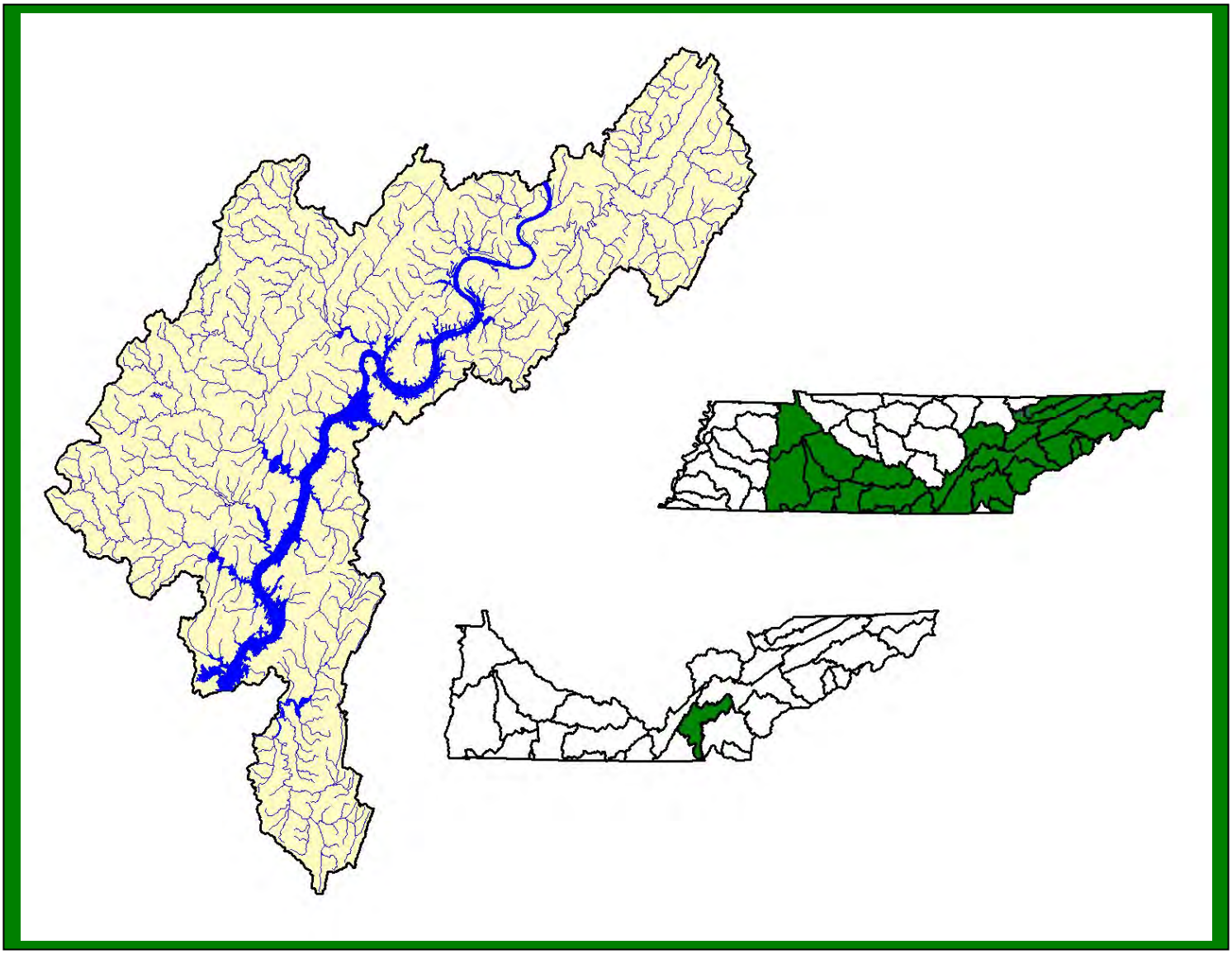
LOWER TENNESSEE RIVER WATERSHED (06020001) OF THE TENNESSEE RIVER BASIN

WATERSHED WATER QUALITY MANAGEMENT PLAN



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

LOWER TENNESSEE RIVER WATERSHED (GROUP 3)
WATER QUALITY MANAGEMENT PLAN

TABLE OF CONTENTS

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

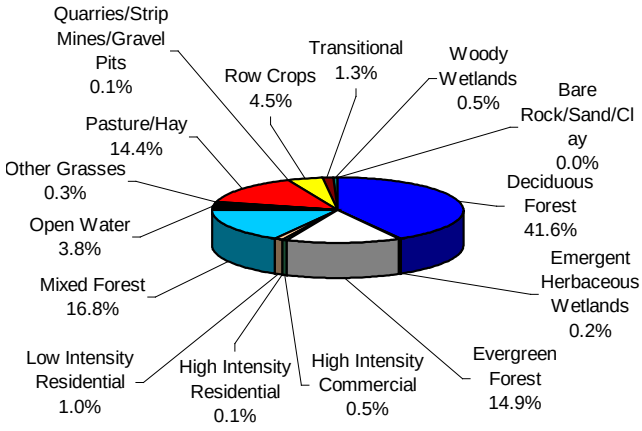
Summary – Lower Tennessee River

In 1996, the Tennessee Department of Environment and Conservation Division of Water Pollution Control adopted a watershed approach to water quality. This approach is based on the idea that many water quality problems, like the accumulation of point and nonpoint pollutants, are best addressed at the watershed level. Focusing on the whole watershed helps reach the best balance among efforts to control point sources of pollution and polluted runoff as well as protect drinking water sources and sensitive natural resources such as wetlands. Tennessee has chosen to use the USGS 8-digit Hydrologic Unit Code (HUC-8) as the organizing unit.

The Watershed Approach recognizes 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 opportunities to participate. The Watershed Approach provides the framework for a watershed-based and community-based approach to address water quality problems.

Chapter 1 of the Lower Tennessee River Watershed Water Quality Management Plan discusses the Watershed Approach and emphasizes that the Watershed Approach is not a regulatory program or an 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. Traditional activities like permitting, planning and monitoring are also coordinated in the Watershed Approach.

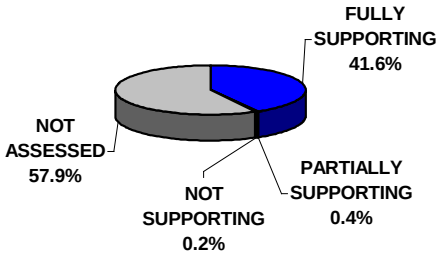
A detailed description of the watershed can be found in Chapter 2, to include information on location, population, hydrology, land use and natural and cultural resources. The Group 3 Portion of the Tennessee portion of the Lower Tennessee River Watershed is approximately 757 square miles and includes parts of 9 Tennessee counties. A part of the Tennessee River drainage basin, the watershed has 974 stream miles in the group 3 portion in Tennessee.



Land Use Distribution in the Tennessee Portion of the Lower Tennessee River Watershed.

There are three greenways, four interpretive areas, and two wildlife management areas located in the watershed. Over one hundred rare plant and animal species have been documented in the watershed, including six rare fish species, eight rare mussel species, one rare snail species, and one rare crustacean species.

A review of water quality sampling and assessment is presented in Chapter 3. Using the Watershed Approach to Water Quality, 55 sampling events occurred in the Group 3 Portion of the Tennessee portion of the Lower Tennessee River Watershed in 1999-2000. These were conducted at ambient, ecoregion or watershed monitoring sites. Monitoring results support the conclusion that 41.6% of total stream miles fully support designated uses.



Water Quality Assessment of Streams and Rivers in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. Assessment data are based on the 2002 Water Quality Assessment of 971.9 miles in the watershed.

Also in Chapter 3, a series of maps illustrate Overall Use Support in the watershed, as well as Use Support for the individual uses of Fish and Aquatic Life Support, Recreation, Irrigation, and Livestock Watering and Wildlife. Another series of maps illustrate streams that are listed for impairment by specific causes (pollutants) such as Pathogens, and Habitat Alteration.

Point and Nonpoint Sources are addressed in Chapter 4. Chapter 4 is organized by HUC-10 subwatersheds. Maps illustrating the locations of STORET monitoring sites and USGS stream gauging stations are presented in each subwatershed.

The Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed is Composed of Five USGS-Delineated Subwatersheds (10-Digit Subwatersheds).

Point source contributions to the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed consist of seven individual NPDES-permitted facilities, two of which discharge into streams that have been listed on the 1998 303(d) list. Other point source permits in the watershed are Aquatic Resource Alteration Permits (35), Tennessee Multi-Sector Permits (35), Mining Permits (5), Ready-Mix Concrete Plant Permits (4) and Concentrated Animal Feeding Operations (1). Agricultural operations include cattle, chicken, hog, and sheep farming. Maps illustrating the locations of NPDES and ARAP permit sites are presented in each subwatershed.

Chapter 5 is entitled *Water Quality Partnerships in the Lower Tennessee River Watershed* and highlights partnerships between agencies and between agencies and landowners that are essential to success. Programs of federal agencies (Natural Resources Conservation Service, Tennessee Valley Authority, U.S. Fish and Wildlife Service, U.S. Geological Survey), and state agencies (TDEC Division of Community Assistance, TDEC Division of Water Supply, and Tennessee Department of Agriculture) are summarized.

Point and Nonpoint source approaches to water quality problems in the Group 3 Portion of the Tennessee portion of the Lower Tennessee River Watershed are addressed in Chapter 6. Chapter 6 also includes comments received during public meetings, along with an assessment of needs for the watershed.

The full Lower Tennessee River Watershed Water Quality Management Plan can be found at: http://www.state.tn.us/environment/wpc/watershed/wsmplans/

CHAPTER 1

WATERSHED APPROACH TO WATER QUALITY

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.

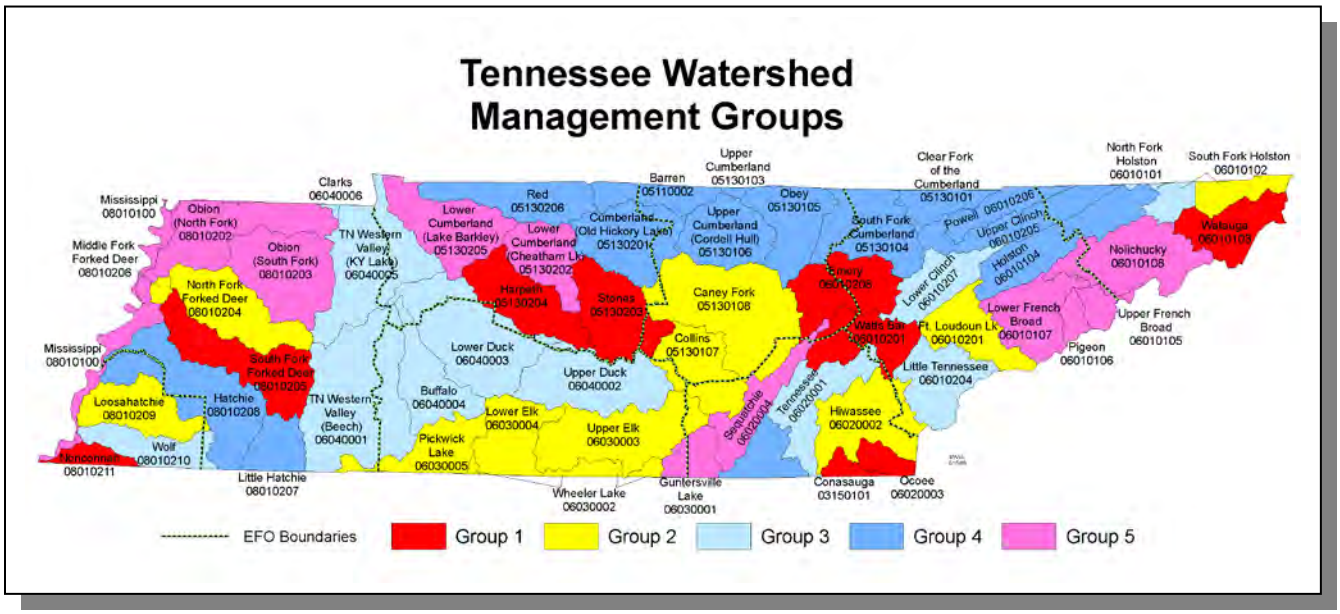


Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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

