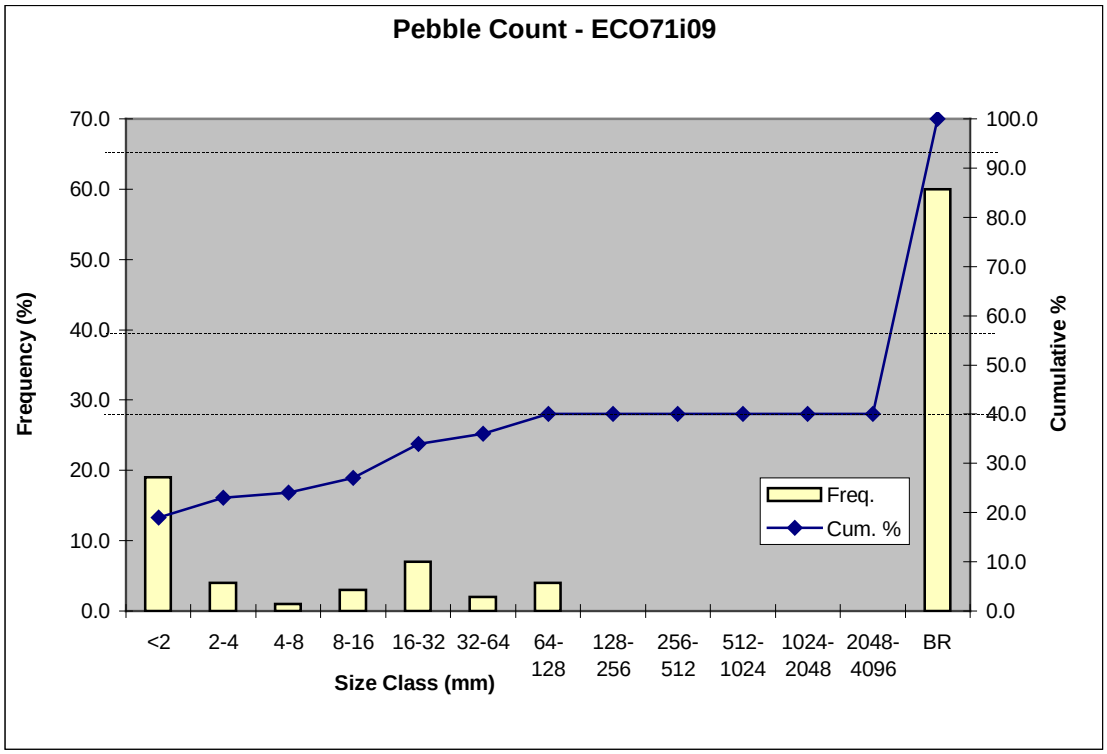



***Figure 3-17b. Particle Count Histogram and Cummulative Frequencey Plot for West Fork Stones River Fluvial Sampling Site (River Mile 32.3).*** *BR, Bed Rock. Data were collected on September 1,1998.*

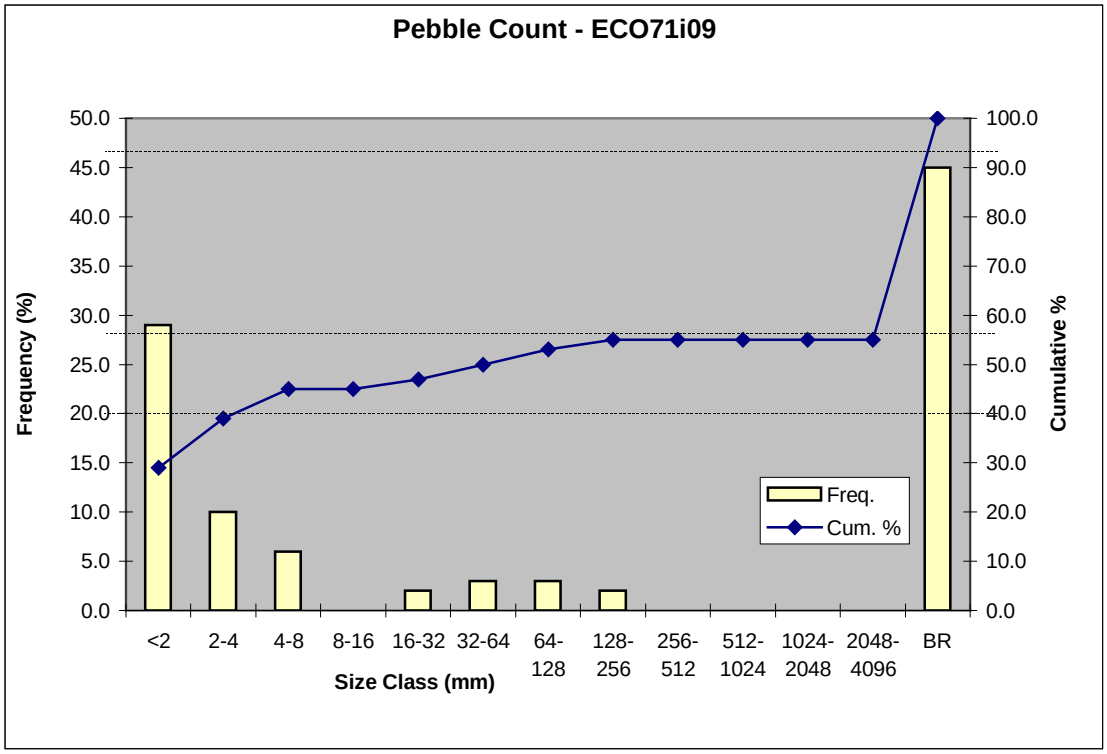



***Figure 3-17c. Particle Count Histogram and Cummulative Frequencey Plot for West Fork Stones River Fluvial Sampling Site (River Mile 32.3).*** *BR, Bed Rock. Data were collected on June 3,1998.*

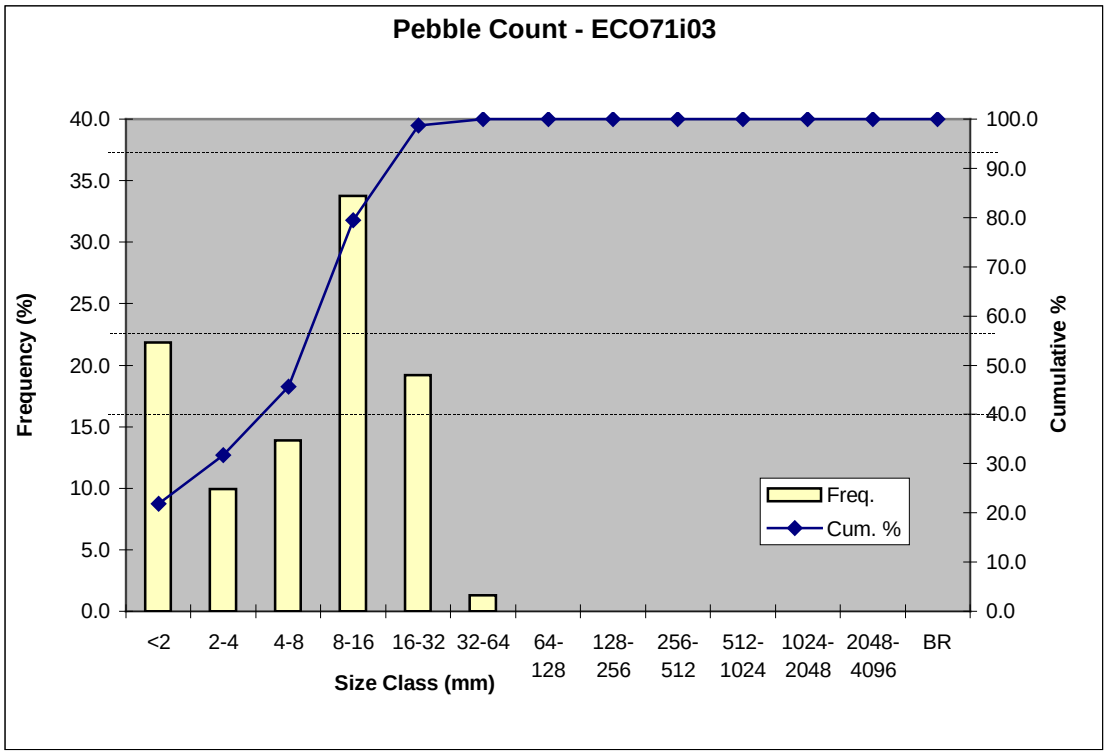



***Figure 3-18. Particle Count Histogram and Cummulative Frequencey Plot for Stewart Creek Fluvial Sampling Site (River Mile 16.7).*** *BR, Bed Rock. Data were collected on October 1,1997.*

# CHAPTER 4

## POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE STONES RIVER WATERSHED


4.1 Background.

4.2. Characterization of HUC-11 Subwatersheds
- 4.2.A. 05130203010
- 4.2.B. 05130203020
- 4.2.C. 05130203030
- 4.2.D. 05130203040
- 4.2.E. 05130203050
- 4.2.F. 05130203060
- 4.2.G. 05130203070
- 4.2.H. 05130203080
- 4.2.I. 05130203090
- 4.2.J. 05130203100
- 4.2.K. 05130203110
- 4.2.L. 05130203120
- 4.2.M. 05130203130


**4.1 BACKGROUND.** This chapter is organized by HUC-11 subwatershed, and the description of each subwatershed is divided into four parts:

i. General description of the subwatershed
ii. Description of point source contributions
ii.a. Description of facilities discharging to water bodies listed on the 1998 303(d) list
iii. Description of nonpoint source contributions

Information for this chapter was obtained from databases maintained by the Division of Water Pollution Control or provided in the WCS (Watershed Characterization System) data set. The WCS used was version 1.1 beta (developed by Tetra Tech, Inc for EPA Region IV) released in 2000.

WCS integrates with ArcView® v3.1 and Spatial Analyst® v1.1 to analyze user-delineated (sub)watersheds based on hydrologically connected water bodies. Reports are generated by integrating WCS with Microsoft® Word. Land Use/Land Cover information from 1992 MRLC (Multi-Resolution Land Cover) data are calculated based on the proportion of county-based land use/land cover in user-delineated (sub)watersheds. Nonpoint source data in WCS are based on agricultural census data collected 1992–1998; nonpoint source data were reviewed by Tennessee NRCS staff.

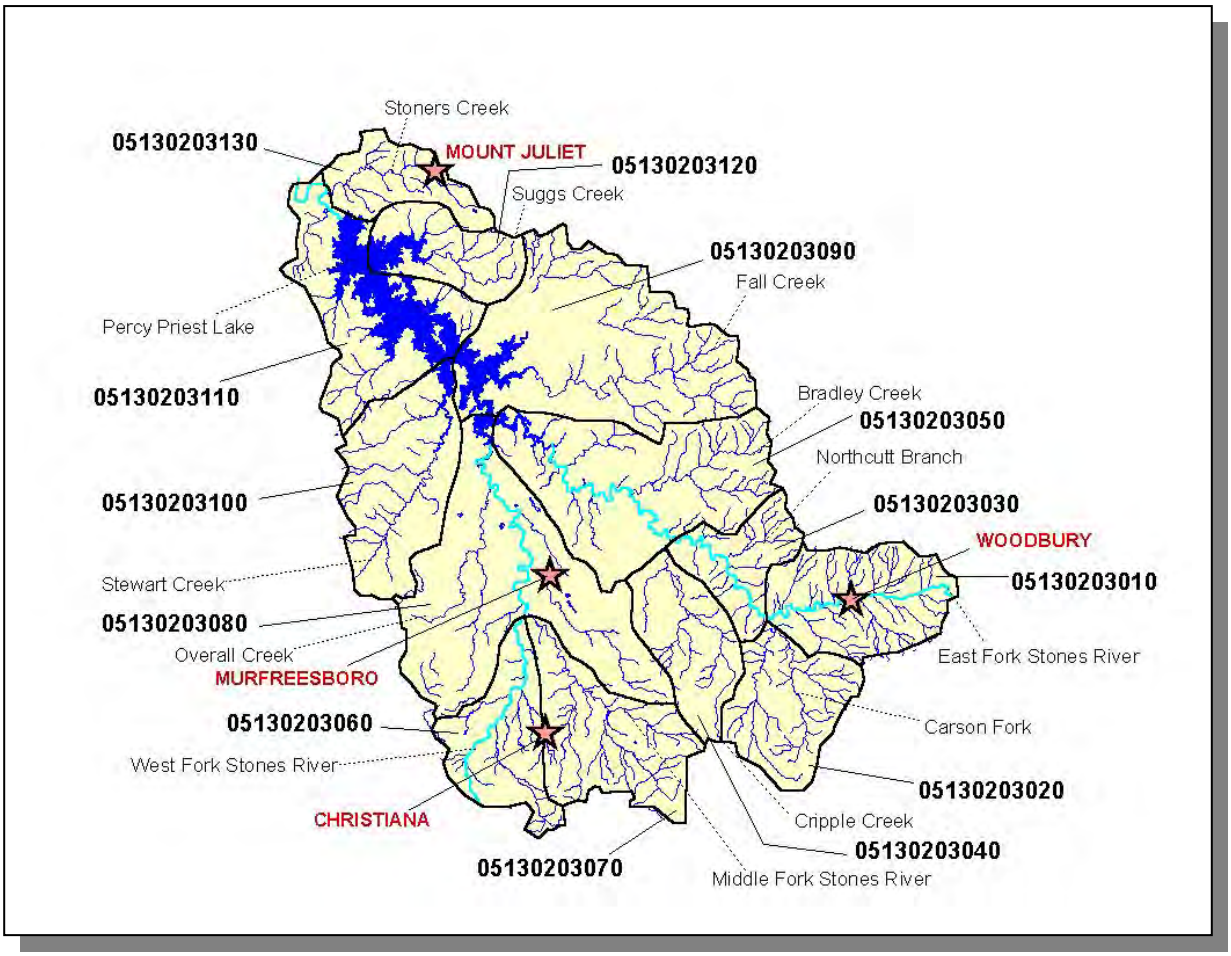



***Figure 4-1. The Stones River Watershed is Composed of Thirteen USGS-Delineated Subwatersheds (11-Digit Subwatersheds).*** *Locations of Christiana, Mount Juliet, Murfreesboro, and Woodbury are shown for reference.*

**4.2. CHARACTERIZATION OF HUC-11 SUBWATERSHEDS.** The Watershed Characterization System (WCS) software and data sets provided by EPA Region 4 were used to characterize each subwatershed in the Stones River Watershed. HUC-14 polygons were aggregated to form the HUC-11 boundaries for data analysis.

| HUC-11 | HUC-14 |
|---|---|
| 05130203010 | 05130203010010 (East Fork Stones River) |
| 05130203020 | 05130203010020 (Brawley's Fork) |
| 05130203030 | 05130203010030 (East Fork Stones River) |
| 05130203040 | 05130203010040 (Cripple Creek) |
| 05130203050 | 05130203010050 (East Fork Stones River)<br>05130203010060 (Bradley Creek)<br>05130203010070 (East Fork Stones River) |
| 05130203060 | 05130203020010 (West Fork Stones River) |
| 05130203070 | 05130203020020 (Middle Fork Stones River) |
| 05130203080 | 05130203020030 (West Fork Stones River)<br>05130203020040 (Lytle Creek)<br>05130203020050 (Overall Creek) |
| 05130203090 | 05130203030020 (Fall Creek)<br>05130203030030 (Spring Creek) |
| 05130203100 | 05130203030040 (Stewart Creek) |
| 05130203110 | 05130203030010 (Percy Priest Lake)<br>05130203030050 (Percy Priest Lake)<br>05130203030080 (Stones River) |
| 05130203120 | 05130203030060 (Suggs Creek) |
| 05130203130 | 05130203030070 (Stoner Creek) |

***Table 4-1. HUC-14 Drainage Areas are Nested Within HUC-11 Drainages.*** *USGS delineated the HUC-11 drainage areas. NRCS inventories and manages the physical database for HUC-14 drainage areas.*

4.2.A. 05130203010.

***Figure 4-2. Location of Subwatershed 05130203010.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.A.i. General Description.

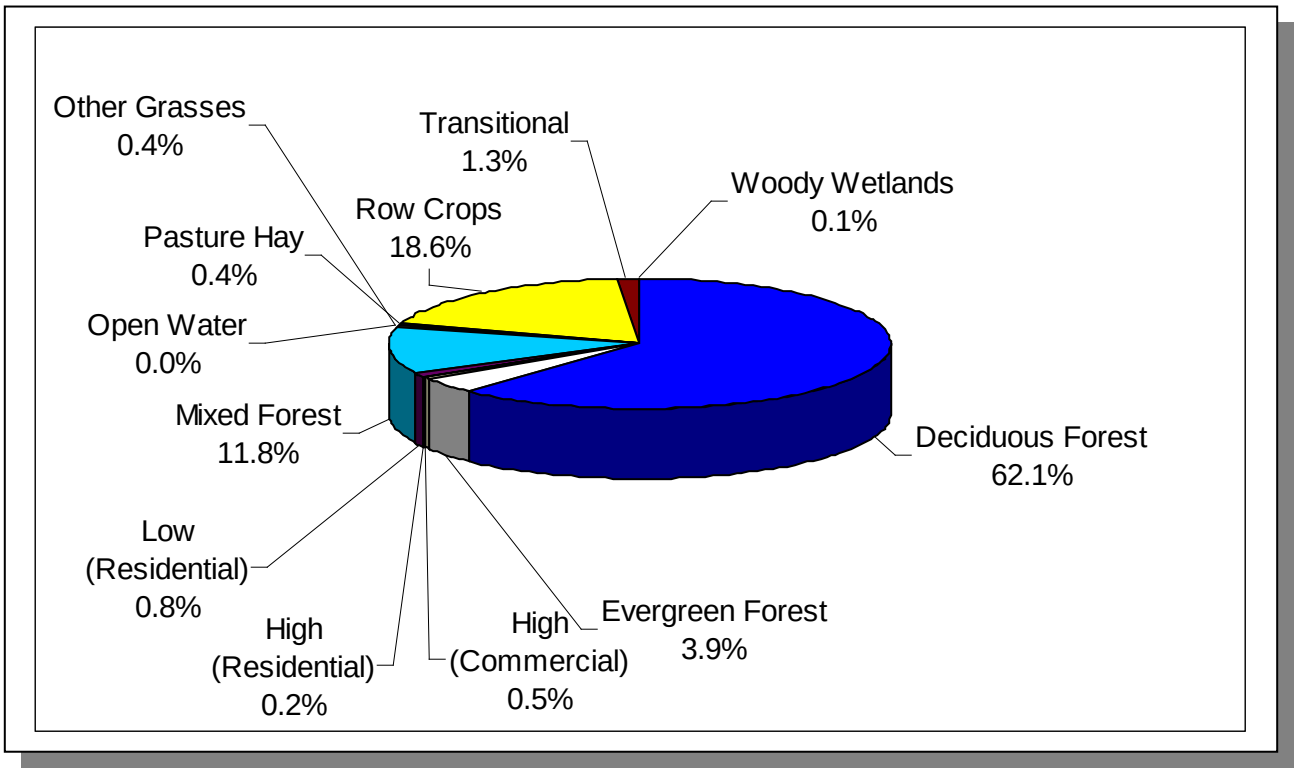



***Figure 4-3. Land Use Distribution in Subwatershed 05130203010.*** *More information is provided in Stones-Appendix IV.*

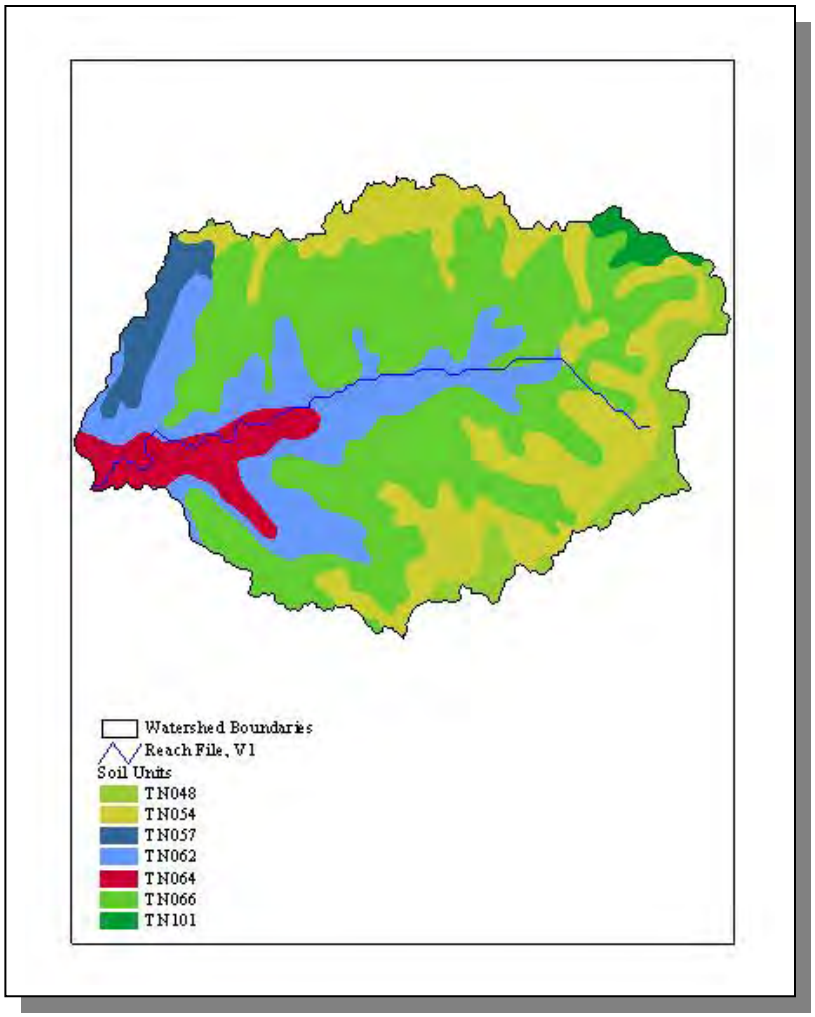



***Figure 4-4. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203010.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN048 | 8.00 | C | 1.38 | 5.06 | Silty Loam | 0.42 |
| TN054 | 0.00 | C | 3.04 | 4.84 | Loam | 0.32 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clayey Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clayey Loam | 0.26 |
| TN064 | 7.00 | C | 1.19 | 5.82 | Silty Loam | 0.37 |
| TN066 | 0.00 | B | 2.62 | 4.75 | Loam | 0.28 |
| TN101 | 0.00 | B | 1.71 | 5.39 | Loam | 0.35 |

***Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203010.*** *More details are provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| County | 1990 | 1997 Est. | Portion of Watershed (%) | 1990 | 1997 | |
| Cannon | 10,467 | 12,011 | 25.9 | 2,710 | 3,110 | 14.8 |

*Table 4-3. Population Estimates in Subwatershed 05130203010.*

| | | | NUMBER OF HOUSING UNITS | | | |
|---|---|---|---|---|---|---|
| Populated Place | County | Population | Total | Public Sewer | Septic Tank | Other |
| Woodbury | Cannon | 2,287 | 1,034 | 1,018 | 16 | 0 |

*Table 4-4. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203010.*

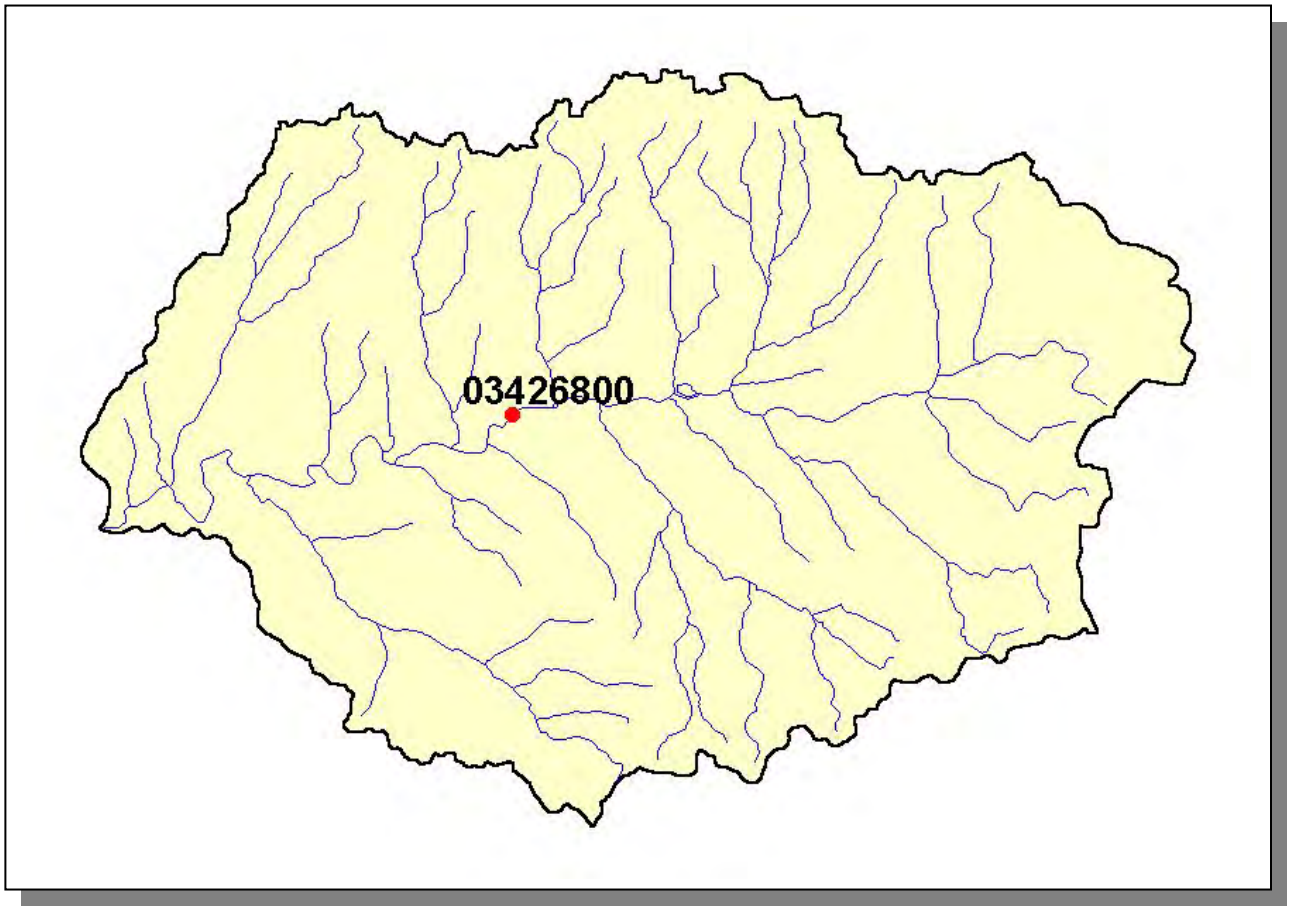



*Figure 4-5. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130203010. More information is provided in Stones-Appendix IV.*

4.2.A.ii Point Source Contributions.


***Figure 4-6. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203010.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

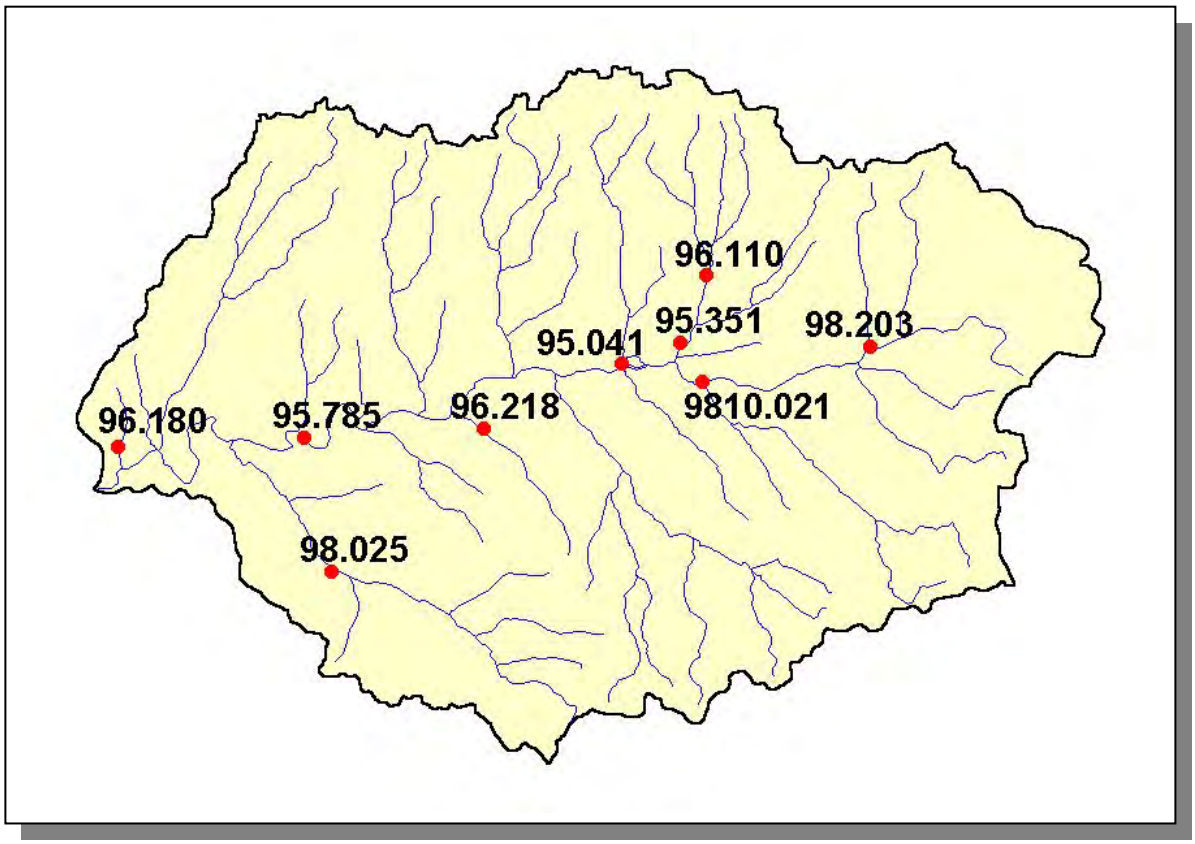



***Figure 4-7. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203010.*** *More information is provided in Stones-Appendix IV.*

4.2.A.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 2,307 | 5,152 | 285 | 10 | 1,074 | 35 |

***Table 4-5. Summary of Livestock Count Estimates in Subwatershed 05130203010.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Cannon | 88.5 | 88.5 | 1.7 | 7.1 |

***Table 4-6. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 05130203010.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Corn (Row Crops) | 7.71 |
| Soybeans (Row Crops) | 3.09 |
| Wheat (Close Grown Cropland) | 3.24 |
| Grass (Hayland) | 0.61 |
| Legume Grass (Hayland) | 0.44 |
| Grass (Pastureland) | 0.32 |
| Legume (Pastureland) | 0.37 |
| Grass, Forbs, Legumes (Mixed (Pasture) | 0.82 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 1.13 |

***Table 4-7. Annual Estimated Total Soil Loss in Subwatershed 05130203010.***

## 4.2.B. 05130203020.

***Figure 4-8. Location of Subwatershed 05130203020.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.B.i. General Description.

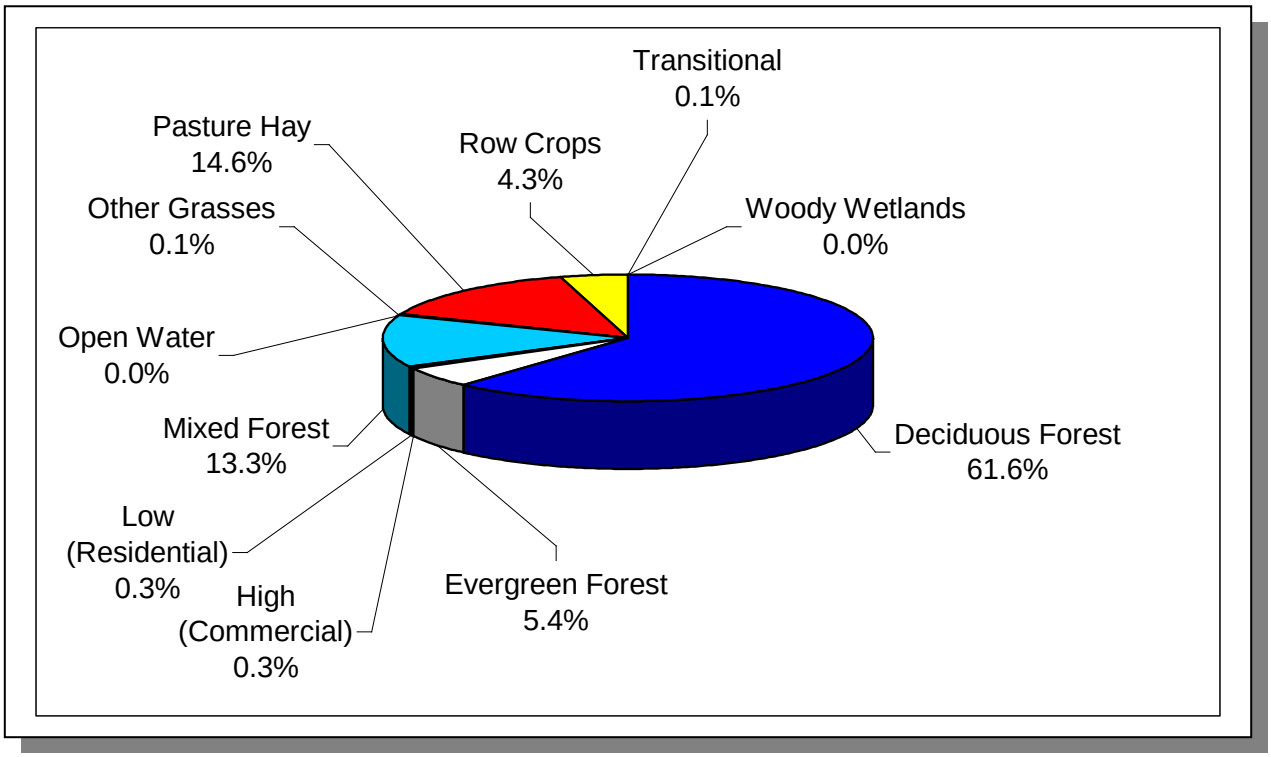



***Figure 4-9. Land Use Distribution in Subwatershed 05130203020.*** *More information is provided in Stones-Appendix IV.*

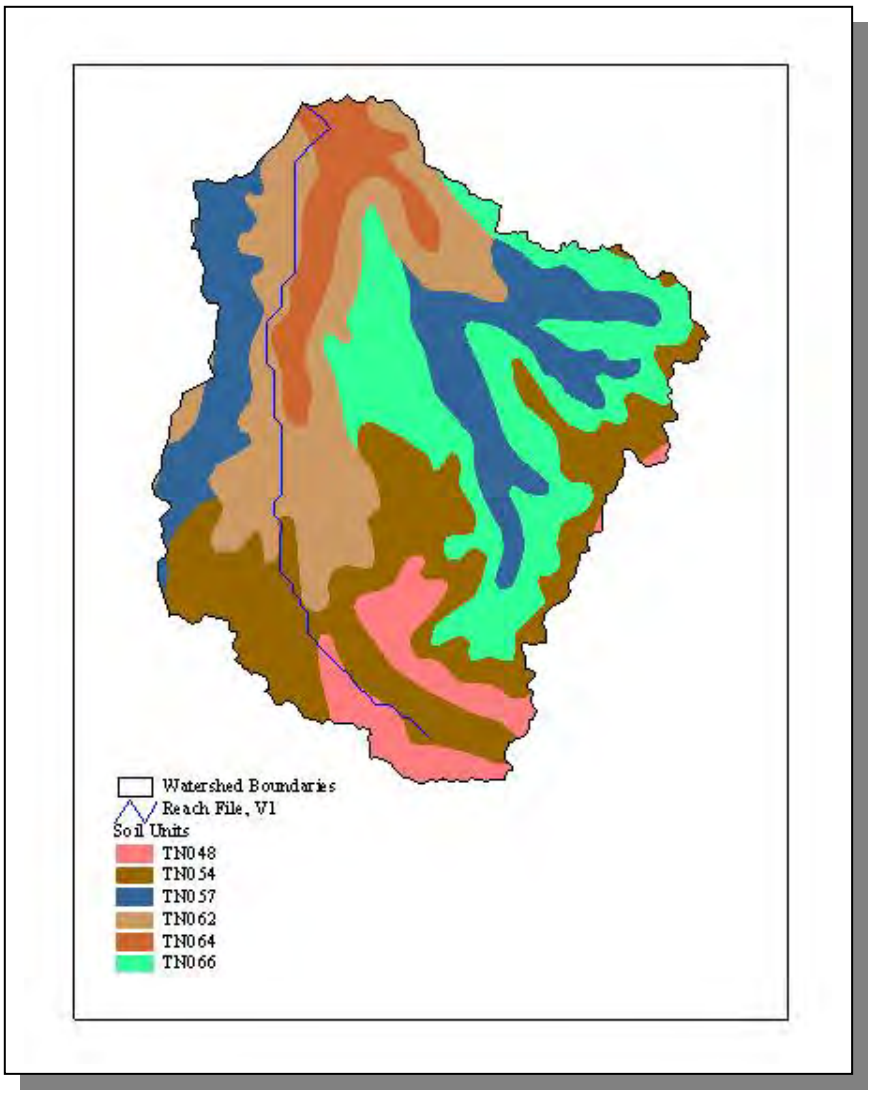



***Figure 4-10. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203020.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN048 | 8.00 | C | 1.38 | 5.06 | Silty Loam | 0.42 |
| TN054 | 0.00 | C | 3.04 | 4.84 | Loam | 0.32 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clay Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clay Loam | 0.26 |
| TN064 | 7.00 | C | 1.19 | 5.82 | Silty Loam | 0.37 |
| TN066 | 0.00 | B | 2.62 | 4.75 | Loam | 0.28 |

***Table 4-8. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203020.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Cannon | 10,467 | 12,011 | 18.59 | 1,946 | 2,233 | 14.7 |
| Coffee | 40,339 | 45,347 | 0.94 | 380 | 427 | 12.4 |
| Rutherford | 118,570 | 159,987 | 0.26 | 307 | 414 | 34.9 |
| **Totals** | **169,376** | **217,345** | | **2,633** | **3,074** | **16.7** |

***Table 4-9. Population Estimates in Subwatershed 05130203020.***


***Figure 4-11. Location of STORET Monitoring Site in Subwatershed 05130203020.*** *More information is provided in Stones-Appendix IV.*

4.2.B.ii. Point Source Contributions.

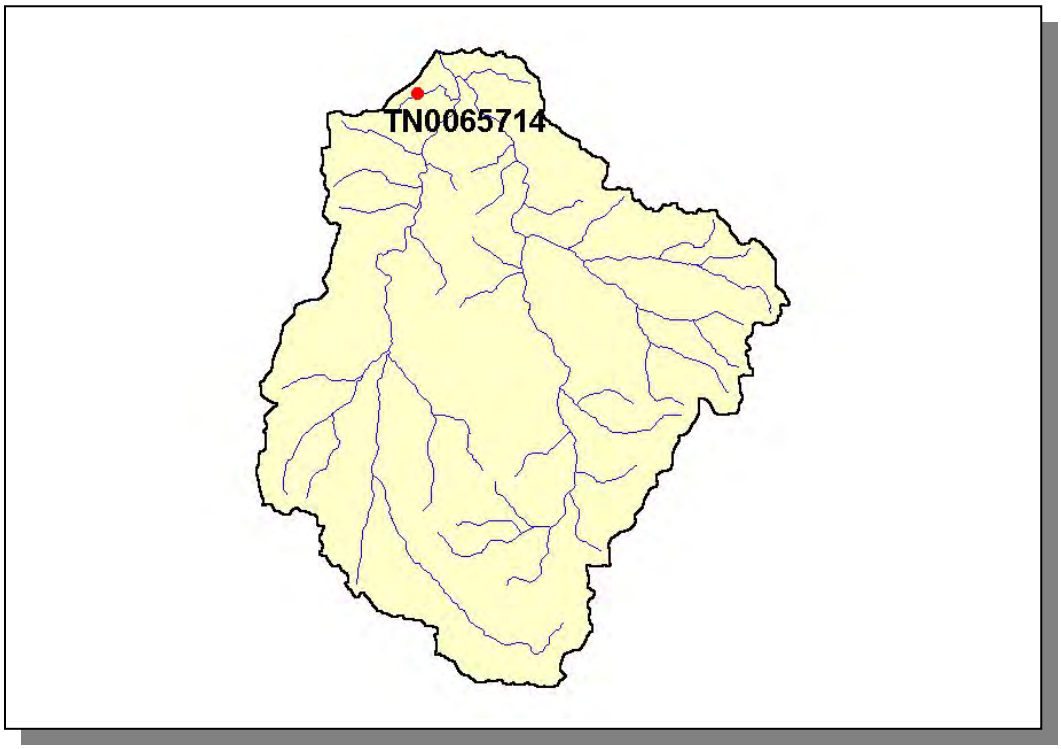



***Figure 4-12. Location of Active Mining Sites in Subwatershed 05130203020.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

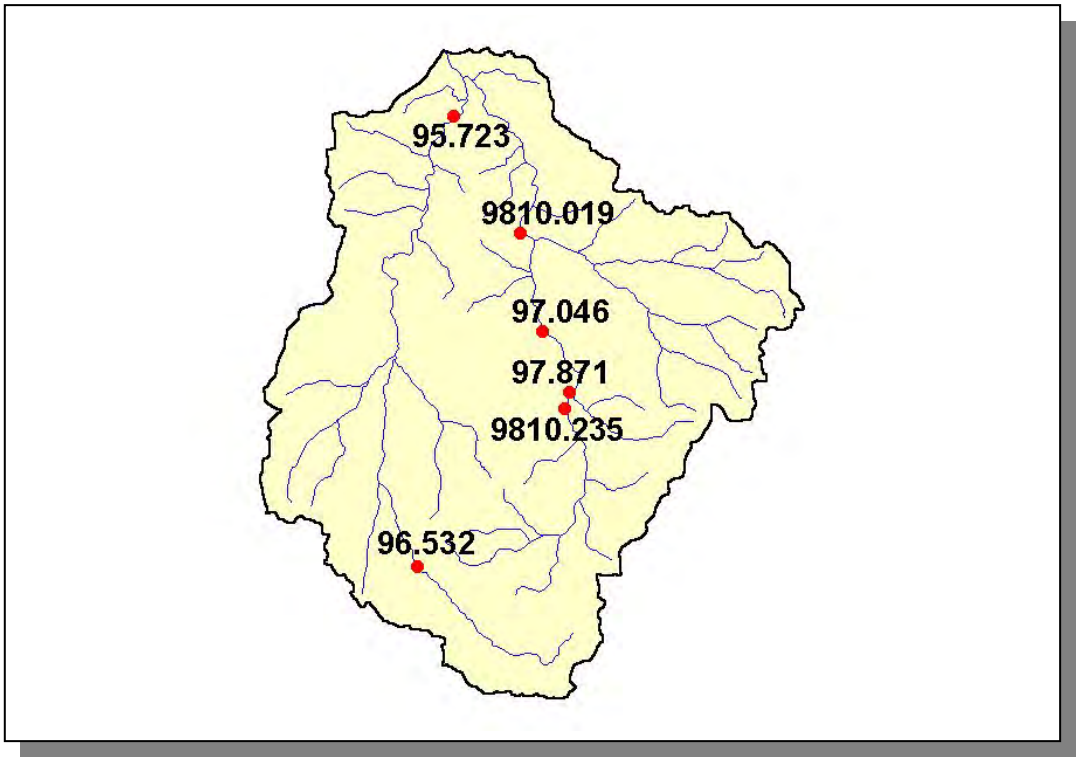



***Figure 4-13. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203020.*** *More information is provided in Stones-Appendix IV.*

4.2.B.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | | |
|---|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Chickens Sold** | **Hogs** | **Sheep** |
| 1,456 | 3,275 | 188 | 6 | 18,774 | 654 | 23 |

***Table 4-10. Summary of Livestock Count Estimates in Subwatershed 05130203020.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Cannon | 88.5 | 88.5 | 1.7 | 7.1 |
| Coffee | 114.4 | 114.2 | 2.8 | 12.7 |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| **Total** | **358.6** | **358.6** | **4.9** | **20.7** |

***Table 4-11. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203020.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Non Agricultural Land Use | 0.00 |
| Berry (Horticultural) | 0.47 |
| Corn (Row Crops) | 7.82 |
| Soybeans (Row Crops) | 4.09 |
| Cotton (Row Crops) | 4.24 |
| Grass (Hayland) | 0.61 |
| Legume (Hayland) | 0.32 |
| Legume Grass (Hayland) | 0.42 |
| Grass (Pastureland) | 0.43 |
| Legume (Pastureland) | 0.36 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.77 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 1.03 |
| Conservation Reserve Program Land | 0.17 |
| Wheat (Close Grown Cropland) | 4.08 |
| Other Vegetable and Truck Crop | 4.37 |
| Other Cropland not Planted | 6.68 |

***Table 4-12. Annual Estimated Total Soil Loss in Subwatershed 05130203020.***

4.2.C. 05130203030.

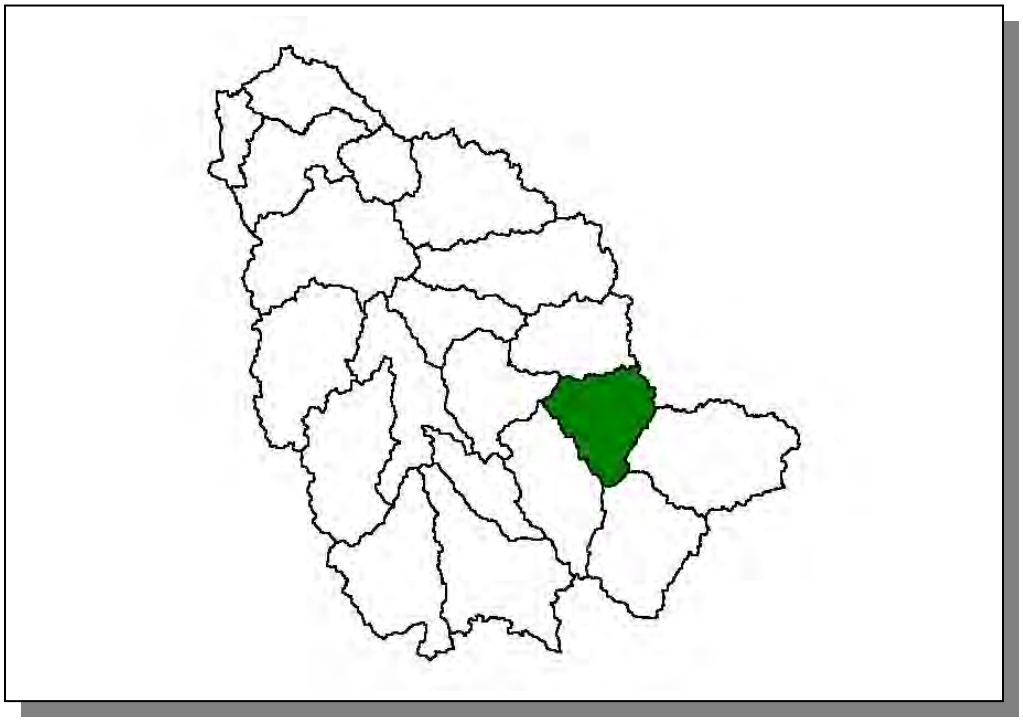


***Figure 4-14. Location of Subwatershed 05130203030.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.C.i. General Description.

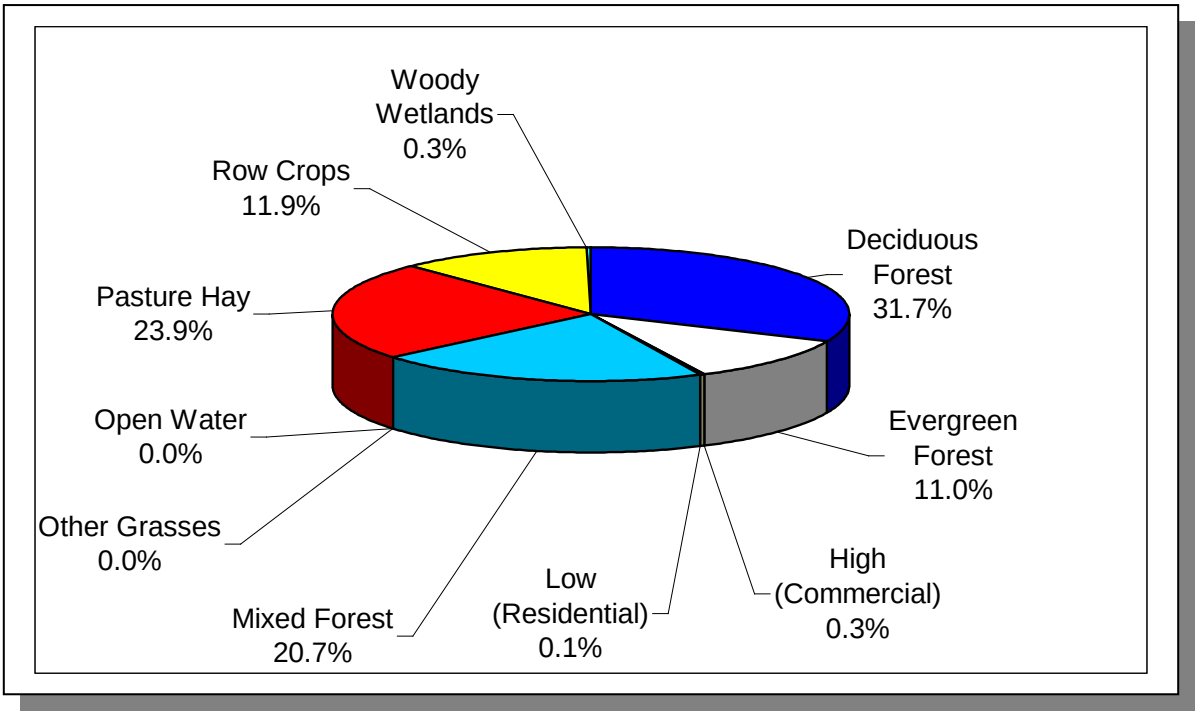



***Figure 4-15. Land Use Distribution in Subwatershed 05130203030.*** *More information is provided in Stones-Appendix IV.*

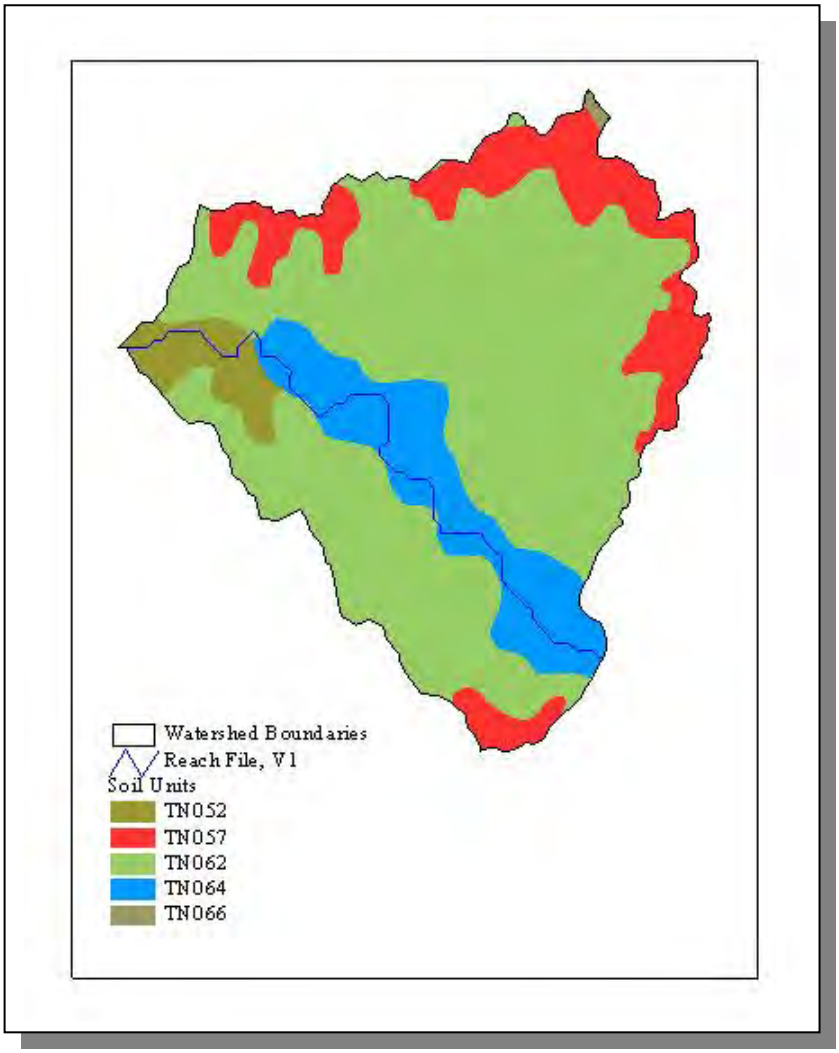



***Figure 4-16. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203030.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clay Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clay Loam | 0.26 |
| TN064 | 7.00 | C | 1.19 | 5.82 | Silty Loam | 0.37 |
| TN066 | 0.00 | B | 2.62 | 4.75 | Loam | 0.28 |

***Table 4-13. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203030.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Cannon | 10467 | 12011 | 4.36 | 456 | 524 | 14.9 |
| Rutherford | 118570 | 159987 | 4.59 | 5448 | 7351 | 34.9 |
| **Totals** | **129037** | **171998** | | **5904** | **7875** | **33.4** |

***Table 4-14. Population Estimates in Subwatershed 05130203030.***

| | | | NUMBER OF HOUSING UNITS | | | |
|---|---|---|---|---|---|---|
| **Populated Place** | **County** | **Population** | **Total** | **Public Sewer** | **Septic Tank** | **Other** |
| Nashville-Davidson Co. | Davidson | 488,518 | 219,521 | 203,640 | 15,576 | 305 |
| Pegram | Cheatham | 1,371 | 535 | 20 | 510 | 5 |
| **Total** | | **489,889** | **220,056** | **203,660** | **16,086** | **310** |

***Table 4-15. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203030.***

4.2.C.ii. Point Source Contributions.

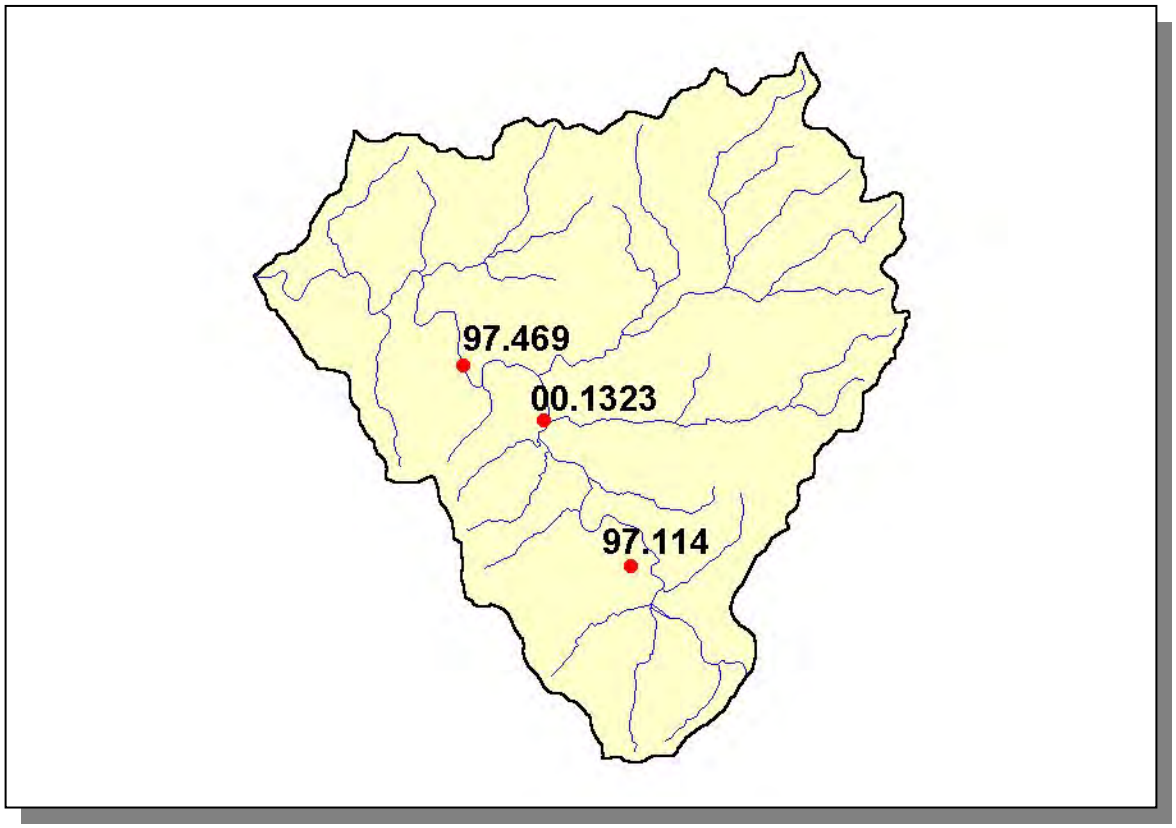



***Figure 4-17. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203030.***
*More information is provided in Stones-Appendix IV.*

4.2.C.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 1,441 | 3,091 | 183 | 5 | 292 | 27 |

***Table 4-16. Summary of Livestock Count Estimates in Subwatershed 05130203030.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Cheatham | 118.2 | 118.2 | 2.3 | 8.4 |
| Davidson | 108.7 | 108.1 | 2.3 | 9.7 |
| Williamson | 142.0 | 142 | 1 | 3.3 |
| **Total** | **368.9** | **368.3** | **5.6** | **21.4** |

***Table 4-17. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203030.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Soybeans (Row Crops) | 9.50 |
| Grass (Hayland) | 0.14 |
| Legume (Hayland) | 0.84 |
| Grass (Pastureland) | 0.53 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.53 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.31 |
| Corn (Row Crops) | 6.14 |
| Other Cropland Not Planted | 5.05 |
| Legume Grass (Hayland) | 0.18 |
| All Other Close Grown Cropland | 2.26 |
| Tobacco (Row Crops) | 6.75 |
| Wheat (Close Grown Cropland) | 1.27 |
| Other Land in Farms | 0.12 |
| Conservation Reserve Program Land | 0.12 |
| Legume (Pastureland) | 0.33 |

***Table 4-18. Annual Estimated Total Soil Loss in Subwatershed 05130203030.***

4.2.D. 05130203040.

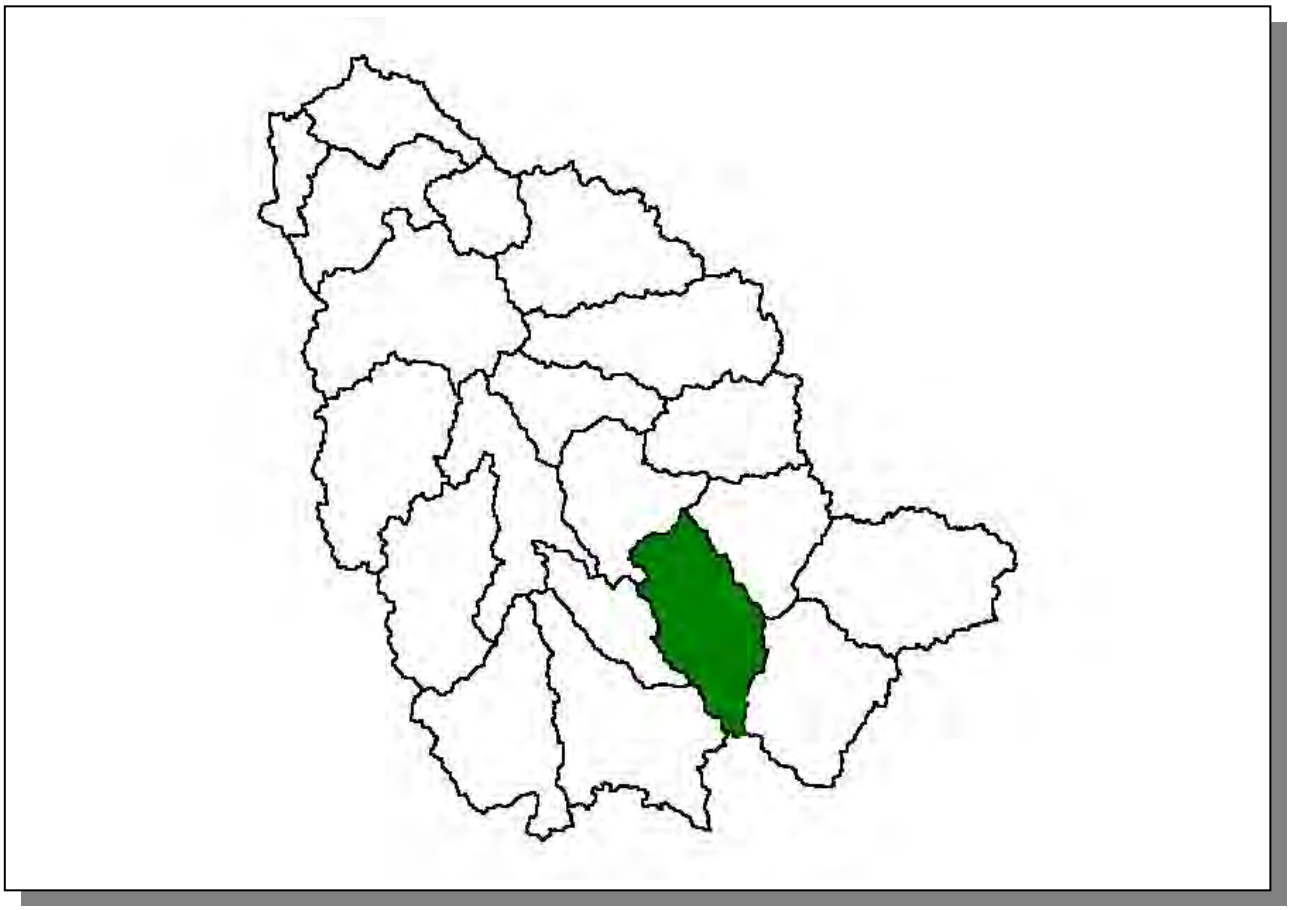


***Figure 4-18. Location of Subwatershed 05130203040.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.D.i. General Description.

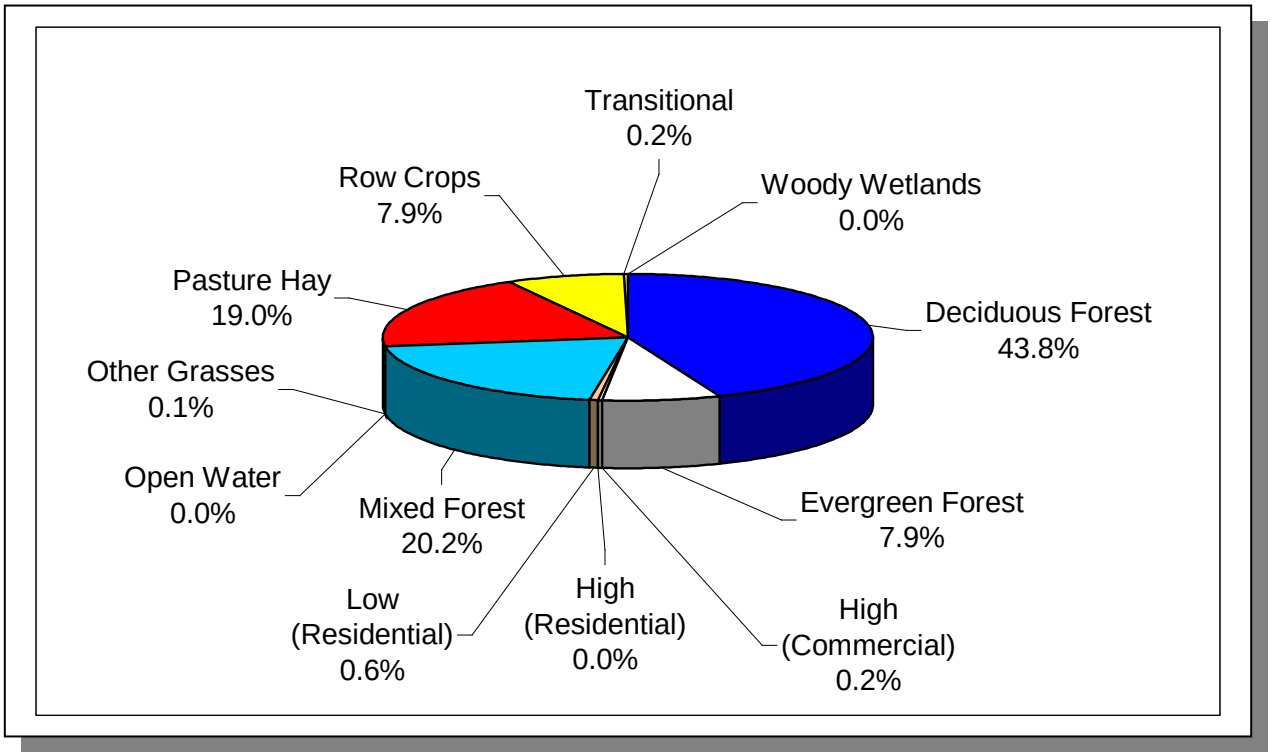



***Figure 4-19. Land Use Distribution in Subwatershed 05130203040.*** *More information is provided in Stones-Appendix IV.*

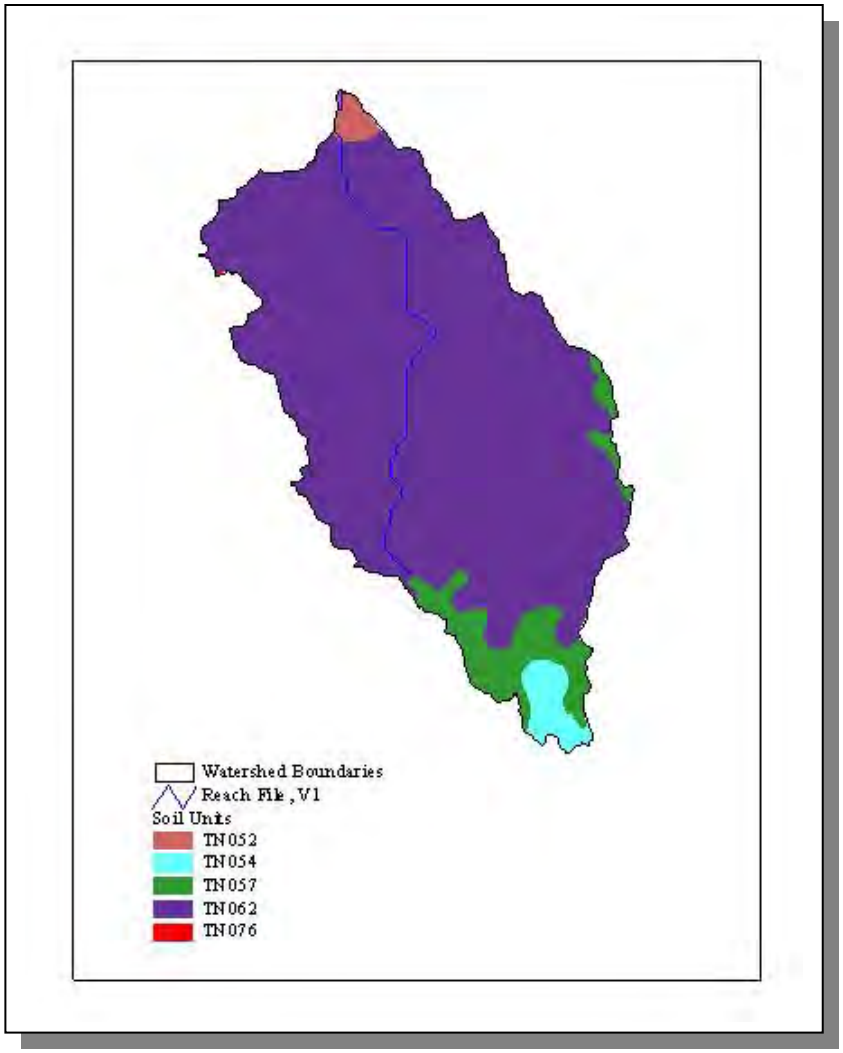



***Figure 4-20. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203040.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN054 | 0.00 | C | 3.04 | 4.84 | Loam | 0.32 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clay Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clay Loam | 0.26 |
| TN076 | 28.00 | C | 0.73 | 6.26 | Silty Clay Loam | 0.33 |

***Table 4-19. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203040.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Cannon | 10,467 | 12,011 | 0.06 | 6 | 7 | 16.7 |
| Coffee | 40,339 | 45,347 | 0.09 | 35 | 40 | 14.3 |
| Rutherford | 118,570 | 159,987 | 7.88 | 9,344 | 12,607 | 34.9 |
| **Totals** | **169,376** | **217,345** | | **9,385** | **12,654** | **34.8** |

***Table 4-20. Population estimates in Subwatershed 05130203040.***

4.2.D.ii. Point Source Contributions.

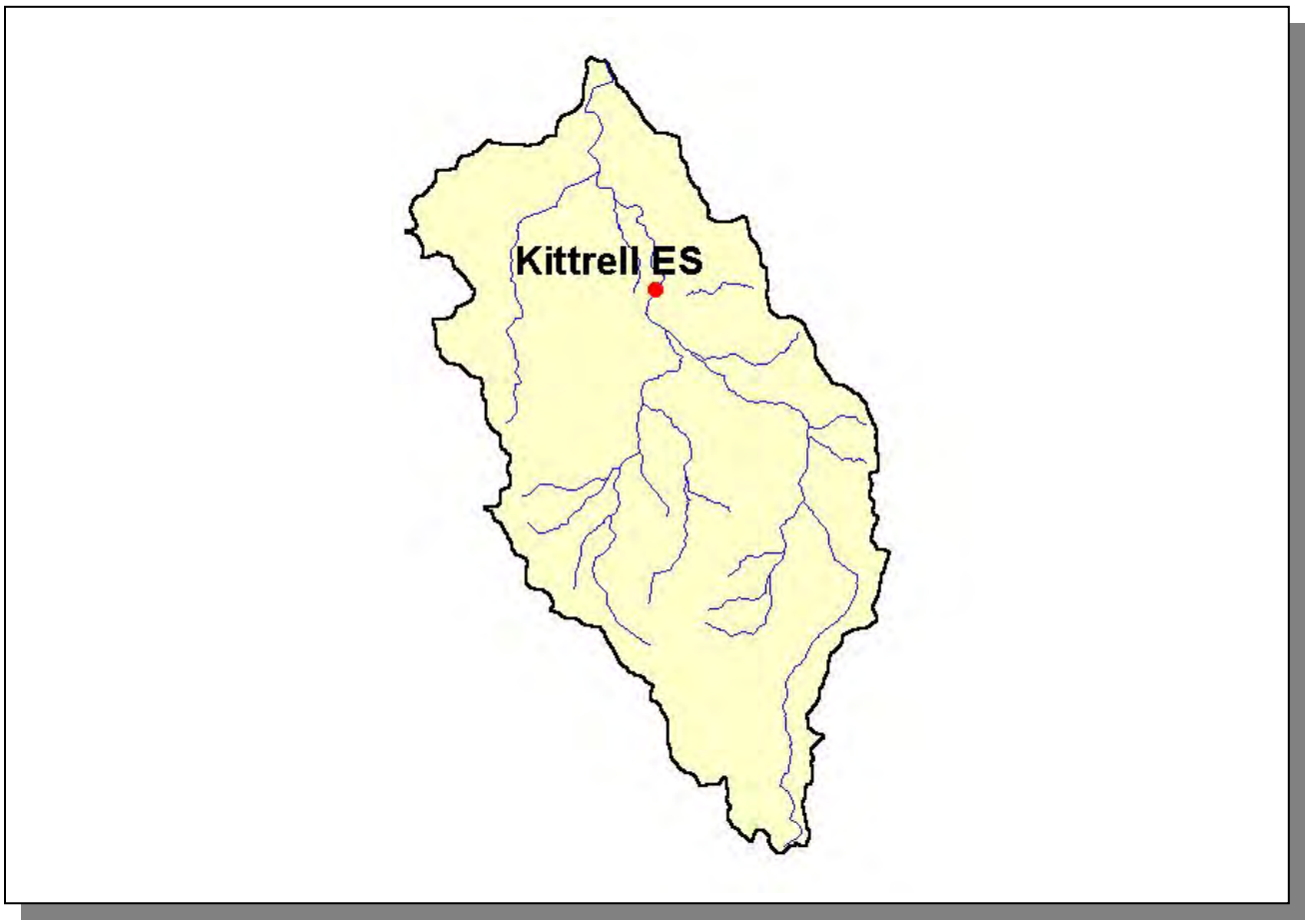



***Figure 4-21. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203040.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

4.2.D.ii.a. Dischargers to Water Bodies Listed on the 1998 303(d) List.

There is one NPDES facility discharging to water bodies listed on the 1998 303(d) list in Subwatershed 05130203040:

- TN 0067253 discharges to Cripple Creek @ RM 5.2

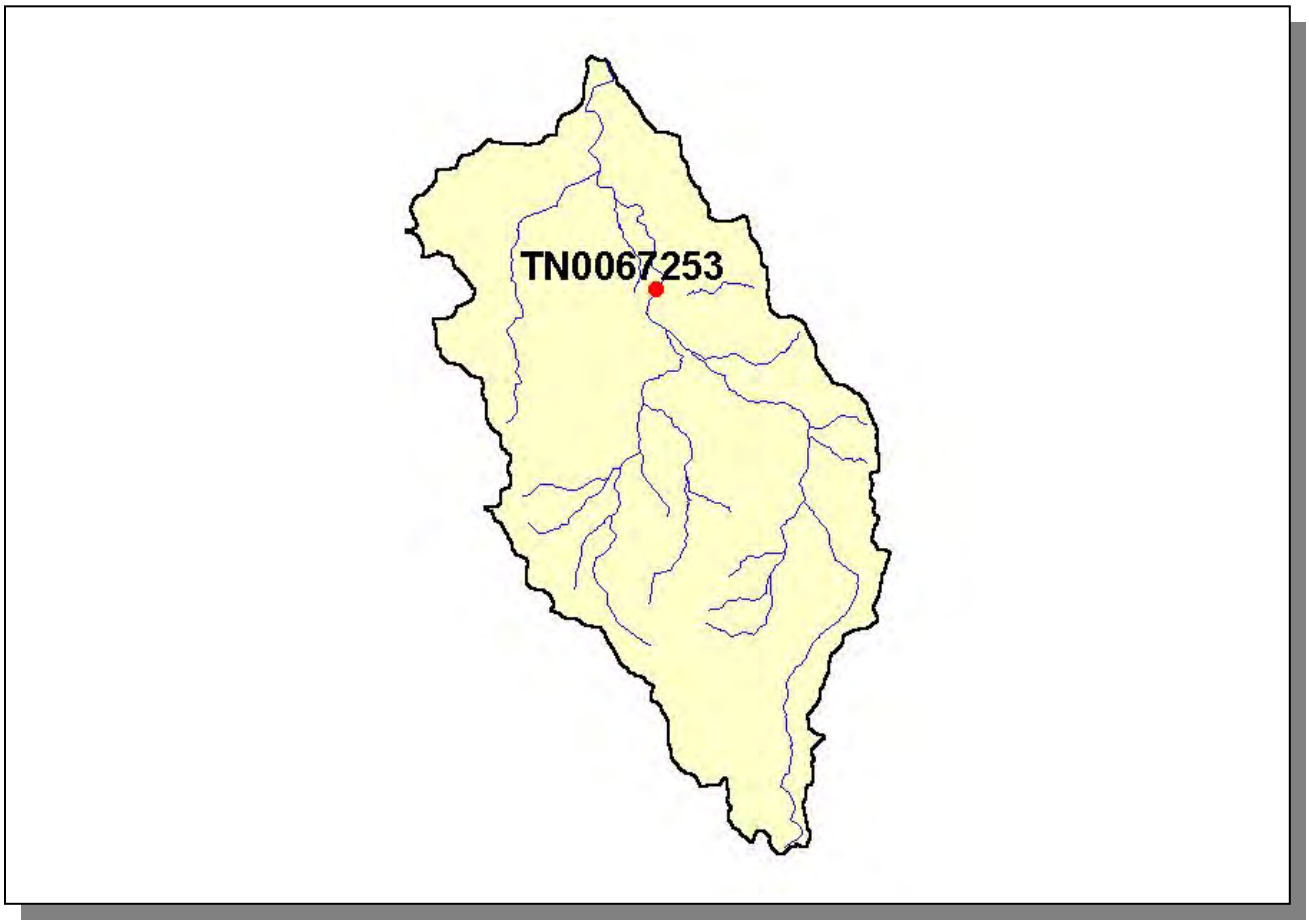



***Figure 4-22. Location of NPDES Discharger to Water Bodies Listed on the 1998 303(d) List in Subwatershed 05130203040.*** *The names of facilities are provided in Stones-Appendix IV.*

| PERMIT # | 7Q10 | 1Q20 | 30Q2 | QDESIGN |
|---|---|---|---|---|
| TN0067253 | 0 | 0 | 0 | 0.019 |

***Table 4-21. Receiving Stream Flow Information for NPDES Dischargers to Water Bodes Listed on the 1998 303(d) List in Subwatershed 05130203040.*** *Data are in million gallons per day (MGD). Data were calculated using data in Flow Duration and Low Flows of Tennessee Streams Through 1992.*

| PERMIT # | $CBOD_5$ | $NH_3$ | FECAL |
|---|---|---|---|
| TN0067253 | X | X | X |

***Table 4-22. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130203040.***

4.2.D.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | | |
|---|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Chickens Sold** | **Hogs** | **Sheep** |
| 1,296 | 2,716 | 168 | <5 | 977 | 64 | 27 |

***Table 4-23. Summary of Livestock Count Estimates in Subwatershed 05130203040.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Cannon | 88.5 | 88.5 | 1.7 | 7.1 |
| Coffee | 114.4 | 114.2 | 2.8 | 12.7 |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |

***Table 4-24. Forest Acreage and Average Annual removal rates (1987-1994) in Subwatershed 05130203040.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Non Agricultural Land Use | 0.00 |
| Berry (Horticultural) | 0.47 |
| Corn (Row Crops) | 3.68 |
| Soybeans (Row Crops) | 2.92 |
| Cotton (Row Crops) | 4.78 |
| Grass (Hayland) | 0.21 |
| Legume (Hayland) | 0.32 |
| Legume Grass (Hayland) | 0.49 |
| Grass (Pastureland) | 0.89 |
| Legume (Pastureland) | 0.12 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.54 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.47 |
| Conservation Reserve Program Land | 0.28 |
| Wheat (Close Grown Cropland) | 10.98 |
| Other Vegetable and Truck Crop | 4.37 |
| Other Cropland not Planted | 6.68 |

***Table 4-25. Annual Soil Loss in Subwatershed 05130203040.***

4.2.E. 05130203050.

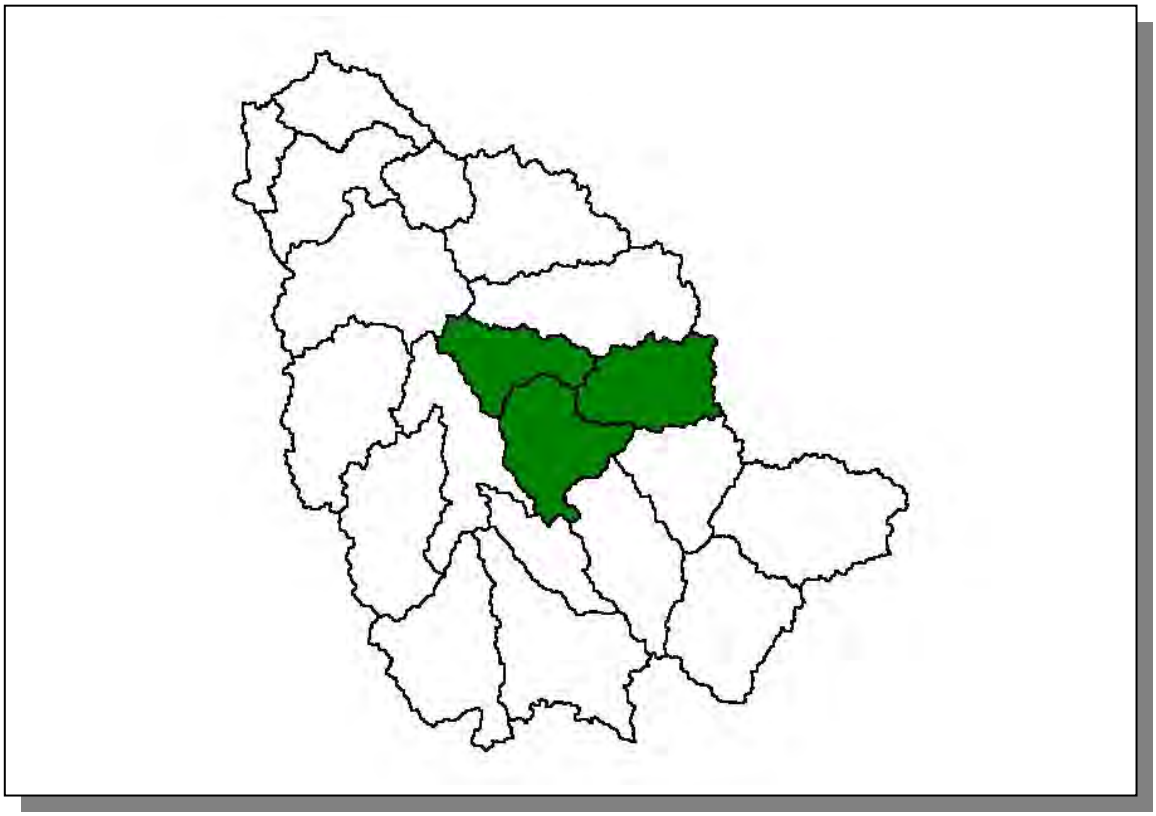


***Figure 4-23. Location of Subwatershed 05130203050.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.E.i. General Description.

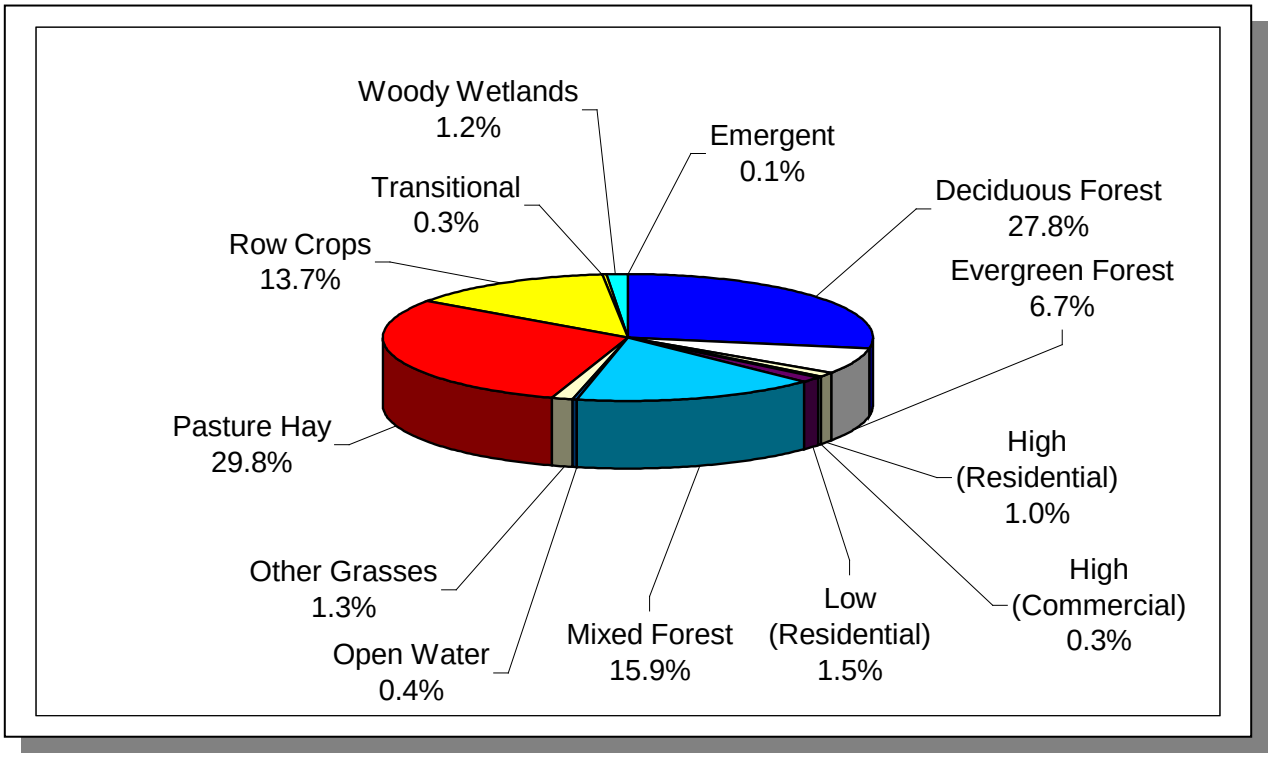



***Figure 4-24. Land Use Distribution in Subwatershed 05130203050.*** *More information is provided in Stones-Appendix IV.*

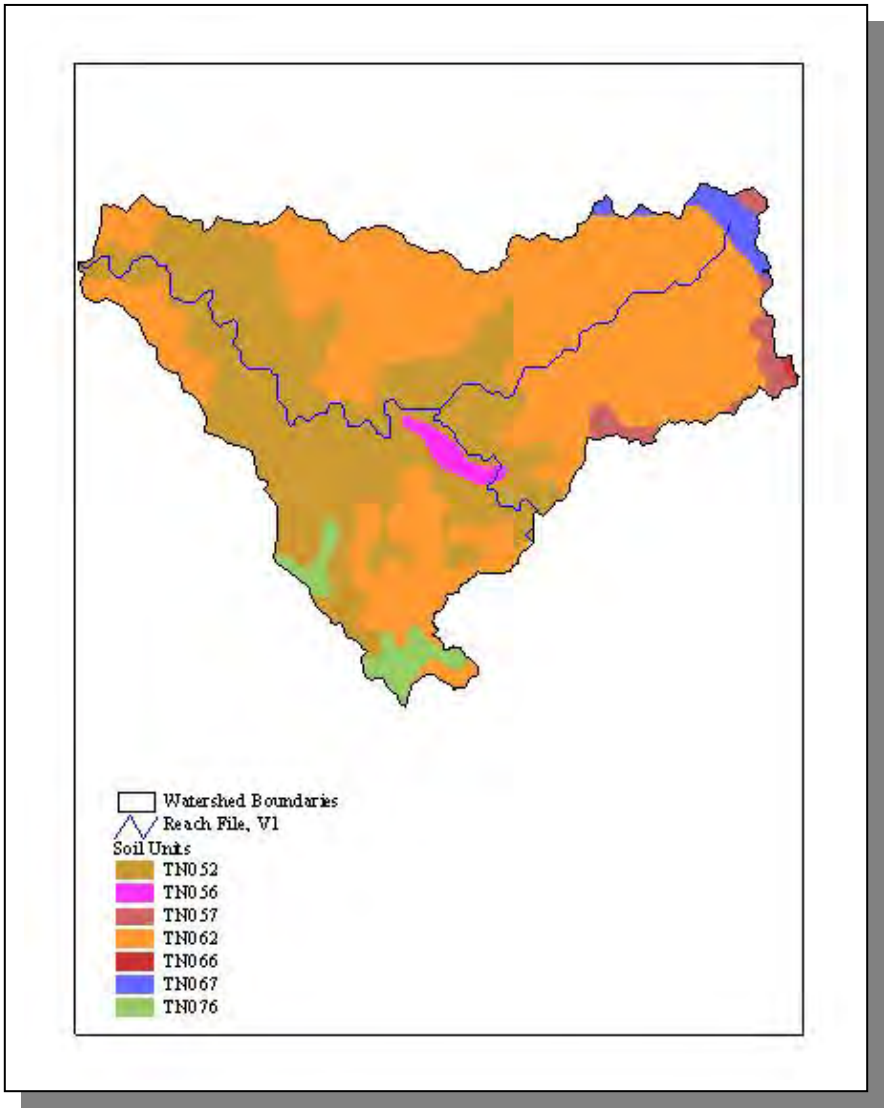



***Figure 4-25. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203050.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATE SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN056 | 0.00 | C | 2.99 | 5.29 | Sandy Clay Loam | 0.25 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clay Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clay Loam | 0.26 |
| TN066 | 0.00 | B | 2.62 | 4.75 | Loam | 0.28 |
| TN067 | 2.00 | C | 2.69 | 5.51 | Silty Loam | 0.35 |
| TN076 | 28.00 | C | 0.73 | 6.26 | Silty Clay Loam | 0.33 |

***Table 4-26. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203050.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Cannon | 10,467 | 12,011 | 0 | 0 | 0 | 0 |
| Rutherford | 118,570 | 159,987 | 17.07 | 20,238 | 27,307 | 34.9 |
| Wilson | 67,675 | 81,327 | 1.33 | 900 | 1,081 | 20.1 |
| **Totals** | **196,712** | **253,325** | | **21,138** | **28,388** | **34.3** |

***Table 4-27. Population estimates in Subwatershed 05130203050.***

| | | | | Number of Housing Units | | |
|---|---|---|---|---|---|---|
| **Populated Place** | **County** | **Population** | **Total** | **Public Sewer** | **Septic Tank** | **Other** |
| Murfreesboro | Rutherford | 44,922 | 18,708 | 17,845 | 855 | 8 |

***Table 4-28. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203050.***

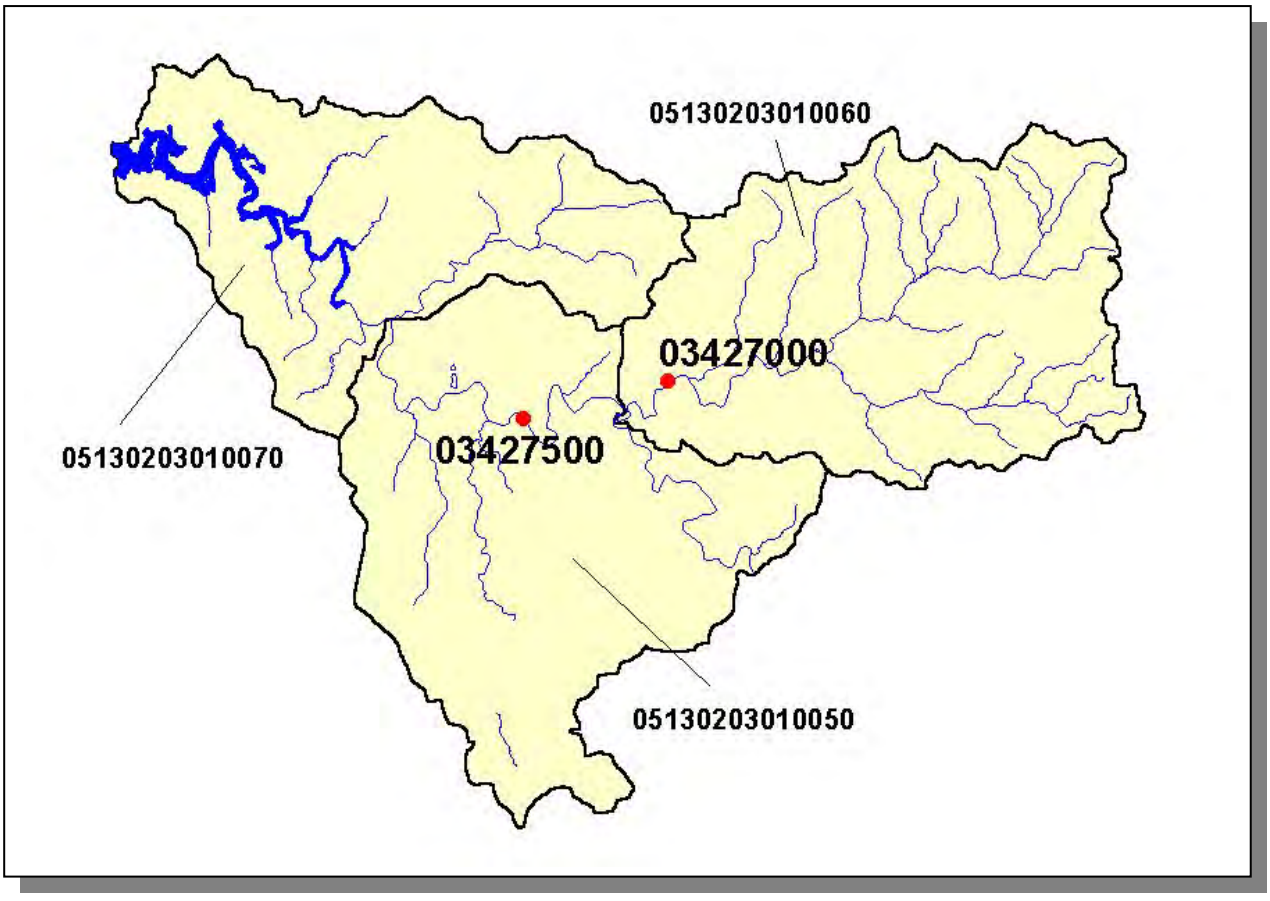



***Figure 4-26. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130203050.*** *Subwatershed 05130203010050, 05130203010060, and 05130203010070 boundaries are shown for reference. More information is provided in Stones-Appendix IV.*


***Figure 4-27. Location of STORET Monitoring Site in Subwatershed 05130203050.*** *Subwatershed 05130203010050, 05130203010060, and 05130203010070 boundaries are shown for reference. More information is provided in Stones-Appendix IV.*

4.2.E.ii. Point Source Contributions.