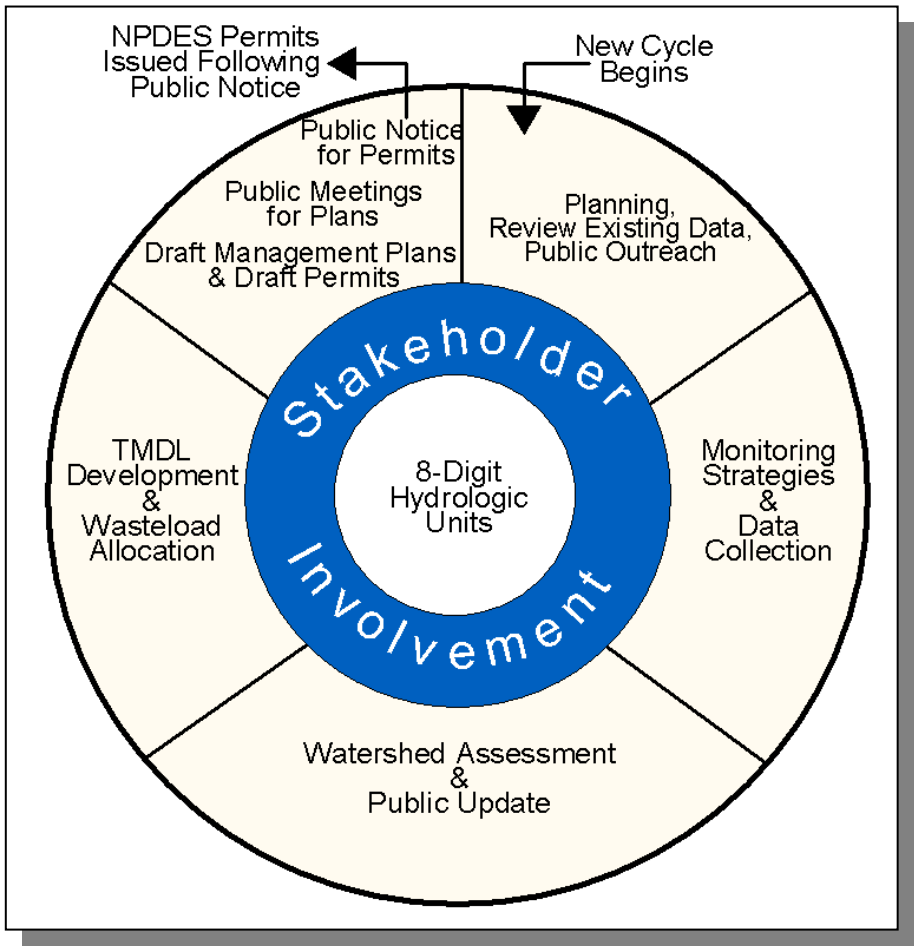


Figure 1-2. The Watershed Approach Cycle.

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 LOWER TENNESSEE RIVER WATERSHED

2.1. BACKGROUND. Chickamauga dam is located 20 miles northeast of Chattanooga. The dam completion in 1940--the fourth of TVA's main river projects--created Chickamauga Lake, named in honor of the Chickamauga tribe of native Americans who broke away from the main band of the Cherokee Nation. Chickamauga villages once lined the shores of present day Chickamauga Lake.

This Chapter describes the location and characteristics of the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed is located in Tennessee, Georgia, and Alabama. The Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed (62.4% of the entire Tennessee portion; 40.5% of the entire watershed) includes parts of Bledsoe, Bradley, Hamilton, Loudon, McMinn, Meigs, Rhea, Roane, and Sequatchie Counties.

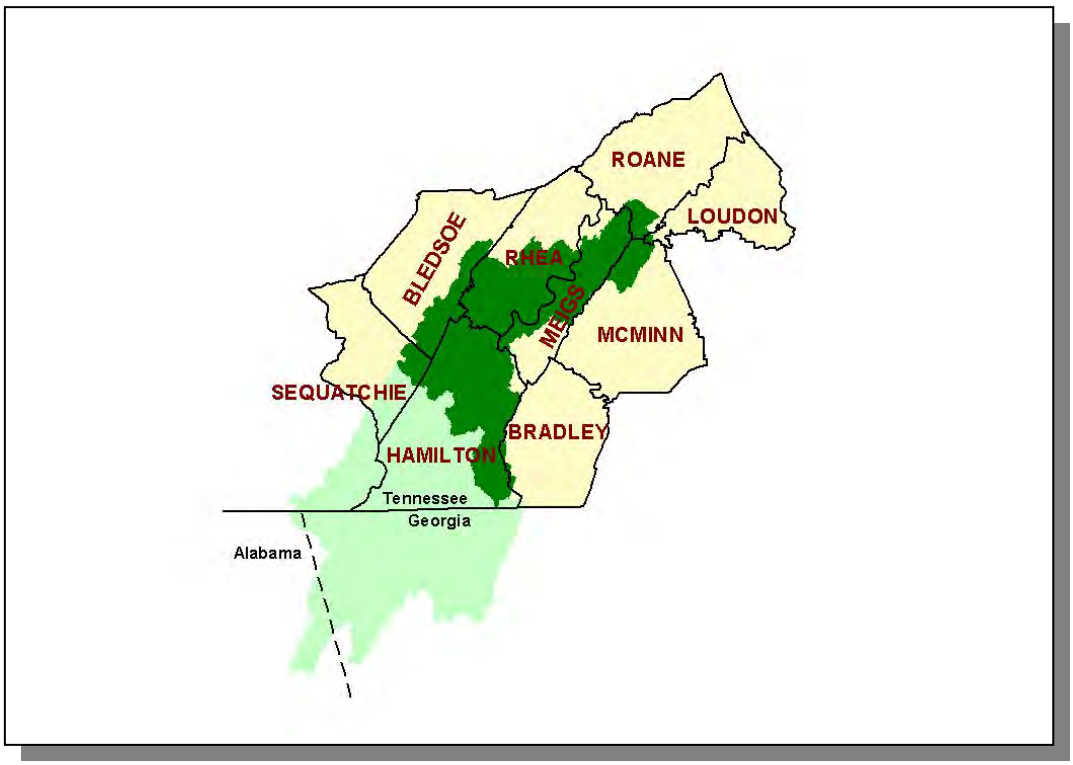


Figure 2-1. General Location of the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Dark green, Group 3 portion of the Tennessee portion (757 square miles); light green, Group 4 (457 square miles), Georgia (612 square miles) and Alabama (57 square miles) portions.*

COUNTY	% OF WATERSHED IN EACH COUNTY
Hamilton	37.6
Rhea	24.4
Meigs	18.4
Bledsoe	8.9
McMinn	5.1
Sequatchie	3.2
Roane	1.6
Bradley	0.5
Loudon	0.2

Table 2-1. The Lower Tennessee River Watershed Includes Parts of Nine East Tennessee Counties. *Percentages are calculated for the Group 3 portion of the Tennessee portion of watershed.*

2.2.B. Population Density Centers. Four state highways and one interstate serve the major communities in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed.

Figure 2-2. Municipalities and Roads in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

MUNICIPALITY	POPULATION	COUNTY
Collegedale	6,531	Hamilton
Dayton*	6,403	Rhea
Decatur*	1,671	Meigs
Graysville	1,538	Rhea

Table 2-2. Communities and Populations in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Population based on 1999 census (Tennessee 2001/2002 Blue Book). Asterisk (*) indicates county seat.*

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Lower Tennessee River Watershed, designated 06020001 by the USGS, drains approximately 1,870 square miles, 1,201 square miles of which are in Tennessee. The Group 3 portion is 757 square miles.

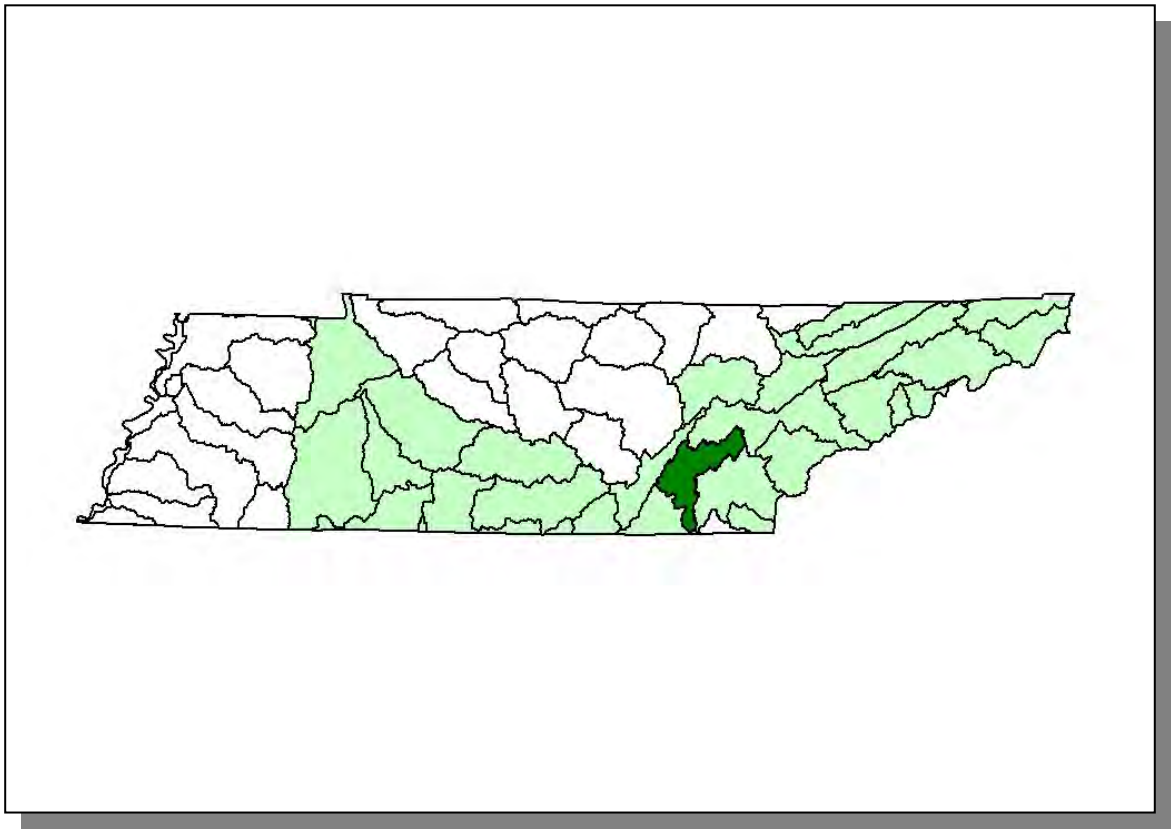


Figure 2-3. The Lower Tennessee River Watershed is Part of the Tennessee River Basin. *The Group 3 portion is shown in dark green.*