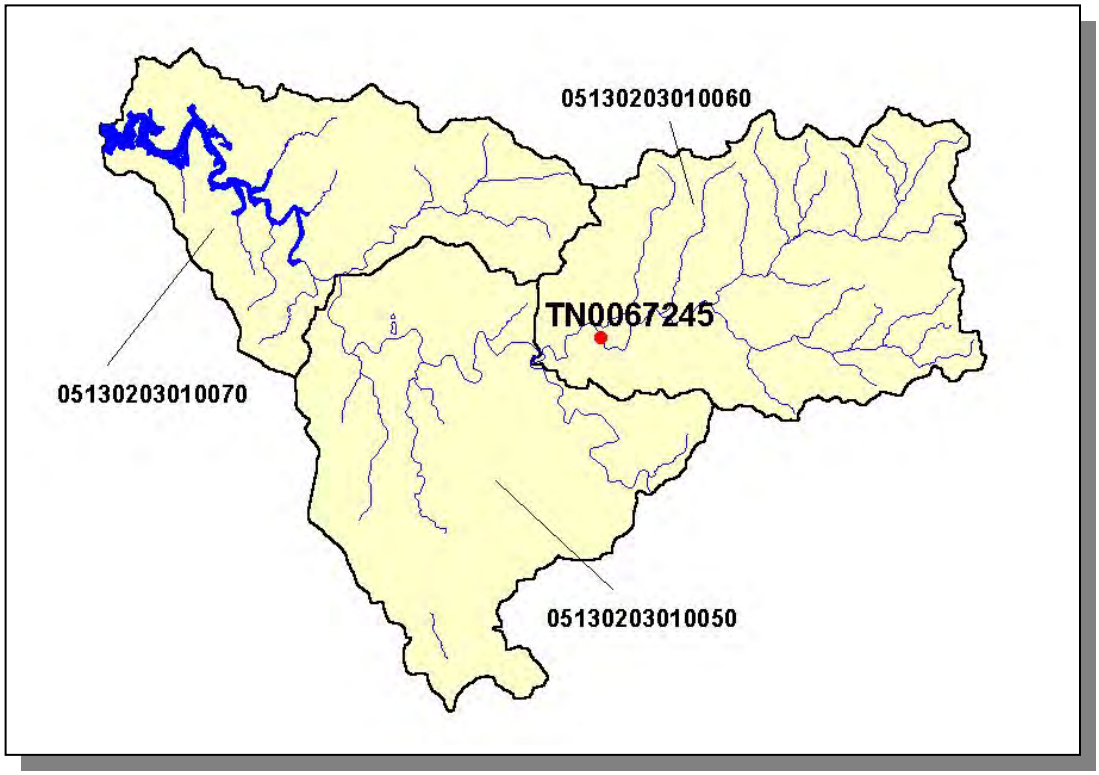



***Figure 4-28. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203050.*** *Subwatershed 05130203010050, 05130203010060, and 05130203010070 boundaries are shown for reference. More information, including the names of facilities, is provided in Stones-Appendix IV.*

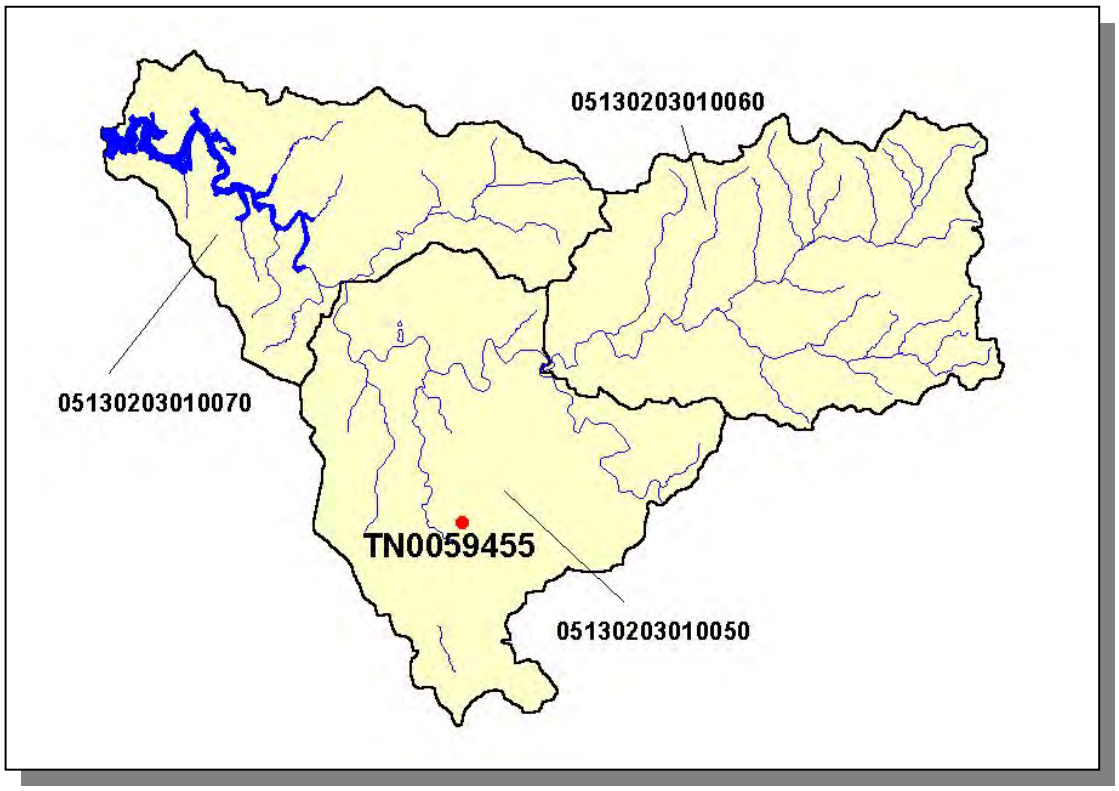



***Figure 4-29. Location of Active Mining Sites in Subwatershed 05130203050.*** *Subwatershed 05130203010050, 05130203010060, and 05130203010070 boundaries are shown for reference. More information, including the names of facilities, is provided in Stones-Appendix IV.*

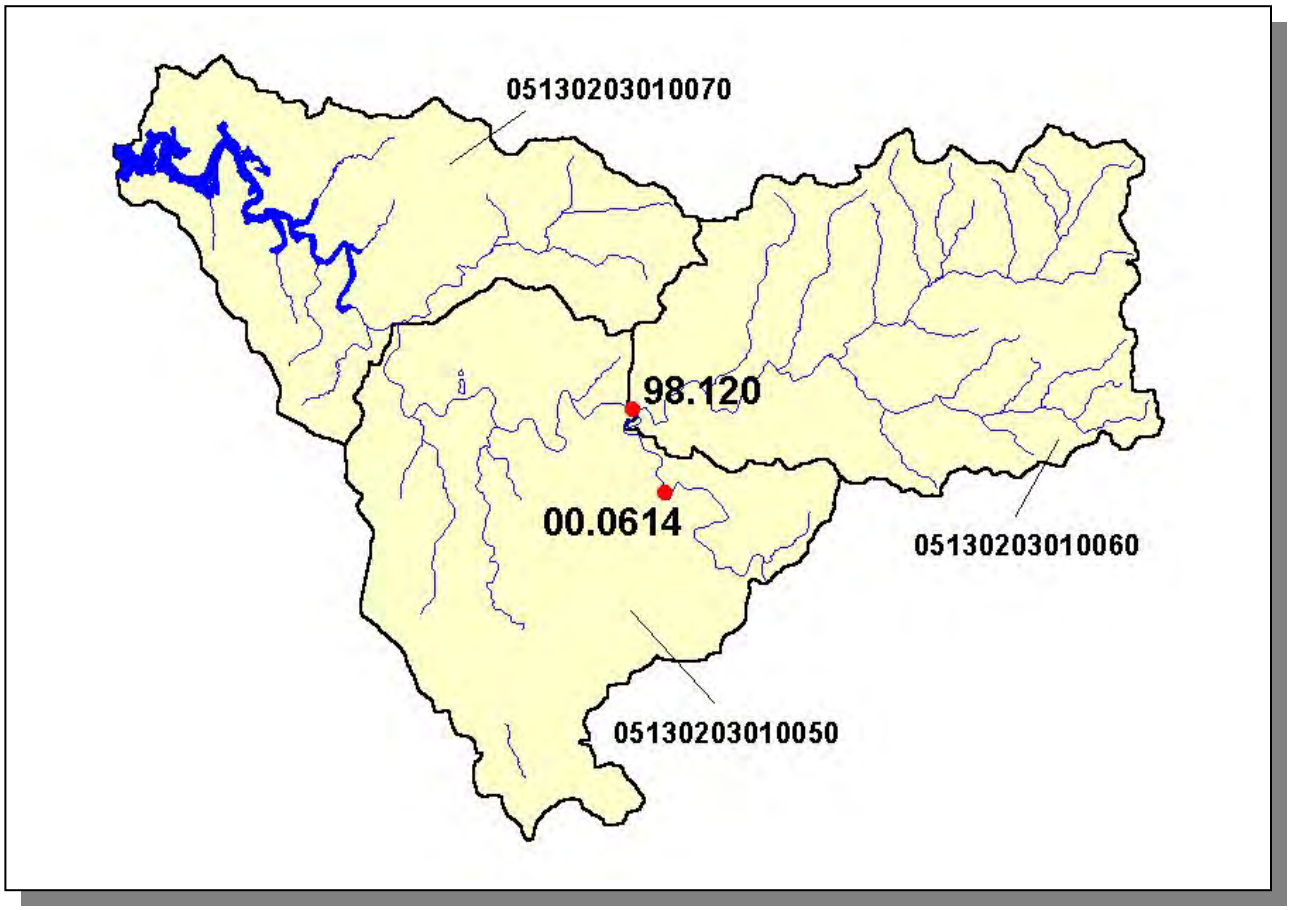



***Figure 4-30. Location of Permitted ARAP sites in Subwatershed 05130203050.*** *Subwatershed 05130203010050, 05130203010060, and 05130203010070 boundaries are shown for reference. More information is provided in Stones-Appendix IV.*

4.2.E.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 4,801 | 9,947 | 583 | 16 | 242 | 100 |

***Table 4-29. Summary of Livestock Count Estimates in Subwatershed 05130203050.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| County | Forest Land (thousand acres) | Timber Land (thousand acres) | Growing Stock (million cubic feet) | Sawtimber (million board feet) |
| Cannon | 88.5 | 88.5 | 1.7 | 7.1 |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| Wilson | 98.1 | 97.0 | 1.7 | 6.8 |
| **Total** | **342.3** | **341.2** | **3.8** | **14.8** |

***Table 4-30. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 05130203050.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Corn (Row Crops) | 3.52 |
| Grass (Hayland) | 0.22 |
| Grass (Pastureland) | 0.86 |
| Grass, Forbs, Legumes (Mixed (Pasture) | 0.57 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.46 |
| Non Agricultural Land Use | 0.00 |
| Soybeans (Row Crops) | 3.08 |
| Tobacco (Row Crops) | 19.23 |
| Wheat (Close Grown Cropland) | 1.97 |
| Legume Grass (Hayland) | 0.48 |
| All Other Close Grown Cropland | 2.49 |
| Berry (Horticultural) | 0.47 |
| Cotton (Row Crops) | 4.79 |
| Legume (Hayland) | 0.32 |
| Legume (Pastureland) | 0.12 |
| Conservation Reserve Program Land | 0.28 |

***Table 4-31. Annual Estimated Soil Loss in Subwatershed 05130203050.***

4.2.F. 05130203060

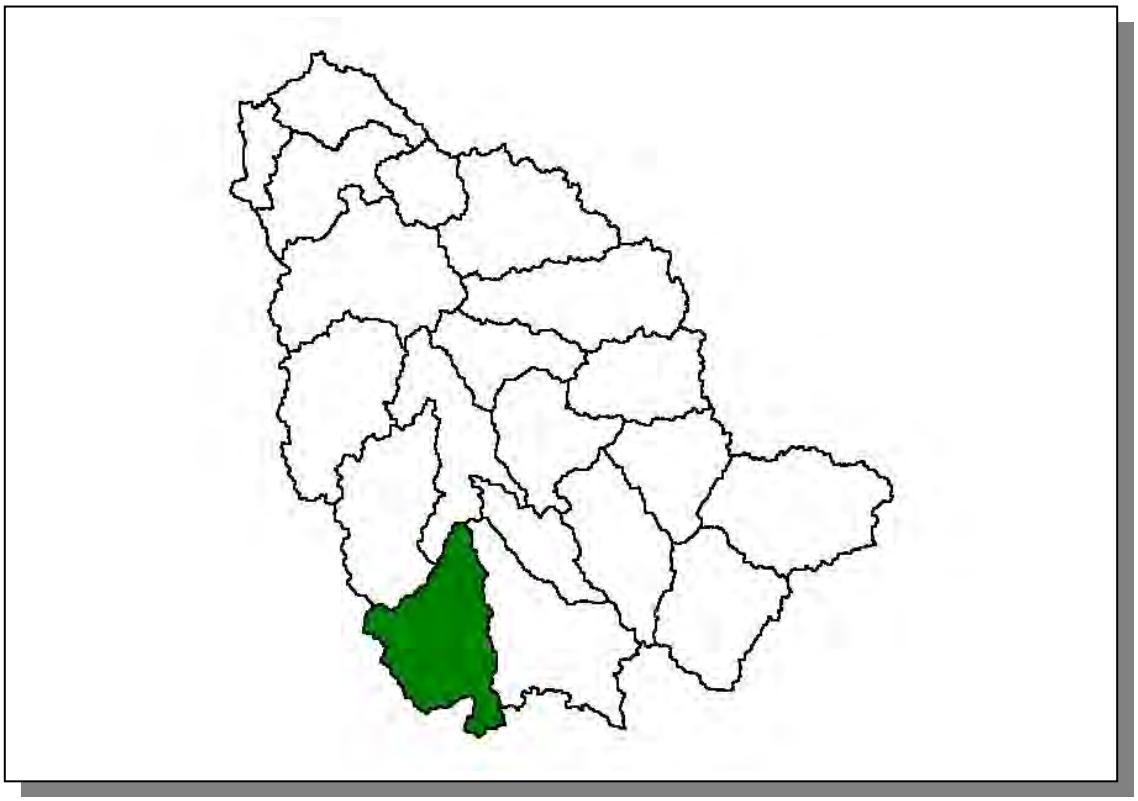


***Figure 4-31. Location of Subwatershed 05130203060.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.F.i. General Description.

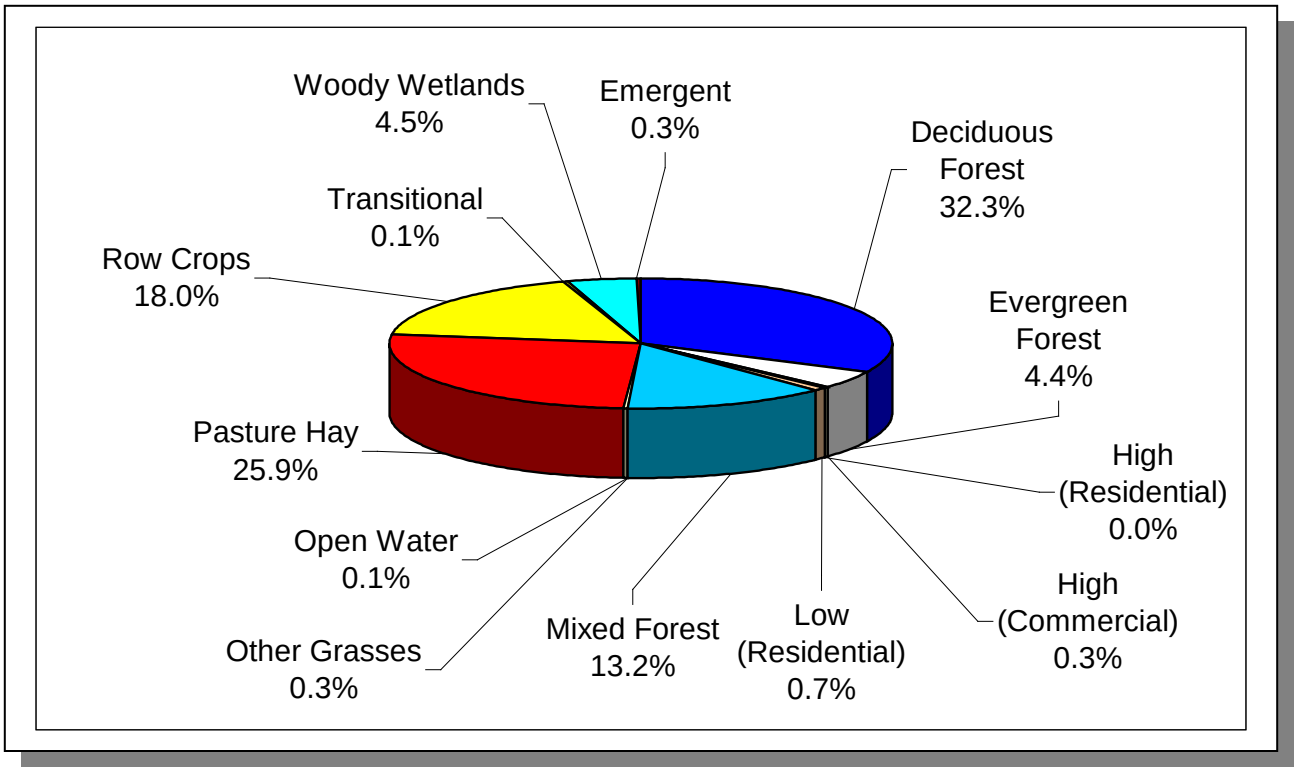



***Figure 4-32. Land Use Distribution in Subwatershed 05130203060.*** *More information is provided in Stones-Appendix IV.*

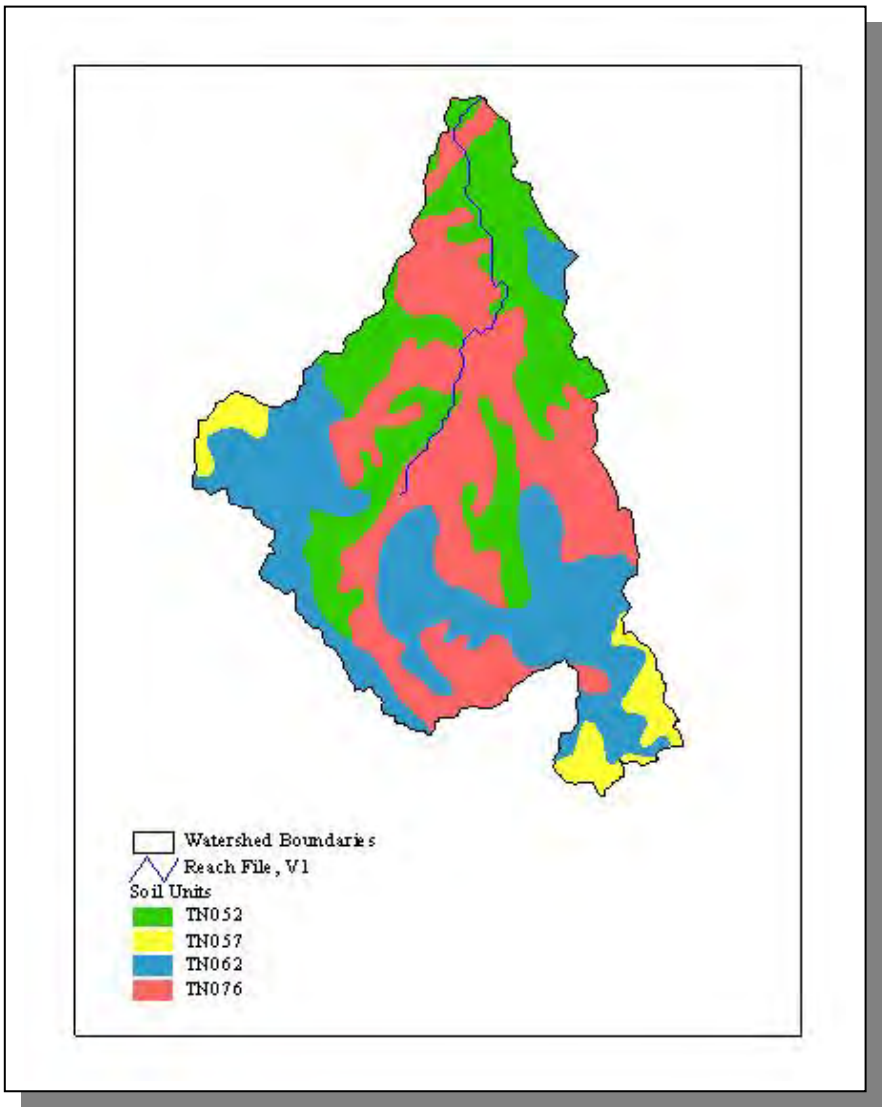



***Figure 4-33. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203060.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATE SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clay Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clay Loam | 0.26 |
| TN076 | 28.00 | C | 0.73 | 6.26 | Silty Clayey Loam | 0.33 |

***Table 4-32. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203060.*** *More information is provided in Stones-Appendix IV.*

| | TOTAL COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | PERCENT CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Bedford | 30,411 | 34,203 | 0.61 | 185 | 208 | 12.4 |
| Rutherford | 118,570 | 159,987 | 9.24 | 10,960 | 14,788 | 34.9 |
| **Totals** | **148,981** | **194,190** | | **11,145** | **14,996** | **34.6** |

***Table 4-33. Population Estimates in Subwatershed 05130203060.***

| | | | | NUMBER OF HOUSING UNITS | | |
|---|---|---|---|---|---|---|
| **Populated Place** | **County** | **Population** | **Total** | **Public Sewer** | **Septic Tank** | **Other** |
| Murfreesboro | Rutherford | 44,922 | 18,708 | 17,845 | 855 | 8 |

***Table 4-34. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203060.***

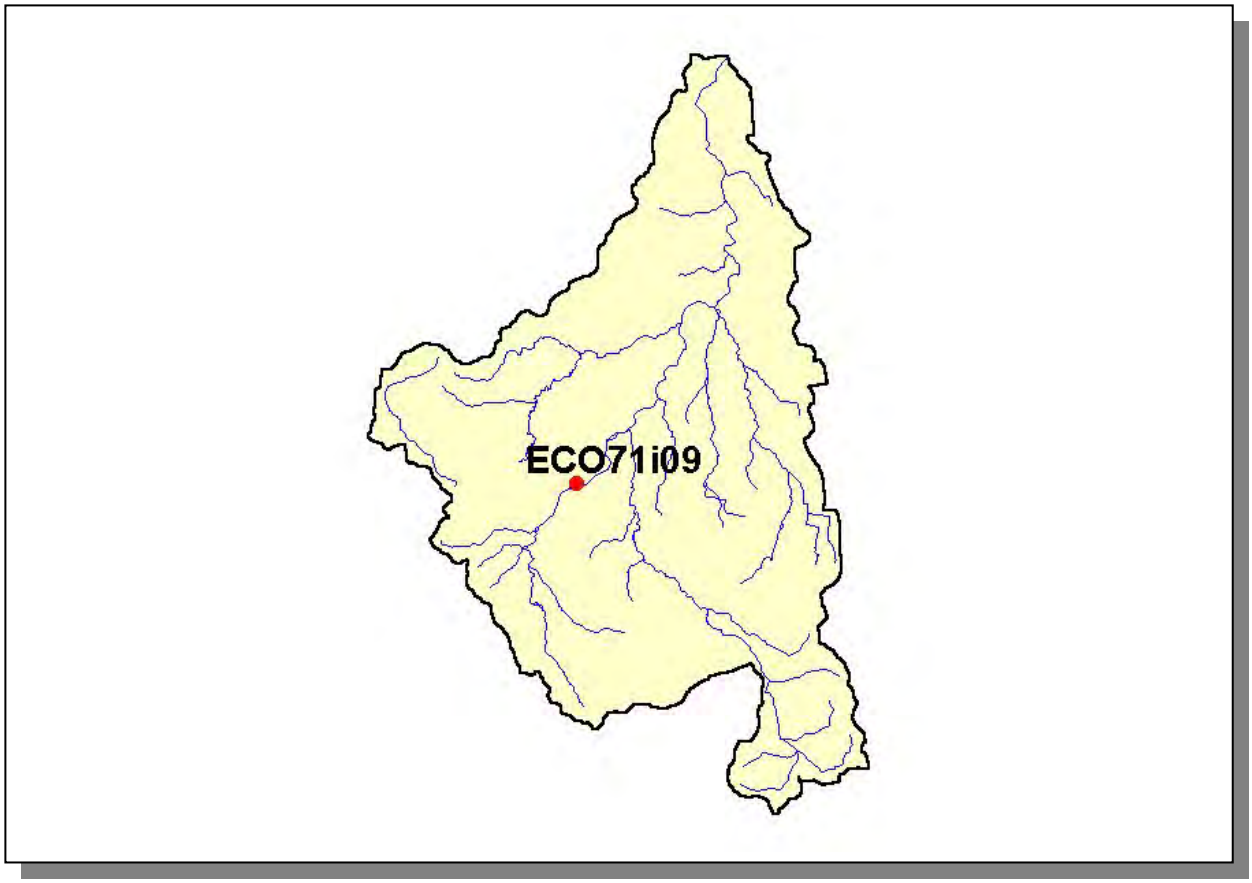



***Figure 4-34. Location of STORET Monitoring Site in Subwatershed 05130203060.*** *More information is provided in Stones-Appendix IV.*

4.2.F.ii. Point Source Contributions.

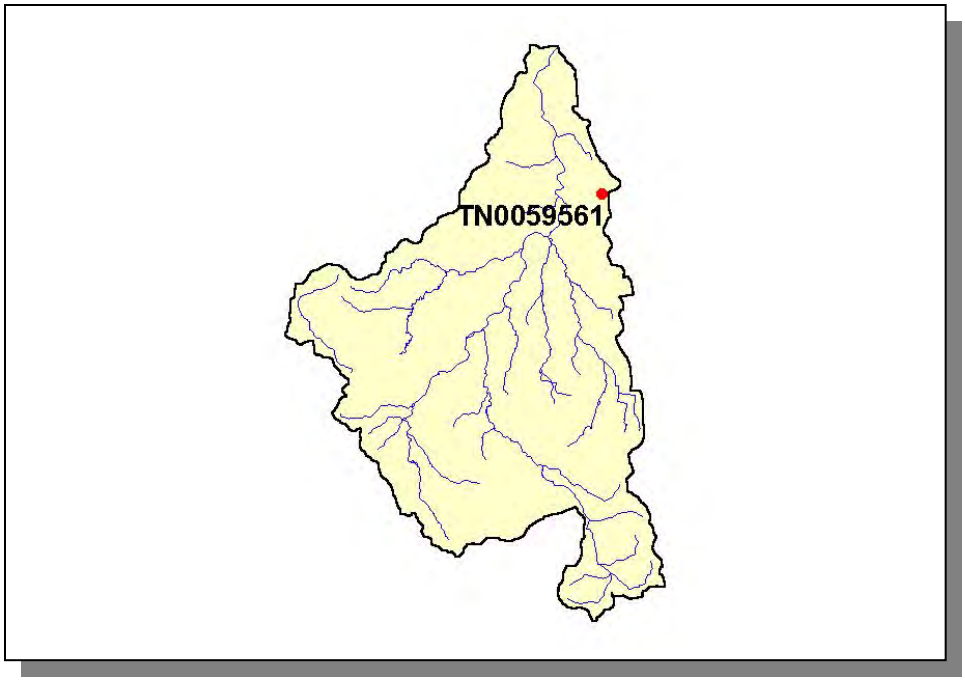



***Figure 4-35. Location of Active Mining Sites in Subwatershed 05130203060.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

4.2.F.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | | |
|---|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Chickens Sold** | **Hogs** | **Sheep** |
| 2,274 | 4,756 | 295 | 8 | 202,886 | 132 | 47 |

***Table 4-35. Summary of Livestock Count Estimates in Subwatershed 05130203060.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | Inventory | | Removal Rate | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Bedford | 74.6 | 74.6 | 0.5 | 1.3 |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| **Total** | **230.3** | **230.3** | **0.9** | **2.2** |

***Table 4-36. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203060.***

| CROP | TONS/ACRE/YEAR |
|---|---|
| Non Agricultural Land Use | 0.00 |
| Berry (Horticultural) | 0.47 |
| Corn (Row Crops) | 3.64 |
| Soybeans (Row Crops) | 2.98 |
| Cotton (Row Crops) | 4.79 |
| Grass (Hayland) | 0.26 |
| Legume (Hayland) | 0.32 |
| Legume Grass (Hayland) | 0.49 |
| Grass (Pastureland) | 0.88 |
| Legume (Pastureland) | 0.12 |
| Grass, Forbs, Legumes (Mixed (Pasture) | 0.53 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads And Ranch Headquarters | 0.45 |
| Conservation Reserve Program L | 0.28 |
| Wheat (Close Grown Cropland) | 2.22 |
| Summer Fallow (Other Cropland) | 4.60 |

***Table 4-37. Annual Estimated Total Soil Loss in Subwatershed 05130203060.***

4.2.G. 05130203070.

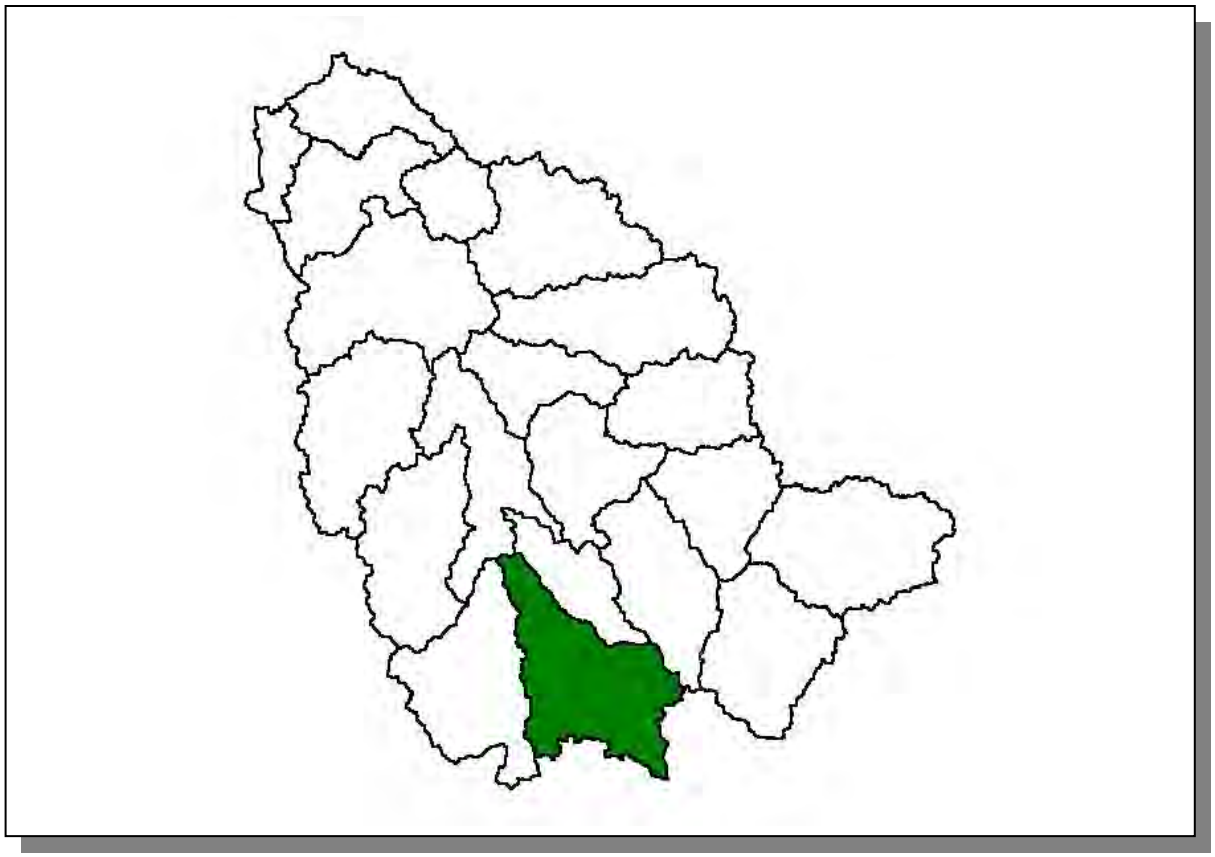


***Figure 4-36. Location of Subwatershed 05130203070.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.G.i. General Description.

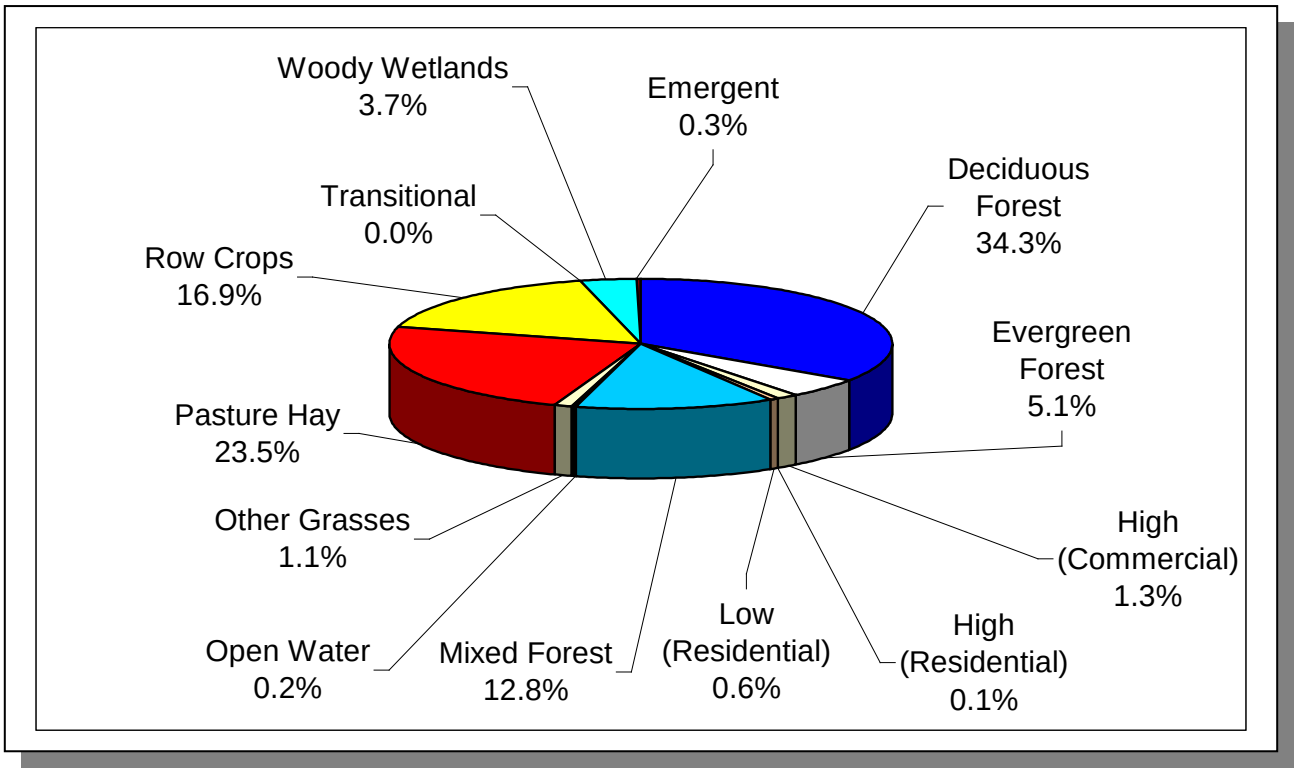



***Figure 4-37. Land Use Distribution in Subwatershed 05130203070.*** *More information is provided in Stones-Appendix IV.*

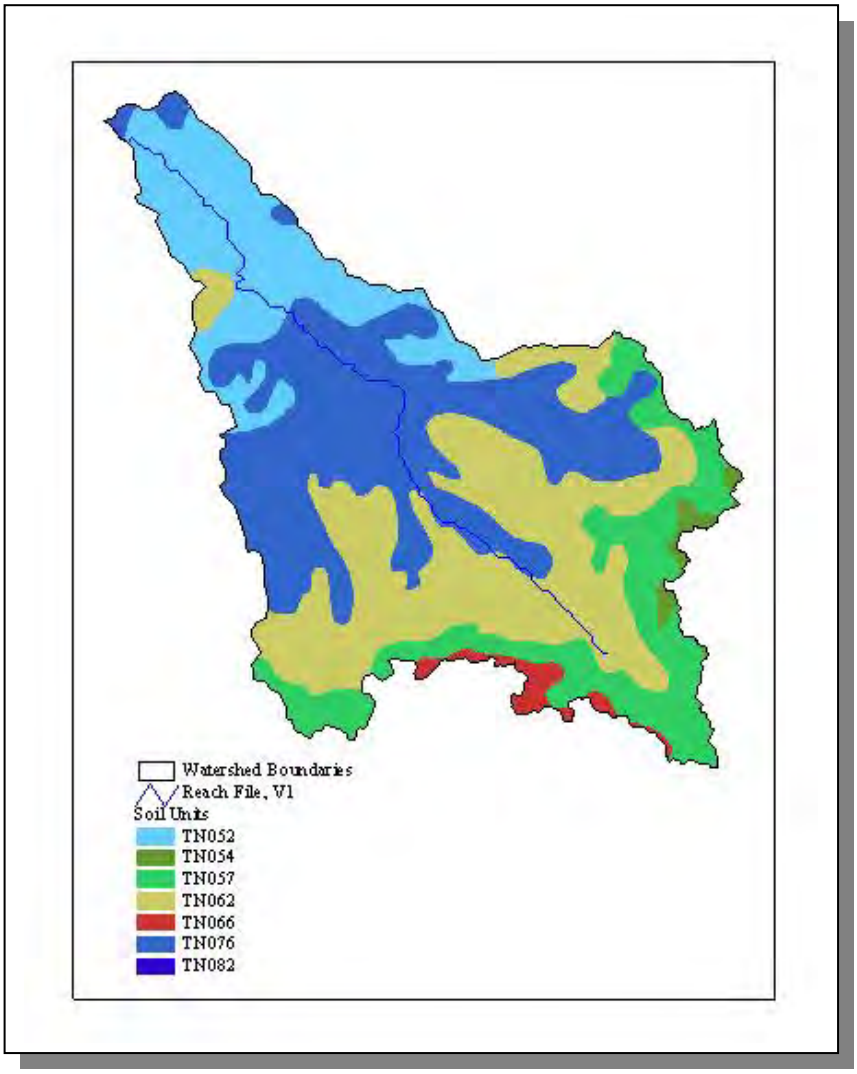



***Figure 4-38. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203070.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN054 | 0.00 | C | 3.04 | 4.84 | Loam | 0.32 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clay Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clay Loam | 0.26 |
| TN066 | 0.00 | B | 2.62 | 4.75 | Loam | 0.28 |
| TN076 | 28.00 | C | 0.73 | 6.26 | Silty Clayey Loam | 0.33 |
| TN082 | 0.00 | B | 1.63 | 5.47 | Loam | 0.34 |

***Table 4-38. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203070.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Bedford | 30,411 | 34,203 | 0.92 | 279 | 314 | 12.5 |
| Coffee | 40,339 | 45,347 | 0.06 | 25 | 29 | 16.0 |
| Rutherford | 118,570 | 159,987 | 10.24 | 12,138 | 16,378 | 34.9 |
| **Totals** | **189,320** | **239,537** | | **12,442** | **16,721** | **34.4** |

***Table 4-39. Population Estimates in Subwatershed 05130203070.***

| NUMBER OF HOUSING UNITS | | | | | | |
|---|---|---|---|---|---|---|
| **Populated Place** | **County** | **Population** | **Total** | **Public Sewer** | **Septic Tank** | **Other** |
| Murfreesboro | Rutherford | 44,922 | 18,708 | 17,845 | 855 | 8 |

***Table 4-40. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203070.***

4.2.G.ii. Point Source Contributions.

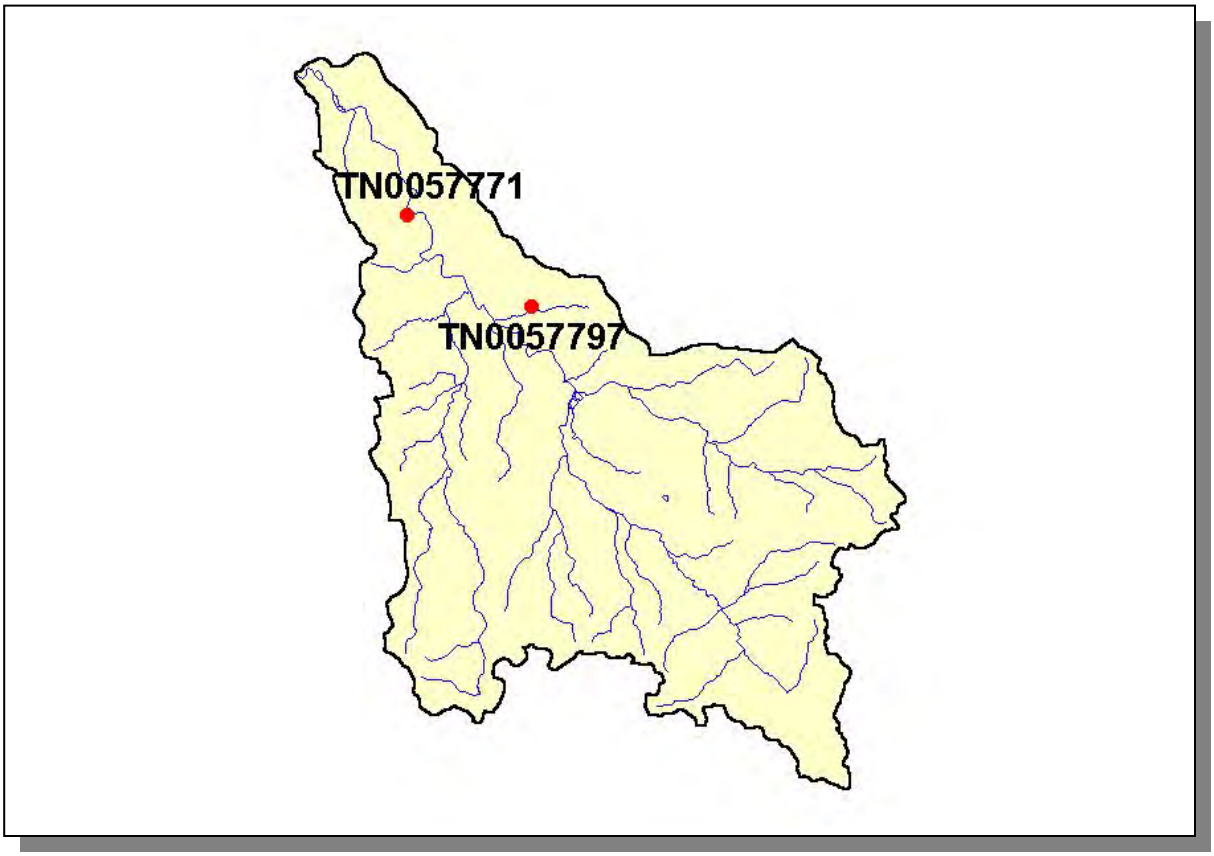



***Figure 4-39. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203070.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

4.2.G.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | | |
|---|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Chickens Sold** | **Hogs** | **Sheep** |
| 2,310 | 4,834 | 299 | 8 | 159,517 | 129 | 48 |

***Table 4-41. Summary of Livestock Count Estimates in Subwatershed 05130203070.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| County | Forest Land (thousand acres) | Timber Land (thousand acres) | Growing Stock (million cubic feet) | Sawtimber (million board feet) |
| Bedford | 74.6 | 74.6 | 0.5 | 1.3 |
| Coffee | 114.4 | 114.2 | 2.8 | 12.7 |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| **Total** | **344.7** | **344.5** | **3.7** | **14.9** |

***Table 4-42. Forest Acreage and Average Removal Rates (1987-1994) in Subwatershed 05130203070.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Non Agricultural Land Use | 0.00 |
| Berry (Horticultural) | 0.47 |
| Corn (Row Crops) | 3.68 |
| Soybeans (Row Crops) | 3.09 |
| Cotton (Row Crops) | 4.79 |
| Grass (Hayland) | 0.27 |
| Legume (Hayland) | 0.32 |
| Legume, Grass (Hayland) | 0.49 |
| Grass (Pastureland) | 0.88 |
| Legume (Pastureland) | 0.12 |
| Grass, Forbs, Legumes Mixed Pasture) | 0.53 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.45 |
| Conservation Reserve Program Land | 0.28 |
| Wheat (Close Grown Cropland) | 2.90 |
| Other Vegetable and Truck Crop | 4.37 |
| Other Cropland not Planted | 6.68 |
| Summer Fallow (Other Cropland) | 4.60 |

***Table 4-43. Annual Estimated Total Soil Loss in Subwatershed 05130203070.***

4.2.H. 05130203080.

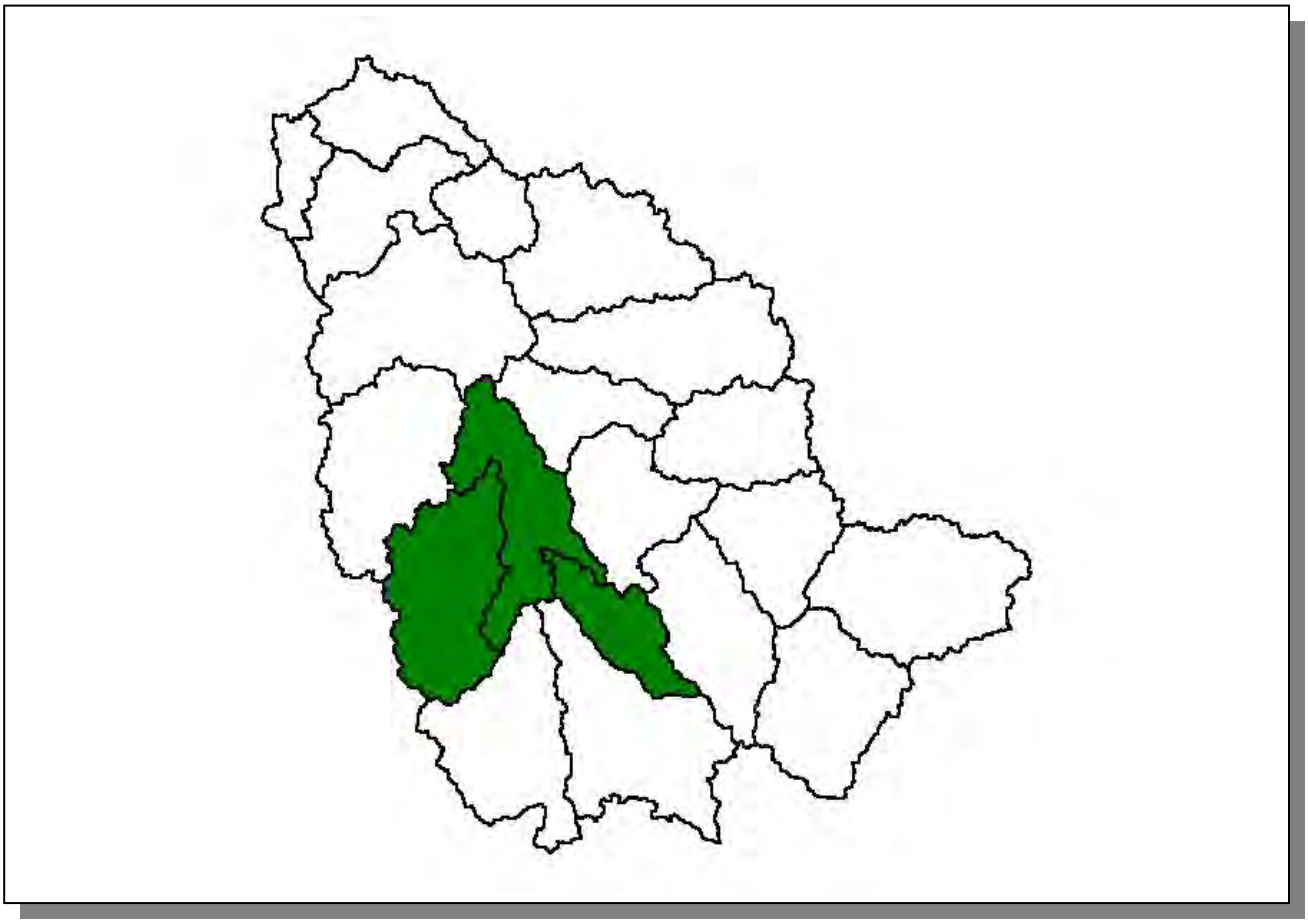


***Figure 4-40. Location of Subwatershed 05130203080.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.H.i. General Description.

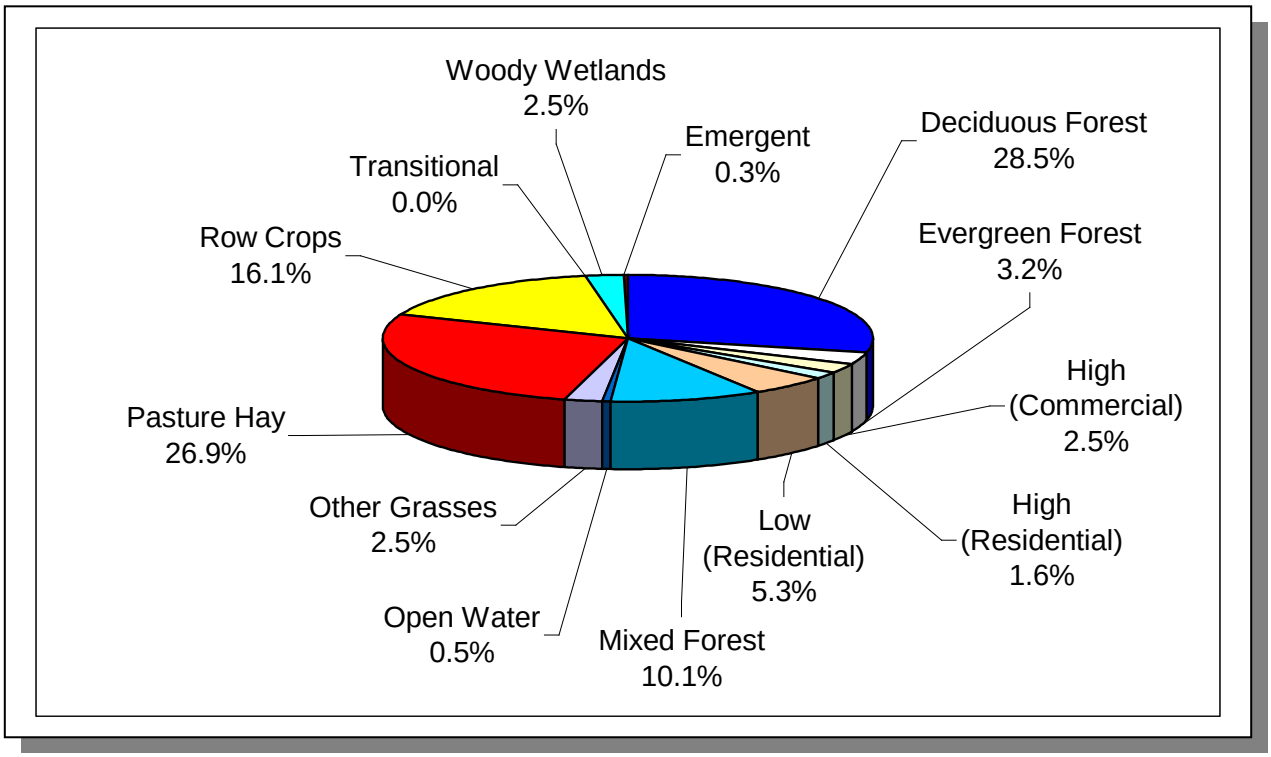



***Figure 4-41. Land Use Distribution in Subwatershed 05130203080.*** More information is provided in Stones-Appendix IV.

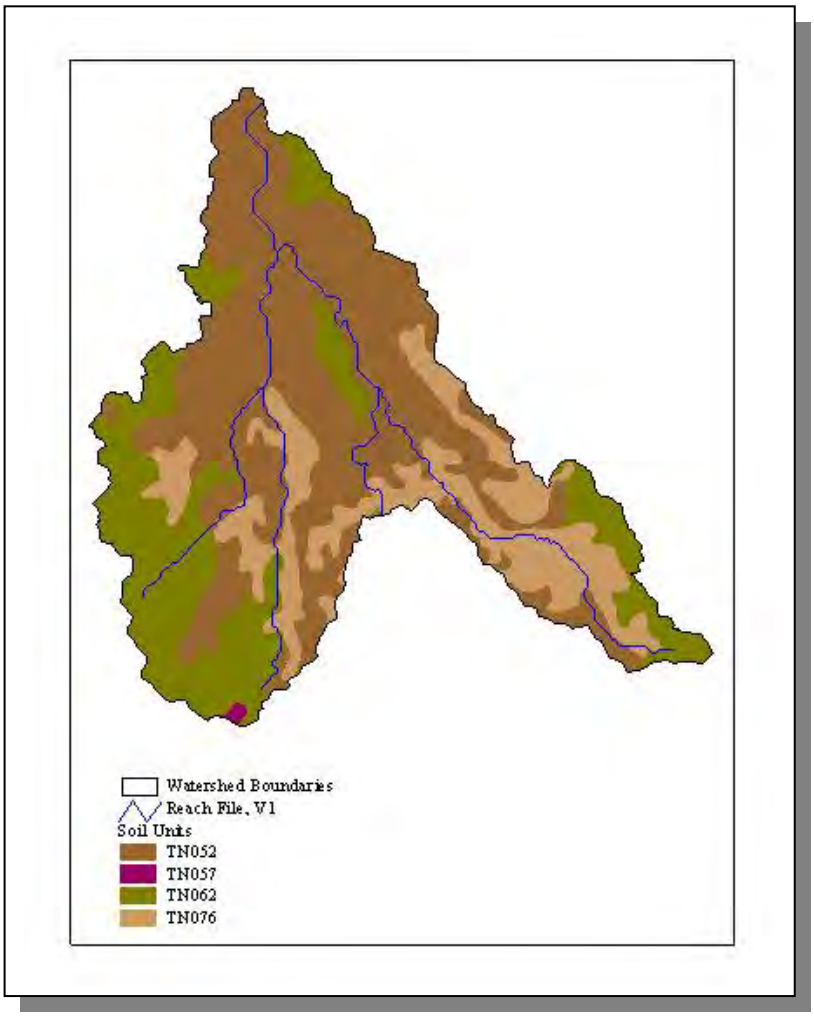



***Figure 4-42. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203080.***

| STATSGO MAP UNIT ID | **PERCENT HYDRIC** | **HYDROLOGIC GROUP** | **PERMEABILITY (in/hour)** | **SOIL pH** | **ESTIMATED SOIL TEXTURE** | **SOIL ERODIBILITY** |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clayey Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clayey Loam | 0.26 |
| TN076 | 28.00 | C | 0.73 | 6.26 | Silty Clayey Loam | 0.33 |

***Table 4-44. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203080.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| County | 1990 | 1997 Est. | Portion of Watershed (%) | 1990 | 1997 | |
| Rutherford | 118,570 | 159987 | 21.4 | 25371 | 34233 | 34.9 |

*Table 4-45. Population estimates in Subwatershed 05130203080.*

| | | | | NUMBER OF HOUSING UNITS | | |
|---|---|---|---|---|---|---|
| Populated Place | County | Population | Total | Public Sewer | Septic Tank | Other |
| Murfreesboro | Rutherford | 44,922 | 18,708 | 17,845 | 855 | 8 |
| Smyrna | Rutherford | 13,647 | 5,312 | 4,959 | 346 | 7 |
| **Total** | | **58,569** | **24,020** | **22,804** | **1,201** | **15** |

*Table 4-46. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203080.*

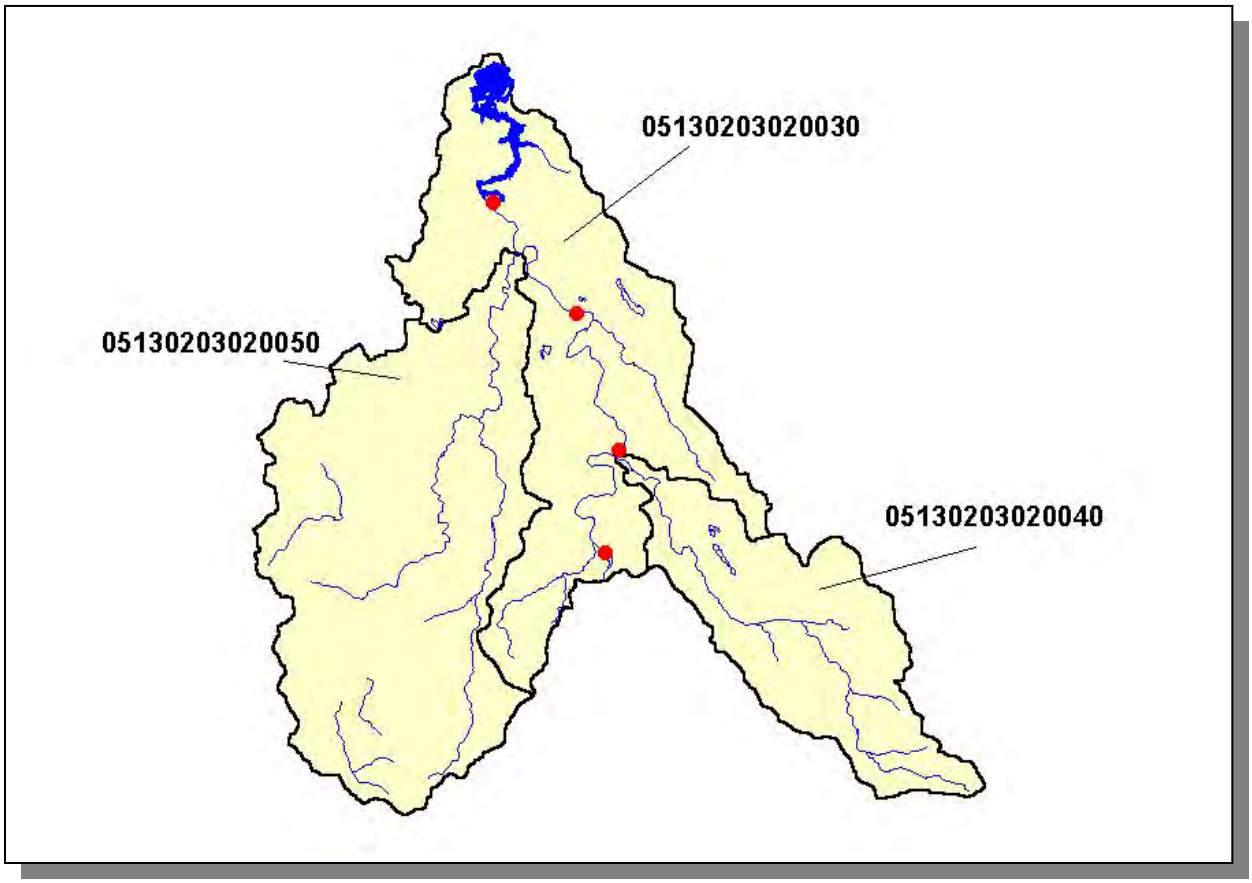



***Figure 4-43. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130203080.*** *Subwatershed 05130203020030, 05130203020040, and 05130203020050 boundaries are shown for reference. More information may be found in Stones-Appendix IV.*

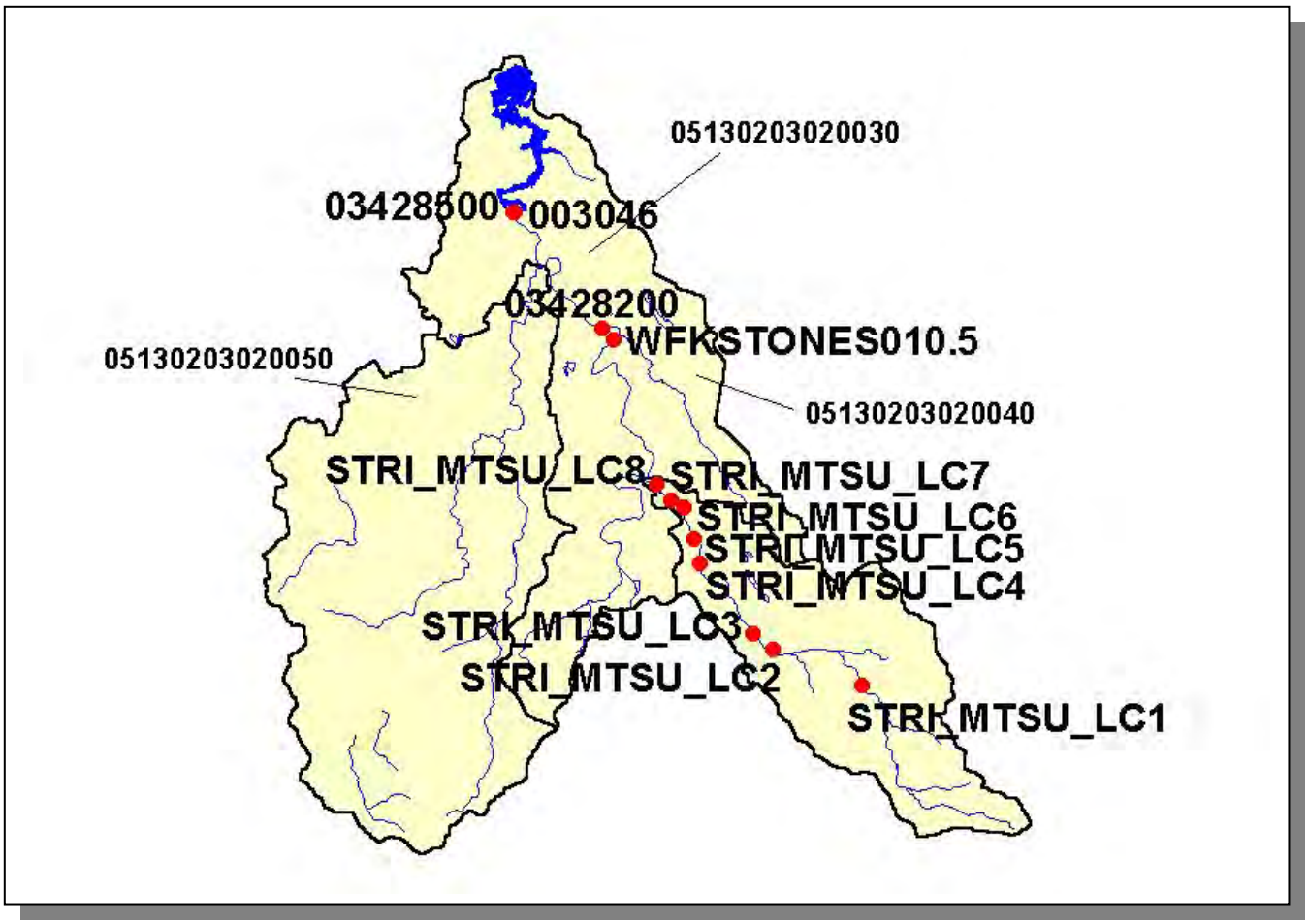



***Figure 4-44. Location of STORET Monitoring Sites in Subwatershed 05130203080.*** *Subwatershed 05130203020030, 05130203020040, and 05130203020050 boundaries are shown for reference. More information may be found in Stones-Appendix IV.*

4.2.H.ii. Point Source Contributions.

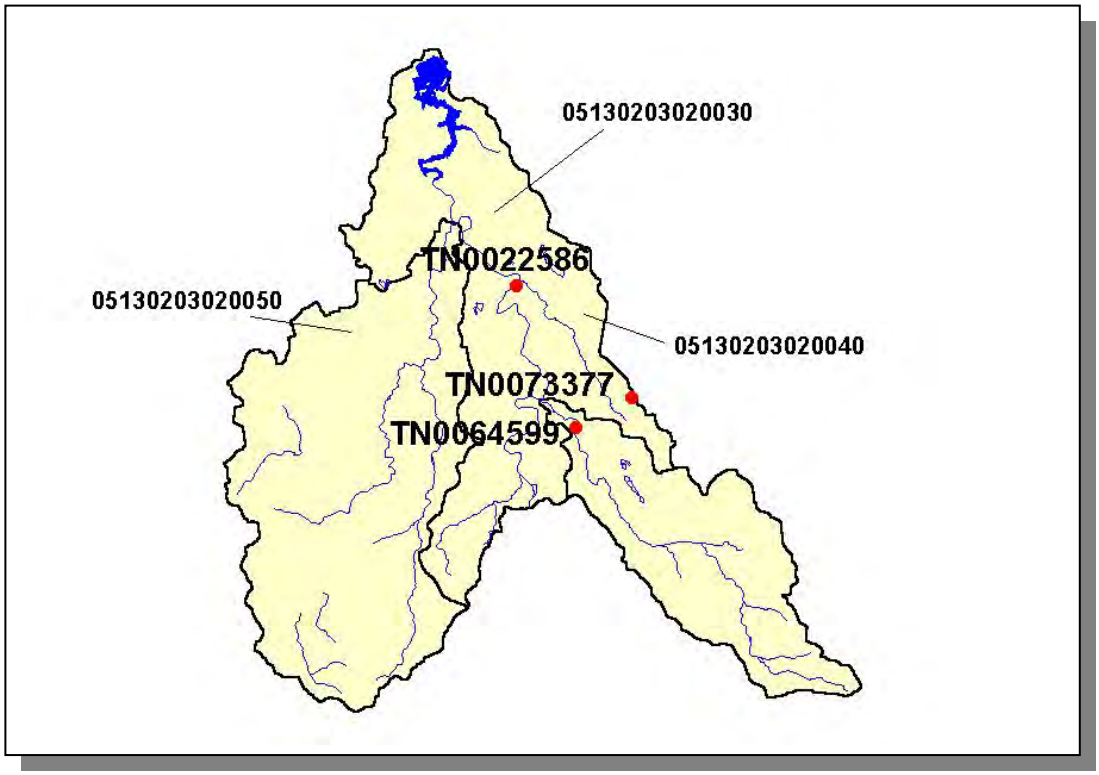



***Figure 4-45. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203080.*** *Subwatershed 05130203020030, 05130203020040, and 05130203020050 boundaries are shown for reference. More information, including the names of facilities, is provided in Stones-Appendix IV.*

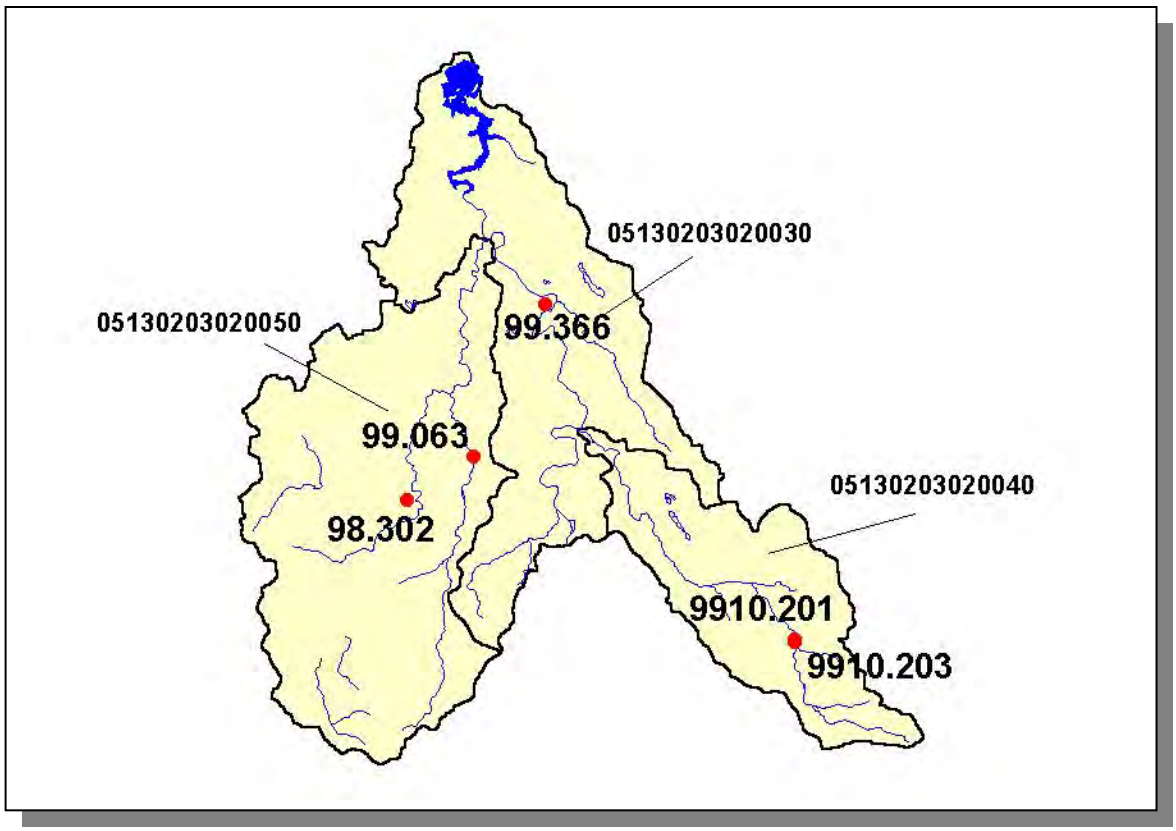



***Figure 4-46. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203080.*** *Subwatershed 05130203020030, 05130203020040, and 05130203040050 boundaries are shown for reference. Additional information may be found in Stones-Appendix IV.*

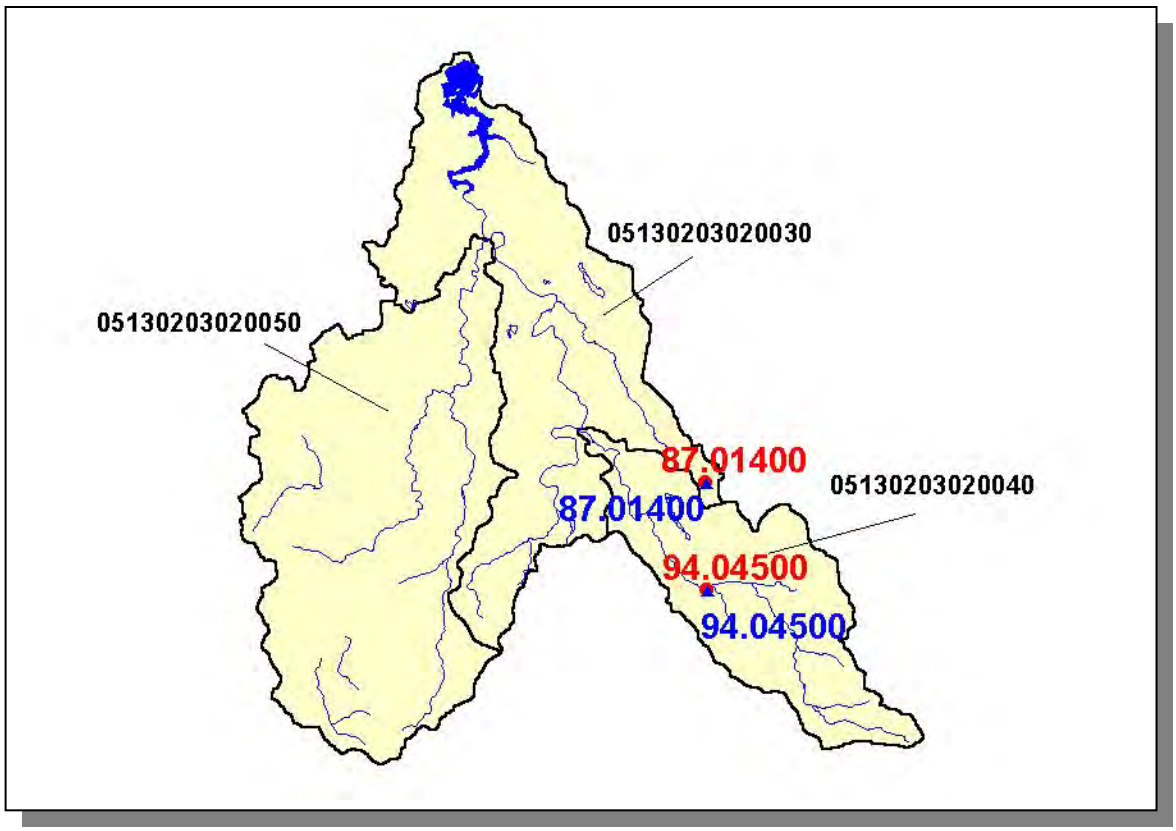



***Figure 4-47. Location of Wetland Impact and Mitigation Sites in Subwatershed 05130203080.*** *Impact (Blue Triangle) and mitigation (Red Circle) sites are from ARAP database. Subwatershed 05130203020030, 05130203020040, and 05130203040050 boundaries are shown for reference. Additional information may be found in Stones-Appendix IV.*

4.2.H.ii.a. Dischargers to Waterbodies Listed on the 1998 303(d) List.

There are three NPDES facilities discharging to water bodies listed on the 1998 303(d) list in Subwatershed 05130203080:

- TN0022586 discharges to West Fork Stones River @ RM 10.5
- TN0064599 discharges to Lytle Creek
- TN0073377 discharges to Sinking Creek

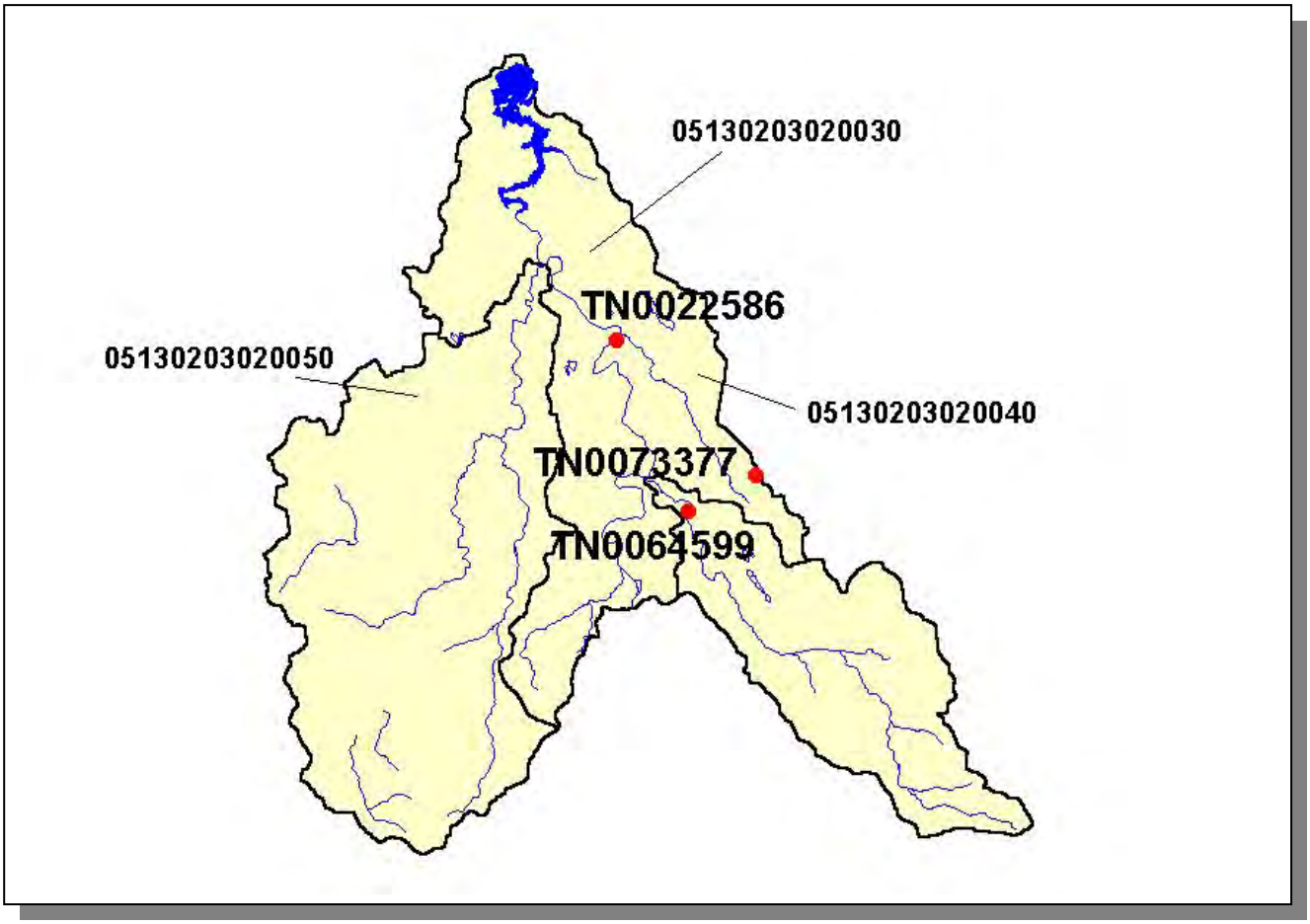



***Figure 4-48. Location of NPDES Dischargers to Water Bodies Listed on the 1998 303(d) List in Subwatershed 05130203080.*** *Subwatershed 05130203020020, 05130203020030, and 05130203020040 boundaries are shown for reference. The names of facilities are provided in Stones-Appendix IV.*

| PERMIT # | 7Q10 | 1Q20 | 30Q2 | QDESIGN | QLTA |
|---|---|---|---|---|---|
| TN0022586 | 0 | 0 | 0 | 8.0 | 9.7 |
| TN0064599 | 0 | 0 | 0 | | 0.0663 |
| TN0073377 | 0 | 0 | 0 | | 0.0043 |

***Table 4-47. Receiving Stream Flow Information for NPDES Dischargers to Water Bodes Listed on the 1998 303(d) List in Subwatershed 05130203080.*** *Data are in million gallons per day (MGD). Data were calculated using data in Flow Duration and Low Flows of Tennessee Streams Through 1992.*

| PERMIT # | $CBOD_5$ | $NH_3$ | FECAL | METAL | WET |
|---|---|---|---|---|---|
| TN0022586 | X | X | X | X | X |
| TN0064599 | | | | X | X |
| TN0073377 | | | | X | X |

***Table 4-48. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130203080.***

| PERMIT # | Cr | Cu | CN | Zn | Pb | TOLUENE | ETHYLBENZENE | BENZENE |
|---|---|---|---|---|---|---|---|---|
| TN0022586 | 0.054[a] | Report | 0.01[a] | Report | | | | |
| TN0064599 | | | | | 0.01 | 0.01 | 0.01 | 0.005 |
| TN0073377 | | | | | 0.01 | 0.01 | 0.01 | 0.005 |

***Table 4-49. Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130203080.*** *[a]Monthly Average.*

| PERMIT # | TSS | pH | O&G | BENZENE | ETHYLBENZENE | TOLUENE | Pb | XYLENE | CN | BYPASS |
|---|---|---|---|---|---|---|---|---|---|---|
| TN0022586 | 40 | 2 | | | | | | | 13 | 1,276 |
| TN0064599 | 9 | | 2 | 5 | 4 | 4 | 4 | 1 | | |
| TN0073377 | 2 | | 1 | 1 | 1 | 4 | 2 | 2 | | |

***Table 4-50. Number of Permit Violations Based on DMR Data (2/28/90-4/30/00) for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130203080.*** *TSS, Total Suspended Solids; O&G, Oil and Grease.*

4.2.H.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 4,915 | 10,292 | 634 | 17 | 242 | 104 |

***Table 4-51. Summary of Livestock Count Estimates in Subwatershed 05130203080.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |

***Table 4-52. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203080.***

| CROP | TONS/ACRE/YEAR |
|---|---|
| Non Agricultural Land Use | 0.00 |
| Berry (Horticultural) | 0.47 |
| Corn (Row Crops) | 3.61 |
| Soybeans (Row Crops) | 2.82 |
| Cotton (Row Crops) | 4.79 |
| Grass (Hayland) | 0.21 |
| Legume (Hayland) | 0.32 |
| Legume Grass (Hayland) | 0.49 |
| Grass (Pastureland) | 0.89 |
| Legume (Pastureland) | 0.12 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.54 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.47 |
| Conservation Reserve Program Land | 0.28 |

***Table 4-53. Annual Estimated Total Soil Loss in Subwatershed 05130203080.***

4.2.I. 05130203090.

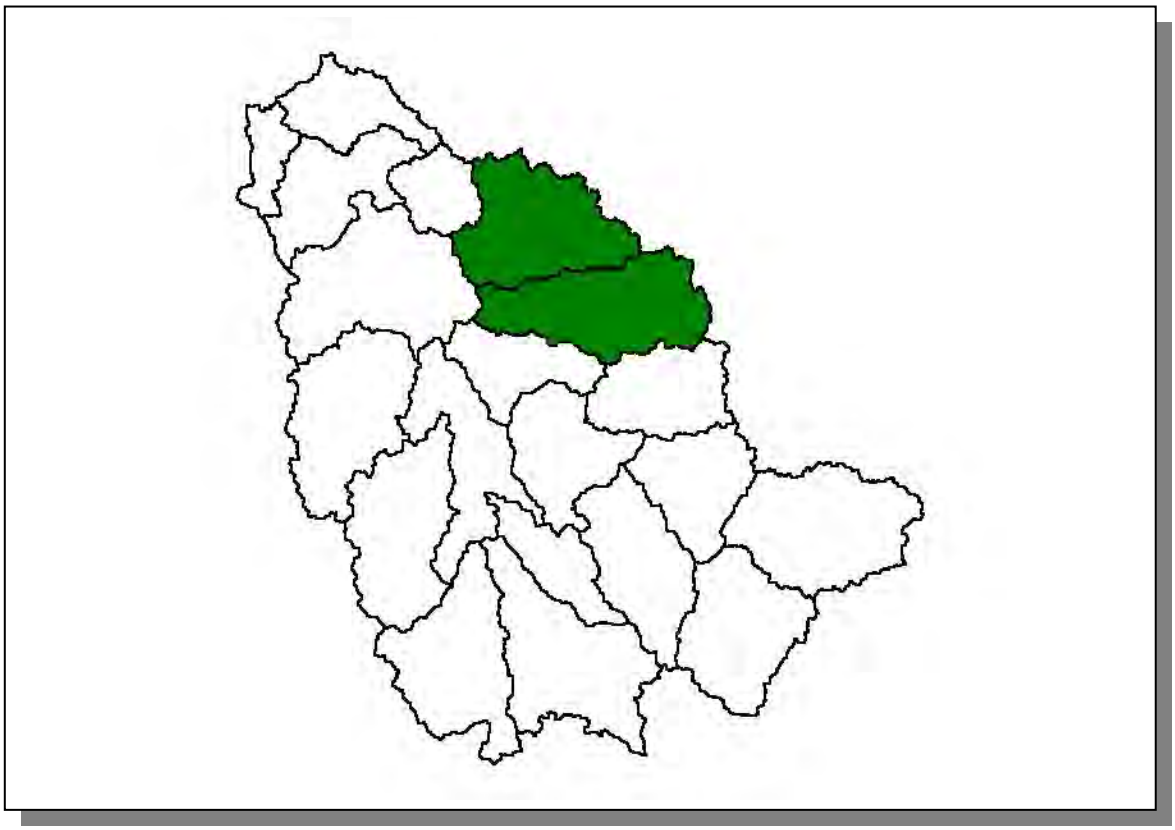


***Figure 4-49. Location of Subwatershed 05130203090.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.I.i. General Description.

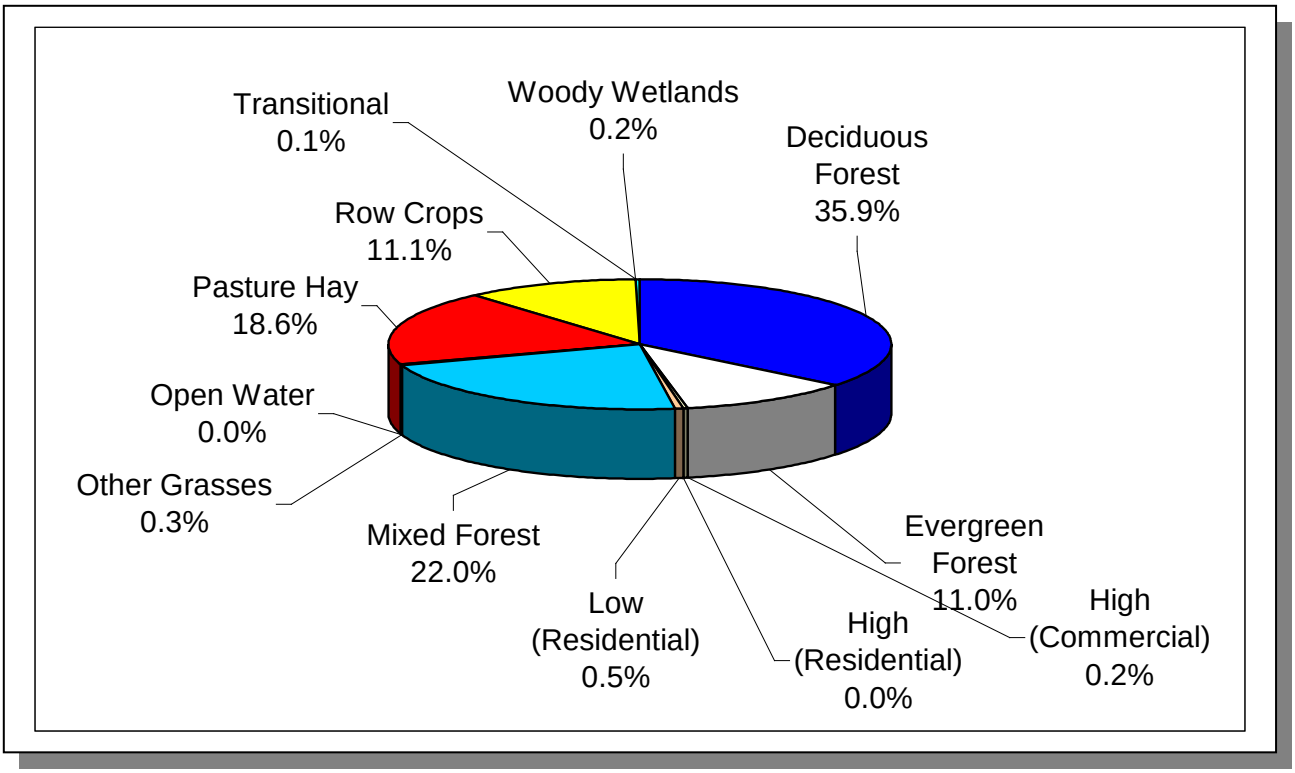



***Figure 4-50. Land Use Distribution in Subwatershed 05130203090.*** *More information is provided in Stones-Appendix IV.*

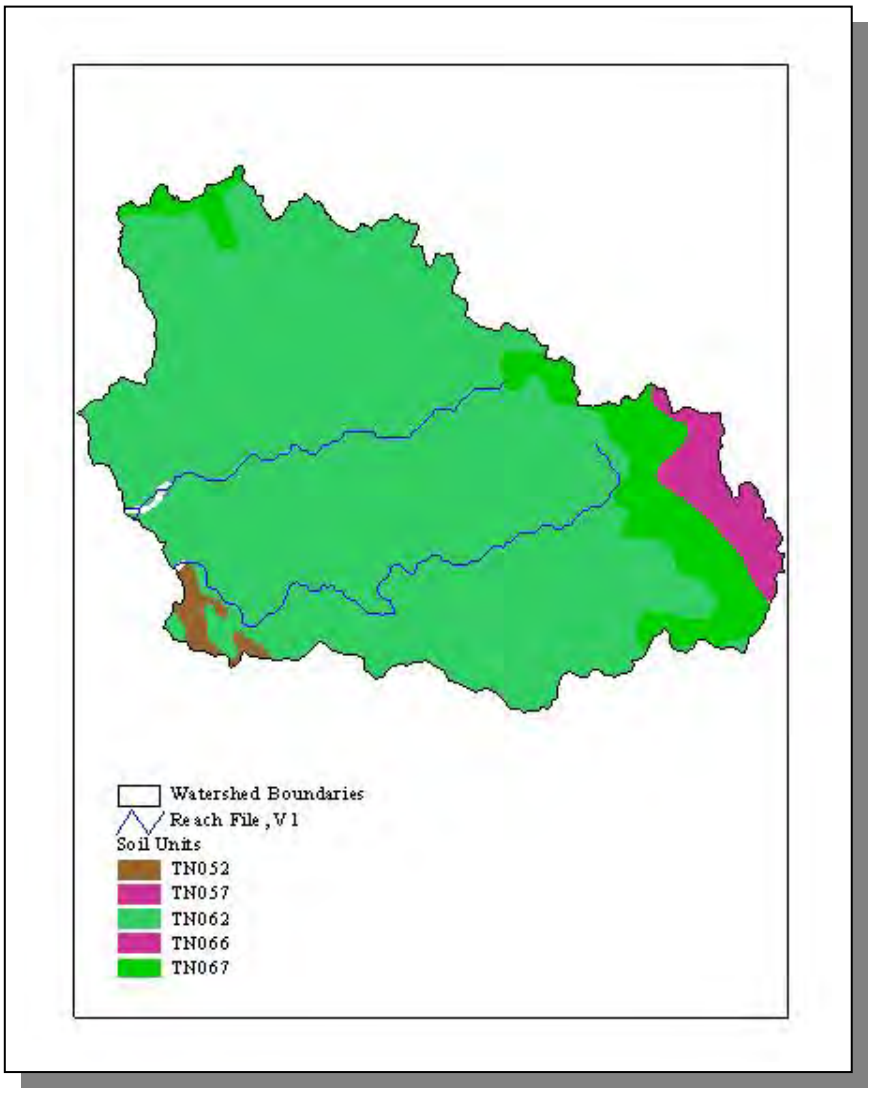



***Figure 4-51. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203090.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN057 | 0.00 | C | 1.14 | 5.01 | Clayey Loam | 0.33 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clayey Loam | 0.26 |
| TN066 | 0.00 | B | 2.62 | 4.75 | Loam | 0.28 |
| TN067 | 2.00 | C | 2.69 | 5.51 | Silty Loam | 0.35 |

***Table 4-54. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203090.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Rutherford | 118,570 | 159,987 | 2.36 | 2,796 | 3,773 | 34.9 |
| Wilson | 67,675 | 81,327 | 18.41 | 12,456 | 14,969 | 20.2 |
| **Totals** | **186,245** | **241,314** | | **15,252** | **18,742** | **22.9** |

***Table 4-55. Population Estimates in Subwatershed 05130203090.***

4.2.I.ii. Point Source Contributions.


***Figure 4-52. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203090.*** *Subwatershed 05130203030020 and 05130203030030 boundaries are shown for reference. More information, including the names of facilities, is provided in Stones-Appendix IV.*

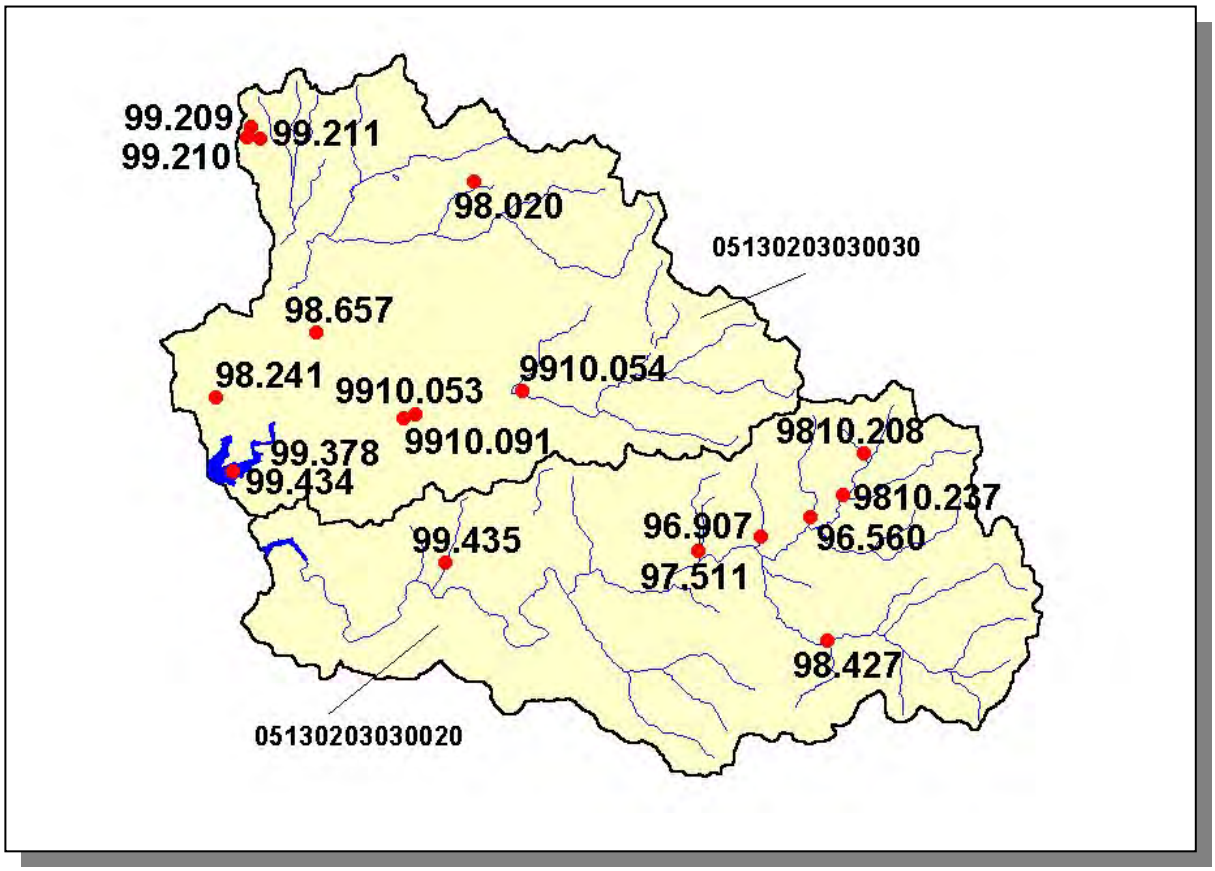



***Figure 4-53. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203090.*** *Subwatershed 05130203030020 and 05130203030030 boundaries are shown for reference. More details may be found in Stones-Appendix IV.*

4.2.I.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 4,267 | 8,055 | 251 | 13 | 264 | 74 |

***Table 4-56. Summary of Livestock Count Estimates in Subwatershed 05130203090.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| County | Forest Land (thousand acres) | Timber Land (thousand acres) | Growing Stock (million cubic feet) | Sawtimber (million board feet) |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| Wilson | 98.1 | 97.0 | 1.7 | 6.8 |
| **Total** | **253.8** | **252.7** | **2.1** | **7.7** |

***Table 4-57. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203090.***

| CROP | TONS/ACRE/YEAR |
|---|---|
| Corn (Row Crops) | 2.39 |
| Grass (Hayland) | 0.35 |
| Grass (Pastureland) | 0.48 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.87 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.28 |
| Non Agricultural Land Use | 0.00 |
| Soybeans (Row Crops) | 6.25 |
| Tobacco (Row Crops) | 19.23 |
| Wheat (Close Grown Cropland) | 1.96 |
| Legume Grass (Hayland) | 0.39 |
| All Other Close Grown Cropland | 2.49 |
| Berry (Horticultural) | 0.47 |
| Cotton (Row Crops) | 4.79 |
| Legume (Hayland) | 0.32 |
| Legume (Pastureland) | 0.12 |
| Conservation Reserve Program Land | 0.28 |

***Table 4-58. Annual Estimated Total Soil Loss in Subwatershed 05130203090.***

4.2.J. 05130203100.

***Figure 4-54. Location of Subwatershed 05130203100.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.J.i. General Description.

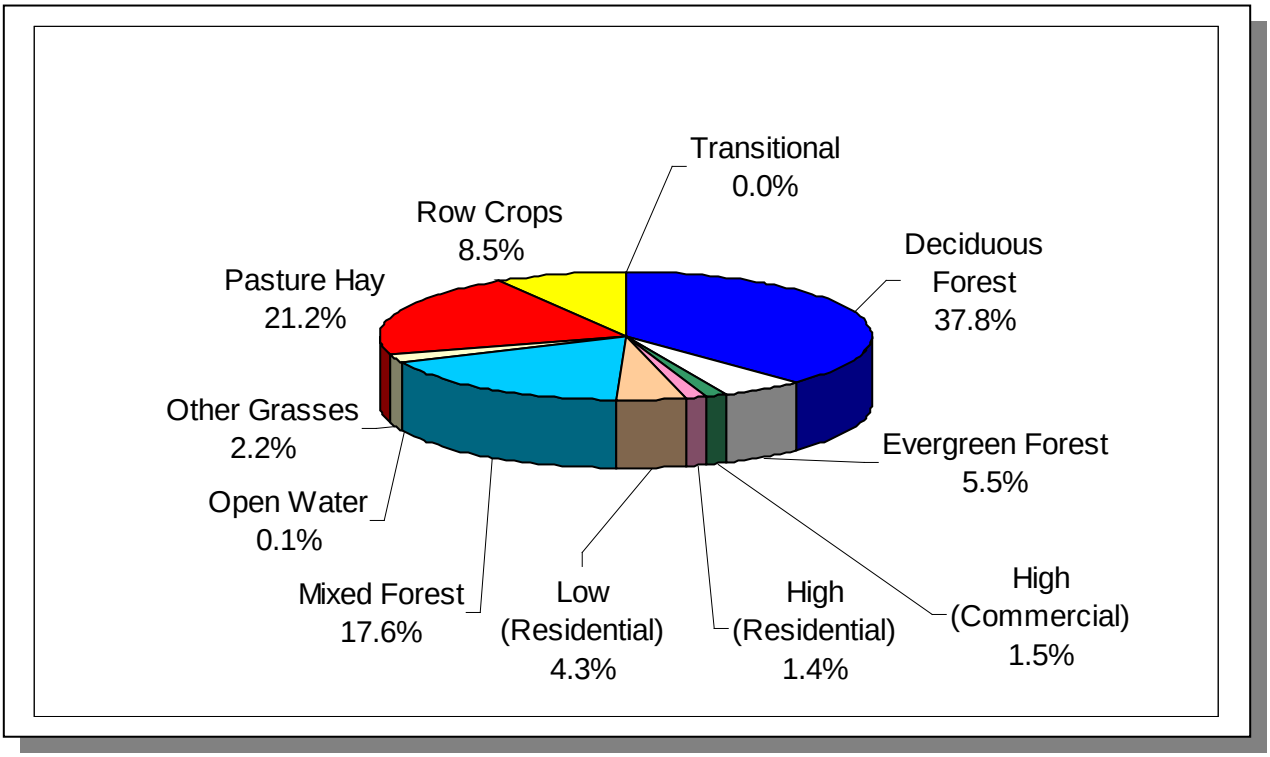



***Figure 4-55. Land Use Distribution in Subwatershed 05130203100.*** *More information is provided in Stones-Appendix IV.*

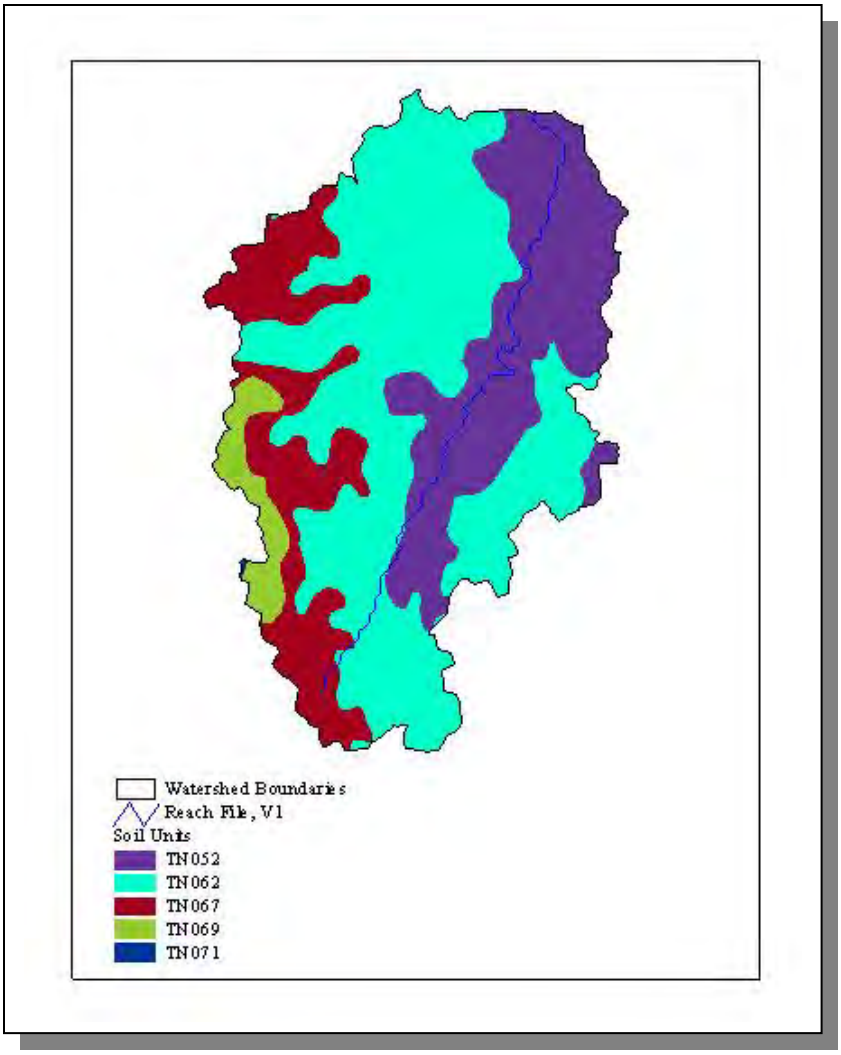



***Figure 4-56. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203100.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clayey Loam | 0.26 |
| TN067 | 2.00 | C | 2.69 | 5.51 | Silty Loam | 0.35 |
| TN069 | 0.00 | C | 2.06 | 5.36 | Loam | 0.34 |
| TN071 | 0.00 | C | 2.37 | 5.70 | Silty Loam | 0.33 |

***Table 4-59. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203100.*** *More information is provided in Stones-Appendix IV*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Rutherford | 118,570 | 159,987 | 9.33 | 11,062 | 14,926 | 34.9 |
| Williamson | 81,021 | 111,453 | 0.73 | 593 | 816 | 37.6 |
| **Totals** | **199,591** | **271,440** | | **11,655** | **15,742** | **35.1** |

***Table 4-60. Population Estimates in Subwatershed 05130203100.***

| | | | NUMBER OF HOUSING UNITS | | | |
|---|---|---|---|---|---|---|
| **Populated Place** | **County** | **Population** | **Total** | **Public Sewer** | **Septic Tank** | **Other** |
| La Vergne | Rutherford | 7,499 | 2,810 | 2,299 | 451 | 60 |
| Smyrna | Rutherford | 13,647 | 5,312 | 4,959 | 346 | 7 |
| **Total** | | **21,148** | **8,122** | **7,258** | **797** | **67** |

***Table 4-61. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203100.***

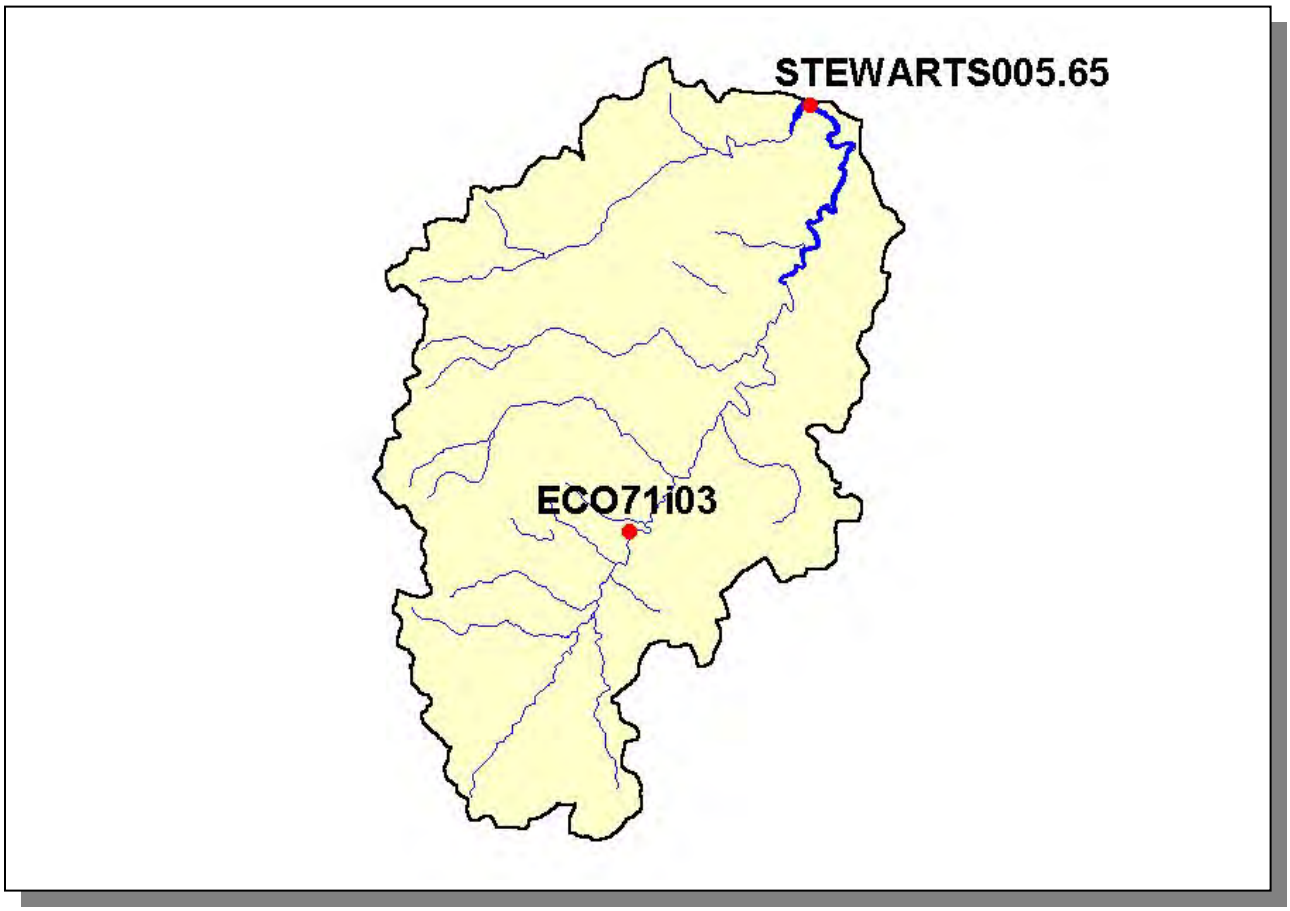



***Figure 4-57. Location of STORET Monitoring Stations in Subwatershed 05130203100.*** *More information is provided in Stones-Appendix IV.*

4.2.J.ii. Point Source Contributions.