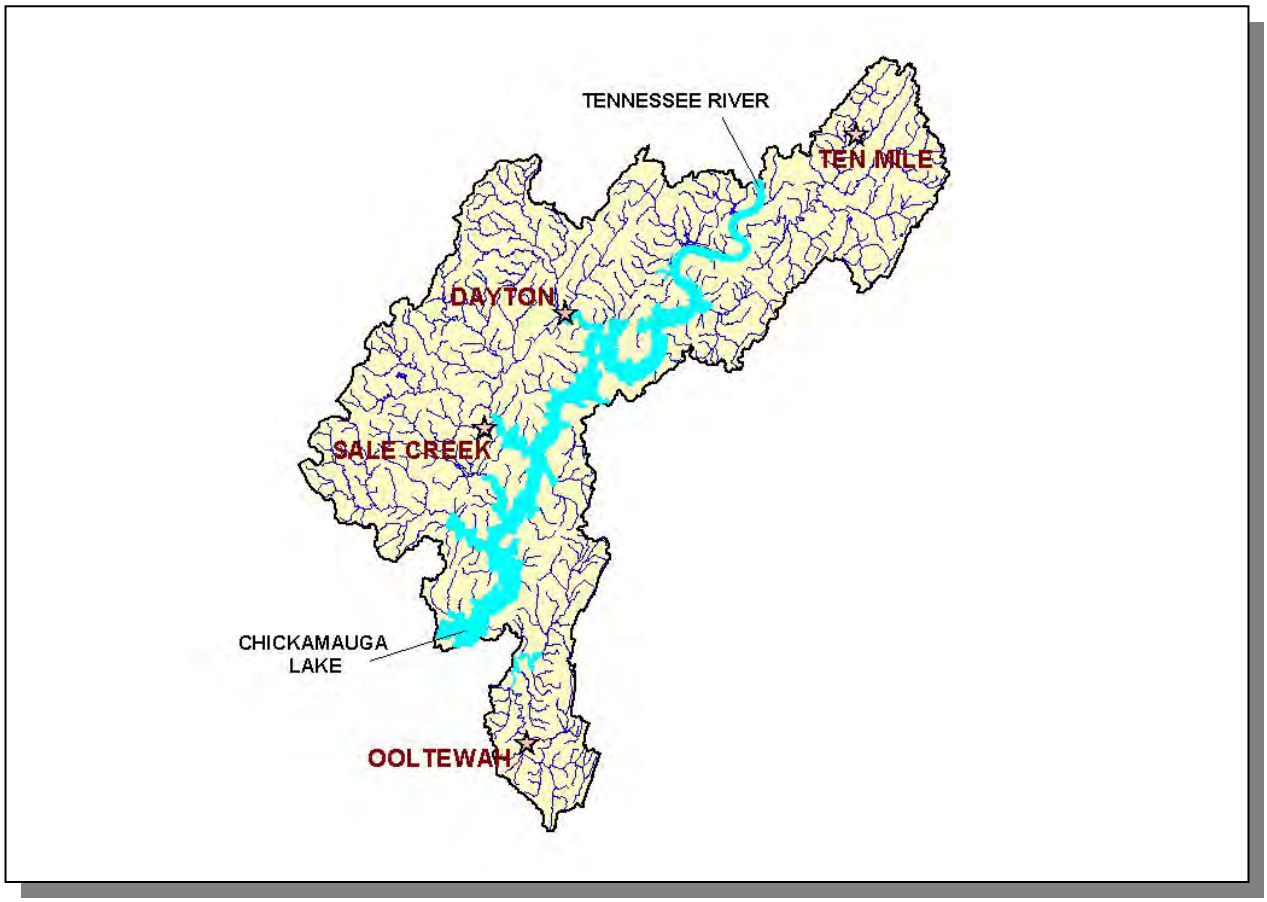


Figure 2-4. Hydrology in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *There are 974 stream miles in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed as catalogued in the River Reach File 3 database. An additional 529 stream miles are located in the Group 4 portion of the Tennessee portion of the watershed, 976 stream miles are located in the Georgia portion of the watershed, and 82 stream miles are located in the Alabama portion of the watershed as catalogued in the River Reach File 3 database. 45,780 lake acres are located in the Tennessee portion of the entire watershed as catalogued in the assessment database. Location of the Tennessee River and Chickamauga Lake, and the cities of Dayton, Ooltewah, Sale Creek, and Ten Mile are shown for reference.*

2.3.B. Dams. There are 9 dams inventoried by TDEC Division of Water Supply in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. These dams either retain 30 acre-feet of water or have structures at least 20 feet high.

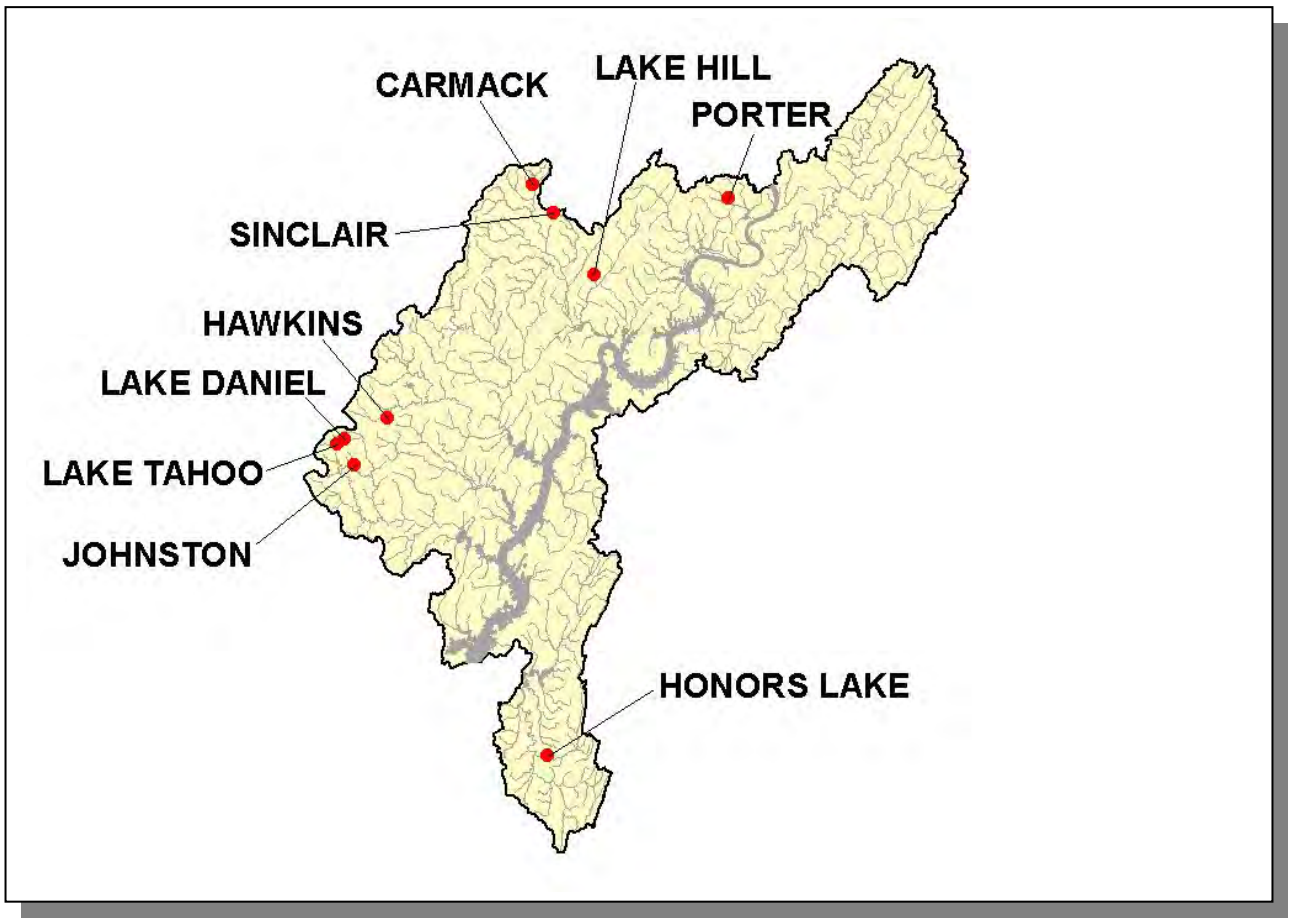


Figure 2-5. Location of Inventoried Dams in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *More information is provided in Appendix II and on the TDEC homepage at http://gwidc.memphis.edu/website/dws/.*

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.