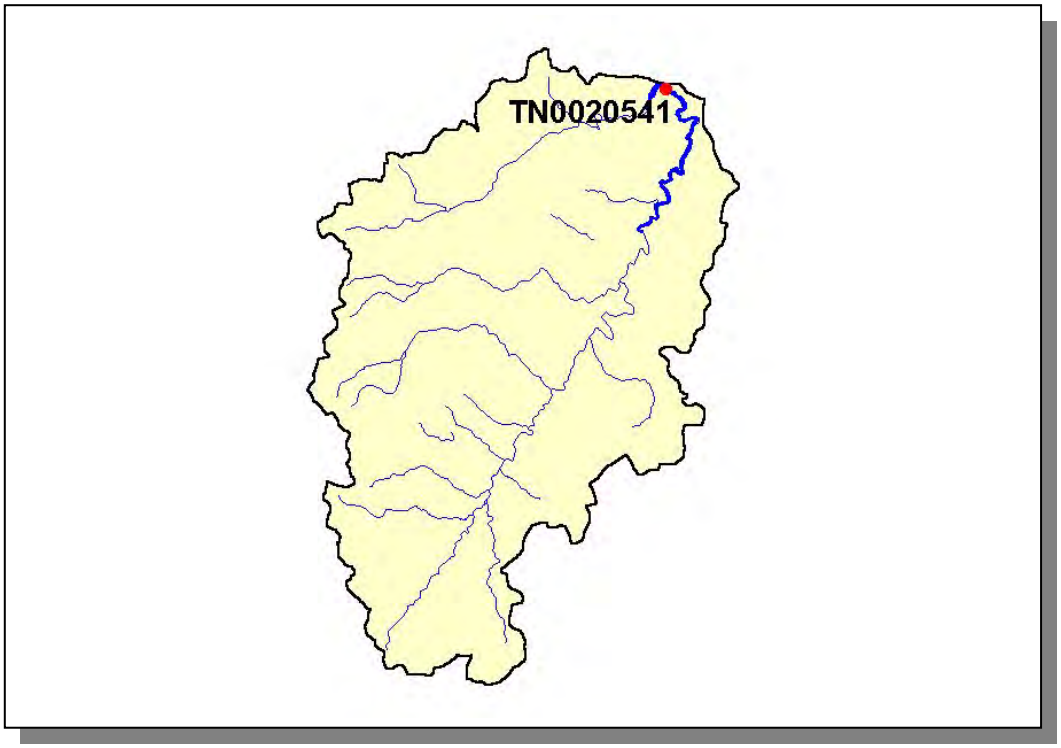



***Figure 4-58. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203100.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

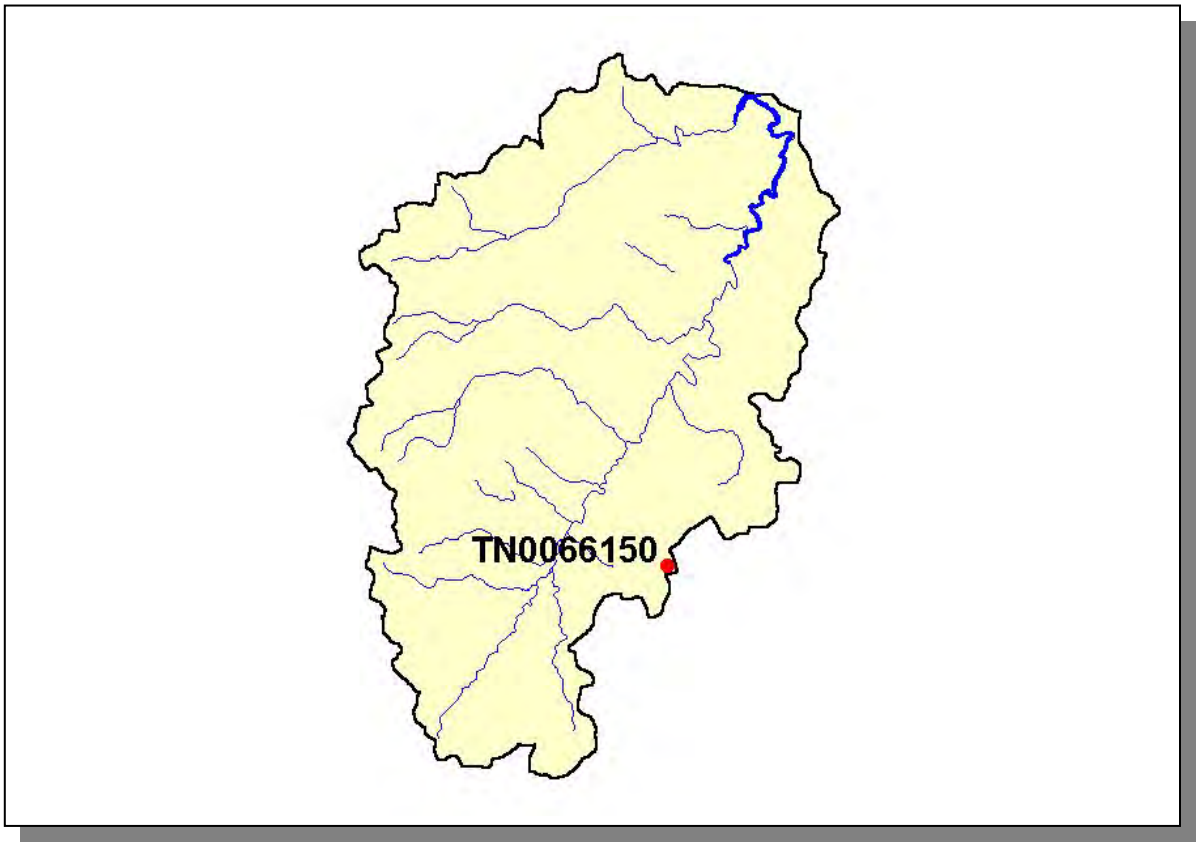



***Figure 4-59. Location of Active Mining Sites in Subwatershed 05130203100.*** *More details may be found in Stones-Appendix IV.*

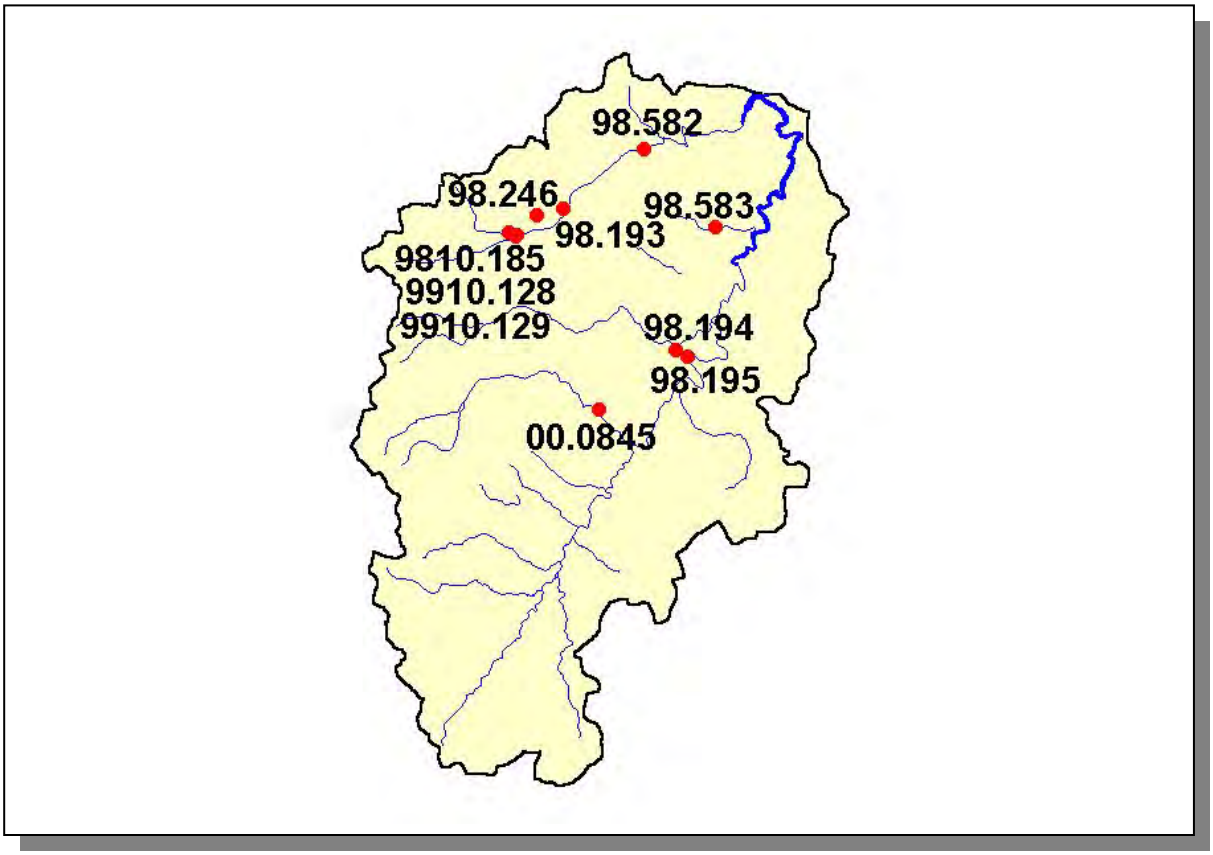



***Figure 4-60. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203100.***
*More details may be found in Stones-Appendix IV.*

4.2.J.ii.a. Dischargers to Water Bodies Listed on the 1998 303(d) List:

There is one facility discharging to water bodies listed on the 1998 303(d) list in Subwatershed 05130203100:

- TN 0020541 discharges to Stewart Creek @ RM 5.65


***Figure 4-61. Location of NPDES Discharger to Water Bodies Listed on the 1998 303(d) List in Subwatershed 05130203100.*** *The names of facilities are provided in Stones-Appendix IV.*

| PERMIT # | 7Q10 | 1Q20 | 30Q2 | QDESIGN |
|---|---|---|---|---|
| TN0020541 | 0 | 0 | 0 | 5.2 |

***Table 4-62. Receiving Stream Flow Information for NPDES Dischargers to Water Bodes Listed on the 1998 303(d) List in Subwatershed 05130203100.*** *Data are in million gallons per day (MGD). Data were calculated using data in Flow Duration and Low Flows of Tennessee Streams Through 1992.*

| PERMIT # | $CBOD_5$ | $NH_3$ | FECAL | WET |
|---|---|---|---|---|
| TN0020541 | X | X | X | X |

***Table 4-63. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130203100.***

4.2.J.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 2,038 | 4,212 | 247 | 6 | 121 | 45 |

***Table 4-64. Summary of Livestock Count Estimates in Subwatershed 05130203100.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| Williamson | 142.0 | 142.0 | 1.0 | 3.3 |
| **Total** | **297.7** | **297.7** | **1.4** | **4.2** |

***Table 4-65. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203100.***

| CROP | TONS/ACRE/YEAR |
|---|---|
| Non Agricultural Land Use | 0.00 |
| Berry (Horticultural) | 0.47 |
| Corn (Row Crops) | 3.73 |
| Soybeans (Row Crops) | 2.86 |
| Cotton (Row Crops) | 4.79 |
| Grass (Hayland) | 0.20 |
| Legume (Hayland) | 0.37 |
| Legume,Grass (Hayland) | 0.47 |
| Grass (Pastureland) | 0.87 |
| Legume (Pastureland) | 0.13 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.53 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.46 |
| Conservation Reserve Program Land | 0.27 |
| Tobacco (Row Crops) | 6.75 |
| Wheat (Close Grown Cropland) | 1.27 |
| Other Cropland not Planted | 6.46 |
| Other Land in Farms | 0.12 |

***Table 4-66. Annual Estimated Total Soil Loss in Subwatershed 05130203100.***

4.2.K. 05130203110.

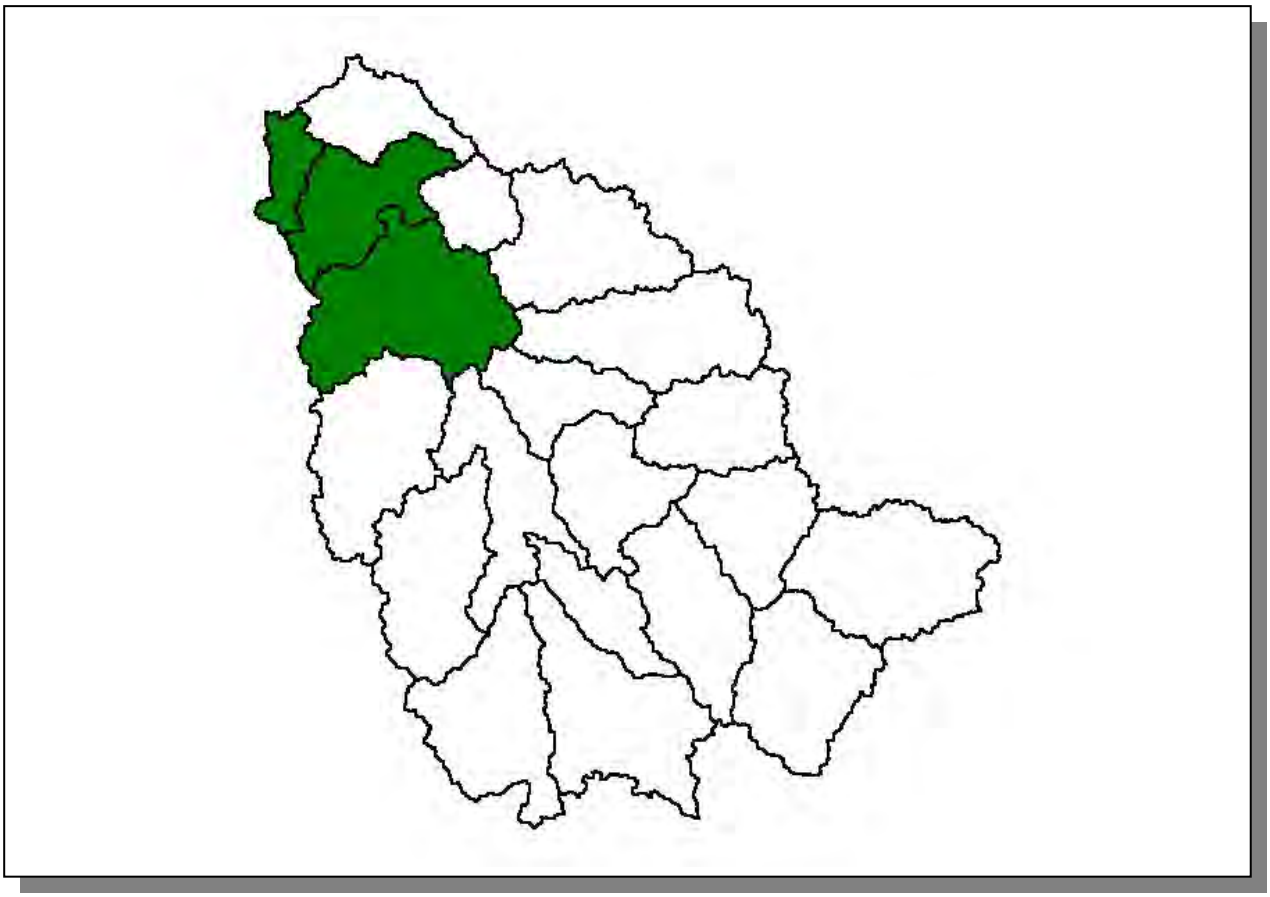


***Figure 4-62. Location of Subwatershed 05130203110.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.K.i. General Description.

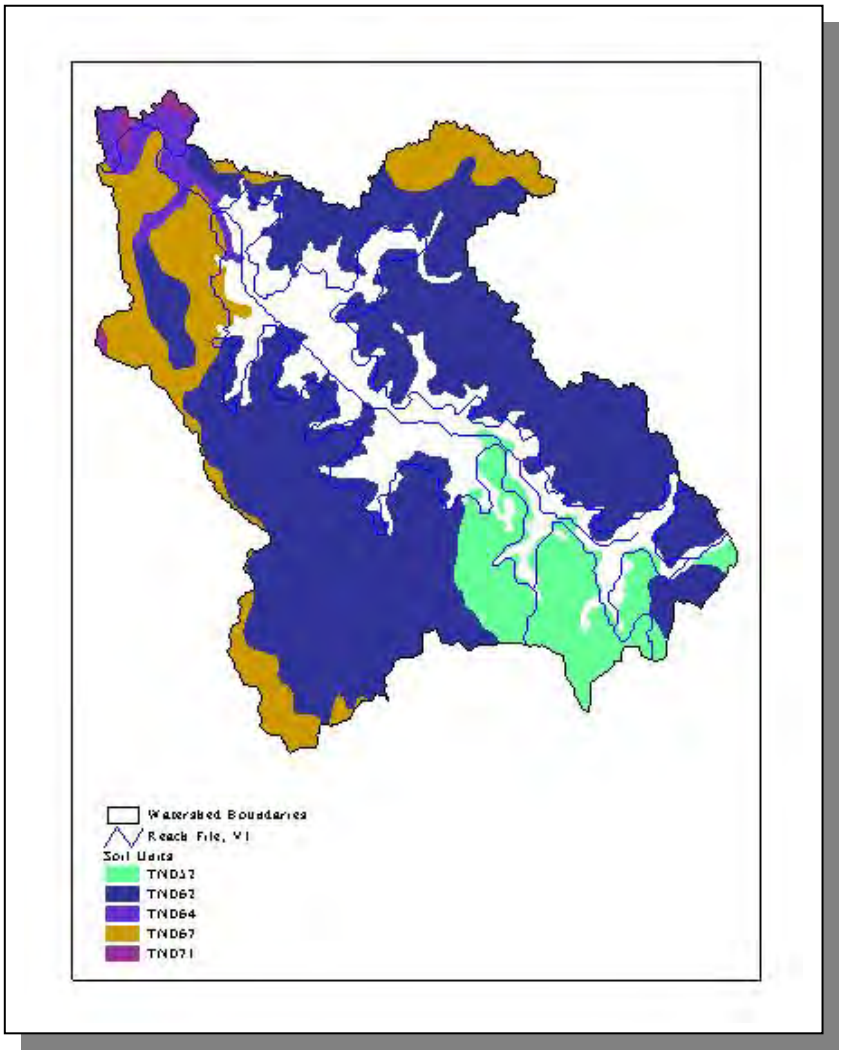



***Figure 4-63. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203110.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN052 | 0.00 | B | 1.23 | 5.46 | Silty Loam | 0.39 |
| TN062 | 0.00 | C | 0.98 | 4.40 | Clayey Loam | 0.26 |
| TN064 | 7.00 | C | 1.19 | 5.82 | Silty Loam | 0.37 |
| TN067 | 2.00 | C | 2.69 | 5.51 | Silty Loam | 0.35 |
| TN071 | 0.00 | C | 2.37 | 5.70 | Silty Loam | 0.33 |

***Table 4-67. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203110.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % Change |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Davidson | 510,784 | 535,032 | 13.71 | 70,029 | 73,353 | 4.7 |
| Rutherford | 118,570 | 159,987 | 7.67 | 9,100 | 12,279 | 34.9 |
| Williamson | 81,021 | 111,453 | 0.05 | 37 | 50 | 35.1 |
| Wilson | 67,675 | 81,327 | 1.7 | 1,152 | 1,384 | 20.1 |
| **Totals** | **778,050** | **887,799** | | **80,318** | **87,066** | **8.4** |

***Table 4-68. Population Estimates in Subwatershed 05130203110.***

| | | | NUMBER OF HOUSING UNITS | | | |
|---|---|---|---|---|---|---|
| **Populated Place** | **County** | **Population** | **Total** | **Public Sewer** | **Septic Tank** | **Other** |
| Mount Juliet | Wilson | 5,389 | 1,926 | 1,265 | 661 | 0 |
| La Vergne | Rutherford | 7,499 | 2,810 | 2,299 | 451 | 60 |
| Smyrna | Rutherford | 13,647 | 5,312 | 4,959 | 346 | 7 |
| Nashville (remainder) | Davidson | 488,518 | 219,521 | 203,640 | 15,576 | 305 |
| **Total** | | **515,053** | **229,569** | **212,163** | **17,034** | **372** |

***Table 4-69. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203110.***

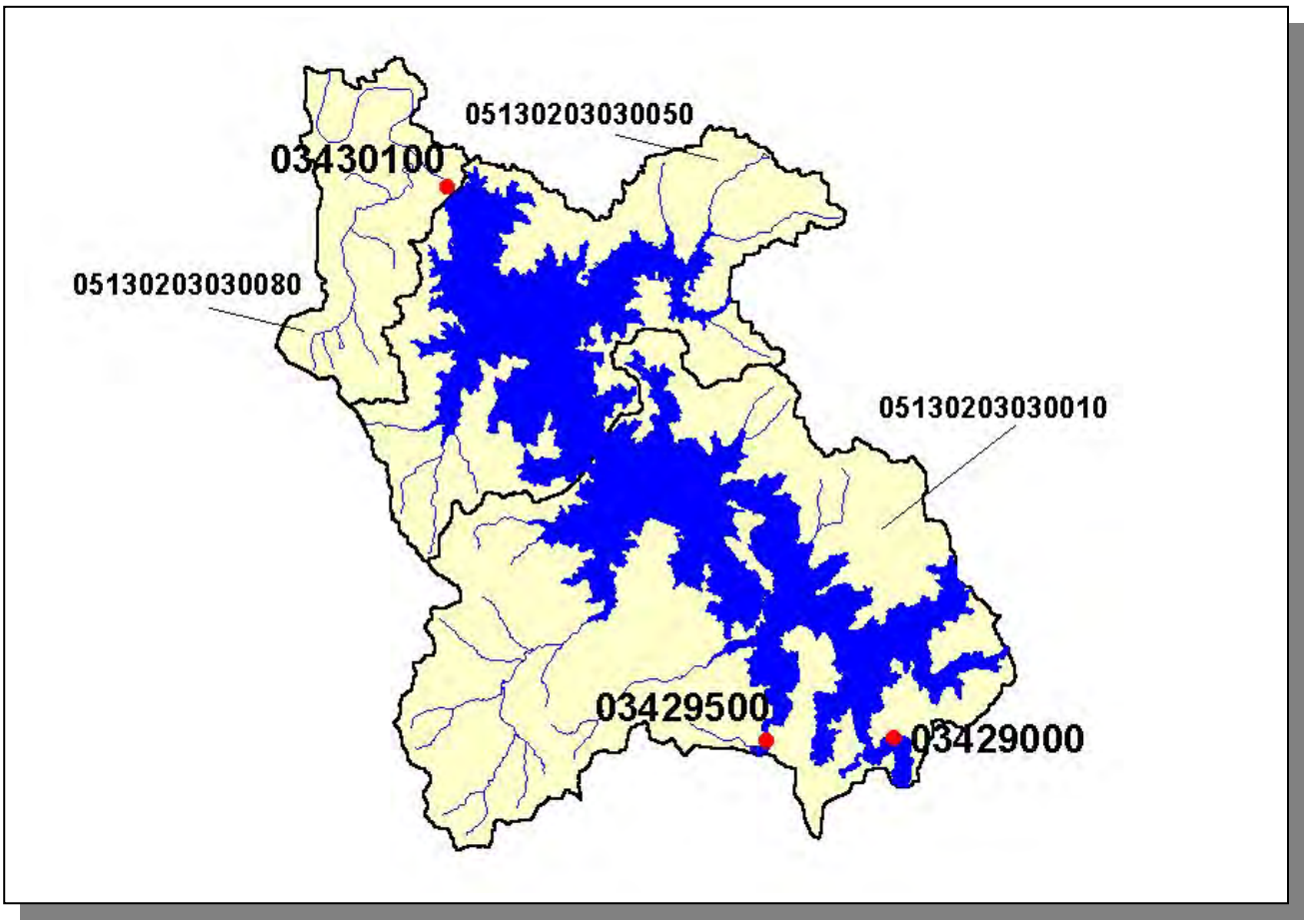



***Figure 4-64. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130203110.*** *Subwatershed 05130203030010, 05130203030050, and 05130203030080 boundaries are shown for reference. More information is provided in Stones-Appendix IV.*

4.2.K.ii. Point Source Contributions.

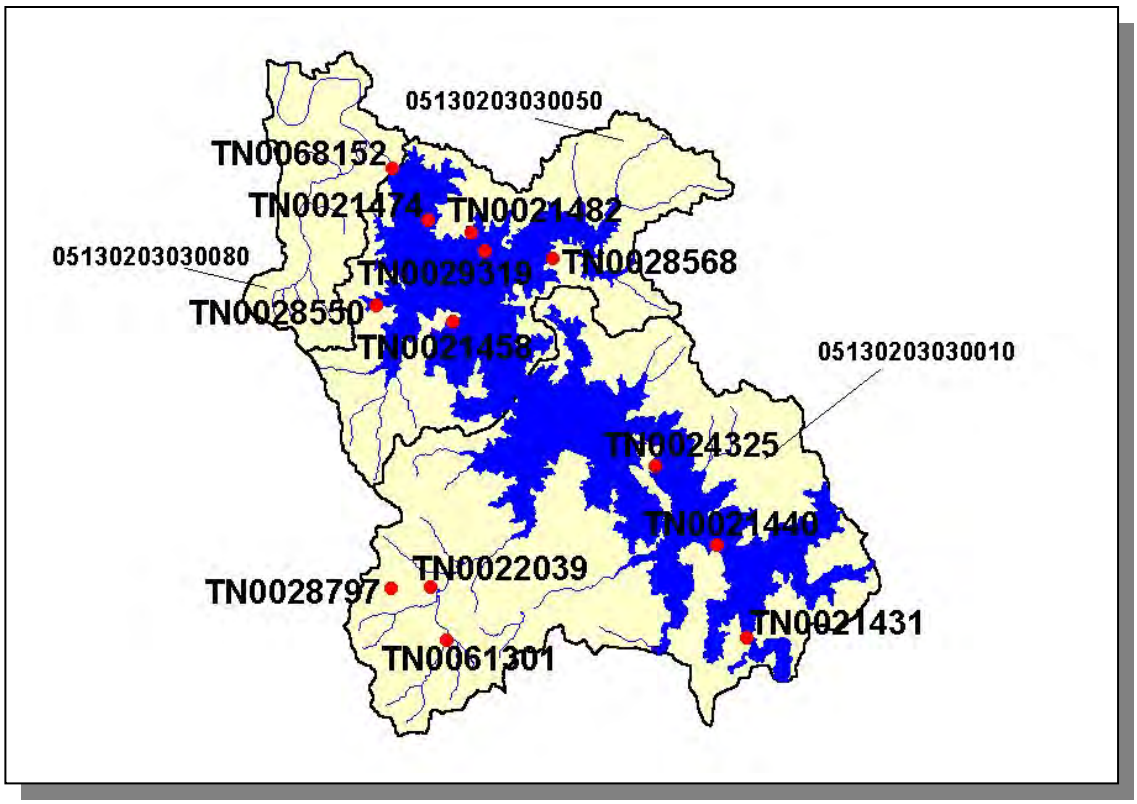



***Figure 4-65. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203110.*** *Subwatershed 05130203030010, 05130203030050, and 05130203030080 boundaries are shown for reference. More information, including the names of facilities, is provided in Stones-Appendix IV.*

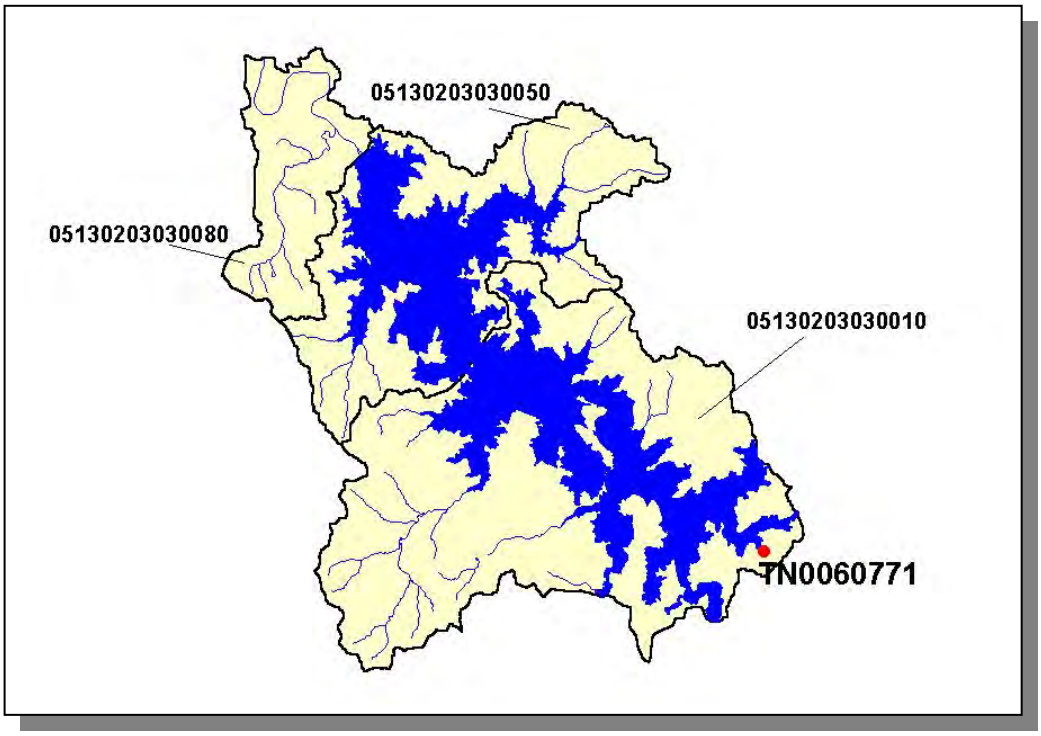



***Figure 4-66. Location of Active Mining Sites in Subwatershed 05130203110.*** *Subwatershed 05130203030010, 05130203030050, and 05130203030080 boundaries are shown for reference. More details may be found in Stones-Appendix IV.*

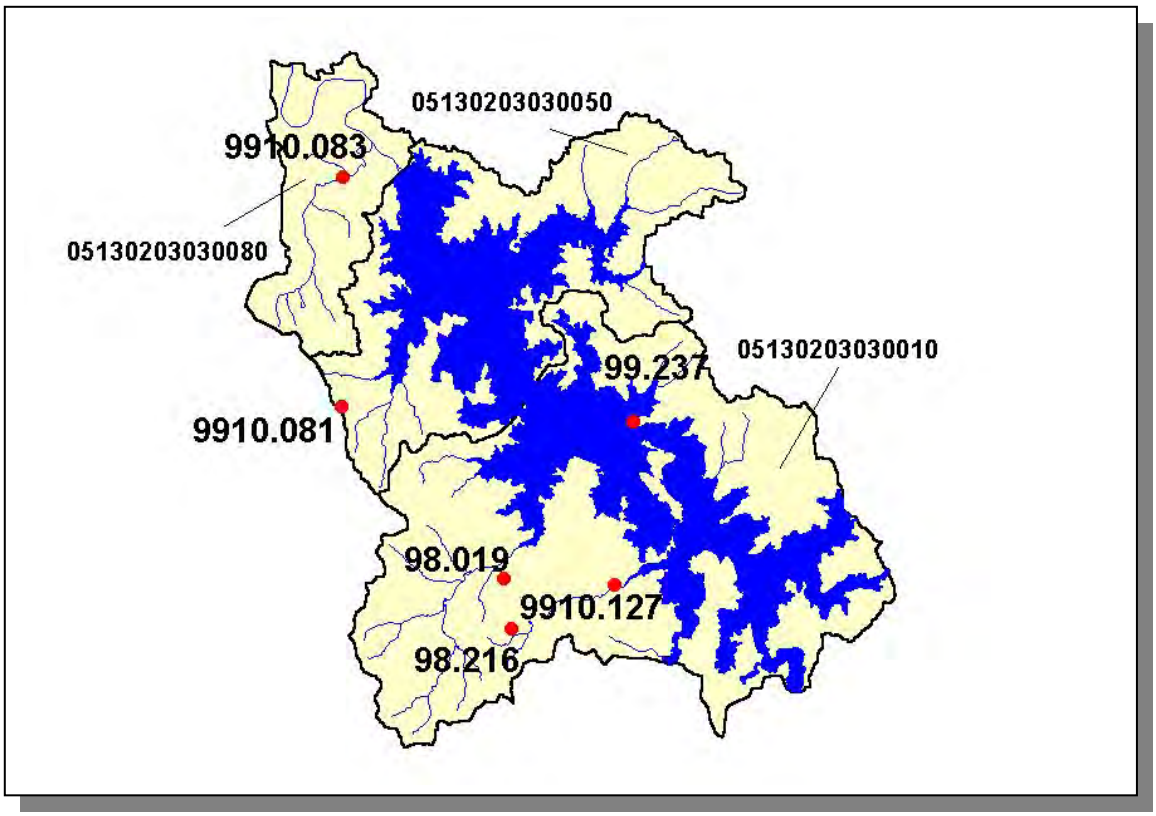



***Figure 4-67. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203110.*** *Subwatershed 05130203030010, 05130203030050, and 05130203030080 boundaries are shown for reference. More details may be found in Stones-Appendix IV.*

4.2.K.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 1,035 | 4,376 | 99 | 9 | 79 | 21 |

***Table 4-70. Summary of Livestock Count Estimates in Subwatershed 05130203110.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| County | Forest Land (thousand acres) | Timber Land (thousand acres) | Growing Stock (million cubic feet) | Sawtimber (million board feet) |
| Davidson | 108.7 | 108.1 | 2.3 | 9.7 |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| Williamson | 142.0 | 142.0 | 1.0 | 3.3 |
| Wilson | 98.1 | 97.0 | 1.7 | 6.8 |
| **Total** | **504.5** | **502.8** | **5.4** | **20.7** |

***Table 4-71. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203110.***

| CROP | TONS/ACRE/YEAR |
|---|---|
| Soybeans (Row Crops) | 9.93 |
| Grass (Pastureland) | 0.60 |
| Non Agricultural Land Use | 0.00 |
| All Other Close Grown Cropland | 2.29 |
| Grass (Hayland) | 0.14 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.56 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.38 |
| Corn (Row Crops) | 3.38 |
| Forest Land (Grazed) | 0.00 |
| Tobacco (Row Crops) | 18.90 |
| Wheat (Close Grown Cropland) | 1.95 |
| Legume, Grass (Hayland) | 0.47 |
| Berry (Horticultural) | 0.47 |
| Cotton (Row Crops) | 4.79 |
| Legume (Hayland) | 0.32 |
| Legume (Pastureland) | 0.12 |
| Conservation Reserve Program Land | 0.28 |
| Other Cropland not Planted | 6.46 |
| Other Land in Farms | 0.12 |

***Table 4-72. Annual Estimated Total Soil Loss in Subwatershed 05130203110.***

4.2.L. 05130203120.

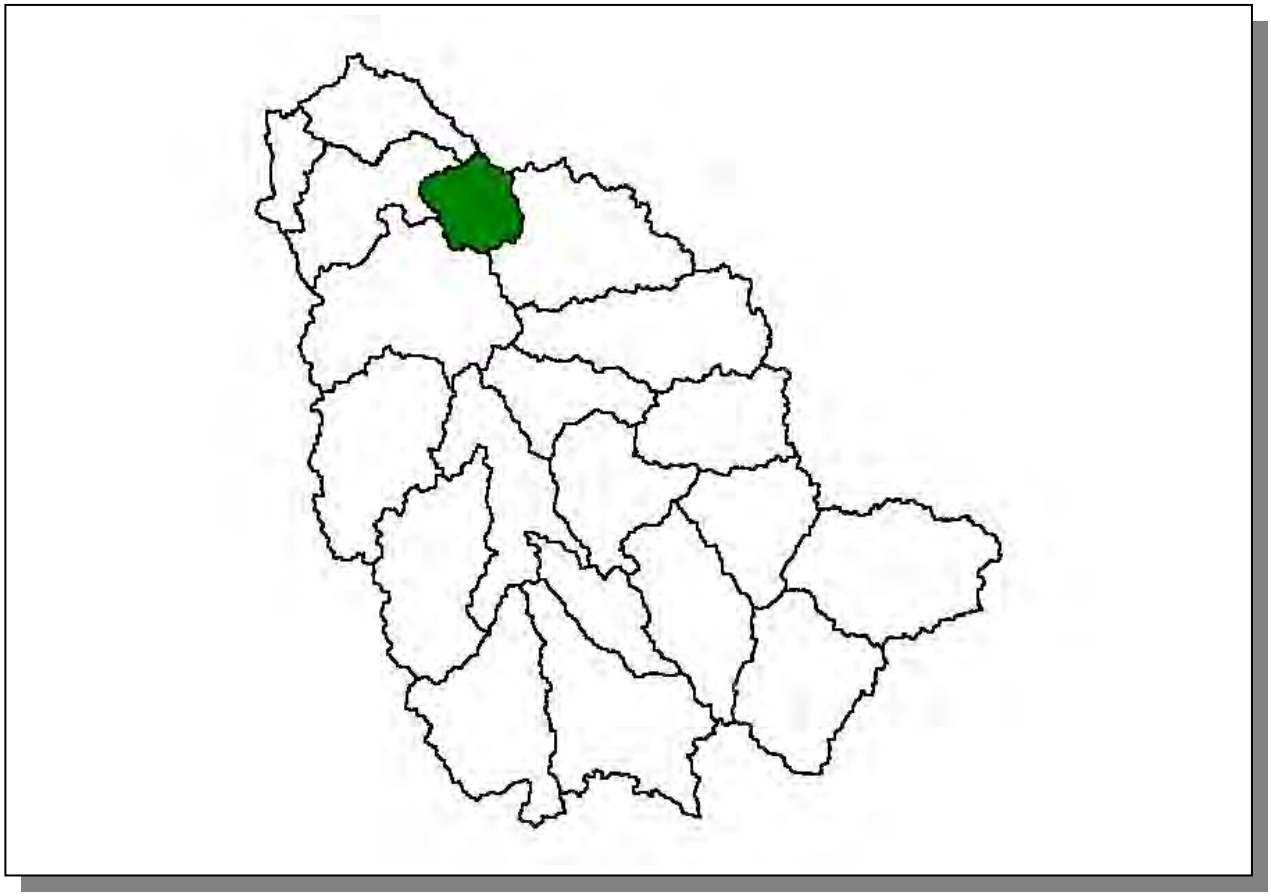


***Figure 4-68. Location of Subwatershed 05130203120.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.L.i. General Description.

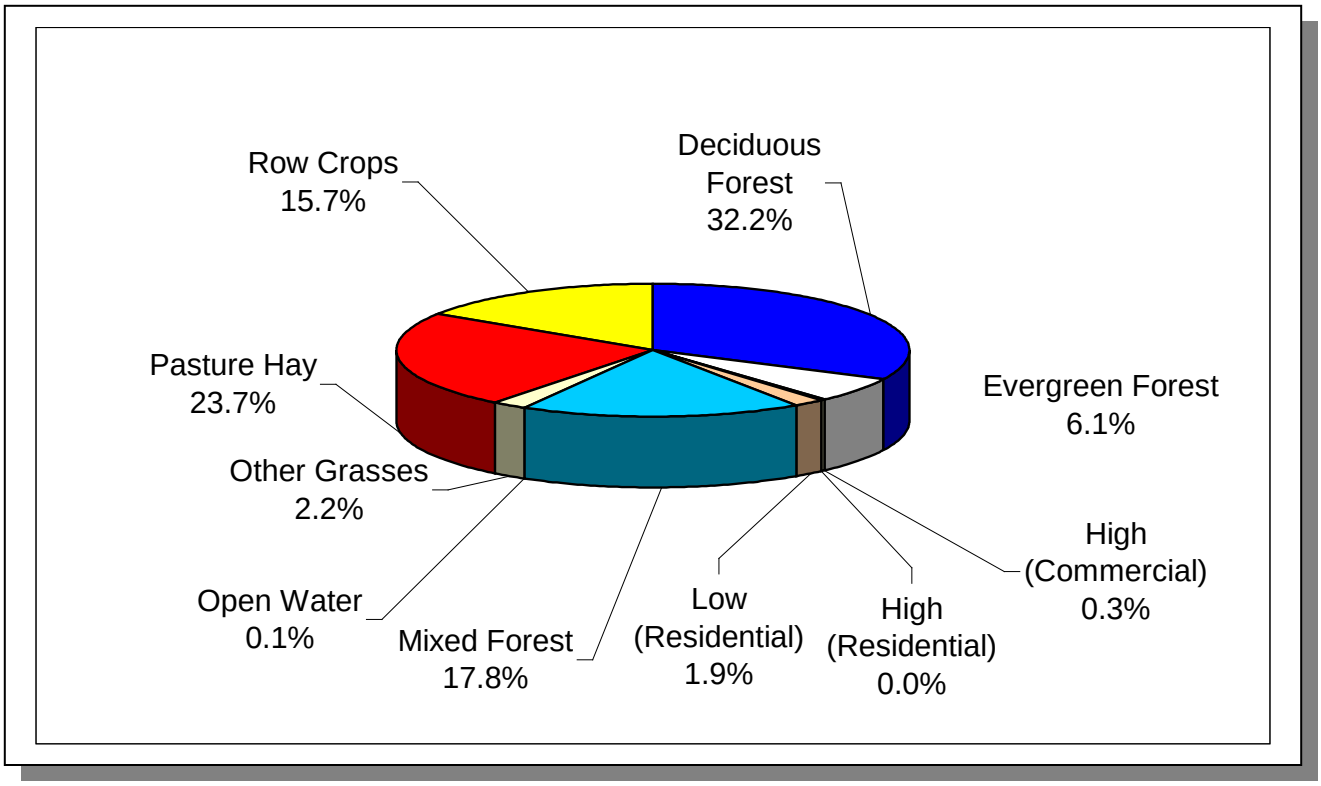



***Figure 4-69. Land Use Distribution in Subwatershed 05130203120.*** *More information is provided in Stones-Appendix IV.*

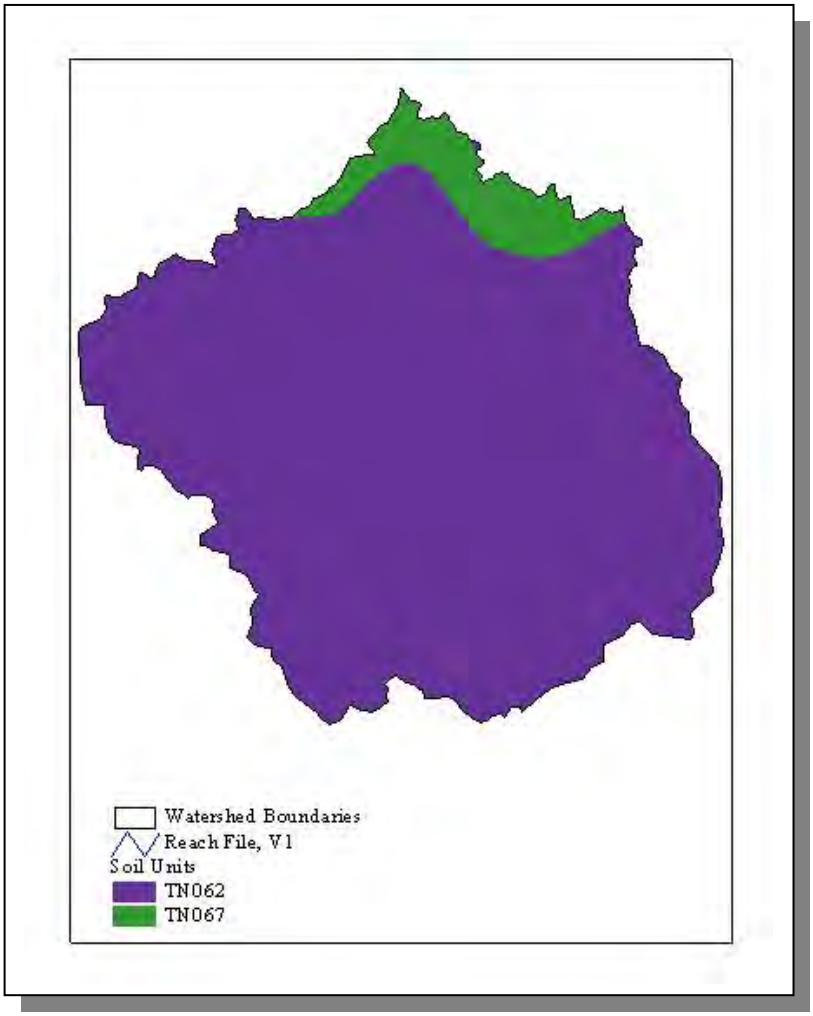



***Figure 4-70. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203120.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN062 | 0.00 | C | 0.98 | 4.40 | Clayey Loam | 0.26 |
| TN067 | 2.00 | C | 2.69 | 5.51 | Silty Loam | 0.35 |

***Table 4-73. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203120.*** *More information is provided in Stones-Appendix IV*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Davidson | 510,784 | 535,032 | 0.03 | 149 | 156 | 4.7 |
| Rutherford | 118,570 | 159,987 | 0.01 | 17 | 22 | 29.4 |
| Wilson | 67,675 | 81,327 | 3.59 | 2,432 | 2,922 | 20.1 |
| **Totals** | **697,029** | **776,346** | | **2,598** | **3,100** | **19.3** |

***Table 4-74. Population Estimates in Subwatershed 05130203120.***

4.2.L.ii. Point Source Contributions.

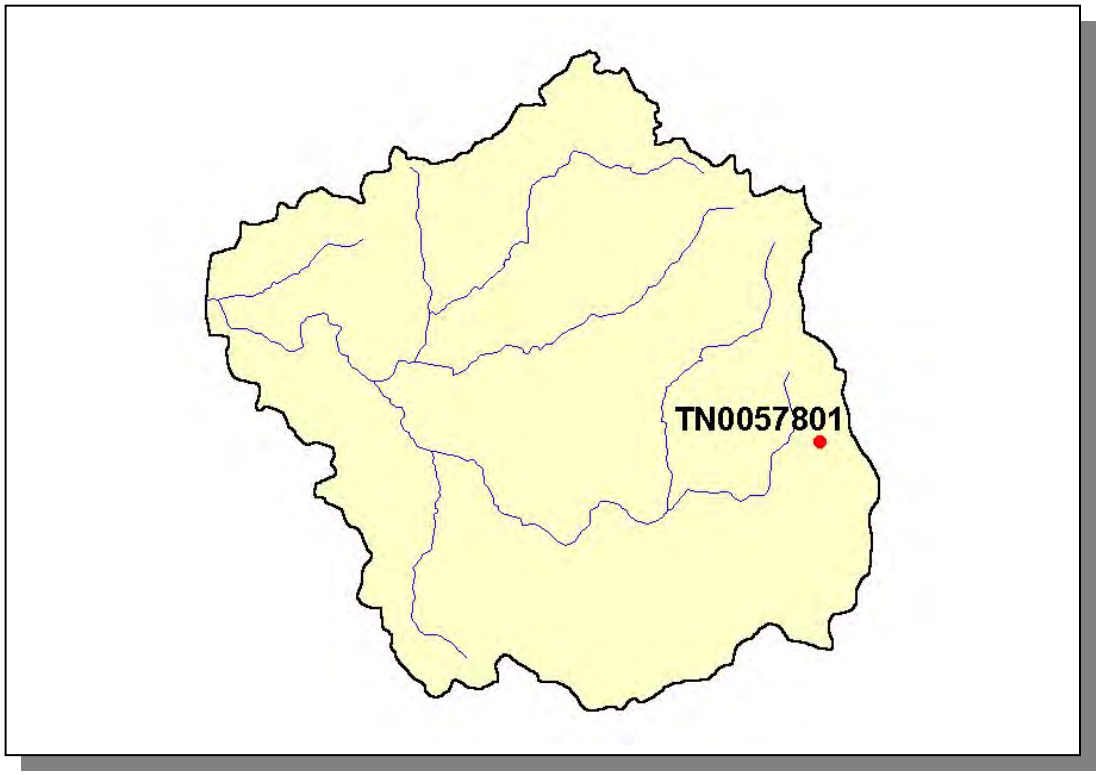



***Figure 4-71. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203120.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

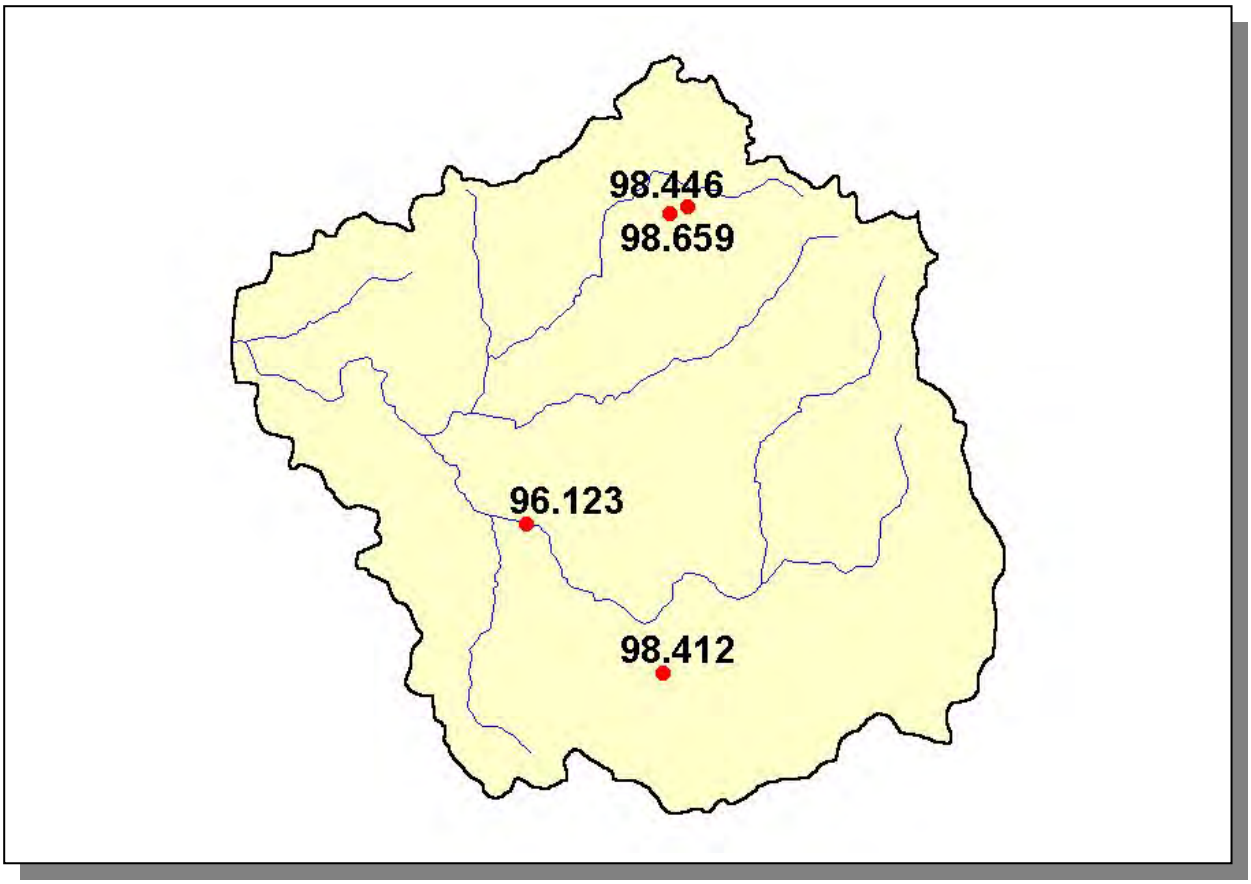



***Figure 4-72. Location of Permitted ARAP Sites (Individual Permits) in Subwatershed 05130203120.*** *More details may be found in Stones-Appendix IV.*

4.2.L.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 940 | 1,811 | 52 | <5 | 59 | 16 |

***Table 4-75. Summary of Livestock Count Estimates in Subwatershed 05130203120.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| County | Forest Land (thousand acres) | Timber Land (thousand acres) | Growing Stock (million cubic feet) | Sawtimber (million board feet) |
| Davidson | 108.7 | 108.1 | 2.3 | 9.7 |
| Rutherford | 155.7 | 155.7 | 0.4 | 0.9 |
| Wilson | 98.1 | 97.0 | 1.7 | 6.8 |
| **Total** | **362.5** | **360.8** | **4.4** | **17.4** |

***Table 4-76. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203120.***

| CROP | TONS/ACRE/YEAR |
|---|---|
| Soybeans (Row Crops) | 6.77 |
| Grass (Pastureland) | 0.43 |
| Non Agricultural Land Use | 0.00 |
| All Other Close Grown Cropland | 2.49 |
| Grass (Hayland) | 0.37 |
| Grass,Forbs, Legumes (Mixed Pasture) | 0.91 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.26 |
| Corn (Row Crops) | 2.23 |
| Forest Land (Grazed) | 0.00 |
| Tobacco (Row Crops) | 19.23 |
| Wheat (Close Grown Cropland) | 1.96 |
| Legume Grass (Hayland) | 0.38 |
| Berry (Horticultural) | 0.47 |
| Cotton (Row Crops) | 4.79 |
| Legume (Hayland) | 0.32 |
| Legume (Pastureland) | 0.12 |
| Conservation Reserve Program Land | 0.28 |

***Table 4-77. Annual Estimated Total Soil Loss in Subwatershed 05130203120.***

4.2.M. 05130203130.

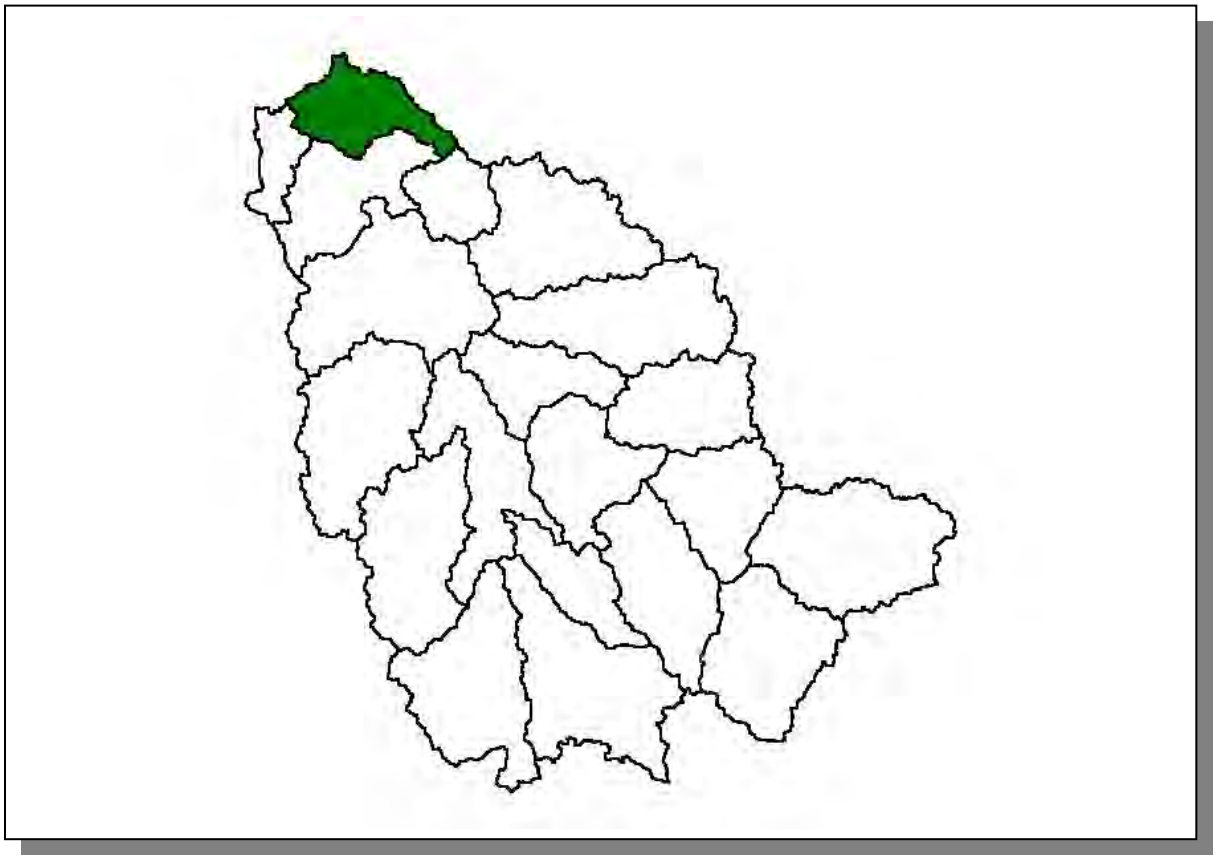


***Figure 4-73. Location of Subwatershed 05130203130.*** *All Stones HUC-14 subwatershed boundaries are shown for reference.*

4.2.M.i. General Description.

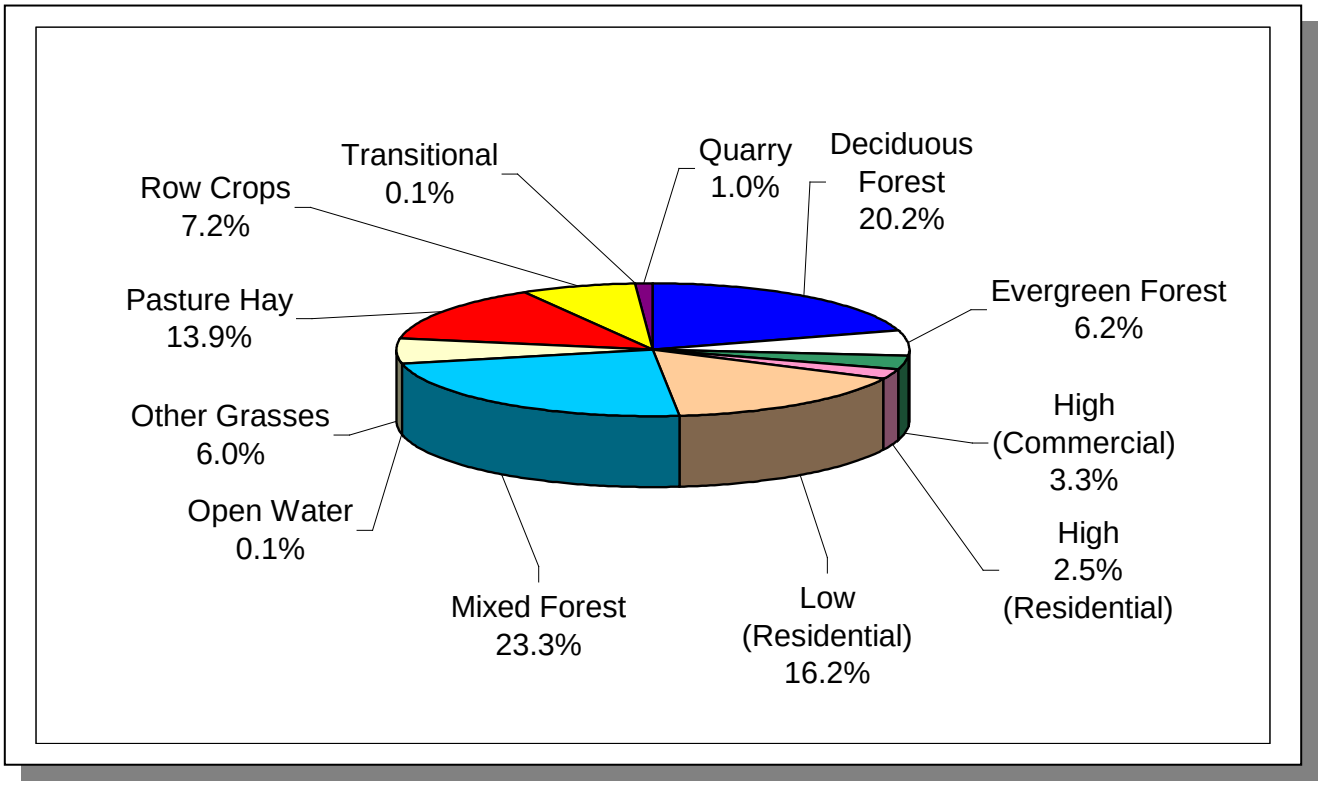



***Figure 4-74. Land Use Distribution in Subwatershed 05130203130.*** *More information is provided in Stones-Appendix IV.*

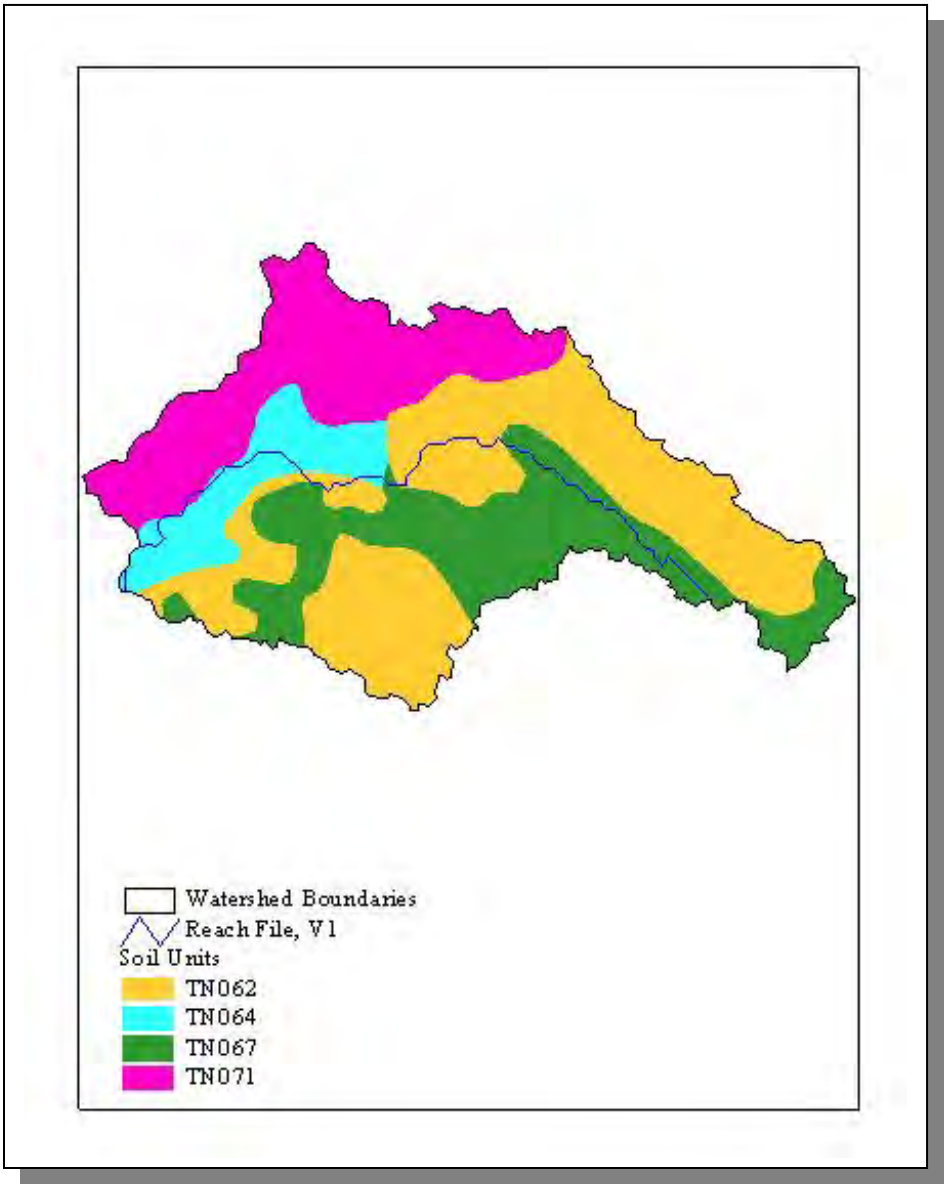



***Figure 4-75. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203130.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN062 | 0.00 | C | 0.98 | 4.40 | Clayey Loam | 0.26 |
| TN064 | 7.00 | C | 1.19 | 5.82 | Silty Loam | 0.37 |
| TN067 | 2.00 | C | 2.69 | 5.51 | Silty Loam | 0.35 |
| TN071 | 0.00 | C | 2.37 | 5.70 | Silty Loam | 0.33 |

***Table 4-78. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130203130.*** *More information is provided in Stones-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| **County** | **1990** | **1997 Est.** | **Portion of Watershed (%)** | **1990** | **1997** | |
| Davidson | 510,784 | 535,032 | 2.93 | 14,953 | 15,662 | 4.7 |
| Wilson | 67,675 | 81,327 | 2.53 | 1,710 | 2,056 | 20.2 |
| **Totals** | **578,459** | **616,359** | | **16,663** | **17,718** | **6.3** |

***Table 4-79. Population Estimates in Subwatershed 05130203130.***

| NUMBER OF HOUSING UNITS | | | | | | |
|---|---|---|---|---|---|---|
| **Populated Place** | **County** | **Population** | **Total** | **Public Sewer** | **Septic Tank** | **Other** |
| Mount Juliet | Wilson | 5,389 | 1,926 | 1,265 | 661 | 0 |
| Nashville (remainder) | Davidson | 488,518 | 219,521 | 203,640 | 15,576 | 305 |
| **Total** | | **493,907** | **221,447** | **204,905** | **16,237** | **305** |

***Table 4-80. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130203130.***


***Figure 4-76. Location of STORET Monitoring Sites in Subwatershed 05130203130.*** *More information is provided in Stones-Appendix IV.*

4.2.M.ii. Point Source Contributions.

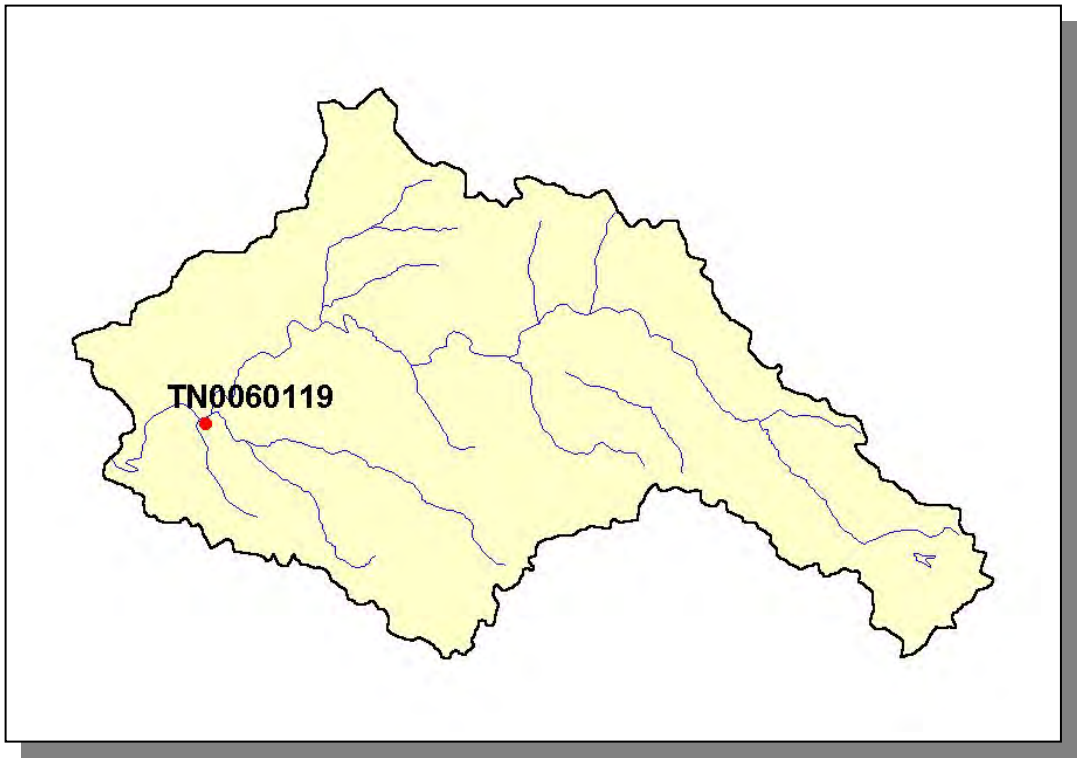



***Figure 4-77. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130203130.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

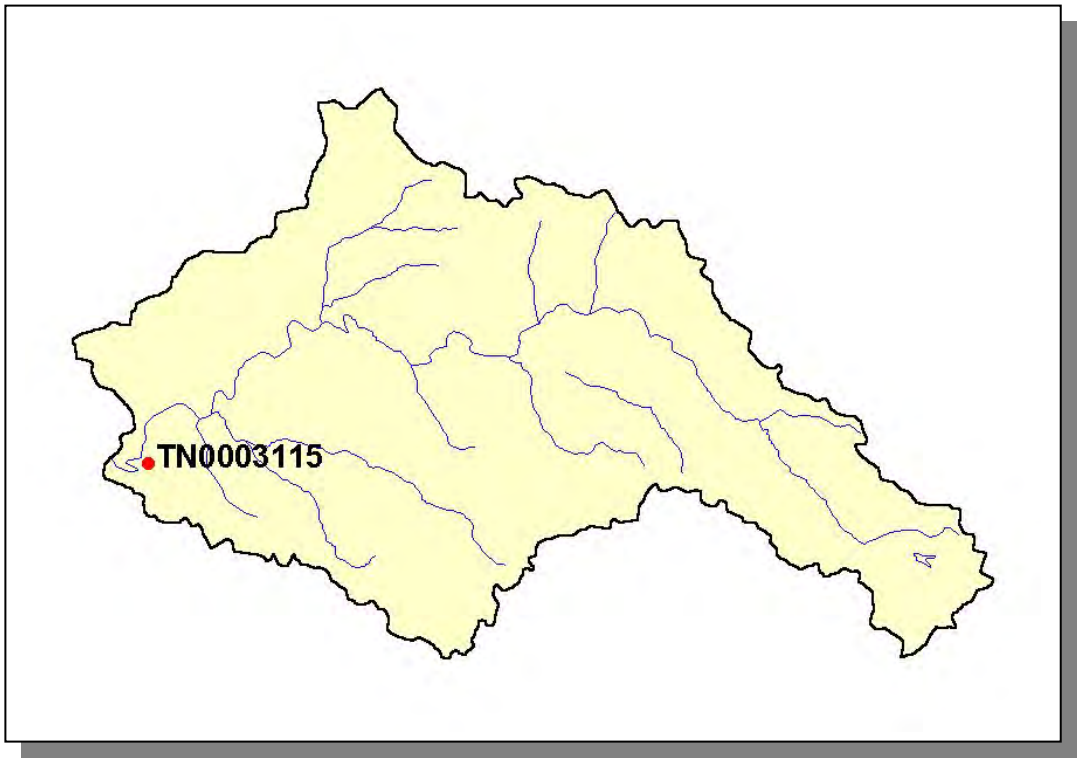



***Figure 4-78. Location of Active Mining Sites in Subwatershed 05130203130.*** *More information, including the names of facilities, is provided in Stones-Appendix IV.*

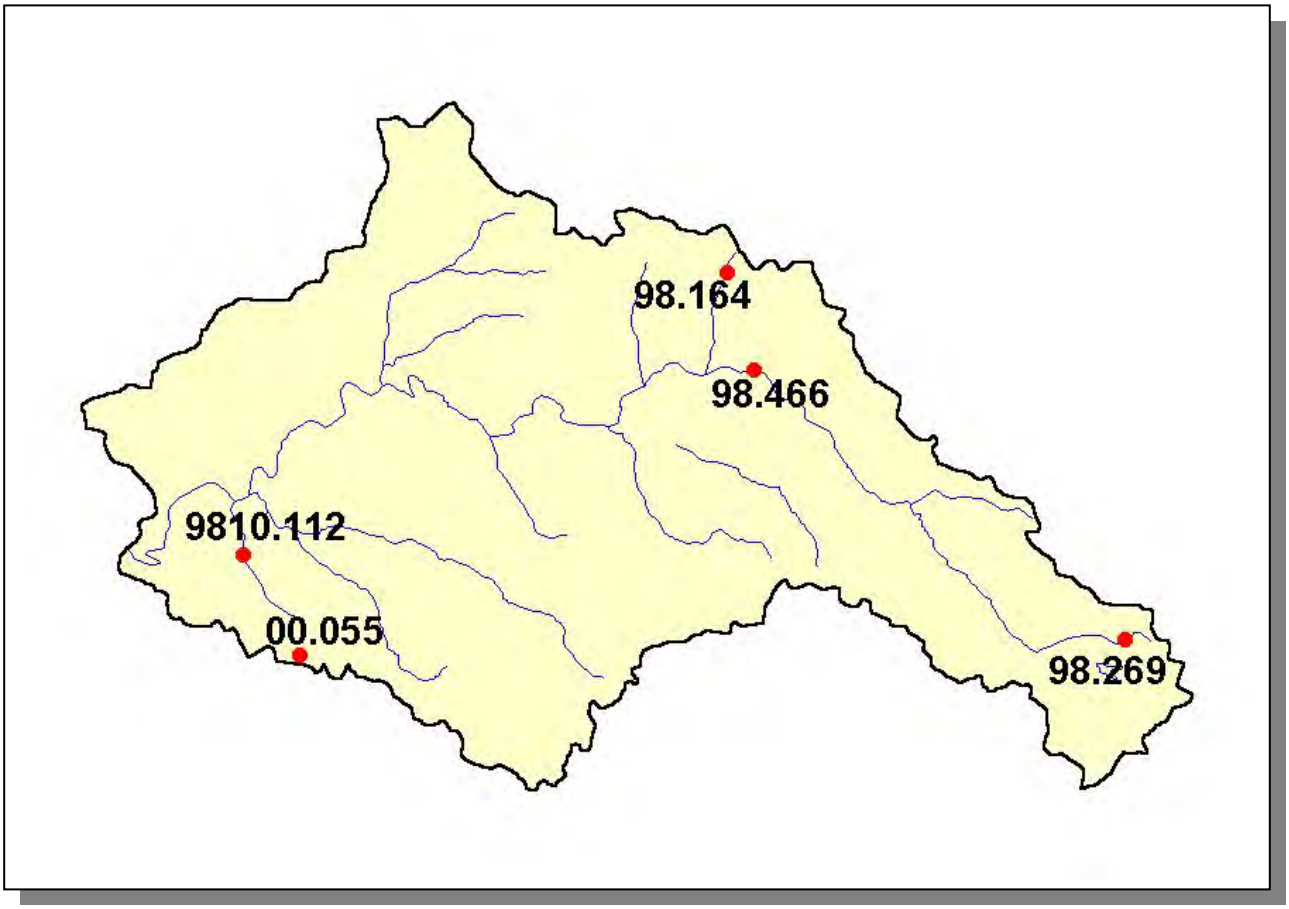



***Figure 4-79. Location of ARAP Sites (Individual Permits) in Subwatershed 05130203130.*** *More details may be found in Stones-Appendix IV.*

4.2.M.ii.a. Dischargers to Waterbodies Listed on the 1998 303(d) List.

There is one NPDES facility discharging to water bodies listed on the 1998 303(d) list in Subwatershed 05130203130:

- TN0060119 discharges to a tributary to the Stones River @ RM 4.2


***Figure 4-80. Location of NPDES Discharger to Water Bodies Listed on the 1998 303(d) List in Subwatershed 05130203130.*** *The names of facilities are provided in Stones-Appendix IV.*

| PERMIT # | 7Q10 | 1Q20 | 30Q2 | QLTA |
|---|---|---|---|---|
| TN0060119 | 0 | 0 | 0 | 0.0025 |

***Table 4-81. Receiving Stream Flow Information for NPDES Dischargers to Water Bodes Listed on the 1998 303(d) List in Subwatershed 05130203130.*** *Data are in million gallons per day (MGD). Data were calculated using data in Flow Duration and Low Flows of Tennessee Streams Through 1992.*

4.2.M.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | |
|---|---|---|---|---|---|
| **Beef Cow** | **Cattle** | **Milk Cow** | **Chickens** | **Hogs** | **Sheep** |
| 539 | 1,663 | 30 | <5 | 39 | 9 |

***Table 4-82. Summary of Livestock Count Estimates in Subwatershed 05130203130.*** *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

| | INVENTORY | | REMOVAL RATE | |
|---|---|---|---|---|
| **County** | **Forest Land (thousand acres)** | **Timber Land (thousand acres)** | **Growing Stock (million cubic feet)** | **Sawtimber (million board feet)** |
| Davidson | 108.7 | 108.1 | 2.3 | 9.7 |
| Wilson | 98.1 | 97.0 | 1.7 | 6.8 |
| **Total** | **206.8** | **205.1** | **4.0** | **16.5** |

***Table 4-83. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130203130.***

| CROP | TONS/ACRE/YEAR |
|---|---|
| Soybeans (Row Crops) | 11.00 |
| Grass (Pastureland) | 0.43 |
| Non Agricultural Land Use | 0.00 |
| All Other Close Grown Cropland | 2.37 |
| Grass (Hayland) | 0.22 |
| Grass, Forbs, Legumes Mixed Pasture) | 0.72 |
| Forest Land (Not Grazed) | 0.00 |
| Farmsteads and Ranch Headquarters | 0.30 |
| Corn (Row Crops) | 2.22 |
| Forest Land (Grazed) | 0.00 |
| Tobacco (Row Crops) | 19.23 |
| Wheat (Close Grown Cropland) | 1.96 |
| Legume Grass (Hayland) | 0.37 |

***Table 4-84. Annual Estimated Total Soil Loss in Subwatershed 05130203130.***

# CHAPTER 5

## WATER QUALITY PARTNERSHIPS IN THE STONES RIVER WATERSHED


**5.1 Background.**

**5.2. Federal Partnerships**
- **5.2.A. Natural Resources Conservation Service**
- **5.2.B. United States Geological Survey**
- **5.2.C. United States Army Corps of Engineers**
- **5.2.D. United States Environmental Protection Agency**

**5.3 State Partnerships**
- **5.3.A. TDEC Division of Water Supply**
- **5.3.B. State Revolving Fund**
- **5.3.C. Tennessee Department of Agriculture**
- **5.3.D. Tennessee Wildlife Resources Agency**

**5.4 Local Initiatives**
- **5.4.A. Black Fox Wetland League**
- **5.4.B. Friends of Murfreesboro Greenway**
- **5.4.C. The Nature Conservancy**


**5.1 BACKGROUND.** The Watershed Approach relies on participation at the federal, state, local and nongovernmental levels to be successful. Two types of partnerships are critical to ensure success:

- Partnerships between agencies
- Partnerships between agencies and landowners

This chapter describes both types of partnerships in the Stones River Watershed. The information presented is provided by the agencies and organizations described.

## 5.2 FEDERAL PARTNERSHIPS.

**5.2.A.** Natural Resources Conservation Service. The Natural Resources Conservation Service (NRCS), an agency of the U.S. Department of Agriculture, provides technical assistance, information, and advice to citizens in their efforts to conserve soil, water, plant, animal, and air resources on private lands.

Performance & Results Measurement System (PRMS) is a Web-based database application providing USDA Natural Resources Conservation Service, conservation partners, and the public fast and easy access to accomplishments and progress toward strategies and performance. The PRMS may be viewed at http://sugarberry.itc.nrcs.usda.gov/netdynamics/deeds/index.html. From the PRMS Products Menu, select "Products," then select "Conservation Treatments." Select the desired program and parameters and choose "Generate Report."

The data can be used to determine broad distribution trends in service provided to customers by NRCS conservation partnerships. These data do not show sufficient detail to enable evaluation of site-specific conditions (e.g., privately-owned farms and ranches) and are intended to reflect general trends.

| CONSERVATION PRACTICE | ACRES |
|---|---|
| Conservation Buffer | 98 |
| Erosion Control | 1,489 |
| Irrigation Management | 0 |
| Nutrient Management Applied | 664 |
| Pest Management | 1,447 |
| Prescribed Grazing | 1,497 |
| Salinity and Alkalinity Control | 0 |
| Tree and Shrub Practices | 0 |
| Tillage and Residue Management | 991 |
| Wildlife Habitat Management | 791 |
| Wetlands Created, Restored, and Enhanced | 0 |
| **Total** | **6,976** |

***Table 5-1. Conservation Practices in Parnership with NRCS in Stones River Watershed.*** *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period. More information is provided in Stones-Appendix V.*

**5.2.B.** United States Geological Survey Water Resource Programs—Tennessee District. The U.S. Geological Survey (USGS) provides relevant, objective scientific studies and information to evaluate the quantity, quality, and use of the Nation's natural resources. In addition to national assessments, the USGS also conducts hydrologic investigations in cooperation with numerous federal, state, and local agencies to address issues of local, regional, and national concern.

The USGS collects hydrologic data to document current conditions and provide a basis for understanding hydrologic systems and solving hydrologic problems. In Tennessee, the USGS records streamflow continuously at more than 60 gaging stations equipped with recorders and makes instantaneous measurements of streamflow at many other

stations. Groundwater levels are monitored statewide, and the physical, chemical and biological characteristics of surface and ground waters are analyzed. USGS activities also include the annual compilation of water-use records and collection of data for national baseline and water-quality networks. National programs conducted by the USGS include the National Atmospheric Deposition Program, National Stream Quality Accounting Network, and the National Water-Quality Assessment Program.

Current Water-Resource Investigations in the Stones River Basin:

> Spatial distribution and flow response characteristics of sinkholes near Mrfreesboro, TN (Cooperative study with City of Murfreesboro Engineering and Planning Department)

Continuous Streamflow Information—Stones River Basin:

> 03428200 West Fork Stones River at Murfreesboro, TN

For streamflow data, contact Donna Flohr at (615) 837-4730.

More information on the activities of the USGS can be obtained by accessing the Tennessee District home page on the World Wide Web at http://tenn.er.usgs.gov/

**5.2.C.** United States Army Corps of Engineers-Nashville District. The geographic boundaries of the Nashville District Corps of Engineers consist of the entire Cumberland and Tennessee river basins, a combined area of approximately 59,000 square miles. This includes portions of seven states: Tennessee, Kentucky, Alabama, Virginia, Mississippi, Georgia, and North Carolina.

Overall responsibilities for the Nashville District include operation and maintenance of 10 reservoirs within the 18,000 square mile Cumberland River Basin. These operate for some or all of the following purposes: hydropower, flood control, navigation, water supply, water quality, fish and wildlife, and recreation.

Within the 41,000 square mile Tennessee River Basin the Nashville District operates a series of navigation locks and has regulatory permit authority over dredge and fill activities under the Clean Water Act.

## WATER QUALITY ACTIONS IN THE STONES RIVER WATERSHED

### J. Percy Priest Reservoir and Tailwater Water Quality Restoration Iniative

J. Percy Priest Dam is located at Stones River Mile 6.8 and impounds J. Percy Priest Reservoir. At summer pool J. Percy Priest Reservoir covers an area of 14,200 acres, however the reservoir is relatively shallow with an average depth of just 33 feet. Various factors including the relative shallowness of the reservoir combined with the large human population in the upstream watershed and the naturally, nutrient rich, local geology contribute to the occurrence of seasonally stressful water quality conditions in J. Percy Priest Reservoir. J. Percy Priest Dam impacts the Stones River downstream from the dam because there is no provision for a continuous minimum flow. Consequently during long periods when there are no power releases, portions of the tailwater can develop poor water quality conditions.

A water quality restoration initiative is underway to address problems related to seasonal stratification and the lack of a minimum release at the dam. Turbine venting, a well proven technology to improve dissolved oxygen of dam releases, is not feasible at J. Percy Priest Dam. Instead, the installation of an oxygen injection system in the dam's forebay is being evaluated. Initial studies indicate such a system would greatly improve water quality near the dam and thus in the turbine releases. Costs for an oxygen injection system are high and would recur annually. However, there is high level management awareness within the Nashville District Corps of Engineers concerning the severe, recurring water quality problems at J. Percy Priest Reservoir. With this awareness has come a new resolve to implement a solution. At this same time the Nashville District COE is seeking a partner or partners to help defray some of the high costs for this improvement.

This year the Nashville District Corps of Engineers will also evaluate options for providing a minimum continuous release from J. Percy Priest Dam. A promising option that will be evaluated is modification of one of the spillway gates. However, it must be cautioned, that the provision of a minimum continuous flow could impact the stability of the summer recreation pool and would negatively impact hydropower production at this multipurpose dam. These considerations will be carefully weighed during the evaluation process.

### Cooperation with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control

The Nashville District Corps of Engineers collects a significant volume of physical, chemical, and biological water quality data every year. These data are collected at representative points both within the reservoir, on various major inflow streams, and in the tailwater. The data are used to help determine watershed water quality trends and to provide for better management of the reservoir. These data are also provided to the TDEC, Division of Water Pollution Control. The water quality data provided by the Corps helps fill in gaps in the water quality record for area streams and rivers which enter J. Percy Priest Reservoir and provides the major source of information for water quality conditions in the reservoir body itself.

**Environmental Education**

Environmental education opportunities are provided to area school age children by the Nashville District Corps of Engineers. Water Quality Control personnel participate in environmental awareness programs conducted at J. Percy Priest by providing information about various aspects of water quality. These presentations include "hands on" demonstrations of sophisticated water quality monitoring instruments and displays of biological specimens that demonstrate responses of biological systems to water quality conditions. The value of such environmental education is enormous because it touches young people early in their lives. It hopefully contributes to a greater lifelong awareness of the importance of conserving and improving water quality and water resources on an individual basis.

The address of the Nashville District home page is http://www.orn.usace.army.mil/

**5.2.D.** U.S. Environmental Protection Agency (EPA). AS part of TMDL development being supported by EPA Region 4's Water Management Division, the Science and Ecosystem Support Division will conduct water quality studies of the West Fork Stones River.

The primary objective of this study is to collect a representative set of water quality and hydraulic data for the West Fork Stones River in order to develop a calibrated model of the system during low flow conditions. This calibrated model will be used as one of the TMDL development tools for the West Fork Stones River, and it is anticipated that it will provide a better understanding of the impact of nutrient enrichment and depressed dissolved oxygen concentrations during a time frame when nonpoint sources dominate the system. Ultimately, the model should be able to account for the difference between base flow point source dominated and high flow point and nonpoint source dominated conditions.

For more information, contact:

Tom McGill, PE
U.S. Environmental Protection Agency-Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960
mcgill.thomas@epa.gov

## 5.3 STATE PARTNERSHIPS.

**5.3.A.** TDEC Division of Water Supply. Congress, the Environmental Protection Agency, and the states are increasing their emphasis on the prevention of pollution, particularly in the protection of the raw water sources for public water systems. The initial step toward prevention of contamination of public water supplies came with the Federal Safe Drinking Water Act Amendments of 1986. At that time, each state was required to develop a wellhead protection program to protect the water source of public water systems relying on groundwater (wells or springs). The new Source Water Assessment provisions of the Federal Safe Drinking Water Act of 1996 Amendments expanded the scope of protection beyond groundwater systems to include protection of the waters supplying surface water systems.

More information may be found at: http://www.state.tn.us/environment/dws.

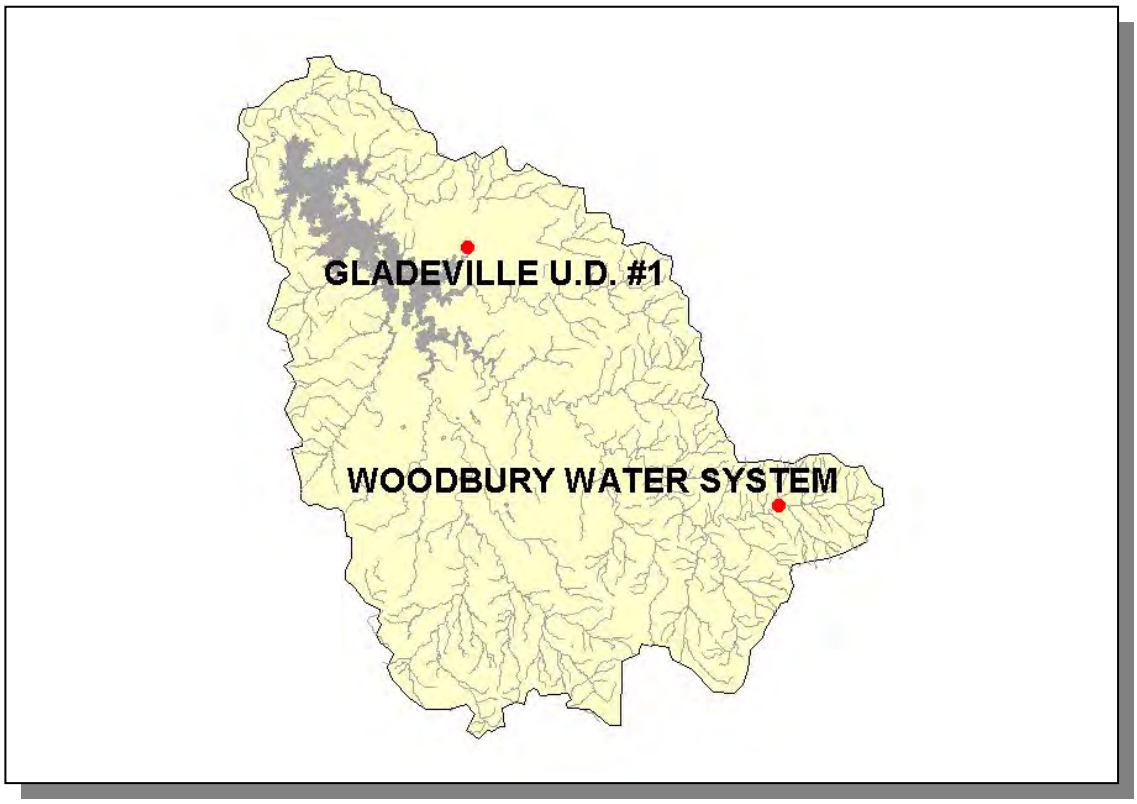



***Figure 5-1. Location of Communities Using Groundwater for Water Supply in the Stones River Watershed.***

A "wellhead" is the source area for the water, which is withdrawn through a well or spring, similar to the concept of the head of a river. To protect the water supply, it is important to know from where the water flowing to that well or spring is coming. Source water/wellhead protection areas for public water systems using groundwater are generally based on hydrologic considerations and/or modeling. Source water protection

areas for public water systems using surface water are based on the portion of the watershed area upstream of the water intake.

There are three basic steps involved in a wellhead protection program: 1) defining the wellhead protection area, 2) inventorying the potential contaminant sources within that area, and 3) developing a wellhead protection plan. The official designation of wellhead protection areas provides valuable input and emphasis to government agencies in the siting of facilities and the prioritization and cleanup of contaminated sites.

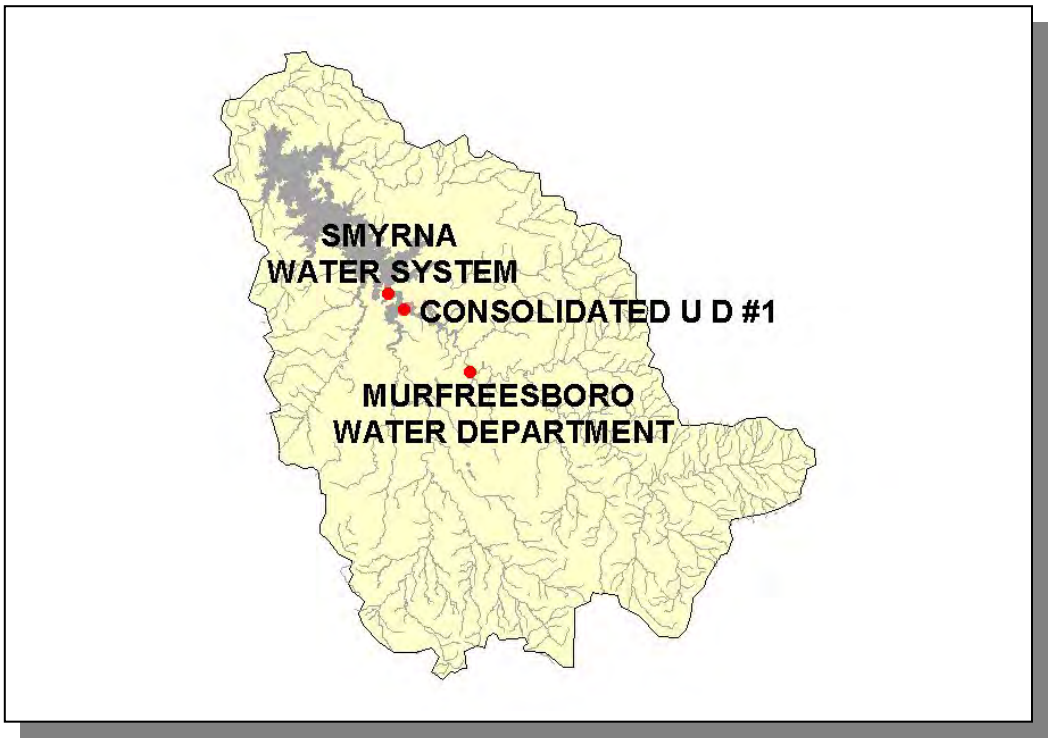



***Figure 5-2. Location of Communities in the Wellhead Protection Program in Stones River Watershed.***

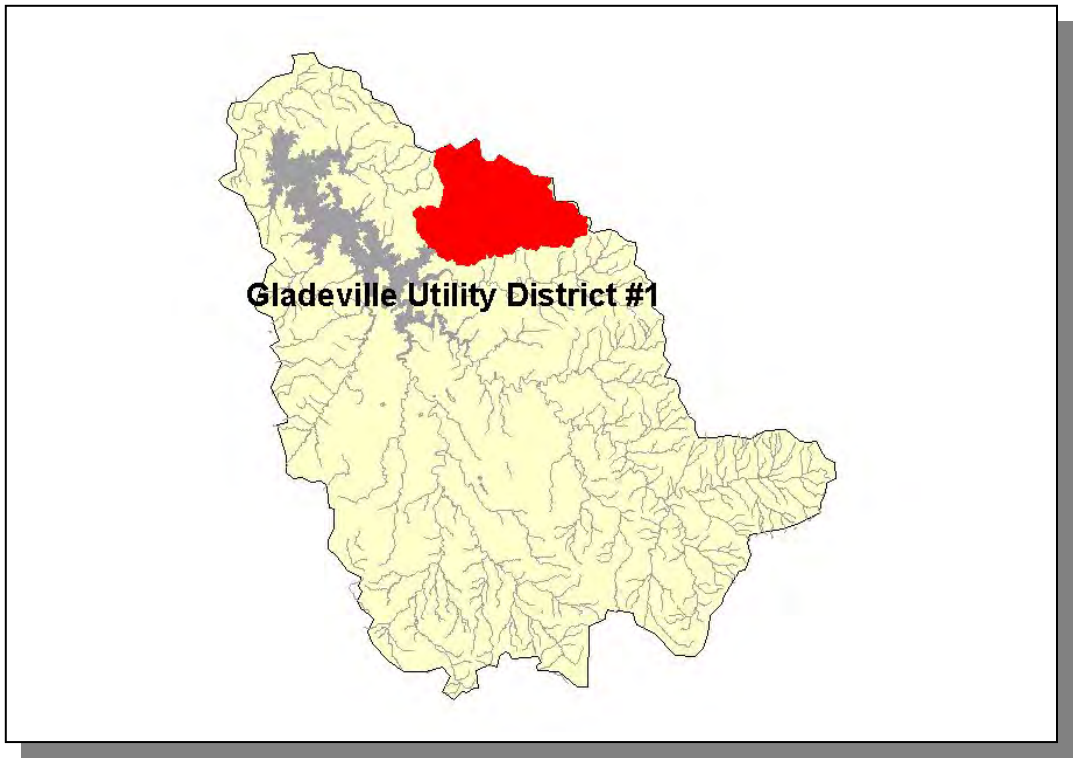



***Figure 5-3. Location of Communities with Surface Water Intakes for Water Supply in Stones River Watershed.***

As a part of the Source Water Assessment Program, public water systems are evaluated for their susceptibility to contamination. These individual source water assessments with susceptibility analyses are available to the public at http://www.state.tn.us/environment/dws as well as other information regarding the Source Water Assessment Program and public water systems.