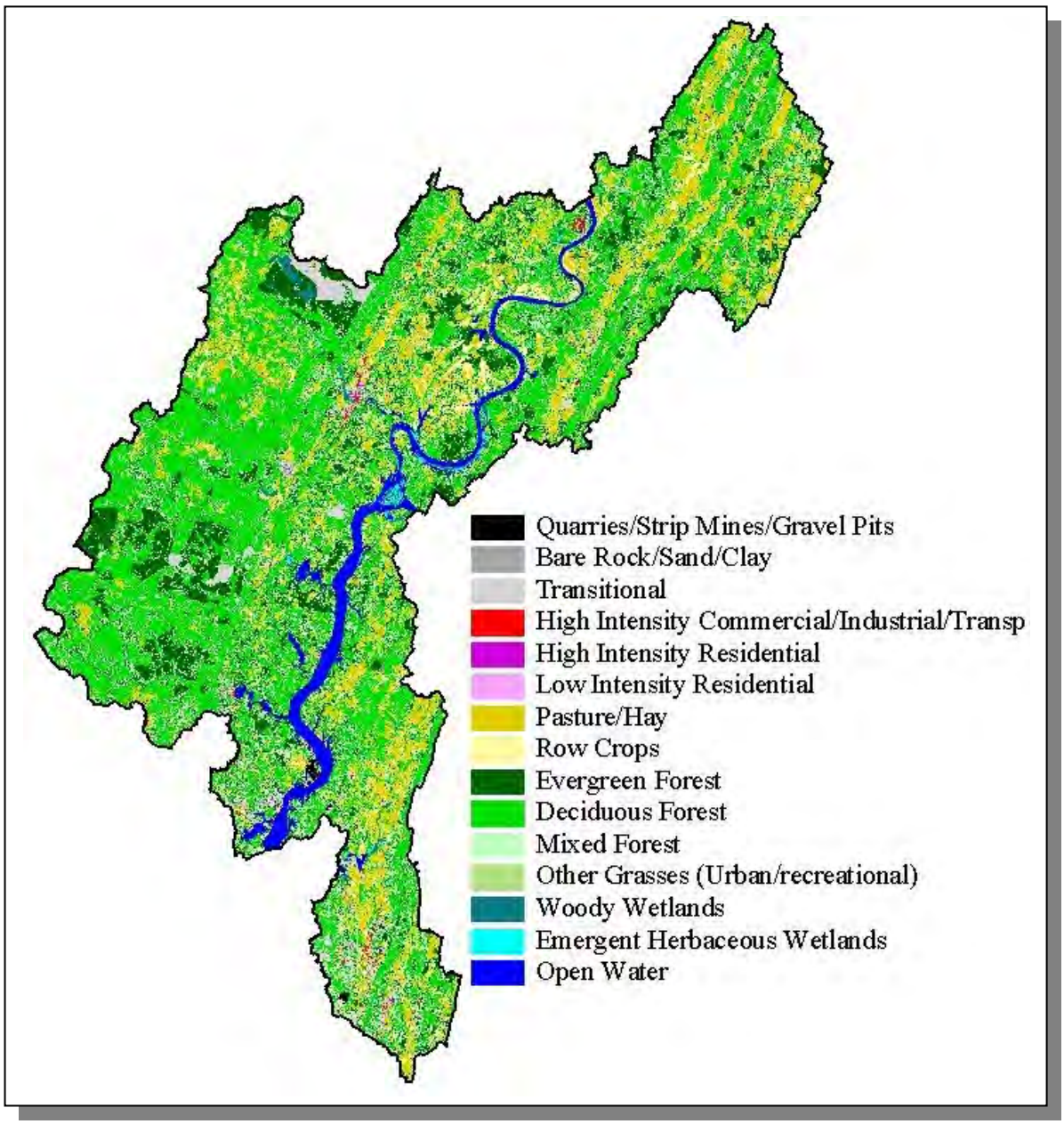


Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

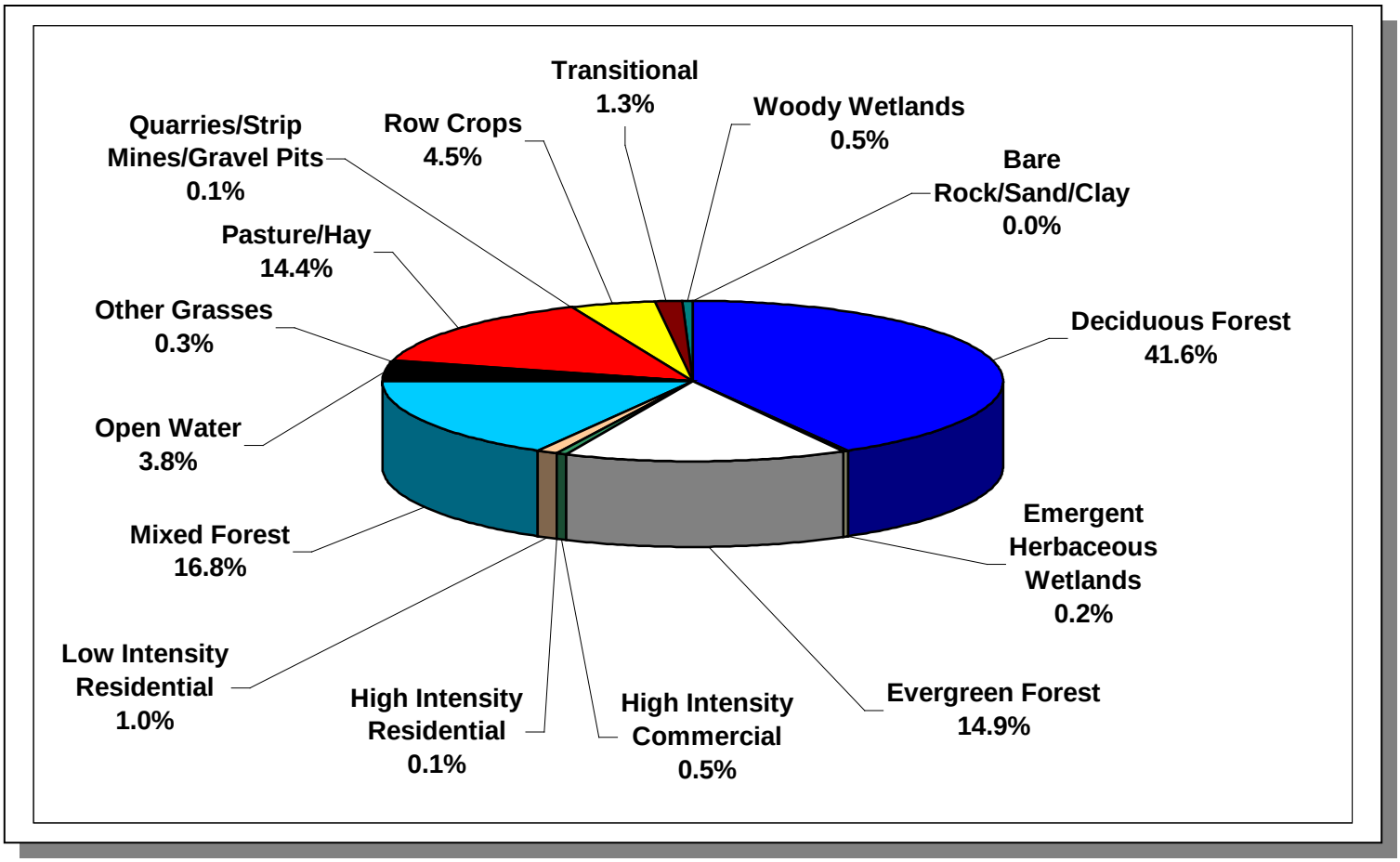


Figure 2-7. Land Use Distribution in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *More information is provided in Appendix II.*

Sinkholes, springs, disappearing streams and caves characterize karst topography. The term “karst” describes a distinctive landform that indicates dissolution of underlying soluble rocks by surface water or ground water. Although commonly associated with limestone and dolomite (carbonate rocks), other highly soluble rocks such as gypsum and rock salt can be sculpted into karst terrain. In karst areas, the ground water flows through solution-enlarged channels, bedding planes and microfractures within the rock. The characteristic landforms of karst regions are: closed depressions of various size and arrangement; disrupted surface drainage; and caves and underground drainage systems. The term “karst” is named after a famous region in the former country of Yugoslavia.

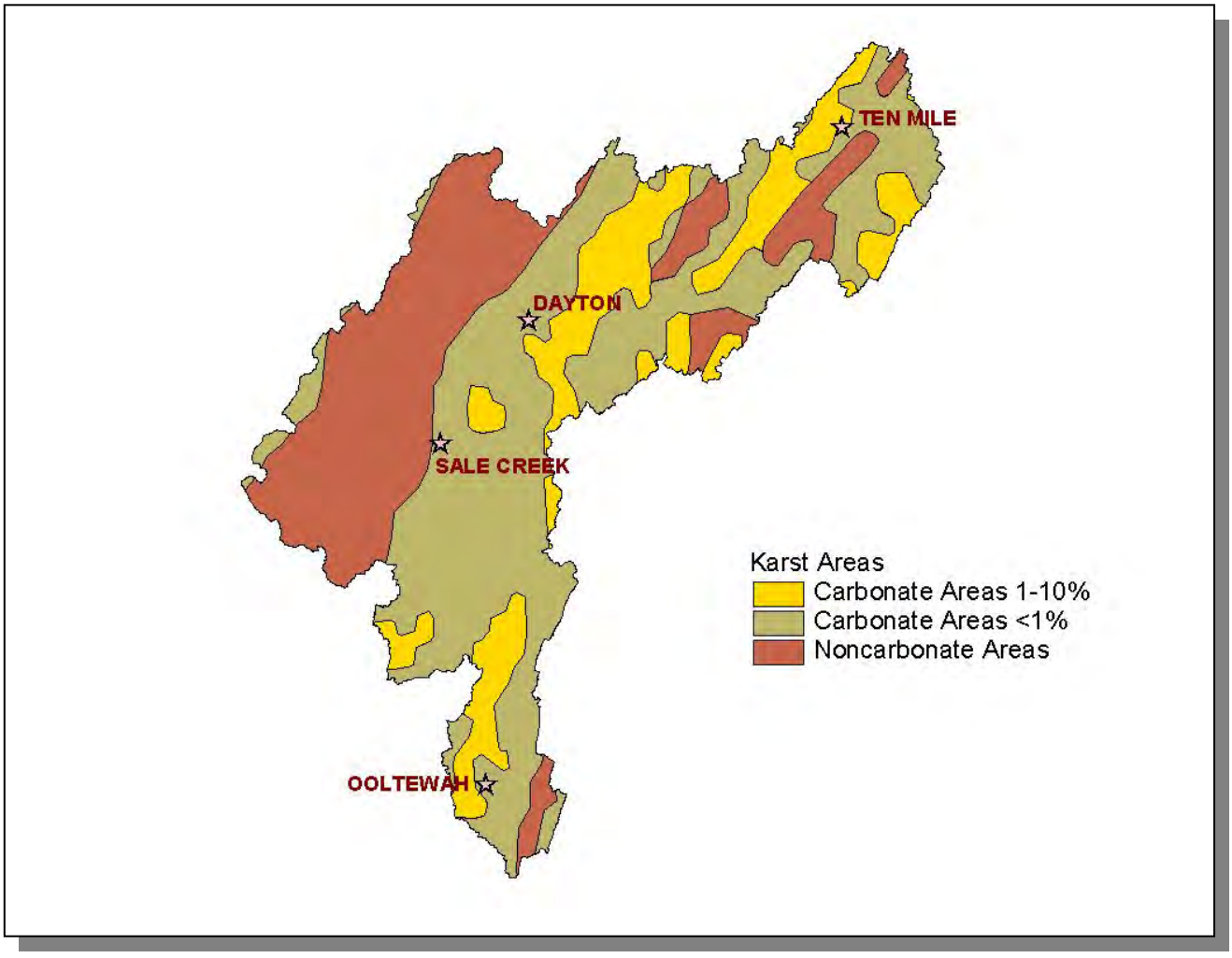


Figure 2-8. Illustration of Karst Areas in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Locations of Dayton, Ooltewah, Sale Creek, and Ten Mile are shown for reference.*

2.5. ECOREGIONS AND REFERENCE STREAMS. Ecoregions are 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 can aid 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 Group 3 portion of the Lower Tennessee River Watershed lies within 2 Level III ecoregions (Ridge and Valley and Southwestern Appalachians) and contains 6 Level IV subecoregions:

- **Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)** form a heterogeneous region composed predominantly of limestone and cherty dolomite. Landforms are mostly low rolling ridges and valleys, and the soils vary in their productivity. Landcover includes intensive agriculture, urban and industrial uses, as well as areas of thick forest. White oak forest, bottomland oak forest, and sycamore-ash-elm riparian forests are the common forest types. Grassland barrens intermixed with cedar-pine glades also occur here.

- **Southern Shale Valleys (67g)** consist of lowlands, rolling valleys, slopes and hilly areas that are dominated by shale materials. The northern areas are associated with Ordovician-age calcareous shale, and the well-drained soils are often slightly acid to neutral. In the south, the shale valleys are associated with Cambrian-age shales that contain some narrow bands of limestone, but the soils tend to be strongly acid. Small farms and rural residences subdivide the land. The steeper slopes are used for pasture or have reverted to brush and forested land, while small fields of hay, corn, tobacco, and garden crops are grown on the foot slopes and bottom land.

- **Southern Sandstone Ridges (67h)** encompass the major sandstone ridges with areas of shale and siltstone. The steep, forested ridges have narrow crests with soils that are typically stony, sandy, and of low fertility. The chemistry of streams flowing down the ridges can vary greatly depending on the geological material. The higher elevation ridges are in the north, including Wallen Ridge and Powell, Clinch and Bays Mountains. White Oak Mountain in the south has some sandstone on the west side, with abundant shale and limestone. Grindstone Mountain, capped by the Gizzard Group sandstone, is the only remnant of Pennsylvanian-age strata in the ridge and valley of Tennessee.

- **Southern Dissected Ridges and Knobs (67i)** contain crenulated, broken, or hummocky ridges. The ridges on the east side of Tennessee's Ridge and Valley tend to be associated with the Ordovician Sevier shale, Athens shale, and Holston and Lenoir limestones. These can include calcareous shale, limestone, siltstone, sandstone, and conglomerate. In the central and western part the shale ridges are associated with the Cambrian-age Rome Formation:

shale and siltstone with beds of sandstone. Chestnut oak forests and pine forests are typical for the higher elevations of the ridges, with white oak, mixed mesophytic forest, and tulip poplar on the lower slopes, knobs, and draws.

- **Cumberland Plateau (68a)** tablelands and open low mountains are about 1000 feet higher than the Eastern Highland Rim (71g) to the west, and receive slightly more precipitation with cooler annual temperatures than the surrounding lower-elevation ecoregions. The plateau surface is less dissected with lower relief compared to the Cumberland Mountains (69d) or the Plateau Escarpment (68c). Elevations are generally 1200-2000 feet, with the Crab Orchard Mountains reaching over 3000 feet. Pennsylvanian-age conglomerate, sandstone, siltstone, and shale is covered by well-drained, acid soils of low fertility. Bituminous coal that has been extensively surface and underground mined underlies the region. Acidification of first and second order streams is common. Stream siltation and mine spoil bedload deposits continue as long-term problems in these headwater systems. Pockets of severe acid mine drainage persist.

- **Plateau Escarpment (68c)** is characterized by steep, forested slopes and high velocity, high gradient streams. Local relief is often 1000 feet or more. The geologic strata include Mississippian-age limestone, sandstone, shale, and siltstone, and Pennsylvanian-age shale, siltstone, sandstone, and conglomerate. Streams have cut down into the limestone, but the gorge talus slopes are composed of colluvium with huge angular, slabby blocks of sandstone. Vegetation community types in the ravines and gorges include mixed oak and chestnut oak on the upper slopes, mesic forests on the middle and lower slopes (beech-tulip poplar, sugar maple-basswood-ash-buckeye), with hemlock along rocky streamsides and river birch along floodplain terraces.

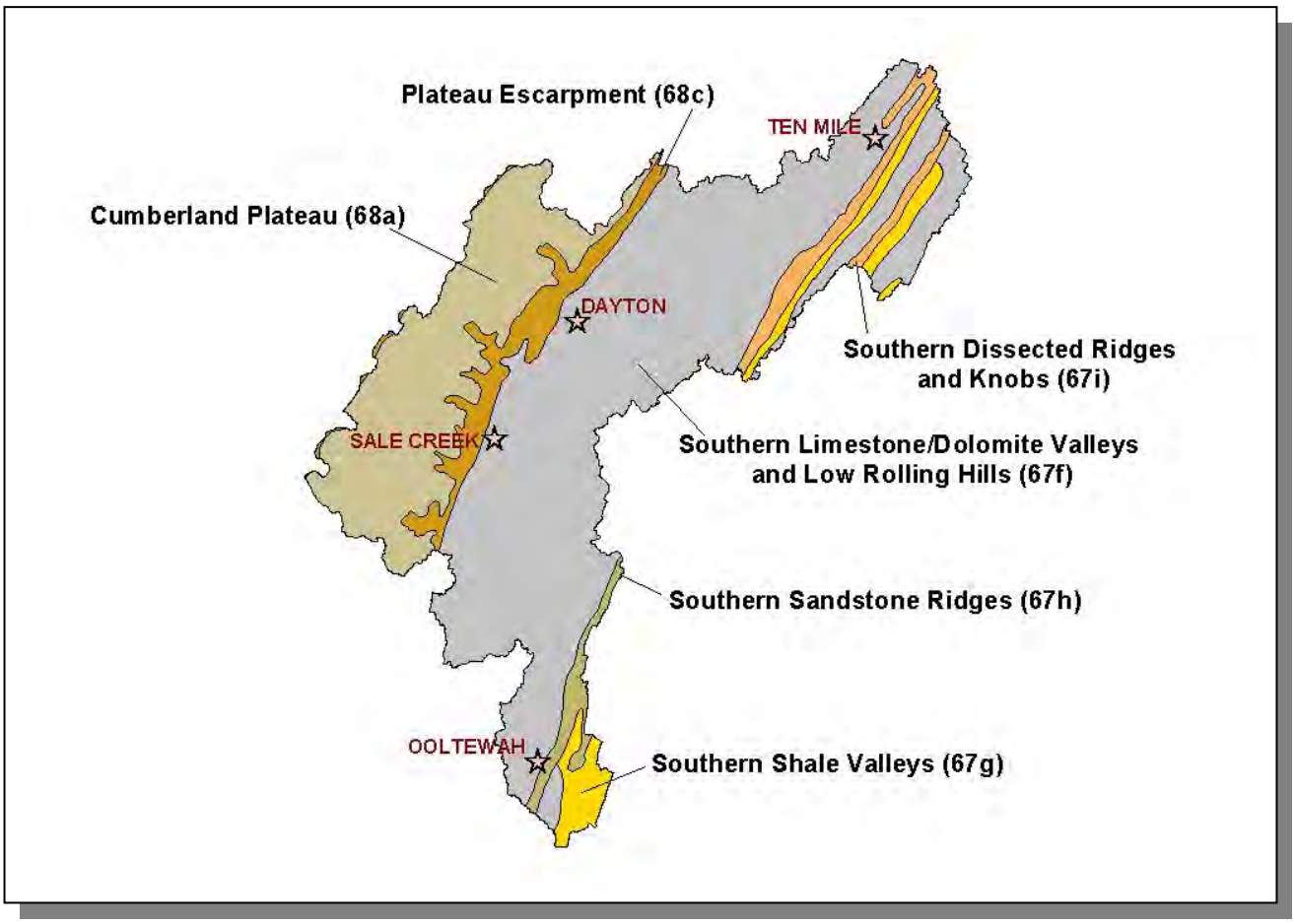


Figure 2-9. Level IV Ecoregions in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed *Locations of Dayton, Ooltewah, Sale Creek, and Ten Mile are shown for reference.*

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.

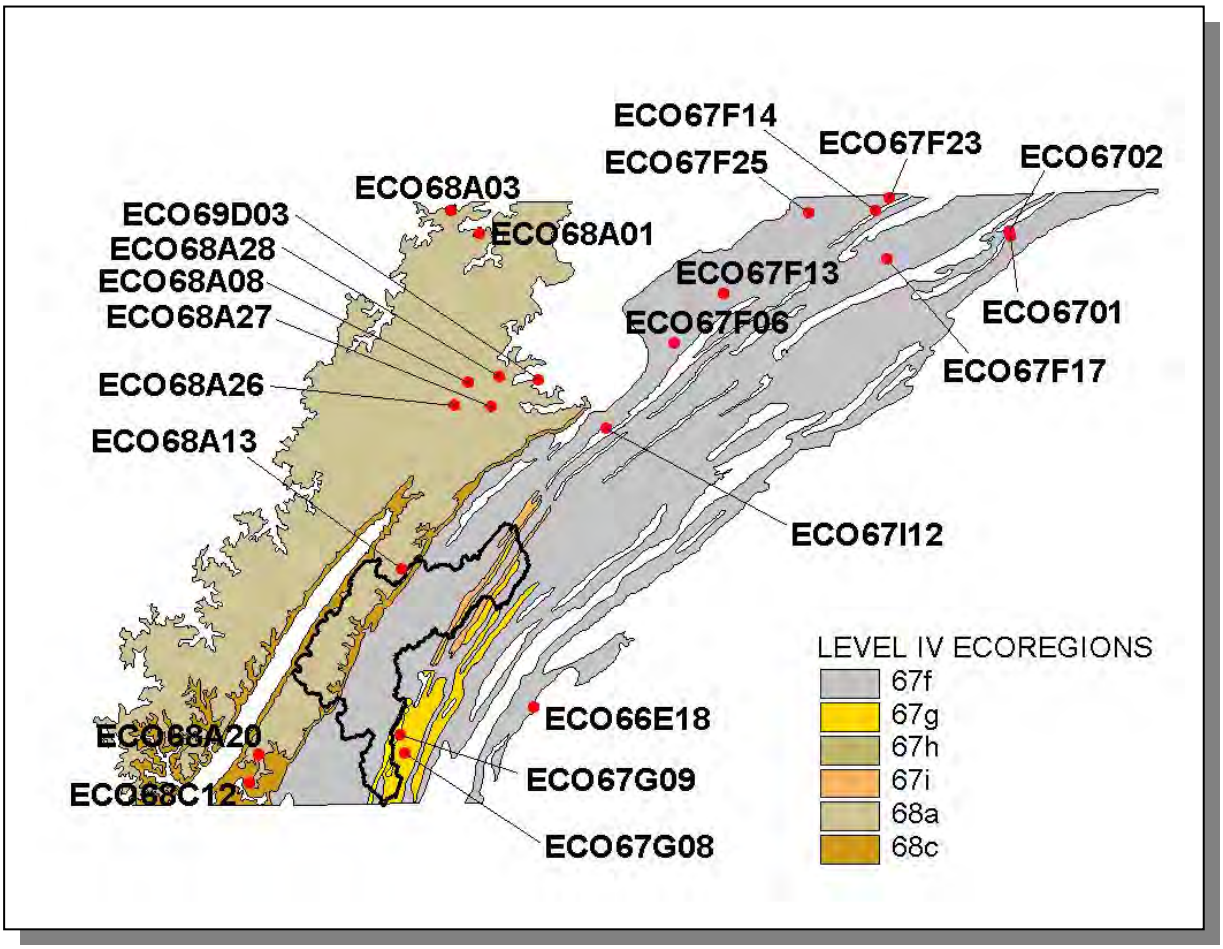


Figure 2-10. Ecoregion Monitoring Sites in Level IV Ecoregions 67f, 67g, 67h, 67i, 68a,67h, and 68c in Tennessee. *The Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed boundary is shown for reference. More information is provided in Appendix II.*

2.6. NATURAL RESOURCES.

2.6.A. 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 and Spiders	5
Mussels	8
Snails	1
Other Invertebrates	2
Amphibians	5
Birds	11
Fish	6
Mammals	6
Reptiles	2
Plants	64
Total	**111**

Table 2-3. There are 111 Known Rare Plant and Animal Species in the Tennessee Portion (Groups 3 and 4) of the Lower Tennessee River Watershed.

In the Tennessee Portion of the Lower Tennessee River Watershed (Groups 3 and 4 portions), there are 7 rare fish species, 1 rare crustacean species, 9 rare mussel species, and 2 rare snail species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Carpiodes velifer	Highfin Carpsucker		D
Hemitremia flammea	Flame Chub	MC	D
Percina tanasi	Snail darter	LT	T
Phoxinus saylori	Laurel dace		E
Phoxinus tennesseensis	Tennessee Dace		D
Typhlichthys subterraneus	Southern Cavefish	MC	D
Cambarus extraneus	Chickamauga Crayfish	MC	T
Cyprogenia irrorata	Eastern Fantail Pearly Mussel	LE	E
Dromus dromus	Dromedary Pearly Mussel	LE	E
Lampsilis abrupta	Pink Mucket	LE	E
Plethobasus cooperianus	Orange-Foot Pimpleback	LE	E
Pleurobema oviforme	Tennessee Clubshell		
Pleurobema plenum	Rough Pigtoe	LE	E
Pleurobema rubrum	Pyramid Pigtoe		
Quadrula intermedia	Cumberland Monkeyface	LE	E
Io fluvialis	Spiny Riversnail		

Table 2-4. Rare Aquatic Species in the Tennessee Portion of the Lower Tennessee River Watershed. *Federal Status: LE, Listed Endangered by the U.S. Fish and Wildlife Service; LT, Listed Threatened by the U.S. Fish and Wildlife Service; MC, Management Concern for U.S. Fish and Wildlife Service. State Status: E, Listed Endangered by the Tennessee Wildlife Resources Agency; T, Listed Threatened by the Tennessee Wildlife Resources Agency; D, Deemed in Need of Management by the Tennessee Wildlife Resources Agency. More information may be found at http://www.state.tn.us/environment/nh/data.php.*