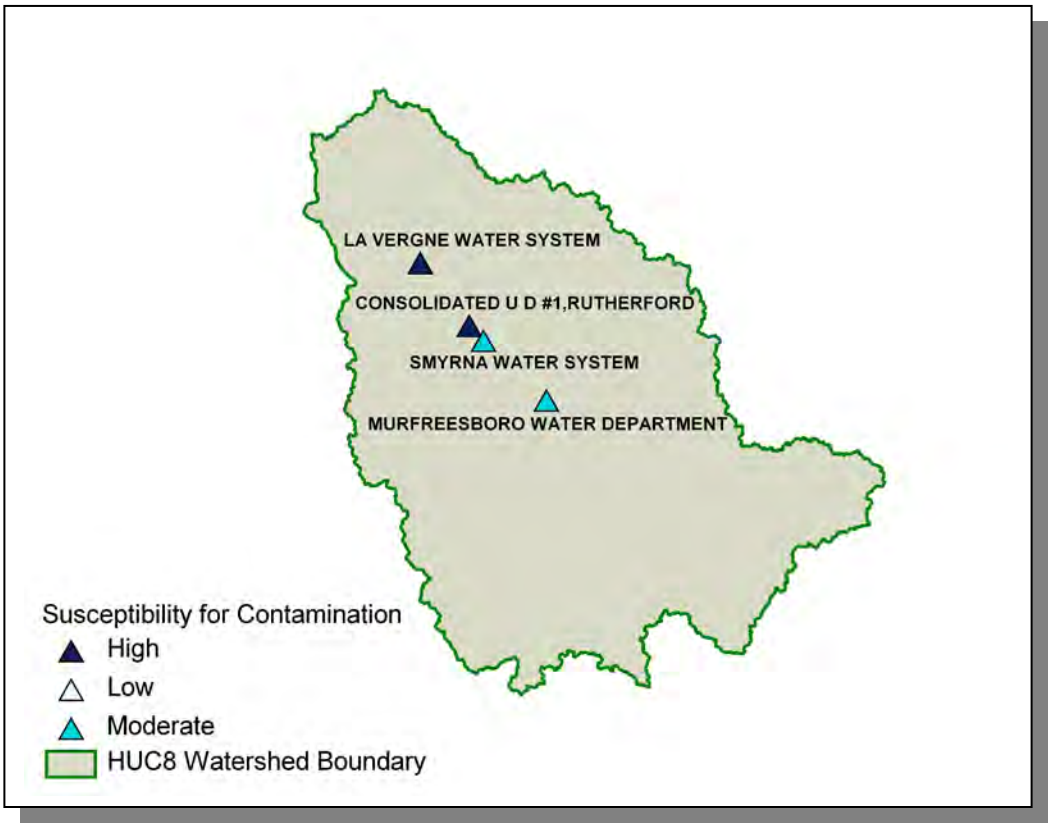



***Figure 5-4. Susceptibility for Contamination in the Stones River Watershed.***

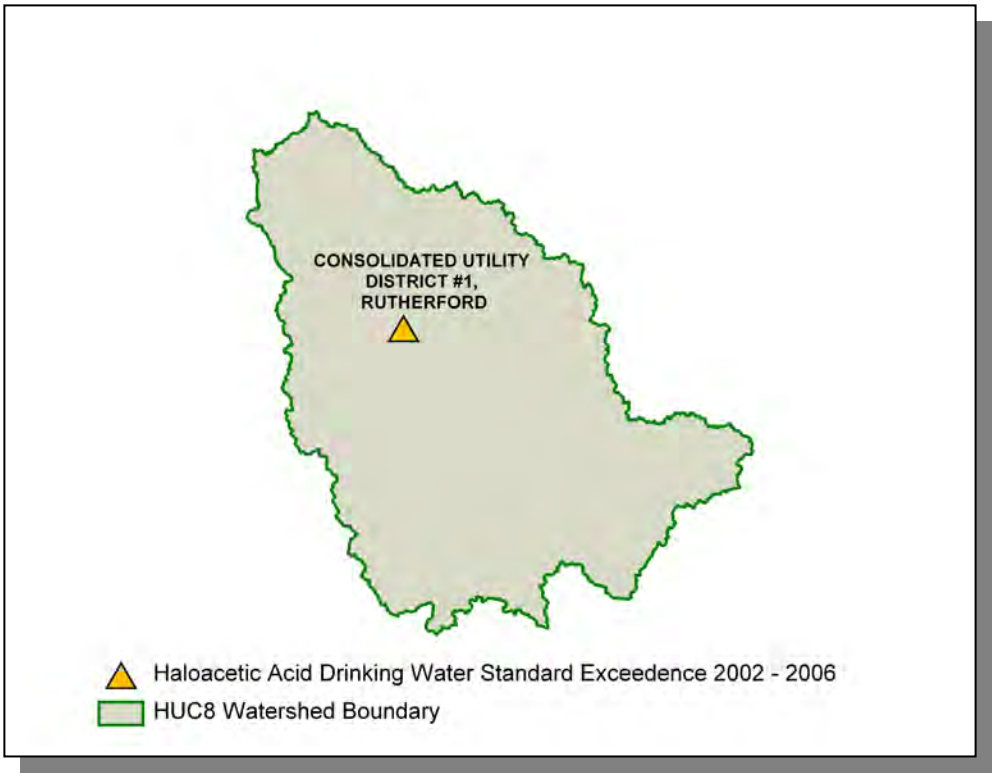



***Figure 5-5. Exceedences of the Haloacetic Acid Drinking Water Standard in the Stones River Watershed.***

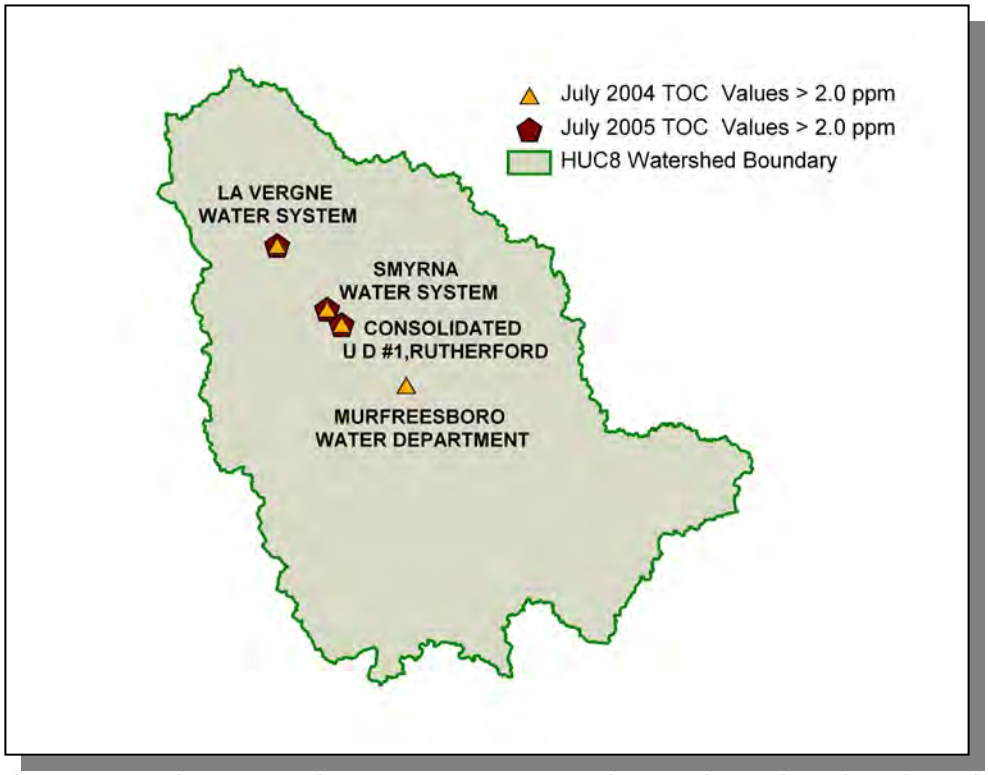



***Figure 5-6. July 2004 and 2005 Raw Water Total Organic Carbon (TOC) Analysis in the Stones River Watershed.***

**5.3.B.** State Revolving Fund. TDEC administers the state's Clean Water State Revolving Fund Program. Amendment of the Federal Clean Water Act in 1987 created the Clean Water State Revolving Fund (SRF) Program to provide low-interest loans to cities, counties, and utility districts for the planning, design, and construction of wastewater facilities. The U.S. Environmental Protection Agency awards annual capitalization grants to fund the program and the State of Tennessee provides a twenty-percent funding match. TDEC has awarded loans totaling approximately $500 million since the creation of the SRF Program. SRF loan repayments are returned to the program and used to fund future SRF loans.

SRF loans are available for planning, design, and construction of wastewater facilities, or any combination thereof. Eligible projects include new construction or upgrading/expansion of existing facilities, including wastewater treatment plants, pump stations, force mains, collector sewers, interceptors, elimination of combined sewer overflows, and nonpoint source pollution remedies.

SRF loan applicants must pledge security for loan repayment, agree to adjust user rates as needed to cover debt service and fund depreciation, and maintain financial records that follow governmental accounting standards. SRF loan interest rates range from zero percent to market rate, depending on the community's per-capita income, taxable sales, and taxable property values. Most SRF loan recipients qualify for interest rates between 2 and 4 percent. Interest rates are fixed for the life of the term of the loan. The maximum loan term is 20 years or the design life of the proposed wastewater facility, whichever is shorter.

TDEC maintains a Priority Ranking System and Priority List for funding the planning, design, and construction of wastewater facilities. The Priority Ranking List forms the basis for funding eligibility determinations and allocation of Clean Water SRF loans. Each project's priority rank is generated from specific priority ranking criteria and the proposed project is then placed on the Project Priority List. Only projects identified on the Project Priority List may be eligible for SRF loans. The process of being placed on the Project Priority List must be initiated by a written request from the potential SRF loan recipient or their engineering consultant. SRF loans are awarded to the highest priority projects that have met SRF technical, financial, and administrative requirements and are ready to proceed.

Since SRF loans include federal funds, each project requires development of a Facilities Plan, an environmental review, opportunities for minority and women business participation, a State-approved sewer use ordinance and Plan of Operation, and interim construction inspections.

For further information about Tennessee's Clean Water SRF Loan Program, call (615) 532-0445 or visit their Web site at http://www.tdec.net/srf.


***Figure 5-7. Location of Communities Receiving SRF Loans or Grants in the Stones River Watershed.*** *More information is provided in Stones-Appendix V.*

**5.3.C.** Tennessee Department of Agriculture. The Tennessee Department of Agriculture's Water Resources Section consists of the federal Section 319 Nonpoint Source Program and the Agricultural Resources Conservation Fund Program. Both of these are grant programs which award funds to various agencies, non-profit organizations, and universities that undertake projects to improve the quality of Tennessee's waters and/or educate citizens about the many problems and solutions to water pollution. Both programs fund projects associated with what is commonly known as "nonpoint source pollution."

The Tennessee Department of Agriculture's Nonpoint Source Program (TDA-NPS) has the responsibility for management of the federal Nonpoint Source Program, funded by the US Environmental Protection Agency through the authority of Section 319 of the Clean Water Act. This program was created in 1987 as part of the reauthorization of the Clean Water Act, and it established funding for states, territories and Indian tribes to address NPS pollution. Nonpoint source funding is used for installing Best Management Practices (BMPs) to stop known sources of NPS pollution, training, education, demonstrations and water quality monitoring. The TDA-NPS Program is a non-regulatory program, promoting voluntary, incentive-based solutions to NPS problems. The TDA-NPS Program basically funds three types of programs:

- BMP Implementation Projects. These projects aid in the improvement of an impaired waterbody, or prevent a non-impaired water from becoming listed on the 303(d) List.

- Monitoring Projects. Up to 20% of the available grant funds are used to assist the water quality monitoring efforts in Tennessee streams, both in the state's 5-year watershed monitoring program, and also in performing before-and-after BMP installation, so that water quality improvements can be verified.

- Educational Projects. The intent of educational projects funded through TDA-NPS is to raise the awareness of landowners and other citizens about practical actions that can be taken to eliminate nonpoint sources of pollution to the waters of Tennessee.

The Tennessee Department of Agriculture Agricultural Resources Conservation Fund Program (TDA-ARCF) provides cost-share assistance to landowners across Tennessee to install BMPs that eliminate agricultural nonpoint source pollution. This assistance is provided through Soil Conservation Districts, Resource Conservation and Development Districts, Watershed Districts, universities, and other groups. Additionally, a portion of the TDA-ARCF is used to implement information and education projects statewide, with the focus on landowners, producers, and managers of Tennessee farms and forests.

Participating contractors in the program are encouraged to develop a watershed emphasis for their individual areas of responsibility, focusing on waters listed on the Tennessee 303(d) List as being impaired by agriculture. Current guidelines for the TDA-ARCF are available. Landowners can receive up to 75% of the cost of the BMP as a reimbursement.

The Tennessee Department of Agriculture has spent $110,041 for Agriculture BMPs in the Stones River Watershed since 1998. Additional information is provided in Stones River Stones-Appendix V.

Since January of 1999, the Department of Agriculture and the Department of Environment and Conservation have had a Memorandum of Agreement whereby complaints received by TDEC concerning agriculture or silviculture projects would be forwarded to TDA for investigation and possible correction. Should TDA be unable to obtain correction, they would assist TDEC in the enforcement against the violator.

**5.3.D.** Tennessee Wildlife Resources Agency. The Tennessee Wildlife Resources Agency conducts a variety of activities related to watershed conservation and management. Fish management activities include documentation of fish and aquatic life through stream sampling and stocking of both warm water and cold water sportfish. Fish data are managed in the Geographic Information System (GIS) project called Tennessee Aquatic Data System (TADS). TWRA nongame and endangered species projects include restoration of special status fish ,aquatic life, and riparian wildlife including otters, and nongame fish such as the blue masked darter. The Agency conducts a variety of freshwater mussel management, conservation, and restoration projects including the propagation and reintroduction of species once common in Tennessee streams. TWRA has been involved in riparian conservation projects since 1991 in partnership with state and federal agencies and conservation groups.

For information on these and other water resources related activities, please contact your Regional TWRA office at the following phone numbers:

| | |
|---|---|
| West Tennessee ( Region I ) | 1-800-372-3928 |
| Middle Tennessee ( Region II ) | 1-800-624-7406 |
| Cumberland Plateau ( Region III ) | 1-800-262-6704 |
| East Tennessee ( Region IV) | 1-800-332-0900. |

TDD services are available @ 615-781-6691.
TWRA's website is http://www.state.tn.us/twra.

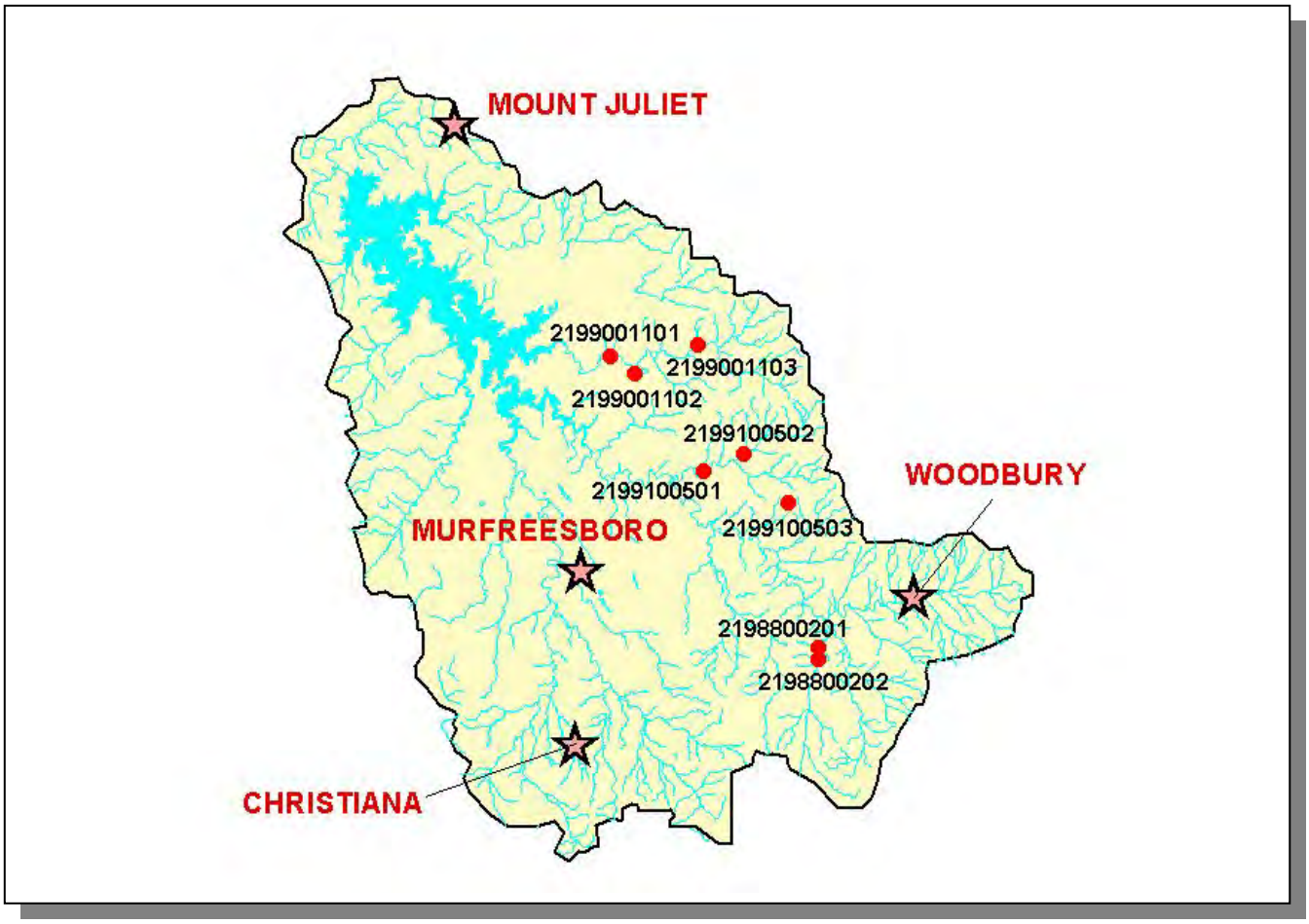



***Figure 5-8. Location of TWRA TADS Sampling Sites in Stones River Watershed.*** *Locations of Mount Juliet, Murfreesboro, Christiana, and Woodbury are shown for reference. Additional Information is presented in Stones-Appendix V.*

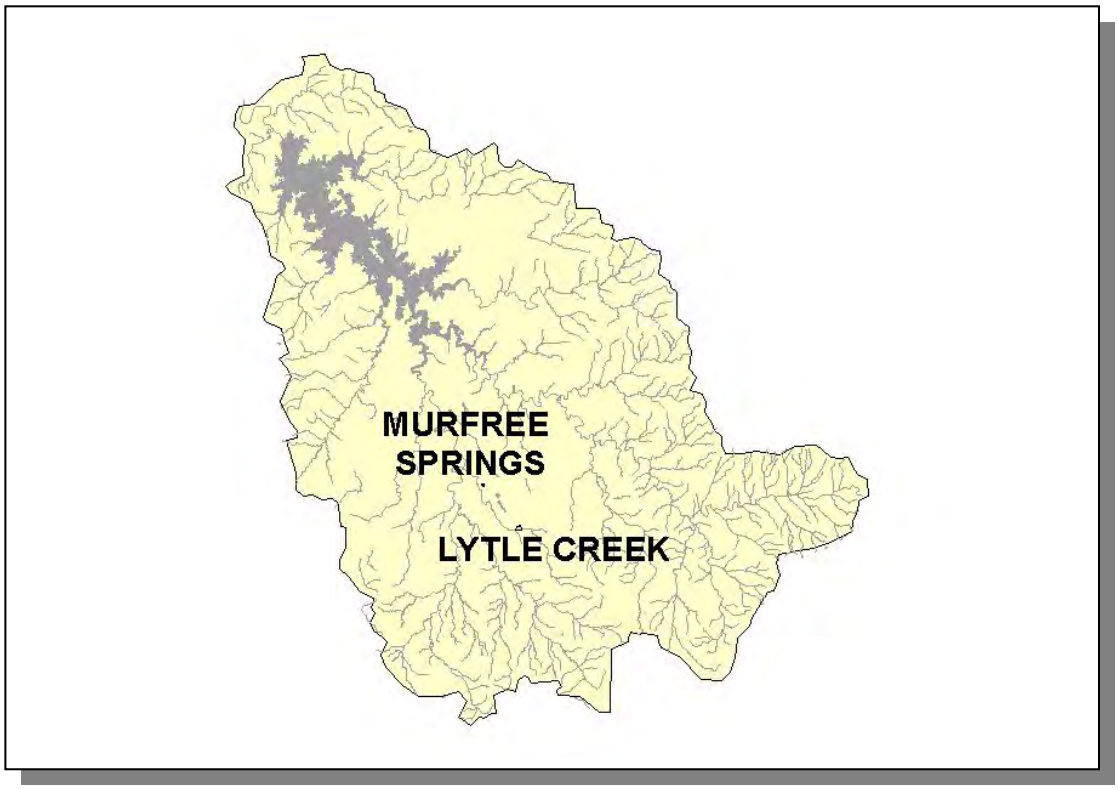



***Figure 5-9. Location of TWRA Wetland Sites in Stones River Watershed Purchased with Wetland Mitigation Funds.***

## 5.4 LOCAL INITIATIVES.

**5.4.A.** Black Fox Wetland League. The Black Fox Wetland League was formed in 1989 for the primary purpose of saving Black Fox Spring and other wetlands. Developers had bought a large acreage encompassing Black Fox Spring and had placed a large drainage ditch directly into the Spring. Sediment was rapidly filling in the large "blue hole" spring. A phone call to developers by a concerned citizen only served to place hay bales and hardware cloth that immediately washed into the Spring. Because a voice from two concerned individuals did not carry much weight, the two were challenged to form a strong non-profit organization. With the help of the State, the newly organized Black Fox Wetland League managed to have the contractors divert the ditch around the Spring into a retention pond with slow release into the stream below.

In the research that followed, it was discovered that the City of Murfreesboro actually owned ten acres including the Spring, and a right-of-way to it. Developers had already built homes on the City's right-of-way. Deeds were cleared up and a new right-of-way given to the City who now claimed their rightful water. It had been purchased in the earlier part of the twentieth century to protect the city's water supply. The stream from the spring flowed eventually into Murphy Spring off Broad Street in downtown Murfreesboro where the City got its water until the early seventies. They now get their water from the East Fork Stones River at Walter Hill. The Black Fox Wetlands League, with donations and grants, managed to purchase acreage adjacent to the city's Black Fox Spring to further protect the water.

The Black Fox Wetlands League achieved its primary purpose. For the past few years, meetings were held monthly with frequent newspaper coverage which served to make the public aware of, and its value as, a wetland. It was a winter hunting camp for Chief Black Fox of the Cherokee Nation, a camping spot on the Trail of Tears. It also held a trading post for Native Americans, and the first residents of the city built there.

The Discovery House of Murfreesboro joined with the Black Fox Wetland League in making the city realize the advantages of a nature area for study of wetlands and all other aspects of nature. The city then donated the old Water Plant off downtown Broad Street to the Discovery House, who are now building a new Discovery House there, and the City is also building boardwalks in the twenty acre wetland adjacent to the old water plant. This will be a study and bird watching area and will connnect to the city's Greenway.

The Back Fox Wetlands League has recently donated their property to the City for a rustic park. The League was also influential in having the Tennessee Wildlife Resources Agency purchase thirty-five acres immediately across the road from their property by the Black Fox Spring. It is planned that eventually this will all be connected to the City's Greenway System.

The Black Fox Wetland League has now turned its sights to other wetlands in Rutherford County and to the further protection of the West, Middle, and east Forks of the Stones River.

For more information about the Black Fox Wetlands League, contact Bertha Chrietzberg at bertha@heartoftnnet.

**5.4.B.** Friends of Murfreesboro Greenway. The Murfreesboro Greenway gets heavy use from walkers and bikers. It lies along the West Fork Stones River and its tributary, Lytle Creek. It is located in the heart of downtown Murfreesboro. Three miles of the Greenway runs along the West Fork of the Stones River, and one and one half miles along Lytle Creek. An additional spur trail of one and one half miles connects Stones River National Battlefield Park where the Civil war Battle of Stones River took place. Another six and one half miles is now being built upstream of the West Fork Stones River and extends to the Barfield Community Park of Murfreesboro.

Building this Greenway has enhanced the water quality of the West Fork Stones River and Lytle Creek tremendously. Stores and businesses back up to the river and it was commonly used as a garbage dump. Many factories, including a battery plant occasionally dumped in the river. A lot of algae and a few carp were found in this polluted stream. Now, the fish have come back, and the banks and river are kept clean. The additional six and one half miles upstream will enhance it even more. There is some concern, however, as to the effect on wildlife. With all the people using the Greenway, their habitat and safety are gone.

The present portion of the Greenway was built by the Federal Government to commemorate the Battle of Stones River, and then turned over to the City of Murfreesboro for maintenance and upkeep.

For more information about the Friends of the Murfreesboro Greenway, contact Bertha Chrietzberg at bertha@heartoftnnet.

**5.4.C.** The Nature Conservancy. The mission of The Nature Conservancy is “to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive."

Flat Rock Cedar Glades State Natural Area is located in the Stones River watershed, just three miles east of Murfreesboro. Famous for its globally unique cedar glade habitats and numerous state and federally listed plant species, Flat Rock also comprises Tennessee's largest block of protected properties that were purchased solely for cedar glade preservation. Land acquisition projects between The Nature Conservancy's Tennessee Chapter and Tennessee's Department of Environment and Conservation total almost 1,000 acres that are now managed within the State Natural Area.

For more information, contact Chris Roberts, Stewardship Ecologist, croberts@tnc.org

# CHAPTER 6

## FUTURE DIRECTIONS IN THE STONES RIVER WATERSHED


6.1 Background

6.2 Comments from Public Meetings
- 6.2.A. Year 1 Public Meeting
- 6.2.B. Year 3 Public Meeting
- 6.2.C. Year 5 Public Meeting

6.3. Assessment of Needs
- 6.3.A. Point Sources
- 6.3.B. Nonpoint Sources


### 6.1 BACKGROUND.

The Watershed Management Plan serves as a comprehensive inventory of resources and stressors in the watershed, a recommendation for control measures, and a guide for planning activities in the next five-year watershed cycle and beyond. Water quality improvement will be a result of implementing both regulatory and nonregulatory programs.

In addition to the NPDES program, some state and federal regulations, such as the TMDL and ARAP programs, address point and nonpoint issues. Construction and MS4 stormwater rules (implemented under the NPDES program) are transitioning from Phase 1 to Phase 2. More information on stormwatrer rules may be found at: http://www.state.tn.us/environment/wpc/stormh2o/MS4.htm.

This Chapter addresses point and nonpoint source approaches to water quality problems in the Stones River Watershed.

**6.2. COMMENTS FROM PUBLIC MEETINGS.** Watershed meetings are open to the public, and most meetings were represented by citizens who live in the watershed, NPDES permitees, business people, farmers, and local river conservation interests. Locations for meetings were frequently chosen after consulting with people who live and work in the watershed. Everyone with an interest in clean water is encouraged to be a part of the public meeting process. The times and locations of watershed meetings are posted at: http://www.state.tn.us/environment/wpc/public.htm.

6.2.A. Year 1 Public Meeting. The first Stones River Watershed public meeting was held September 17, 1996 at the Fleming Training Center. The goals of the meeting were to 1)present, and review the objectives of, the Watershed Approach, 2)introduce local, state, and federal agency and nongovernment organization partners, 3)review water quality monitoring plans, and 4)solicit input from the public.

Major Concerns/Comments

- Education and voluntary programs are not enough to make a difference
- Siltation due to stream bank erosion
- Tires stacked along river banks
- Loss of biodiversity, especially mussels
- Runoff from landfill
- Pressure from population increase in watershed

6.2.B. Year 3 Public Meeting. The second Stones River public meeting was held April 13, 1998 at the Fleming Training Center. The goals of the meeting were to 1)provide an overview of the watershed approach, 2)review the monitoring strategy, 3)summarize the most recent water quality assessment, 4)discuss the TMDL schedule and citizens' role in commenting on draft TMDLs, and 5)discuss BMPs and other nonpoint source tools available through the Tennessee Department of Agriculture 319 Program and NRCS conservation assistance programs.

Major Concerns/Comments

- Difficulty quantifying NPS contribution
- Loss of public access to river
- Failing septic systems
- Runoff from landfill
- Pressure from population increase in watershed

6.2.C. Year 5 Public Meeting. The third Stones River Watershed public meeting was held August 8, 2002 at the Fleming Training Center (Murfreesboro). The meeting featured seven educational stations:

- Draft Watershed Water Quality Management Plan
- Benthic macroinvertebrate samples and interpretation
- Smart Board with interactive GIS maps
- "Watershed Approach" (self-guided slide show)
- "How We Monitor Streams" (self-guided slide show)
- "Why We Do Biological Sampling" (self-guided slide show)
- Landowner Assistance Programs (NRCS and TDA)

In addition, citizens had the opportunity to make formal comments on the Draft Year 2002 303(d) List.

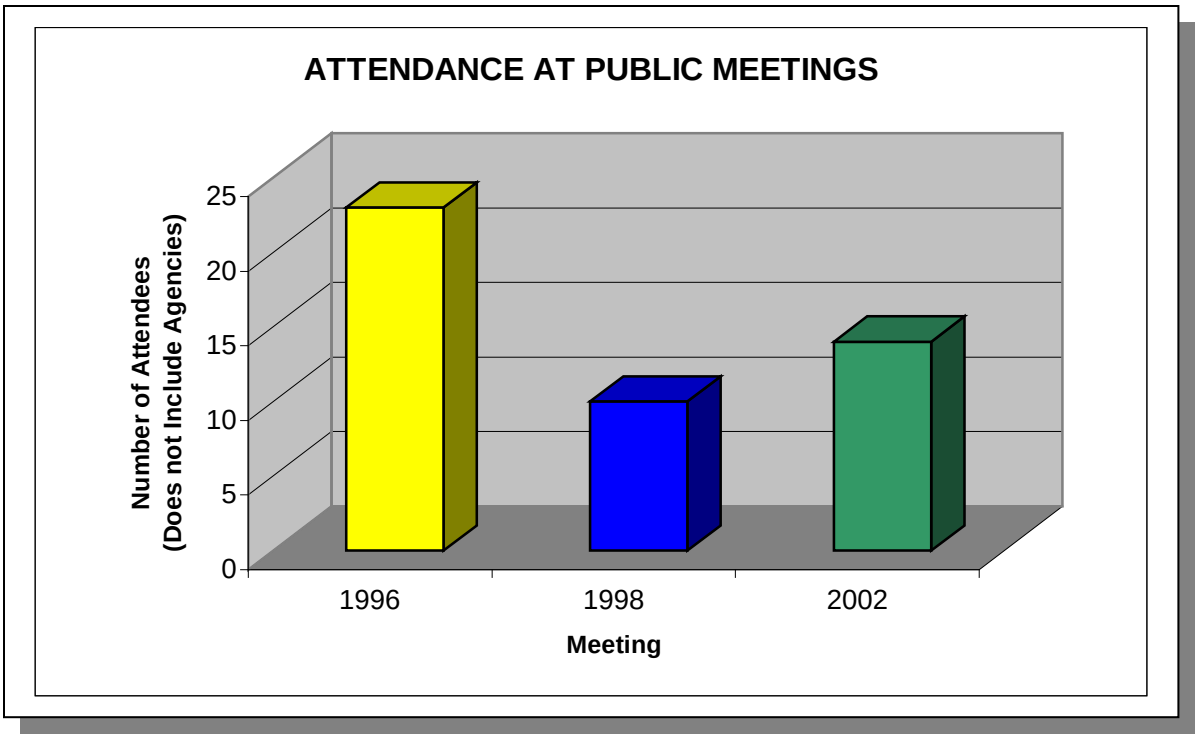



***Figure 6-1. Attendance at Public Meetings in the Stones River Watershed.*** *Attendance numbers do not include agency personnel.*

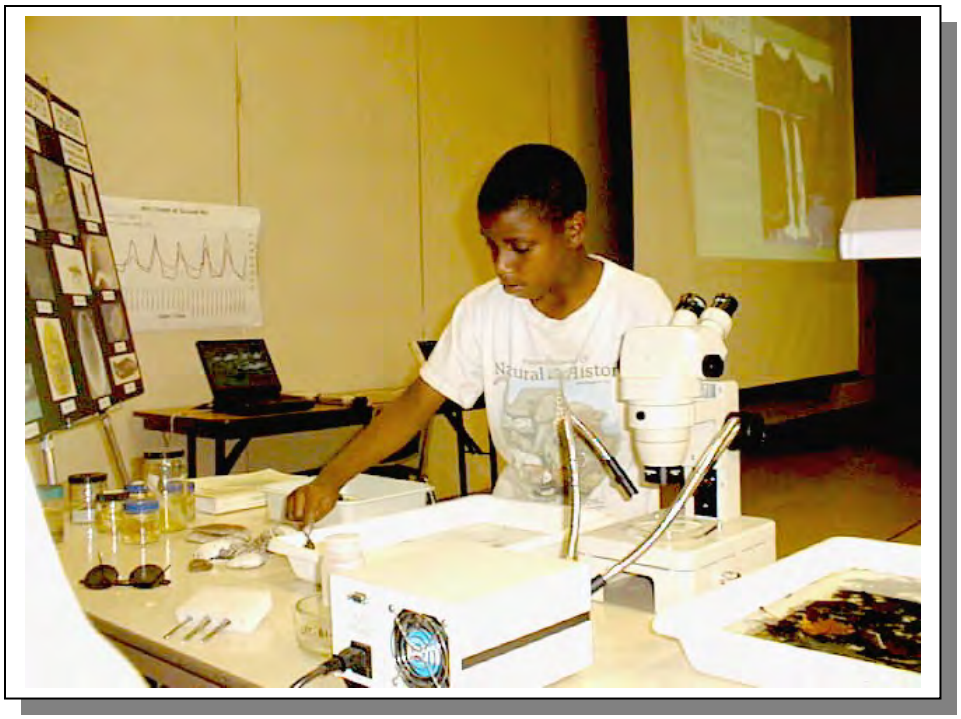


***Figure 6-2. The Biology Station at the Stones River Meeting Captured the Imagination of Many Attendees.***

## 6.3. ASSESSMENT OF NEEDS.

6.3.A. Point Sources. Point source contributions to stream impairment are primarily addressed by NPDES and ARAP permit requirements and compliance with the terms of the permits. Notices of NPDES and ARAP draft permits available for public comment can be viewed at http://www.state.tn.us/environment/wpc/wpcppo/index.html. Discharge monitoring data submitted by NPDES-permitted facilities may be viewed at http://www.epa.gov/enviro/html/pcs/pcs_query_java.html.

The purpose of the TMDL program is to identify remaining sources of pollution and allocate pollution control needs in places where water quality goals are still not being achieved. TMDL studies are tools that allow for a better understanding of load reductions necessary for impaired streams to return to compliance with water quality standards. More information about Tennessee's TMDL program may be found at:
http://www.state.tn.us/environment/wpc/tmdl.htm

TMDLs are prioritized for development based on many factors.

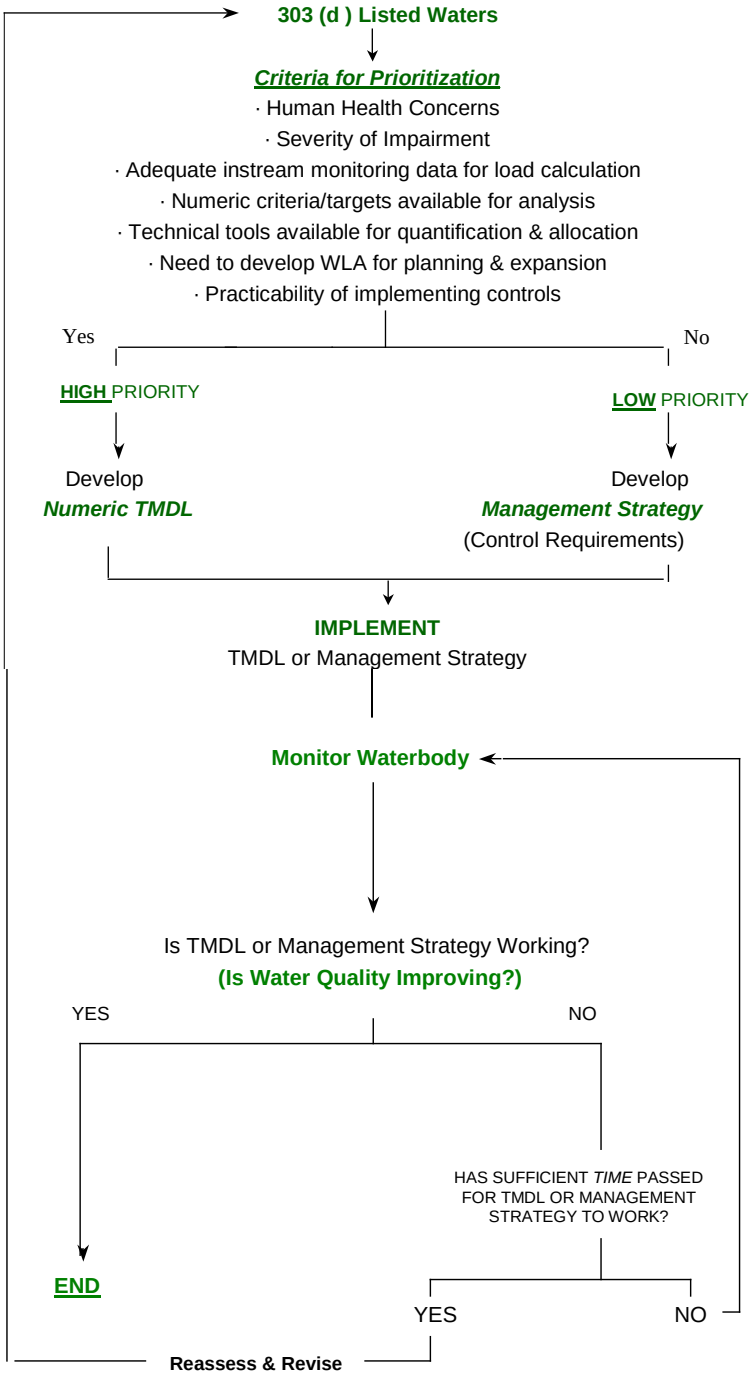



***Figure 6.3. Prioritization scheme for TMDL Development.***

6.3.B. Nonpoint Sources.

Common nonpoint sources of pollution include urban runoff, riparian vegetation removal, and inappropriate land development, agricultural, and road construction practices. Since nonpoint pollution exists essentially everywhere rain falls and drains to a stream, existing point source regulations can have only a limited effect, so other measures are necessary.

State and federal regulations can address some of the contaminants impacting the Stones River and much attention has been addressed to point sources (discharged through a pipe or ditch). However, since the vast majority of impacts to streams in the Stones River watershed are nonpoint, or diffuse, in nature, controls of point sources are often not sufficient to protect waters.

Some measures include voluntary efforts by landowners and volunteer groups, while others may involve new regulations. Many agencies, including the Tennessee Department of Agriculture and NRCS, offer financial assistance to landowners for corrective actions (like Best Management Practices) that may be sufficient for recovery of impacted streams. Many nonpoint problems will require an active civic involvement at the local level geared towards establishment of improved zoning guidelines, building codes, streamside buffer zones and greenways, and general landowner education.

The following text describes certain types of impairments, causes, suggested improvement measures, and control strategies. The suggested measures and streams are only examples and efforts should not be limited to only those streams and measures mentioned.

6.3.B.i. Sedimentation.

6.3.B.i.a. From Construction Sites. Construction activities have historically been considered "nonpoint sources." In the late 1980's, EPA designated them as being subject to NPDES regulation if more than 5 acres are disturbed. The general permit issued for such construction sites sets out conditions for maintenance of the sites to minimize pollution from stormwater including requirements for inspection of the controls. Also the general permit imposes more stringent inspection and self-monitoring requirements on sites in the watershed of streams that are impaired due to sedimentation.

Construction sites within a sediment-impaired watershed may also have higher priority for inspections by WPC personnel, and are likely to have substantial enforcement actions for failure to control erosion. Some sediment-impaired streams in the Stones River watershed are Olive Branch, Rock Spring Branch and Stewart Creek in the Smyrna area; West Fork Stones River, Lytle Creek, Dry Branch, and Bear Branch in the Murfreesboro area, and in the Fall Creek drainage around S.R. 840.

The same requirements applying to construction sites in sediment-impaired drainages also apply to those within the drainage of high quality waters. Carson Fork and the upper reach of the West Fork Stones River are examples of high quality streams in the Stones River watershed.

The state's construction stormwater permitting measures are currently required for all sites of 5 acres or more, but may also be required on a site-by-site basis for smaller sites where warranted. Regardless of the size, state regulations direct that no construction site be allowed to cause a condition of pollution.

Due to the explosive population growth within the Stones River Watershed during the last decade, sediment erosion and riparian destruction from construction activities have become main sources of stream impairment. The rapid pace and ephemeral nature of these activities have put a substantial strain on the ability of agencies to inspect and monitor these sites adequately. The establishment of local stormwater management agencies within larger urbanized areas in the next couple of years should aid in regulation and controlling runoff from construction activities. Rutherford County, and the cities of Murfreesboro, Smyrna, and LaVergne are currently slated to develop their own MS4 (Municipal Separate Storm Sewer System) programs. Part of the mandate for these MS4 programs will be to draft zoning and building codes designed to address sedimentation. In addition, new federal requirements will reduce the size of the sites subject to NPDES construction stormwater permitting to one acre. Regardless of the size, no construction site is allowed to cause a condition of pollution.

Additional non-regulatory strategies for controlling sediment runoff for residents to consider include the immediate re-vegetation of any bare area, including ditches beside driveways, and the covering of topsoil piles.

6.3.B.i.b. From Channel Alteration and Bank Erosion. Due to past bank and channel alterations and riparian vegetation removal, many streams within the Stones River Watershed have unstable and eroding banks. This erosion can release a surprising amount of sediment downstream. Several agencies are working to stabilize portions of stream banks. These include NRCS, TDOT, and TDA. Much of this work involves voluntary, cost-sharing projects with landowners. Some methods or controls that might be necessary to address common problems are:

*Voluntary activities*

- Re-establishment of bank vegetation. This is perhaps the most effective means of reducing not only bank erosion and sedimention, but also a variety of other impacts, including organic enrichment and aggravated flooding. Many impacted streams would benefit from the reestablishment of riparian vegetation, including Wades Branch, McKnight Branch, and the East Fork Stones River.
- Establish off-channel watering areas for cattle. Cattle activity can create very destabilized and denuded banks. Several current BMP methods exist for moving watering troughs and feeders back from stream banks, including solar powered pumps, or pond construction. An example of a stream that could benefit would be Cedar Creek. Where it is not possible to exclude cattle from a creek, effort should be made to limit cattle access to streams to a single point, using fencing or other methods.

*Additional strategies*

- Increased efforts in the Master Logger program to recognize impaired streams and require more effective erosion management and road-building practices in silviculture activities.
- Additional restrictions on logging in streamside management zones.

- Better community planning of development impacts on small streams, especially development in rapidly growing areas.
- Local restrictions requiring postconstruction runoff rates to be no greater than preconstruction rates in order to avoid in-channel erosion and downstream flooding.
- Restrictions on impervious surface densities in urbanized areas. Impervious surfaces (parking lots, roads, rooftops) increase runoff rates to streams, causing destabilization and erosion as well as increased pollutant transport.
- Better landowner education on the proper, low-impact methods for clearing of stream and ditch banks. *Note: Permits are currently required for any work along streams if water quality is altered.*
- Additional restrictions on multiple road and utility line crossings of streams. This should include the proper sizing and installation of culverts.
- Restrictions on the use of off-highway vehicles on stream banks and in stream channels.

6.3.B.ii. Pathogen Contamination.

Possible sources of pathogens are inadequate or failing septic tank systems, overflows or breaks in public sewer collection systems, poorly disinfected discharges from sewage treatment plants, and fecal matter in streams and storm drains due to pets, livestock and wildlife. Permits issued by the Division of Water Pollution Control regulate discharges from point sources, and these permits require adequate control for these sources. Individual homes are required to have subsurface, on-site treatment (i.e., septic tank and field lines) if public sewers are not available. Septic tank and field lines are regulated by TDEC's Division of Ground Water Protection and delegated county health departments. In addition to discharges to surface waters, businesses may employ either subsurface or surface disposal of wastewater. The Division of Water Pollution Control regulates surface disposal.

Other measures that may be necessary to control pathogens are:

*Voluntary activities*

- Off-channel watering of livestock or limiting livestock access to streams (see above).
- Proper management of animal waste from feeding operations.

*Enforcement strategies*

- Greater enforcement of regulations governing on-site wastewater treatment.
- Timely and appropriate enforcement for non-complying sewage treatment plants, large and small, and their collection systems.
- Identification of Concentrated Animal Feeding Operations not currently permitted, and enforcement of current regulations.

*Additional strategies*

- Restrict development in areas where sewer is not available to only those sites with appropriate soils.
- Develop and enforce leash laws and controls on pet fecal material in highly populated areas.

- Greater efforts by sewer utilities to identify leaking lines or overflowing manholes, and more frequent upgrades to reduce infiltration and inflow (examples: McCrory and Stoners Creek in Davidson County.)

6.3.B.iii. Excessive Nutrients and/or Dissolved Oxygen Depletion.

These two impacts are usually listed together because high nutrients often contribute to low dissolved oxygen within a stream. Since nutrients often have the same source as pathogens, the measures previously listed can also address many of these problems. Elevated nutrient loadings are also often associated with urban runoff from impervious surfaces and from fertilized lawns and croplands.

Other sources of nutrients can be addressed by:

*Voluntary activities*

- Encourage no-till farming, and the proper rate of fertilizer for the soil and crop.
- Educate homeowners and lawn care companies in the proper application of fertilizers.
- Encourage landowners, developers, and builders to leave stream buffer zones. Streamside vegetation can filter out many nutrients and other pollutants before they reach the stream. These riparian buffers are also vital along livestock pastures. Additional examples of streams that could benefit from buffers are Jarman Branch and streams in the Bradley Creek drainage.
- Use grassed drainageways that can remove fertilizer before it enters streams.
- Use native plants for landscaping since they don't require as much fertilizer and water.

Physical changes to streams can prevent them from providing enough oxygen to biodegrade the materials that are naturally present. A few additional actions can address this problem:

- Maintain shade over a stream. Cooler water can hold more oxygen and retard the growth of algae. Many streams in the Stones River watershed suffer from canopy removal.
- Discourage impoundments. Deepwater environments such as ponds and lakes do not aerate water, and often become eutrophic through nutrient buildup, encouraging algae growth. *Note: Permits are required for any work on a stream, including impoundments.*

## 6.3.B.iv. Toxins and Other Materials.

Many materials enter our streams due to apathy, or lack of civility or knowledge by the public. Litter in roadside ditches, garbage bags tossed over bridge railings, paint brushes washed off over storm drains, and oil drained into ditches are all blatant examples of pollution in streams. Some can be addressed by:

*Voluntary activities*

- Providing public education.
- Painting warnings on storm drains indicating a connection with a stream. (This would benefit urban streams like Stewart, Lytle, and West Fork Stones).
- Sponsoring community clean-up days.
- Landscaping of public areas and greenway development.
- Encouraging public surveillance of their streams and reporting of dumping activities to their local authorities.
- Public education concerning dumping into sinkholes, and their connection with groundwater contamination

*Needing regulation*

- Prohibition of illicit discharges to storm drains. (Local MS4 programs will help address this.)
- Litter laws and strong enforcement at the local level.

## 6.3.B.v. Habitat Alteration.

The alteration of the habitat within a stream can have severe consequences. Whether it is the removal of the vegetation providing a root system network for holding soil particles together, the release of sediment, which increases the bed load and covers benthic life and fish eggs, the removal of gravel bars, “cleaning out” creeks with heavy equipment, or the impounding of the water in ponds and lakes, many alterations impair the use of the stream for designated uses. Habitat alteration also includes the draining or filling of wetlands. Measures that can help address this problem include:

*Voluntary activities*

- Organizing stream cleanups removing trash, limbs and debris by hand or winch before they cause blockage.
- Avoiding use of heavy equipment to “clean out” streams.
- Planting vegetation along streams to stabilize banks and provide habitat.
- Encouraging developers to avoid extensive culverting or relocation of streams.

*Current regulations*

- Reduce or restrict modification of streams by such means as culverting, lining, or impounding. (McCrory Creek would benefit.)
- Require mitigation for impacts to streams and wetlands when modifications are allowed.

*Additional Enforcement or Restrictions*

- Increased enforcement may be needed when violations of current regulations occur.
- More restrictive alteration regulations to discourage extensive relocations, impoundment of headwater streams, culverting, ripraping of banks, and removal of riparian vegetation.