2.6.B. 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/nh/wetlands/

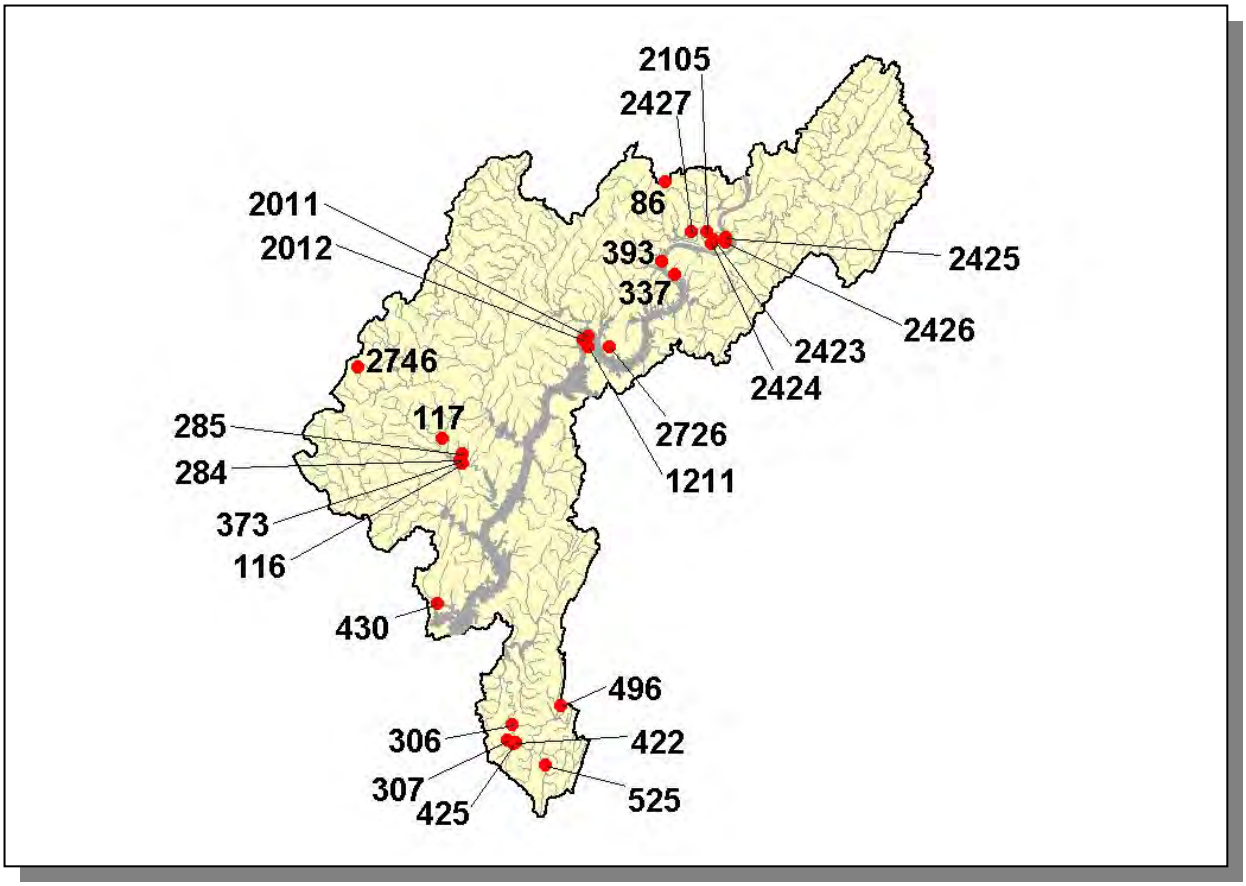


Figure 2-11. Location of Wetland Sites in TDEC Division of Natural Heritage Database in the Group 3 Potion of the Tennessee Portion of the Lower Tennessee River Watershed. This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands*. More information is provided in Appendix II.*

2.7. CULTURAL RESOURCES.

2.7.A. Greenways. The Group 3 portion of the Lower Tennessee River Watershed has at three greenways/trails:

- Birchwood Elementary School Trail
- Sale Creek High School Trail
- Wolftever Creek Greenway

More information about greenways and trails in the watershed may be found at:

http://www2.state.tn.us/tdec/GREENWAYS/tnmap.htm

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

- Hiwassee Wildlife Refuge has a platform area for viewing the up to 50,000 migrating greater sandhill cranes. The approximately 1,300 acres are managed for wildlife by TWRA.
- Watts Bar Dam Reservation features boating, fishing, swimming, and camping. The site is managed by TVA.
- Harrison Bay State Park was originally developed as a TVA recreation demonstration area in the 1930's. The 1,220-acre park has 40 miles of Chickamauga lake shoreline and is managed by the state of Tennessee.
- Booker T. Washington State Park is a 353-acre park along TVA's Chickamauga Lake. The Park is named in honor of Booker Taliaferro Washington, a former president of Tuskegee Institute.

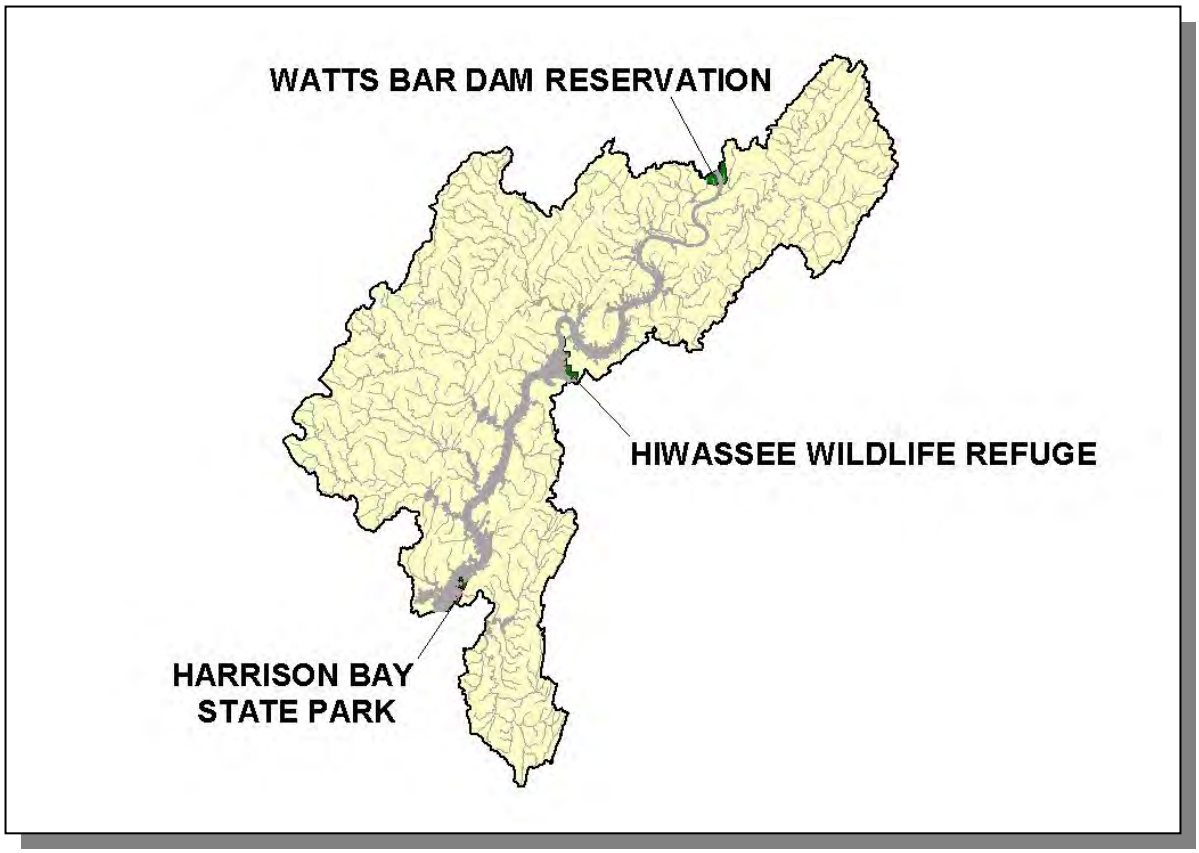


Figure 2-12. Locations of State- and Federally-Managed Lands in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

2.7.C. Wildlife Management Area. The Tennessee Wildlife Resources Agency manages two wildlife management areas in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

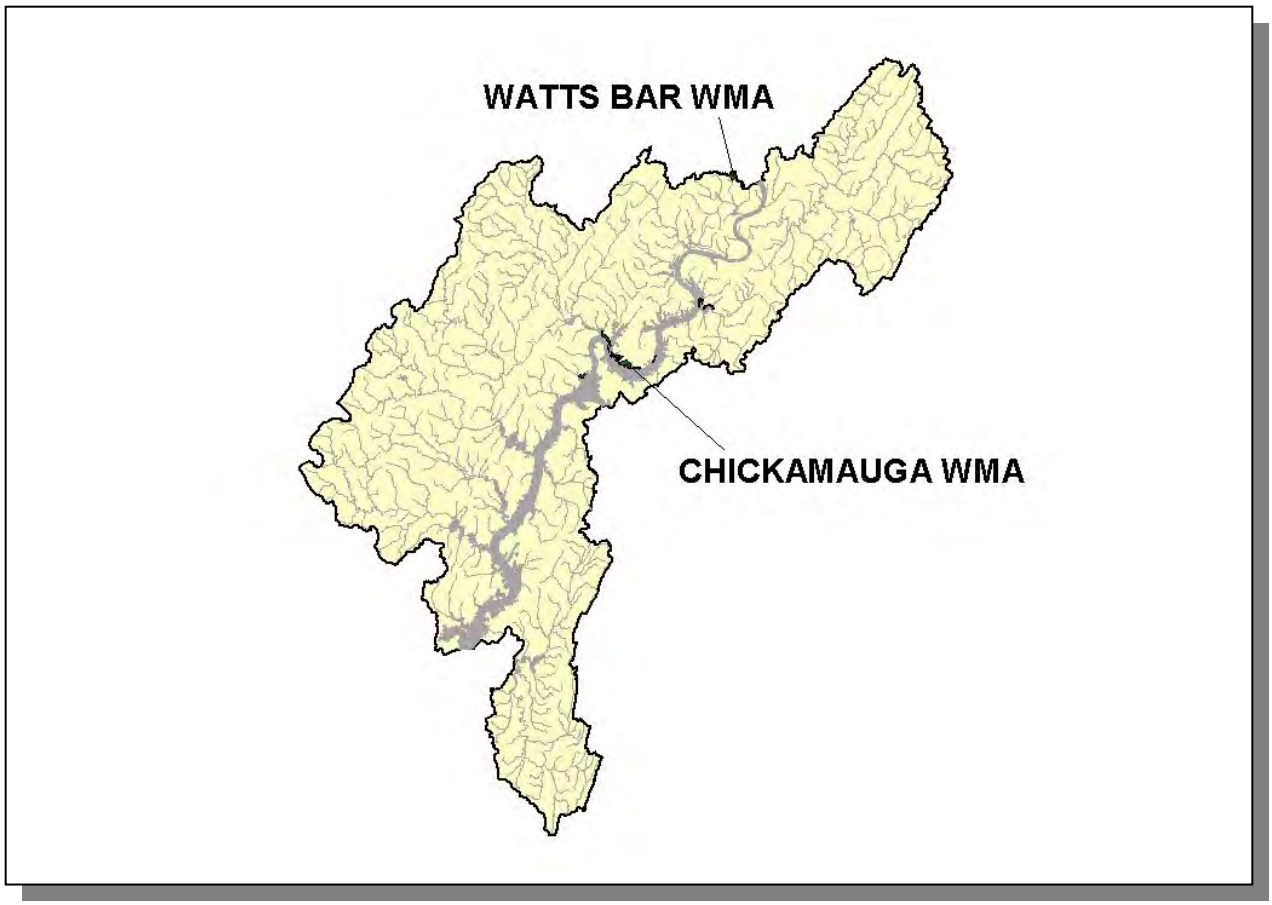


Figure 2-13. TWRA Manages Wildlife Management Areas in the Group 3 Portion of the Tennessee Portion of the Lowe Tennessee River Watershed.

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/publications/riv/

STREAM	NSQ	RB	RF		STREAM	NSQ	RB	RF
Bear Branch Creek	2				McGill Greek	2	3	
Big Possum Creek	1				North Suck Creek	2	2,3	
Big Sewee Creek	2	2	3,4		Paine Creek	2		
Black Ankle Creek	3				Polebridge Creek	3		
Blue Springs Branch Creek	3				Possum Creek	2	2	
Broad Camp Creek	3				Richland Creek	1	2,3	
Brush Creek	1				Roaring Creek	1,2	2	
Clear Creek	3		3		Rock Creek	1	2	
Dry Fork Creek	3				Sale Creek	3		
Fork Creek	2				Soddy Creek	1	2	
Goodfield Creek	3				South Chickamauga Creek	3	2	
Gray Creek	1				South Fork Little Sewee Creek	2		
Henderson Creek	1	2			South Suck Creek	1		
Hurricane Creek	3				Suck Creek	2	2	
Little Ooltewah Creek	2				Sugar Creek	3		
Little Possum Creek	1	2			Tenmile Creek	3		3
Little Sewee Creek	3		3		Tigues Creek	3	2	
Little Woftever Creek	4				Woltever Creek	3		
Long Savannah Creek	3				Yellow Creek	4		

Table 2-5. Stream Scoring from the Tennessee Rivers Assessment Project in the Lower Tennessee River Watershed. *Streams listed may be in the Group 3 or Group 4 portions of the watershed.*

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

CHAPTER 3

WATER QUALITY ASSESSMENT OF THE LOWER TENNESSEE RIVER WATERSHED

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 of the watershed cycle, following one to two years of data collection. More information about the Watershed Approach may be found in Chapter 1 and at http://www.state.tn.us/environment/wpc/watershed/

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 2002 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/surf/.

The 303(d) list is a compilation of the waters of Tennessee that fail to support some or all of their classified 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) for which it is listed.

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/wpc/publications/2004_303dlist.pdf

and information about Tennessee's TMDL program may be found at:
http://www.state.tn.us/environment/wpc/tmdl/.

This chapter provides a summary of water quality in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed, summarizes data collection and assessment results, and describes impaired waters.

3.2. DATA COLLECTION. Comprehensive water quality monitoring in the South Fork Holston River Watershed was conducted in 1999-2000. Data are from one of four site types: (1) Ambient sites, (2) Ecoregion sites, (3) Watershed sites, or (4) Tier Evaluation sites.

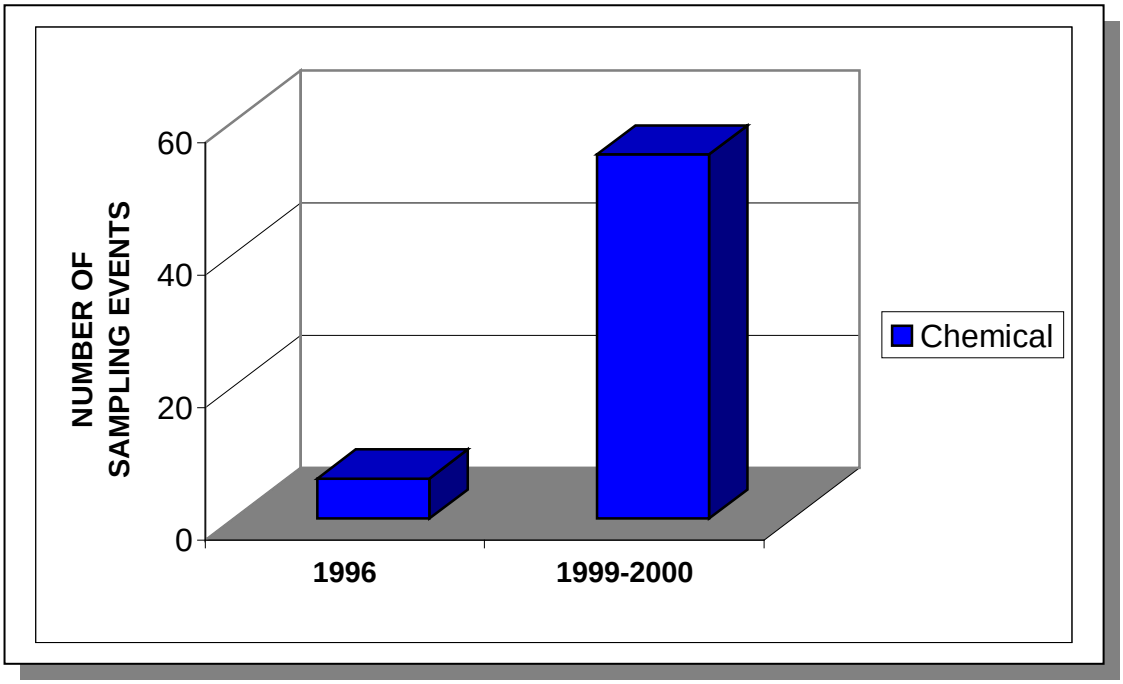


Figure 3-1. Number of Sampling Events Using the Traditional Approach (1996) and Watershed Approach (1999-2000) in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

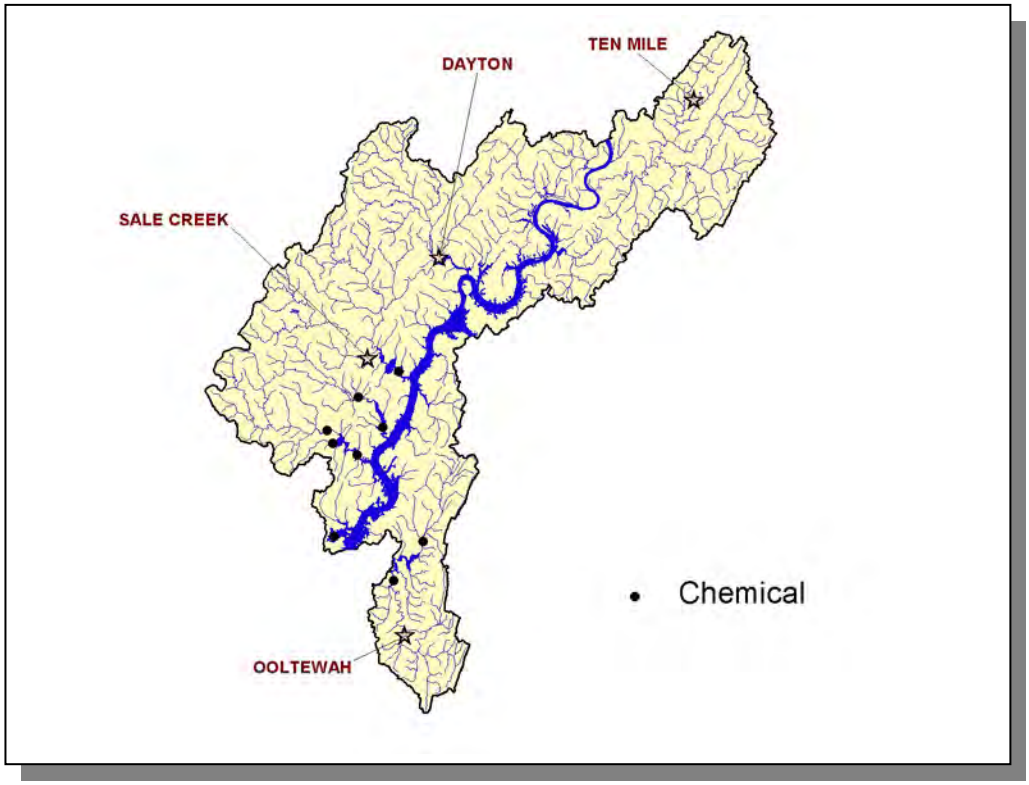


Figure 3-2. Location of Monitoring Sites in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Locations of Dayton, Ooltewah, Sale Creek, and Ten Mile are shown for reference.*

	1996	1999-2000
Biological	0	0
Chemical	6	55
Total	**6**	**55**

Table 3-1. Number of Sampling Events in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed During the Data Collection Phase of the Watershed Approach.

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Field Office-Chattanooga 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 traditionally measured at ambient sites in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed are provided in Appendix IV.

Data from ambient monitoring stations are entered into the STORET (Storage and Retrieval) system administered by EPA.

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 Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed lies within 2 Level III ecoregions (Ridge and Valley and Southwestern Appalachians) and contains 6 subecoregions (Level IV):

- Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)
- Southern Shale Valleys (67g)
- Southern Sandstone Ridges (67h)
- Southern Dissected Ridges and Knobs (67i)
- Cumberland Plateau (68a)
- Plateau Escarpment (68c)

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 during the watershed sampling time period.

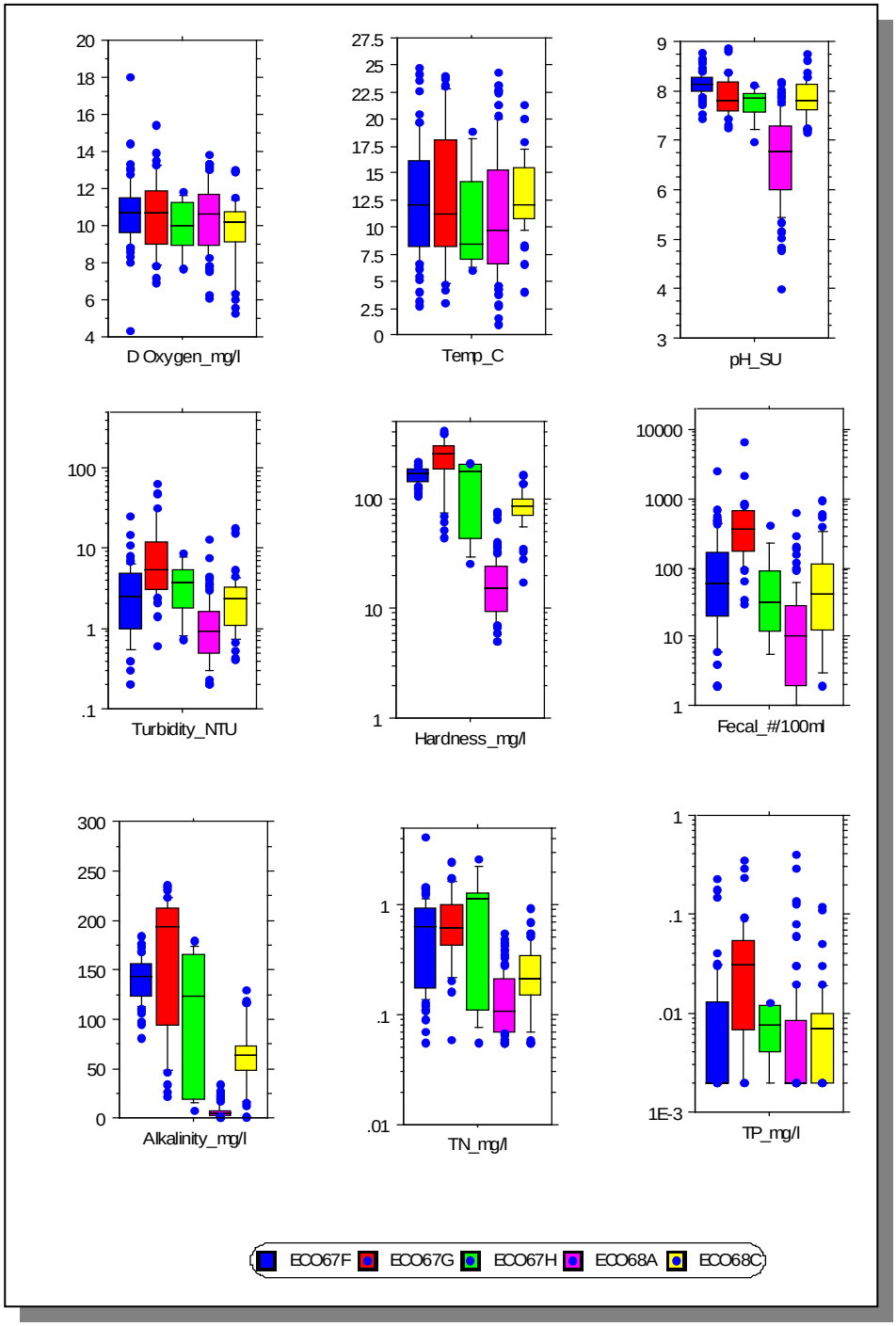


Figure 3-3. Select Chemical Data Collected in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. Fecal, fecal coliform bacteria; TN, Total Nitrogen; TP, Total Phosphorus.*