# APPENDIX II

| ID | NAME | HAZARD |
|---|---|---|
| 87003 | HURST LAKE DAM | O |
| 197014 | LESTER'S LK | 3 |
| 197028 | MCCRORY CREEK #1 | 3 |
| 757001 | TODD'S LK | B |
| 757002 | FARMER | L |
| 757003 | MATHEWS | L |
| 757004 | TODD'S LK #2 | B |
| 757005 | BROWNS MILL | 3 |
| 757006 | WALTER HILL LK | 3 |
| 757007 | NISSAN DETENTION POND | 3 |
| 757010 | CLARK DAM | L |
| 957001 | HIDDEN COVE | B |

***Table A2-1. Inventoried Dams in the Stones River Watershed.*** *Hazard Codes: F, Federal; High (H, 1); Significant, (S, 2); Low, (L, 3); Breached, (B); O, Too Small. TDEC only regulates dams indicated by a numeric hazard score.*

| LAND COVER/LAND USE | SQUARE MILES | % OF WATERSHED |
|---|---|---|
| Open Water | 25.5 | 2.7 |
| Forested Wet | 1.8 | 0.2 |
| Nonforested | 1.5 | 0.2 |
| Pasture | 443.3 | 47.3 |
| Crop Land | 21.0 | 2.2 |
| Scrub Shrub | 0.0 | 0.0 |
| Deciduous Forest | 243.7 | 26.0 |
| Mixed Forest | 119.5 | 12.8 |
| Coniferous Forest | 45.7 | 4.6 |
| Urban | 37.6 | 4.0 |
| Barren Land | 0.0 | 0.0 |
| Strip Mines | 0.0 | 0.0 |
| Cloud/Shadow | 0.0 | 0.0 |
| Forested Dead Wetland | 0.0 | 0.0 |
| Total | 939.3 | 100 |

***Table A2-2. Land Use Distribution in Stones River Watershed.*** *Data are from Multi-Resolution Land Characterization (MRLC) derived by applying a generalized Anderson level II system to mosaics of Landsat thematic mapper images collected every five years.*

| ECOREGION | REFERENCE STREAM | WATERSHED (HUC) | |
|---|---|---|---|
| Eastern Highland Rim (71g) | Flat Fork | Emory | (06010208) |
| | Hurricane Creek | Upper Elk | (06030003) |
| | Carson Fork | Stones | (05130203) |
| Outer Nashville Basin (71h) | Carson Fork | Stones | (05130203) |
| | Clear Fork | Caney Fork | (05130108) |
| | Flynn Creek | Cordell Hull | (05130106) |
| | Indian Creek | Caney Fork | (05130108) |
| | West Fork Mulberry Creek | Upper Elk | (06030003) |
| Inner Nashville Basin (71i) | Flat Creek | Upper Duck | (06040002) |
| | Sinking Creek | Upper Duck | (06040002) |
| | Spring Creek | Upper Duck | (06040002) |
| | Stewart Creek | Stones | (05130203) |
| | West Fork Stones River | Stones | (05130203) |

***Table A2-3. Ecoregion Monitoring Sites in Level IV Ecoregions 71g, 71h, and 71i.***

| CODE | NAME | AGENCY | AGENCY ID |
|---|---|---|---|
| 6 | TDEC/DNH OAKLANDS SPRING WETLANDS SITE | TDEC/DNH | S.USTNHP 795 |
| 35 | TDEC/DNH HALL FARM GLADES SITE | TDEC/DNH | S.USSERO1 660 |
| 49 | TDEC/DNH BRYANT GROVE GLADE SITE | TDEC/DNH | S.USTNHP 240 |
| 80 | TDEC/DNH RADIO TOWER MARSH SITE | TDEC/DNH | S.USTNHP 144 |
| 81 | TDEC/DNH BLACK FOX CAMP SPRING SITE | TDEC/DNH | S.USTNHP 644 |
| 199 | USACOE-N CLIENT SITE | USACOE-N | |
| 463 | TDEC/WPC UNNAMED TRIB PERMIT/MITIGATION SITE | TDEC/WPC | |
| 1896 | TWRA LYTLE CREEK-BLACK FOX SWAMP SITE | TWRA | |
| 2266 | TWRA BLACK FOX SWAMP SITE | TWRA | |
| 2267 | TWRA BLACK FOX SWAMP SITE | TWRA | |
| 2268 | TWRA TODDS LAKE SITE | TWRA | |
| 2361 | TWRA MURFREE SPRING SITE | TWRA | |
| 2362 | TWRA MURFREE SPRING SITE | TWRA | |
| 2608 | TDOT SR 1 SITE | TDOT | |
| 2680 | NRCS SITE | NRCS | |
| 2723 | USACOE FOX CAMP SPRING SITE | USACOE-N | 960048508 |
| 2732 | USACOE ZIMMERMAN FAMILY PARTNERSHIP SITE | USACOE-N | 960047775 |
| 2740 | TDEC/WPC SAMSONITE BOULEVARD SITE | TDEC-WPC | |

***Table A2-4. Wetland Sites in Stones River Watershed in TDEC Database.*** *TDEC, Tennessee Department of Environment and Conservation; USACOE-N, United States Army Corps of Engineers-Nashville District; WPC, Water Pollution Control; TDOT, Tennessee Department of Transportation' NRCS, Natural Resources Conservation Service; TWRA, Tennessee Wildlife Resources Agency; DNH, Division of Natural Heritage.*

# APPENDIX III

| STREAM | LOCATION | COUNTY |
|---|---|---|
| | | |
| Alexander Creek | ¼ mi u/s Pepper Hill Road | Bedford |
| Cedar Creek | 50 yd u/s Old Railroad Road | Wilson |
| Bear Creek | 100 yd u/s Osborne Road | Rutherfoird |
| Big Rock Creek | 100 yd d/s unnamed road @ Verona | Marshall |
| Cedar Creek | Off Cedar Creek Road | Maury |
| Cedar Creek | Off Centerville Road | Wilson |
| Fall Creek | Off Simmons Bluff Road | Wilson |
| Christmas Creek | 500 yd d/s Crescent Road | Rutherford |
| Cripple Creek | 150 yd d/s Cranor Road | Rutherford |
| Crooked Creek | 200 yd u/s Tom Lunn Road | Maury |
| Davis Creek | 300 yd u/s Richmond Pike | Bedford |
| EF Stones River | 400 yd u/s Guy James Road | Rutherford |
| East Rock Creek | 100 yd d/s Pickle Road | Bedford |
| Fall Creek | 100 yd d/s Gregory Mill Road | Bedford |
| Fall Creek | 100 yd u/s Mona Road | Rutherford |
| Florida Creek | 100 yd u/s Cainsville Road | Wilson |
| Johnson Creek | 450 yd u/s Big Springs Road | Wilson |
| Bartons Creek | 50 yd d/s Medlin Road | Wilson |
| Hurricane Creek | 200 yd u/s Midland Road | Bedford |
| Hurricane Creek | Off Cobbs Rd 1/3 mi east of Hwy 41 | Rutherford |
| Little Creek | 150 yd d/s Mays Chapel Road | Wilson |
| Little Flat Creek | 200 yd u/s Will Brown Road | Maury |
| Lytle Creek | 60 yd d/s foot bridge @ Old Fort Park | Rutherford |
| McKnight Branch | 600 yd east of Trimble Road | Rutherford |
| Mill Creek | 300 yd u/s Concord Road | Davidson |
| Mill Creek | 300 yd u/s Antioch Pike | Davidson |
| North Fork Creek | ¼ mi d/s Squire Hall Road | Bedford |
| Overall Creek | ¼ mi d/s Mooreland Lane | Rutherford |
| Sinking Creek | 150 yd u/s Wheel Road | Bedford |
| Sinking Creek | 200 yd u/s Gant Road | Bedford |
| Spencer Creek | 75 yd d/s Northern Road | Wilson |
| Spring Creek | 100 yd u/s Chicken Road | Wilson |
| Spring Creek | 200 yd u/s Hwy 141 | Wilson |
| Spring Creek | 75 yd d/s Belotes Ferry Road | Wilson |
| Suggs Creek | 50 yd u/s Mount Juliet Road | Wilson |
| Thick Creek | 100 yd u/s Pyles Road | Marshall |
| WF Stones River | 100 yd u/s closed ford off Barfield Road | Rutherford |
| Weakley Creek | 150 yd u/s Coopertown Road | Bedford |
| Fall Creek | 100 yd u/s Mona Road | Rutherford |
| Wilson Creek | 100 yd u/s Chapel Hill/Unionville Road | Bedford |
| Clem Creek | 200 yd d/s Old Pencil Mill Road | Bedford |
| Little Sinking Creek | 100 yd d/s Simms Road | Bedford |
| North Fork Creek | 100 yd u/s Hwy 41A | Bedford |
| Rich Creek | 50 yd u/s Coble Road | Marshall |
| Bradley Creek | 80 yd d/s Rhodes Lane | Rutherford |
| Henry Creek | ¼ mi u/s Christiana Road | Rutherford |

| | | |
|---|---|---|
| Stewart Creek | 300 yd u/s Burnt Knob Road | Rutherford |
| Harpeth River | 125 yd d/s McDaniel Road | Williamson |
| Wallace Creek | 200 yd u/s Flat Creek Road | Williamson |
| Sinking Creek | Off Piedmont Road | Wilson |

***Table A3-1. Probabilistic Monitoring Sites in Subecoregion 71i****. d/s, downstream; u/s, upstream.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Andrews Creek | TN05130203026_0300 | 7.3 |
| Bradley Creek | TN05130203029_1000 | 29.0 |
| Brawleys Fork | TN05130203027_1000 | 29.8 |
| Bushman Creek | TN05130203023_0200 | 5.9 |
| Carson Fork | TN05130203027_0100 | 28.9 |
| Cavender Branch | TN05130203026_0700 | 5.5 |
| Cripple Creek | TN05130203025_1000 | 7.7 |
| Cripple Creek | TN05130203025_2000 | 15.3 |
| Doolittle Creek | TN05130203026_0600 | 9.1 |
| Dry Fork | TN05130203029_0400 | 16.5 |
| Dry Fork Creek | TN05130203018_0300 | 19.7 |
| Dry Fork Creek | TN05130203035_0300 | 5.0 |
| East Fork Stones River | TN05130203023_1000 | 19.7 |
| East Fork Stones River | TN05130203026_1000 | 19.7 |
| East Fork Stones River | TN05130203026_2000 | 6.5 |
| Fall Creek | TN05130203032_1000 | 30.7 |
| Florida Creek | TN05130203032_0500 | 18.3 |
| Haws Spring Fork | TN05130203027_0110 | 16.4 |
| Hill Creek | TN05130203026_1200 | 15.9 |
| Hollis Creek | TN05130203026_1300 | 12.4 |
| Hurricane Creek | TN05130203021_0100 | 18.1 |
| Jug Creek | TN05130203032_0400 | 6.2 |
| Locke Creek | TN05130203026_0400 | 8.3 |
| Long Creek | TN05130203021_0300 | 22.3 |
| Lytle Creek | TN05130203018_0200 | 19.0 |
| McElroy Branch | TN05130203025_0210 | 5.0 |
| Middle Fork Stones River | TN05130203021_1000 | 18.8 |
| North Creek | TN05130203230_0100 | 2.1 |
| North Fork Suggs | TN05130203232_0100 | 9.2 |
| Overall Creek | TN05130203015_1000 | 16.7 |
| Panther Creek | TN05130203018_0400 | 10.5 |
| Parchcorn Hollow Branch | TN05130203026_1100 | 7.6 |
| Puckett Creek | TN05130203015_0100 | 6.7 |
| Reed Creek | TN05130203025_0100 | 6.8 |
| Rockhouse Branch | TN05130203026_0800 | 11.8 |
| Rocky Fork Creek | TN05130203010_0100 | 7.4 |
| Rush Creek | TN05130203026_0500 | 7.1 |
| Scotts Creek | TN05130203035_0100 | 4.7 |
| Shelton Branch | TN05130203027_0200 | 4.5 |
| Shonborne Branch | TN05130203026_0900 | 2.7 |
| Stewarts Creek | TN05130203010_2000 | 7.1 |
| Stoners Creek | TN05130203035_2000 | 12.6 |
| Unnamed trib to Stoners Creek | TN05130203035_0200 | 2.4 |
| West Fork Stones River | TN05130203018_2000 | 5.1 |
| West Fork Stones River | TN05130203018_3000 | 21.8 |
| Wright Branch | TN05130203230_1000 | 3.6 |

***Table A3-2a. Streams Fully Supporting Designated Uses in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Cedar Creek | TN05130203032_0200 | 1.7 |
| Dry Branch | TN05130203023_0300 | 1.6 |
| East Branch Hurricane Creek | TN05130203036_0100 | 7.3 |
| East Fork Stones River | TN05130203026_3000 | 11.1 |
| Hurricane Creek | TN05130203036_1000 | 8.5 |
| Jarman Branch | TN05130203029_0100 | 4.4 |
| Lytle Creek | TN05130203022_2000 | 10.1 |
| McCrory Creek | TN05130203001_0100 | 12.1 |
| McKnight Branch | TN05130203026_0200 | 18.8 |
| Olive Branch | TN05130203010_0200 | 8.1 |
| Rock Spring Branch | TN05130203010_0300 | 10.8 |
| Stewarts Creek | TN05130203010_1000 | 16.9 |
| Stoners Creek | TN05130203035_1000 | 1.9 |
| Stones River | TN05130203001_1000 | 6.7 |
| Suggs Creek | TN05130203232_1000 | 18.1 |
| Unnamed trib to Lytle Creek | TN05130203022_0100 | 1.0 |
| Unnamed trib to Stoners Creek | TN05130203035_0400 | 1.4 |
| Wades Branch | TN05130203023_0100 | 7.2 |

***Table A3-2b. Streams Partially Supporting Designated Uses in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Armstrong Branch | TN05130203015_0110 | 5.3 |
| Bear Branch | TN05130203023_0310 | 3.5 |
| East Fork Hamilton Creek | TN05130203539_1000 | 6.0 |
| Lees Spring Branch | TN05130203022_0200 | 1.0 |
| Lytle Creek | TN05130203022_1000 | 9.0 |
| Unnamed Trib to Bradley Creek | TN05130203029_0200 | 2.7 |
| Unnamed trib to Fall Creek | TN05130203032_0100 | 3.0 |
| Upper Wades Branch | TN05130203023_0110 | 3.9 |
| West Fork Hamilton Creek | TN05130203539_0100 | 1.8 |
| West Fork Stones River | TN05130203018_1000 | 7.6 |

***Table A3-2c. Streams Not Supporting Designated Uses in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Buzzard Branch | TN05130203021_0200 | 3.6 |
| Dry Branch | TN05130203025_0300 | 5.3 |
| Dry Fork Creek | TN05130203032_0600 | 9.9 |
| Hurricane Creek | TN05130203033_1000 | 24.4 |
| Misc tribs to East Fork Stones River | TN05130203026_0999 | 35.7 |
| Misc tribs to Middle Fork Stones River | TN05130203021_0999 | 35.9 |
| Misc tribs to Stoners Creek | TN05130203035_0999 | 7.9 |
| Misc. tribs to East Fork Stones River | TN05130203023_0999 | 14.1 |
| Misc. tribs to Overall Creek | TN05130203015_0999 | 9.8 |
| Misc. tribs to Percy Priest | TN05130203003T_1000 | 24.6 |
| Misc. tribs to Stewarts Creek | TN05130203010_0999 | 19.3 |
| Misc. tribs. To West Fork Stones River | TN05130203018_0999 | 21.1 |
| Murray Branch | TN05130203025_0200 | 12.6 |
| Sinking Creek | TN05130203018_0100 | 5.5 |
| Sinking Creek | TN05130203033_0100 | 27.4 |
| Trimble Creek | TN05130203026_0100 | 5.6 |
| Unnamed trib to Bradley Creek | TN05130203029_0300 | 1.7 |
| Unnamed trib to Fall Creek | TN05130203032_0300 | 2.4 |
| Unnamed trib to Bradley Creek | TN05130203029_0310 | 1.8 |
| West Branch Hurricane Creek | TN05130203036_0200 | 3.5 |

***Table A3-2d. Streams Not Assessed in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (ACRES) |
|---|---|---|
| Percy Priest Reservoir | TN05130203003_1000 | 22,691 |

***Table A3-2e. Lakes Fully Supporting Designated Uses in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SIZE (MILES) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Bear Branch | TN05130203023_0310 | 3.5 | Not supporting |
| Cedar Creek | TN05130203032_0200 | 1.7 | Partial |
| East Branch Hurricane Ck | TN05130203036_0100 | 7.3 | Partial |
| East Fork Hamilton Creek | TN05130203539_1000 | 6.0 | Not supporting |
| East Fork Stones River | TN05130203026_3000 | 11.1 | Partial |
| Jarman Branch | TN05130203029_0100 | 4.4 | Partial |
| Lees Spring Branch | TN05130203022_0200 | 1.0 | Not supporting |
| Lytle Creek | TN05130203022_1000 | 9.0 | Not supporting |
| Lytle Creek | TN05130203022_2000 | 10.1 | Partial |
| McCrory Creek | TN05130203001_0100 | 12.1 | Partial |
| McKnight Branch | TN05130203026_0200 | 18.8 | Partial |
| Olive Branch | TN05130203010_0200 | 8.1 | Partial |
| Rock Spring Branch | TN05130203010_0300 | 10.8 | Partial |
| Stewarts Creek | TN05130203010_1000 | 16.9 | Partial |
| Unnamed Trib to Bradley Ck | TN05130203029_0200 | 2.7 | Not supporting |
| Unnamed trib to Fall Creek | TN05130203032_0100 | 3.0 | Not supporting |
| Upper Wades Branch | TN05130203023_0110 | 3.9 | Not supporting |
| Wades Branch | TN05130203023_0100 | 7.2 | Partial |
| West Fork Hamilton Creek | TN05130203539_0100 | 1.8 | Not supporting |

***Table A3-3a. Stream Impairment Due to Habitat Alterations in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SIZE (MILES) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Armstrong Branch | TN05130203015_0110 | 5.3 | Not supporting |
| East Fork Hamilton Creek | TN05130203539_1000 | 6.0 | Not supporting |
| Hurricane Creek | TN05130203036_1000 | 8.5 | Partial |
| Jarman Branch | TN05130203029_0100 | 4.4 | Partial |
| Stones River | TN05130203001_1000 | 6.7 | Partial |
| Unnamed Trib to Bradley Creek | TN05130203029_0200 | 2.7 | Not supporting |
| Unnamed trib to Lytle Creek | TN05130203022_0100 | 1.0 | Partial |
| West Fork Stones River | TN05130203018_1000 | 7.6 | Not supporting |

***Table A3-3b. Stream Impairment Due to Organic Enrichment/ Low Dissolved Oxygen Levels in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SIZE (MILES) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Suggs Creek | TN05130203232_1000 | 18.1 | Partial |
| McCrory Creek | TN05130203001_0100 | 12.1 | Partial |
| East Fork Hamilton Creek | TN05130203539_1000 | 6.0 | Not supporting |
| Stones River | TN05130203001_1000 | 6.7 | Partial |
| Unnamed trib to Lytle Creek | TN05130203022_0100 | 1.0 | Partial |

***Table A3-3c. Stream Impairment Due to Pathogens in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SIZE (MILES) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Arkansas Creek | TN05130204010_0600 | 5.7 | Partial |
| Arrington Creek | TN05130204016_0500 | 24.6 | Partial |
| Barren Fork | TN05130204006_0500 | 10.6 | Partial |
| Bedford Creek | TN05130204010_0500 | 5.0 | Partial |
| Beech Creek | TN05130204021_0200 | 7.7 | Partial |
| Cayce Branch | TN05130204013_0320 | 5.9 | Partial |
| Cheatham Branch | TN05130204018_0400 | 3.4 | Partial |
| Concord Creek | TN05130204018_0200 | 15.1 | Not supporting |
| Dog Creek | TN05130204001_0500 | 3.8 | Not supporting |
| Donelson Creek | TN05130204016_1100 | 3.4 | Not supporting |
| Fivemile Creek | TN05130204016_0900 | 14.4 | Partial |
| Goslin Branch | TN05130204006_0700 | 4.3 | Partial |
| Gum Branch | TN05130204006_0930 | 2.7 | Partial |
| Harpeth River | TN05130204018_2000 | 7.4 | Not supporting |
| Harpeth River | TN05130204016_3000 | 7.5 | Partial |
| Harpeth River | TN05130204016_2000 | 9.0 | Partial |
| Jones Creek | TN05130204002_2000 | 15.1 | Partial |
| Jordan Hollow Creek | TN05130204006_0920 | 2.4 | Partial |
| Kelley Creek | TN05130204018_0300 | 9.3 | Not supporting |
| Little Harpeth River | TN05130204021_1000 | 4.1 | Partial |
| Lynwood Creek | TN05130204016_0100 | 5.4 | Partial |
| Murray Branch | TN05130204009_0600 | 3.6 | Partial |
| Nails Creek | TN05130204006_0800 | 7.6 | Partial |
| Newsom Branch | TN05130204009_0200 | 1.7 | Partial |
| Otter Creek | TN05130204021_0100 | 4.6 | Partial |
| Parker Creek | TN05130204006_0600 | 4.1 | Partial |
| Polk Creek | TN05130204013_0100 | 8.8 | Partial |
| Rials Branch | TN05130204006_0510 | 1.9 | Partial |
| Spencer Creek | TN05130204016_0200 | 19.9 | Partial |
| Spicer Branch | TN05130204002_0300 | 4.6 | Not supporting |
| Starnes Creek | TN05130204016_0700 | 10.0 | Partial |
| Tidwell Branch | TN05130204006_0300 | 1.1 | Partial |
| Unnamed trib to Harpeth River | TN05130204009_0800 | 2.1 | Not supporting |
| Unnamed trib to Jones Creek | TN05130204002_0400 | 0.5 | Not supporting |
| Watson Branch | TN05130204016_0300 | 6.8 | Partial |
| West Harpeth River | TN05130204013_1000 | 13.4 | Partial |

***Table A3-3d. Stream Impairment Due to Siltation in Stones River Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

# APPENDIX IV

| LAND USE/LAND COVER | AREAS IN HUC-11 SUBWATERSHEDS (SQ MILES) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 010 | 020 | 030 | 040 | 050 | 060 | 070 |
| Deciduous Forest | 40.88 | 32.50 | 12.42 | 21.27 | 31.07 | 19.20 | 23.07 |
| Evergreen Forest | 2.57 | 2.84 | 4.32 | 3.85 | 7.49 | 2.64 | 3.45 |
| High Intensity: Commercial/Industrial/Transportation | 0.30 | 0.15 | 0.12 | 0.12 | 1.09 | 0.17 | 0.89 |
| High Intensity: Residential | 0.11 | | | 0.00 | 0.30 | 0.01 | 0.08 |
| Low Intensity: Residential | 0.55 | 0.18 | 0.06 | 0.30 | 1.73 | 0.40 | 0.41 |
| Mixed Forest | 7.73 | 6.70 | 8.10 | 9.82 | 17.80 | 7.83 | 8.59 |
| Open Water | 0.02 | 0.01 | 0.01 | 0.01 | 0.40 | 0.04 | 0.10 |
| Other Grasses: Urban/Recreational | 0.29 | 0.03 | 0.01 | 0.06 | 1.47 | 0.20 | 0.72 |
| Pasture/Hay | 12.28 | 7.69 | 9.33 | 9.27 | 33.37 | 15.36 | 15.81 |
| Row Crops | 0.83 | 2.29 | 4.67 | 3.87 | 15.39 | 10.67 | 11.33 |
| Transitional | 0.05 | 0.04 | | 0.11 | 0.38 | 0.05 | 0.02 |
| Woody Wetlands | 0.00 | 0.00 | 0.10 | 0.00 | 1.29 | 2.69 | 2.51 |
| Emergent Herbaceous Wetlands | | | | | 0.14 | 0.15 | 0.20 |
| Quarries/Strip Mines | | | | | | | |
| **Total** | **65.60** | **52.72** | **39.13** | **48.68** | **111.92** | **59.38** | **67.20** |

| LAND USE/LAND COVER | AREAS IN HUC-11 SUBWATERSHEDS (SQ MILES) | | | | | |
|---|---|---|---|---|---|---|
| | 080 | 090 | 100 | 110 | 120 | 130 |
| Deciduous Forest | 37.31 | 42.88 | 23.15 | | 6.67 | 6.03 |
| Evergreen Forest | 4.21 | 1.31 | 3.35 | | 1.27 | 1.85 |
| High Intensity: Commercial/Industrial/Transportation | 3.26 | 0.30 | 0.90 | | 0.07 | 1.00 |
| High Intensity: Residential | 2.11 | 0.01 | 0.86 | | 0.00 | 0.74 |
| Low Intensity: Residential | 6.90 | 0.62 | 2.62 | | 0.39 | 4.82 |
| Mixed Forest | 13.19 | 26.31 | 10.81 | | 3.70 | 6.95 |
| Open Water | 0.63 | 0.06 | 0.04 | | 0.01 | 0.03 |
| Other Grasses: Urban/Recreational | 3.21 | 0.35 | 1.36 | | 0.46 | 1.79 |
| Pasture/Hay | 35.18 | 22.26 | 12.99 | | 4.91 | 4.14 |
| Row Crops | 21.01 | 13.24 | 5.18 | | 3.25 | 2.16 |
| Transitional | 0.04 | 0.09 | 0.01 | | | 0.02 |
| Woody Wetlands | 3.31 | 0.23 | | | | |
| Emergent Herbaceous Wetlands | 0.44 | | | | | |
| Quarries/Strip Mines | | 0.02 | | | | 0.31 |
| **Total** | **130.81** | **119.44** | **61.28** | | **20.75** | **29.84** |

***Table A4-1. Land Use Distribution in Stones River Watershed by HUC-11.*** *Data are from 1992 Multi-Resolution Land Characterization (MRLC) derived by applying a generalized Anderson Level II system to mosaics of Landsat thematic mapper images collected every five years.*

| HYDROLOGIC SOIL GROUPS |
| --- |
| **GROUP A SOILS** have low runoff potential and high infiltration rates even when wet. They consist chiefly of sand and gravel and are well to excessively drained.<br><br>**GROUP B SOILS** have moderate infiltration rates when wet and consist chiefly of soils that are moderately deep to deep, moderately to well drained, and moderately coarse to coarse textures.<br><br>**GROUP C SOILS** have low infiltration rates when wet and consist chiefly of soils having a layer that impedes downward movement of water with moderately fine to fine texture.<br><br>**GROUP D SOILS** have high runoff potential, very low infiltration rates, and consist chiefly of clay soils. |

***Table A4-2. Hydrologic Soil Groups in Tennessee as Described in WCS.***

| STATION | HUC-11 | NAME | AREA (SQ MILES) | PERIOD OF OBSERVATIONS | FLOW (CFS) | | |
|---|---|---|---|---|---|---|---|
| | | | | | Min | Max | Mean |
| 03426800 | 05130203010 | East Fork Stones River | 39.1 | 10/01/62-10/09/89 | 3.0 | 3,900.0 | 67.0 |
| 03427500 | 05130203050 | East Fork Stones River | 262.0 | 02/01/51-09/30/91 | 0.0 | 34,900.0 | 458.0 |
| 03427000 | 05130203050 | Bradley Creek at Lascassas | 37.0 | 10/01/54-09/30/61 | 0.0 | 3,660.0 | 62.0 |
| 03428200 | 05130203080 | West Fork Stones River | 177.0 | 07/20/72-09/30/94 | 5.0 | 21,200.0 | 318.0 |
| 03428000 | 05130203080 | West Fork Stones River | 128.0 | 10/01/31-10/07/69 | 0.0 | 16,100.0 | 205.0 |
| 03428500 | 05130203080 | West Fork Stones River | 237.0 | 10/01/65-09/30/91 | 0.0 | 43,900.0 | 439.0 |
| 03428070 | 05130203080 | West Fork Stones River | 165.0 | 07/11/73-10/08/81 | 0.0 | 19,400.0 | 266.0 |
| 03430100 | 05130203110 | Stones River Below Percy Priest Dam | 892.0 | 02/01/39-09/30/67 | 8.0 | 60,200.0 | 1,68.0 |
| 03429500 | 05130203110 | Stewart Creek | 69.7 | 10/01/52-09/30/58 | 0.0 | 4,340.0 | 107.0 |
| 03429000 | 05130203110 | Stones River | 571.0 | 08/01/25-09/30/67 | 1.0 | 46,100.0 | 933.0 |

***Table A4-3. Historical USGS Streamflow Data Summary Based on Mean Daily Flows in Stones River Watershed.*** *Min, absolute minimum flow for period of record.*

| PARAMETER ID | PARAMETER NAME |
|---|---|
| 00010 | Water Temperature (Degrees Centigrade) |
| 00061 | Flow, Stream, Instantaneous (cfs) |
| 00080 | Color (Platinum-Cobalt Units) |
| 00094 | Specific Conductance, Field (μmhos/cm @ 25° C) |
| 00095 | Specific Conductance, Field (μmhos/cm @ 25° C) |
| 00300 | Oxygen Dissolved (mg/L) |
| 00310 | BOD 5 Day @ 20° C (mg/L) |
| 00335 | COD in .025 N $K_2Cr_2O_7$ (mg/L) |
| 00400 | pH (Standard Units) |
| 00410 | Alkalinity, Total (mg/L as $CaCO_3$) |
| 00515 | Residue, Total Filtrable (mg/L) |
| 00530 | Residue, Total Nonfiltrable (mg/L) |
| 00610 | Nitrogen Ammonia Total (mg/L as N) |
| 00619 | Ammonia, Unionized (Calculated From Temp-pH-$NH_4$; mg/L) |
| 00620 | Nitrate Nitrogen, Total (mg/L as N) |
| 00630 | Nitrite Plus Nitrate, Total (1 Determination mg/L as N) |
| 00665 | Phosphorus, Total (mg/L as P) |
| 00900 | Hardness, Total (mg/L as $CaCO_3$) |
| 00940 | Chloride, Total In Water (mg/L) |
| 00945 | Sulfate, Total (mg/L as $SO_4$) |
| 01002 | Arsenic, Total (μg/L as As) |
| 01027 | Cadmium, Total (μg/L as Cd) |
| 01034 | Chromium, Total (μg/L as Cr) |
| 01042 | Copper, Total (μg/L as Cu) |
| 01045 | Iron, Total (μg/L as Fe) |
| 01051 | Lead, Total (μg/L as Pb) |
| 01067 | Nickel, Total (μg/L as Ni) |
| 01077 | Silver Total (μg/L as Ag) |
| 01092 | Zinc, Total (μg/L as Zn) |
| 01105 | Aluminum, Total (μl as Al) |
| 31616 | Fecal Coliform (Membrane Filter, M-FC Broth at 44.5° C) |
| 71900 | Mercury, Total (μg/L as Hg) |

***Table A4-4a. Water Quality Parameters and Codes.***

| PARAMETER ID | SUBWATERSHED | | | | | |
|---|---|---|---|---|---|---|
| | 020 | 050 | 060 | 080 | 100 | 130 |
| 00010 | a | b | c | d,e,f,g,h,i,j,k,l,o,m,n | p,q | r,s |
| 00061 | a | b | c | d,o | q | s |
| 00080 | a | | c | | q | |
| 00094 | a | | c | e,f,g,h,ij,k,l,m,n | p,q | r |
| 00095 | | b | | d,o | | r,s |
| 00300 | a | | c | e,f,g,h,i,j,k,l,m,n | p,q | r |
| 00310 | | | | m | p | r |
| 00335 | | | | n | | r |
| 00400 | a | | c | m,n | p,q | r |
| 00410 | a | | c | e,f,g,h,i,j,k | q | |
| 00515 | a | | c | n | q | r |
| 00530 | a | | c | m,n | p,q | r |
| 00610 | a | | c | e,f,g,h,i,j,k,l,m,n | p,q | r |
| 00619 | a | | c | e,f,g,h,i,j,k,l,m,n | p,q | r |
| 00620 | | | | e,f,g,h,i,j,k,l | | |
| 00630 | a | | c | n | p,q | r |
| 00665 | a | | c | n | p,q | r |
| 00900 | a | | c | e,f,g,h,i,j,k,l,m,n | p,q | r |
| 00940 | a | | c | e,f,g,h,i,j,k,l | q | |
| 00945 | a | | c | | p,q | |
| 01002 | a | | c | n | q | r |
| 01027 | a | | c | m,n | p,q | r |
| 01034 | a | | c | m,n | p,q | r |
| 01042 | a | | c | m,n | p,q | r |
| 01045 | a | | c | | p,q | |
| 01051 | a | | c | m,n | p,q | r |
| 01067 | a | | c | m,n | p,q | r |
| 01077 | | | | m | p | |
| 01092 | a | | c | m,n | p,q | r |
| 01105 | | | | | p | |
| 31616 | a | | c | n | p,q | r |
| 71900 | a | | c | m,n | p,q | r |

***Table A4-4b. Water Quality Parameters Monitored in the Stones River Watershed.***

| CODE | STATION | ALIAS | AGENCY | LOCATION |
|---|---|---|---|---|
| a | ECO71h09 | | TDEC | Carson Fork @RM 5.4 |
| b | 03427500 | | USGS | East Fork Stones River near Lascassas |
| c | ECO71i09 | | TDEC | West Fork Stones River @ RM 32.3 |
| d | 03428200 | | USGS | West Fork Stones River @ Murfreesboro |
| e | STRI_MTSU_LC1 | | NPS | Lytle Creek @ Dilton Mankin Road |
| f | STRI_MTSU_LC2 | | NPS | Lytle Creek @ Highway 41 Bridge |
| g | STRI_MTSU_LC3 | | NPS | Lytle Creek @ Rutherford Boulevard Bridge |
| h | STRI_MTSU_LC4 | | NPS | Lytle Creek @ the Coop |
| i | STRI_MTSU_LC5 | | NPS | Lytle Creek @ the Post Office |
| j | STRI_MTSU_LC6 | | NPS | Lytle Creek @ Cannonsburgh |
| k | STRI_MTSU_LC7 | | NPS | Lytle Creek @ the Brickyard |
| l | STRI_MTSU_LC8 | | NPS | Lytle Creek @ Rosencrans Central |
| m | WFKSTONES010.5 | WFSTO010.5RU | TDEC | 0.5 mi Upstream of Murfreesboro STP |
| n | 003046 | WFSTO006.2RU | TDEC | West Fork Stones River @ RM 6.2 |
| o | 03428500 | | USGS | West Fork Stones River near Smyrna |
| p | STEWARTS005.65 | STEWA005.6RU | TDEC | 80 feet upstream of Smyrna STP |
| q | ECO71i03 | | TDEC | Stewart Creek @ RM 16.7 |
| r | 002862 | STONE003.9DA | TDEC | Stones River at Highway 70 Bridge |
| s | 03430147 | | TDEC | Stoners Creek near Hermitage |

***Table A4-4c. Water Quality Monitoring Stations in Stones River Watershed. TDEC, Tennessee Department of Environment and Conservation; USGS, United States Geological Survey; NPS, National Park Service.***

| FACILITY NUMBER | FACILITY NAME | SIC | SIC NAME | MADI | WATERBODY | HUC-11 |
|---|---|---|---|---|---|---|
| TN0025089 | Woodbury STP | 4952 | Sewerage Systems | Minor | East Fork Stones River @ RM 45.2 | 05130203010 |
| TN0067253 | Kittrell ES | 4952 | Sewerage Systems | Minor | Cripple Creek @ RM 5.2 | 05130203040 |
| TN0067245 | Lascassas ES | 4952 | Sewerage Systems | Minor | Bradley Creek | 05130203050 |
| TN0057797 | Buchanan ES | 4952 | Sewerage Systems | Minor | Trib to Middle Fork Stones River @ RM 7.9 | 05130203070 |
| TN0057771 | Community Care STP | 4952 | Sewerage Systems | Minor | Middle Fork Stones River @ RM 4.3 | 05130203070 |
| TN0022586 | Sinking Creek STP | 4952 | Sewerage Systems | Major | West Fork Stones River @ RM 10.5 | 05130203080 |
| TN0073504 | Interstate 66 Market | 5541 | Convenience Stores | Minor | Unnamed Trib | 05130203080 |
| TN0073377 | Delta Express #3203 | 5441 | Convenience Stores | Minor | Sinking Creek | 05130203080 |
| TN0064599 | Delta Express #1020 | 5541 | Convenience Stores | Minor | Lytle Creek | 05130203080 |
| TN0004278 | General Electric | 3621 | Motors and Generators | Minor | West Fork Stones River @ RM 13.8 | 05130203080 |
| TN0058149 | Cedars of Lebanon State Park STP | 4952 | Sewerage Systems | Minor | Cave Creek @ RM 1.6 | 05130203090 |
| TN0067237 | TX Eastern Transmission: Gladeville Compression | 4922 | Natural Gas Transmission | Minor | Sinking Creek | 05130203090 |
| TN0020541 | Smyrna STP | 4952 | Sewerage Systems | Major | Stewart Creek @ RM 5.65 | 05130203100 |
| TN0021482 | USACOE: Cooks Campground STP | 4952 | Sewerage Systems | Minor | Stones River @ RM 11.8 | 05130203110 |
| TN0021474 | USACOE: Cooks Picnic Area STP | 4952 | Sewerage Systems | Minor | Stones River @ RM 8.6 | 05130203110 |
| TN0028568 | USACOE: 7 Points Picnic Area STP | 4952 | Sewerage Systems | Minor | J. Percy Priest Lake | 05130203110 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TN0021440 | USACOE: Fate Sanders Rec Area | 4952 | Sewerage Systems | Minor | Stones River | 05130203110 |
| TN0021431 | USACOE: Fate Sanders Rec Area | 4952 | Sewerage Systems | Minor | Stones River | 05130203110 |
| TN0024325 | USACOE: Poole Knobs Campground STP | 4952 | Sewerage Systems | Minor | Stones River @ RM 28.2 | 05130203110 |
| TN0021458 | USACOE: Anderson Road Picnic Area STP | 4952 | Sewerage Systems | Minor | Smith Spring Creek @ RM 1.1 | 05130203110 |
| TN0022039 | Bridgestone/Firestone | 3011 | Tires and Inner Tubes | Minor | East Branch Hurricane Creek @ RM 0.2 | 05130203110 |
| TN0028550 | Hamilton Creek Recreation Area STP | 4952 | Sewerage Systems | Minor | Hamilton Creek @ RM 1.3 | 05130203110 |
| TN0029319 | USACOE: 7 Points Camp STP | 4952 | Sewerage Systems | Minor | Stones River @ RM 11.9 | 05130203110 |
| TN0068152 | J. Percy Priest Power Plant | 4911 | Electric Power Distribution | Minor | Stones River @ RM 6.7 | 05130203110 |
| TN0028797 | Music City Auto/Truck Stop | 5541 | Convenience Stores | Minor | Trib to West Branch Hurricane Creek | 05130203110 |
| TN0061301 | Speedway #8454 | 5541 | Convenience Stores | Minor | East Branch Hurricane Creek @ RM 1.3 | 05130203110 |
| TN0057801 | Gladeville ES | 4952 | Sewerage Systems | Minor | Trib to Trib to Suggs Creek @ RM 16.4 | 05130203120 |
| TN0073628 | Nashville Ready-Mix | 3273 | Ready-Mix Concrete | Minor | Trib to Stones Creek @ RM 10.0 | 05130203130 |
| TN0060119 | Lojac Enterprises | 7699 | Repair Shop | Minor | Trib to Stones River @ RM 4.2 | 05130203130 |

***Table A4-5. Active Permitted Point Source Facilities in the Stones River Watershed.*** *SIC, Standard Industrial Classification; MADI, Major Discharge Indicator.*

| FACILITY NUMBER | FACILITY NAME | SIC | SIC NAME | WATERBODY | HUC-11 |
|---|---|---|---|---|---|
| **TN0065714** | Readyville Quarry | 1422 | Crushed and Broken Limestone | Trib to Carson Fork | 05130203020 |
| TN0059455 | Hoover, Inc. #608 | 1422 | Crushed and Broken Limestone | Bushman Creek | 05130203050 |
| **TN0059561** | Rutherford County Quarry | 1422 | Crushed and Broken Limestone | Karst Topography, Trib to West Fork Stones River | 05130203060 |
| TN0066150 | The Stone Man, Inc. | 1422 | Crushed and Broken Limestone | Stewarts Creek | 05130203100 |
| TN0060771 | Hoover, Inc. #637 | 1422 | Crushed and Broken Limestone | Trib to Fall Creek | 05130203110 |
| TN0003115 | Vulcan Company: Hermitage Quarry | 1422 | Crushed and Broken Limestone | Stoners Creek | 05130203130 |

***Table A4-6. Active Mining Sites in the Stones River Watershed.*** *SIC, Standard Industrial Classification; MADI, Major Discharge Indicator.*

| LOG NUMBER | COUNTY | DESCRIPTION | WATERBODY | HUC-11 |
|---|---|---|---|---|
| 95.041 | Cannon | Gravel Dredging | Stones River | 05130203010 |
| 95.351 | Cannon | Gravel Dredging | Rock House Creek | 05130203010 |
| 95.785 | Cannon | Gravel Dredging | East Fork Stones River | 05130203010 |
| 96.110 | Cannon | Gravel Dredging | Rockhouse Creek | 05130203010 |
| 96.180 | Cannon | Debris Removal | Trib to Stones River | 05130203010 |
| 96.218 | Cannon | Road Crossing | Trib toStones River | 05130203010 |
| 98.025 | Cannon | Bridge Replacement | Hollis Creek | 05130203010 |
| 98.203 | Cannon | Gravel Dredging | East Fork Stones River | 05130203010 |
| 9810.021 | Cannon | Gravel Dredging | East Fork Stones River | 05130203010 |
| 95.723 | Cannon | Gravel Dredging | Brawley's Fork | 05130203020 |
| 96.532 | Cannon | Gravel Dredging | Gilley Hill Creek | 05130203020 |
| 97.046 | Cannon | Gravel Dredging | Carson Fork Creek | 05130203020 |
| 97.871 | Cannon | Bridge Replacement | Carson Fork Creek | 05130203020 |
| 9810.019 | Cannon | Gravel Dredging | Trib to Carson Frok | 05130203020 |
| 9810.235 | Cannon | Road Crossing | Carson Fork Creek | 05130203020 |
| 97.114 | Cannon | Gravel Dredging | Stones River | 05130203030 |
| 97.469 | Rutherford | Gravel Dredging | East Fork Stones River | 05130203030 |
| 00.1323 | Rutherford | Gravel Dredging | East Fork Stones River | 05130203030 |
| 98.120 | Rutherford | Bridge Replacement | East Fork Stones River | 05130203050 |
| 00.0614 | Rutherford | Referred To Corps | East Fork Stones River | 05130203050 |
| 98.302 | Rutherford | Impoundment | Overall Creek | 05130203080 |
| 99.063 | Rutherford | Road Crossing | Puckett Creek | 05130203080 |
| 99.366 | Rutherford | Outfall Replacement | Stones River | 05130203080 |
| 9910.201 | Rutherford | Road Crossing | Lytle Creek | 05130203080 |
| 9910.203 | Rutherford | Road Crossing | Lytle Creek | 05130203080 |
| 96.560 | Wilson | Bridge Replacement | Trib to Fall Creek | 05130203090 |
| 96.907 | Wilson | Box Bridge | Cedar Branch | 05130203090 |
| 97.511 | Wilson | Box Culvert | Fall Branch | 05130203090 |
| 98.020 | Davidson | Debris Removal | Scotts Hollow | 05130203090 |
| 98.241 | Davidson | Gravity Sewer Line | Trib to Mill Creek | 05130203090 |
| 98.427 | Wilson | Gravel Dredging And Bank Stabilization | Florida Creek | 05130203090 |
| 98.657 | Davidson | Wetland/Stream Enchancement Project | Sims Creek | 05130203090 |
| 99.209 | Davidson | Plate Girder Bridge | Cumberland River | 05130203090 |
| 99.210 | Davidson | Wetland Impacts | Wetland | 05130203090 |
| 99.211 | Davidson | Channel Relocation | Love Branch | 05130203090 |
| 99.378 | Sullivan | Culvert | Kendrick Creek | 05130203090 |
| 99.434 | Wilson | Widen Two Existing Bridges | Trib to Hurricane Creek | 05130203090 |
| 99.435 | Wilson | 3 Box Culverts | Trib to Fall Creek | 05130203090 |
| 9810.208 | Wilson | Road Crossing | Trib to Fall Creek | 05130203090 |
| 9810.237 | Wilson | Road Crossing | Trib to Fall Creek | 05130203090 |
| 9910.053 | Wilson | Road Crossing | Hurricane Creek | 05130203090 |
| 9910.054 | Wilson | Road Crossing | Hurricane Creek | 05130203090 |
| 9910.091 | Wilson | Road Crossing | Hurricane Creek | 05130203090 |
| 98.193 | Rutherford | Bridge Widening | Spring Branch | 05130203100 |
| 98.194 | Rutherford | Bridge Widening | Olive Branch | 05130203100 |
| 98.195 | Rutherford | Bridge Widening | Stewart Creek | 05130203100 |
| 98.246 | Rutherford | Proposed Gas Line Replacement | Rock Springs Branch | 05130203100 |
| 98.582 | Rutherford | Concrete Box Culvert | Rick Springs Branch | 05130203100 |
| 98.583 | Rutherford | Concrete Box Culvert | Trib to Stewart Creek | 05130203100 |
| 9810.185 | Rutherford | Road Crossing | Trib to Rock Springs Branch | 05130203100 |
| 9910.128 | Rutherford | Utility Line Crossing | Rock Spring Creek | 05130203100 |
| 9910.129 | Rutherford | Utility Line Crossing | Rock Spring Creek | 05130203100 |
| 00.0845 | Rutherford | Gravel Dredging | Rocky Fork Creek | 05130203100 |
| 98.019 | Davidson | Debris Removal | Trib to Trace Creek | 05130203110 |

| | | | | |
|---|---|---|---|---|
| 98.216 | Rutherford | Bank Stabilization | Finch Branch | 05130203110 |
| 99.237 | Davidson | Retaining Wall Around Swimming Area | Stones River | 05130203110 |
| 9910.081 | Davidson | Wet Weather Conveyance | WWC to Percy Priest Lake | 05130203110 |
| 9910.083 | Davidson | Bank Stabilization | McCrory Creek | 05130203110 |
| 9910.127 | Rutherford | Utility Line Crossing | Tributary To Finch Branch | 05130203110 |
| 96.123 | Wilson | Concrete Slab | Suggs Creek | 05130203120 |
| 98.412 | Davidson | Encasing Piers With Concrete | Cumberland River | 05130203120 |
| 98.446 | Davidson | Debris Removal | Trib to Trace Creek | 05130203120 |
| 98.659 | Davidson | Debris Removal | Trib to Ewing Creek | 05130203120 |
| 00.055 | Davidson | Stream Relocation | Trib To Stoners Creek | 05130203130 |
| 98.164 | Davidson | Culvert Extension | Scotts Creek | 05130203130 |
| 98.269 | Wilson | Utility Line Crossing | Trib to Stoners Creek | 05130203130 |
| 98.466 | Wilson | Proposed Span Bridge | Stoner Creek | 05130203130 |
| 9810.112 | Davidson | Road Crossing | Old Stoners Creek | 05130203130 |
| 00.055 | Davidson | Stream Relocation | Trib to Stones Creek | 05130203130 |

***Table A4-7. Individual ARAP Permits Issued January 1994 Through June 2000 in Stones River Watershed.***

| PERMIT # | COUNTY | DATE ISSUED | SITE | IMPACTED ACRES | IMPACTED WATER | MITIGATION | HUC-11 |
|---|---|---|---|---|---|---|---|
| 87.01400 | Rutherford | 03/06/87 | US 70 | 3.9 | Wetland | on-site | 05130203080 |
| 94.04500 | Rutherford | 03/23/94 | US 70 | 0.0 | Wetland | off-site | 05130203080 |

***Table A4-8a. Individual ARAP Permits Issued for Impacting Wetlands in Stones River Watershed.***

| PERMIT # | COUNTY | IMPACTED ACREAGE | MITIGATED ACREAGE | MITIGATION SITE | HUC-11 |
|---|---|---|---|---|---|
| 87.01400 | Rutherford | 3.9 | 4.0 | Impacted Wetland | 05130203080 |
| 94.04500 | Rutherford | 0.9 | 0.9 | Black Fox Wetland | 05130203080 |

***Table A4-8b. Individual ARAP Permits Issued for Mitigating Wetlands in Stones River Watershed.***

# APPENDIX V

| CONSERVATION PRACTICE | UNITS | AMOUNT |
|---|---|---|
| Alley Cropping | Acres | 0 |
| Contour Buffer Strips | Acres | 0 |
| Crosswind Trap Strips | Acres | 0 |
| Grassed Waterways | Acres | 2 |
| Filter Strips | Acres | 13 |
| Riparian Forest Buffers | Acres | 83 |
| Streambank and Shoreline Protection | Feet | 5,000 |
| Windbreaks and Shelterbelts | Feet | 0 |
| Hedgerow Plantings | Feet | 0 |
| Herbaceous Wind Barriers | Feet | 0 |
| Field Borders | Feet | 90,437 |

***Table A5-1a. Conservation Buffers Conservation Practices in Partnership with NRCS in Stones River Watershed.*** *Data are from Performance & Results Measurement System (PRMS) for October 1, 1999 through September 30, 2000 reporting period.*

| PARAMETER | TOTAL |
|---|---|
| Highly Erodible Land With Erosion Control Practices | 1,463 |
| Estimated Annual Soil Saved By Erosion Control Measures (Tons/Year) | 10,377 |
| Total Acres Treated With Erosion Control Measures | 1,489 |

***Table A5-1b. Erosion Control Conservation Practices in Partnership with NRCS in Stones River Watershed.*** *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

| PARAMETER | TOTAL |
|---|---|
| Number of Pest Management Systems | 12 |
| Acres of Pest Management Systems | 1,447 |

***Table A5-1c. Pest Management Conservation Practices in Partnership with NRCS in Stones River Watershed.*** *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

| PARAMETER | TOTAL |
|---|---|
| Acres of AFO Nutrient Management Applied | 165 |
| Acres of Non-AFO Nutrient Management Applied | 499 |
| Total Acres Applied | 664 |

***Table A5-1d. Nutrient Management Conservation Practices in Partnership with NRCS in Stones River Watershed.*** *Data are from PRMS and represent total of Watts Bar and Fort Loudoun Lake Subwatersheds for October 1, 1999 through September 30, 2000 reporting period.*

| CONSERVATION PRACTICE | ACRES |
|---|---|
| Acres of Coniferous Tree and Shrub Establishment | 0 |
| Acres Prepared for Revegetation of Forestland | 0 |
| Acres Improved Through Forest Stand Improvement | 317 |
| Acres of Tree and Shrub Establishment | 0 |

***Table A5-1e. Tree and Shrub Conservation Practices in Partnership with NRCS in Stones River Watershed.*** *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

| CONSERVATION PRACTICE | ACRES |
|---|---|
| Acres of Upland Habitat Management | 791 |
| Acres of Wetland Habitat Management | 0 |
| Total Acres Wildlife Habitat Management | 791 |

***Table A5-1f. Wildlife Habitat Management Conservation Practices in Partnership with NRCS in Stones River Watershed.*** *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

| COMMUNITY | TYPE OF LOAN | PROJECT DESCRIPTION | AWARD DATE |
|---|---|---|---|
| Gladeville | Plan, Design, Construction | New Service Lines | 7/13/2000 |
| Murfreesboro | Plan, Design, Construction | Addition to Existing WWTP | 3/27/1995 |
| Murfreesboro | Design, Construction | Inflow/Infiltration Correction | 7/10/1996 |
| Murfreesboro | Design, Construction | Interceptor Sewer | 7/10/1996 |

***Table A5-2. Communities in Stones River Watershed Receiving SRF Grants or Loans.***

| PRACTICE | COUNTY | NUMBER OF BMPs |
|---|---|---|
| Alternative Water Source | Rutherford | 4 |
| Alternative Water Source | Wilson | 4 |
| Animal Waste System | Cannon | 1 |
| Critical Area Treatment | Cannon | 1 |
| Critical Area Treatment | Rutherford | 1 |
| Critical Area Treatment & Pipeline | Cannon | 1 |
| Crop Conversion | Rutherford | 16 |
| Crop Conversion | Wilson | 8 |
| Cropland Conversion Pasture Renovation | Rutherford | 2 |
| Fencing | Cannon | 1 |
| Grassed Waterway | Rutherford | 7 |
| Hayland Establishment | Rutherford | 1 |
| Hayland Planting | Cannon | 2 |
| Heavy Use Area | Cannon | 3 |
| Pasture & Hayland Planting | Rutherford | 1 |
| Pasture & Hayland Planting | Cannon | 1 |
| Pasture Establishment | Rutherford | 14 |
| Pasture Establishment | Wilson | 3 |
| Pasture Establishment & Cropland Conversion | Rutherford | 2 |
| Pasture Planting | Wilson | 1 |
| Pasture Renovation | Cannon | 1 |
| Pasture Renovation | Rutherford | 4 |
| Pipeline | Cannon | 2 |
| Seeding | Cannon | 1 |
| Spring Development | Cannon | 1 |
| Trough | Cannon | 1 |
| Trough | Rutherford | 1 |
| Water Tank | Rutherford | 1 |
| Watering System | Wilson | 2 |
| Waterway | Rutherford | 2 |

***Table A5-3. Best Management Practices Installed by Tennessee Department of Agriculture and Partners in Stones River Watershed.***

| SIITE ID | WATER BODY |
|---|---|
| 2198800201 | Brawleys Fork Creek |
| 2198800202 | Brawleys Fork Creek |
| 2199001101 | Fall Creek |
| 2199001102 | Fall Creek |
| 2199001103 | Fall Creek |
| 2199100501 | Bradley Creek |
| 2199100502 | Bradley Creek |
| 2199100503 | Bradley Creek |

***Table A5-4. TWRA TADS Sampling Sites in Stones River Watershed.***