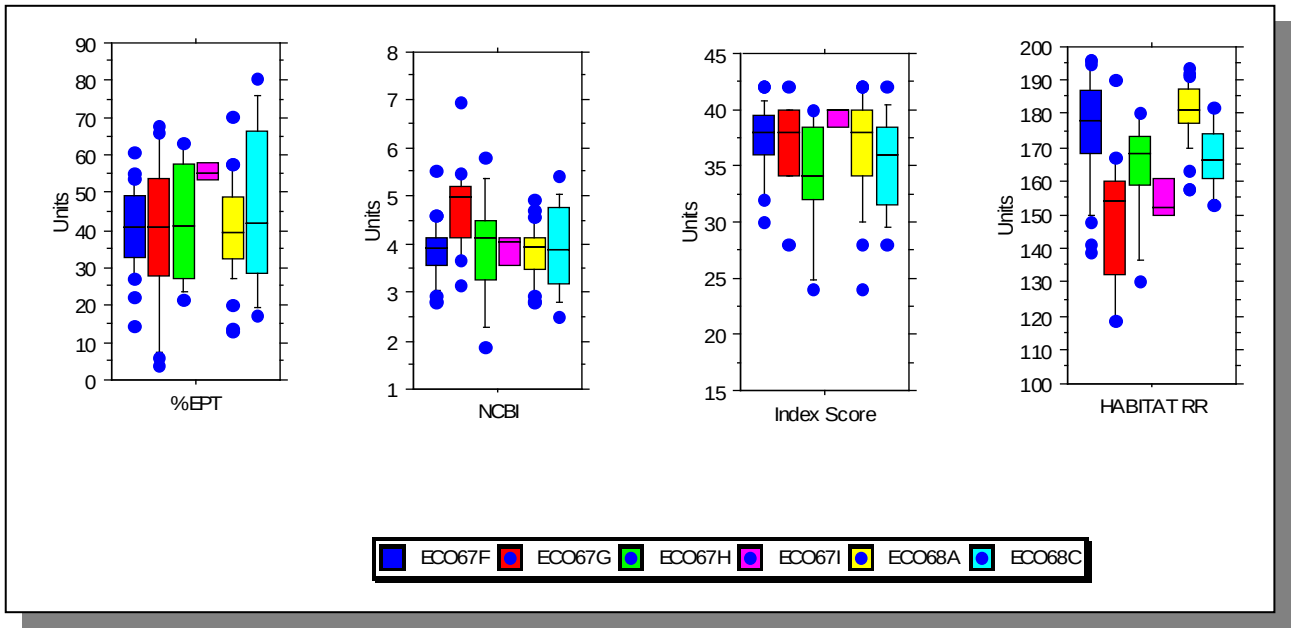


Figure 3-4. Benthic Macroinvertebrate and Habitat Scores for the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score and Habitat Riffle/Run scoring system are described in TDEC's Quality System Standard Operating Procedure for Macroinvertebrate Surveys (2002).*

3.2.C. Watershed Screening Sites. Activities that take place at watershed sites are benthic macroinvertebrate 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 [mayfly], Plecoptera [stonefly], Trichoptera [caddisfly]). Factors and resources used for selecting BioRecon sites are:

- The current 303(d) list,
- HUC-10 maps (every HUC-10 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 regular monitoring of a station over a fixed period of time. Intensive surveys (Rapid Bioassessment Protocols) are performed when BioRecon results warrant it.

3.2.D. Special Surveys. These investigations are performed when needed and include:

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

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 readily available data are considered, including data from TDEC Environmental Field Offices, 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.

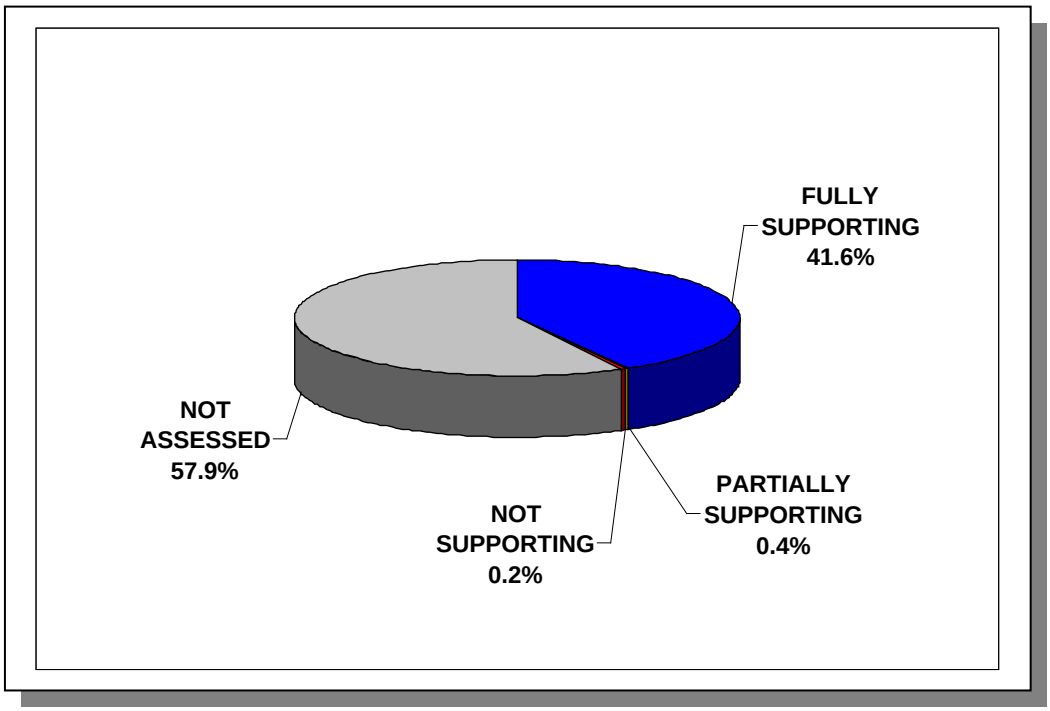


Figure 3-5a. Water Quality Assessment of Streams and Rivers in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment of 971.9 miles in the watershed. More information is provided in Appendix III.*

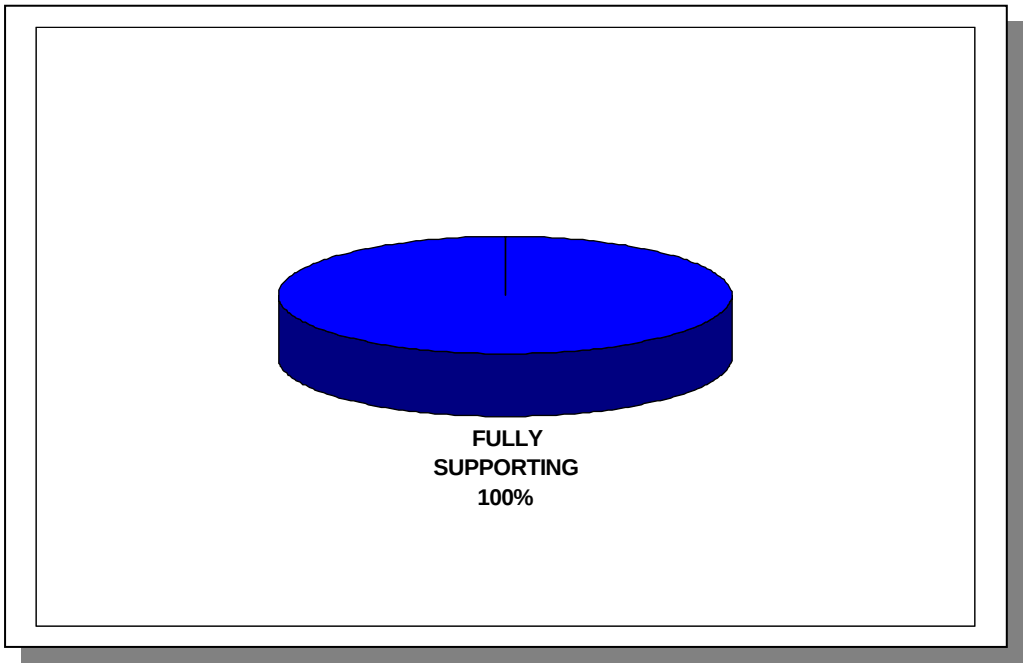


Figure 3-5b. Water Quality Assessment of Lakes in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment of 35,400 lake acres in the watershed. More information is provided in Appendix III.*

3.3.A. Assessment Summary.

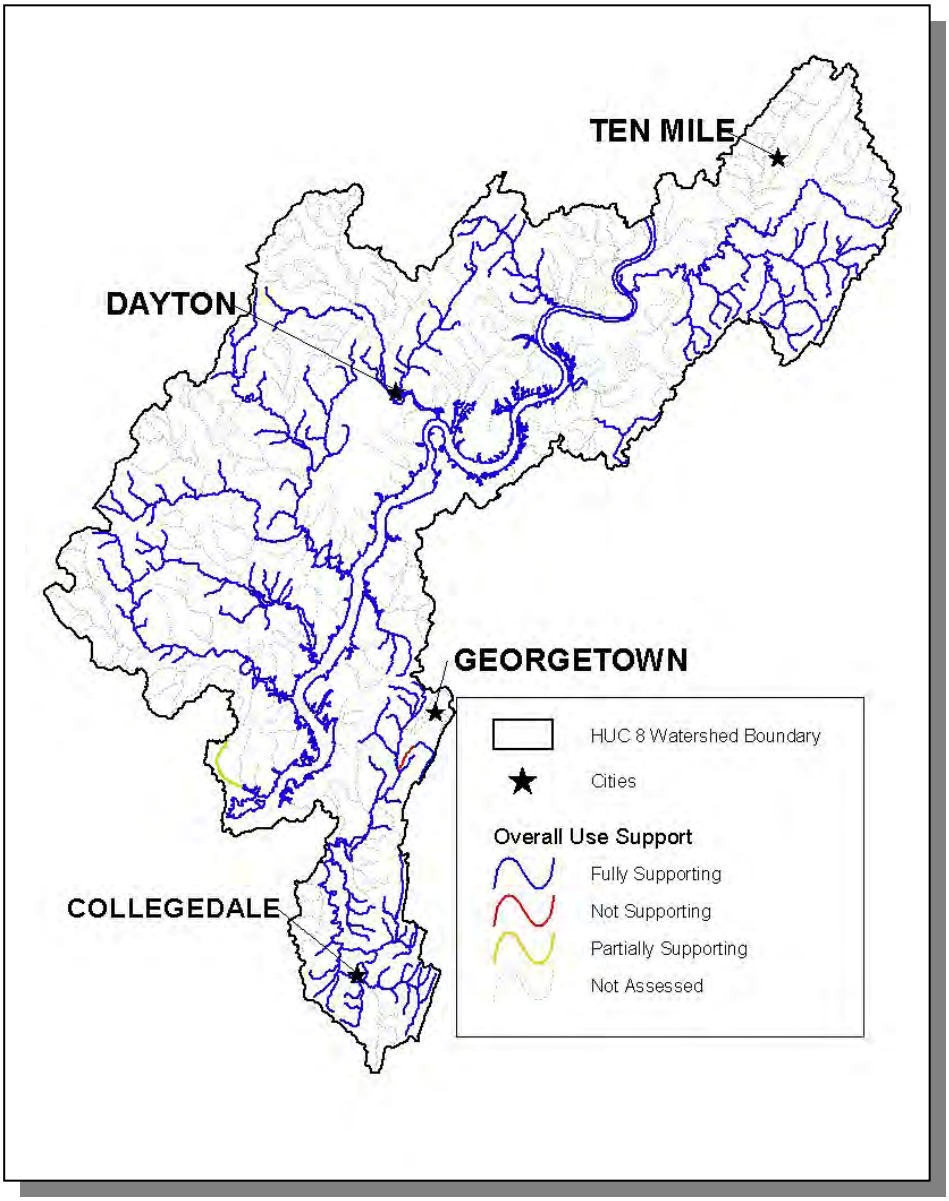


Figure 3-6a. Overall Use Support Attainment in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

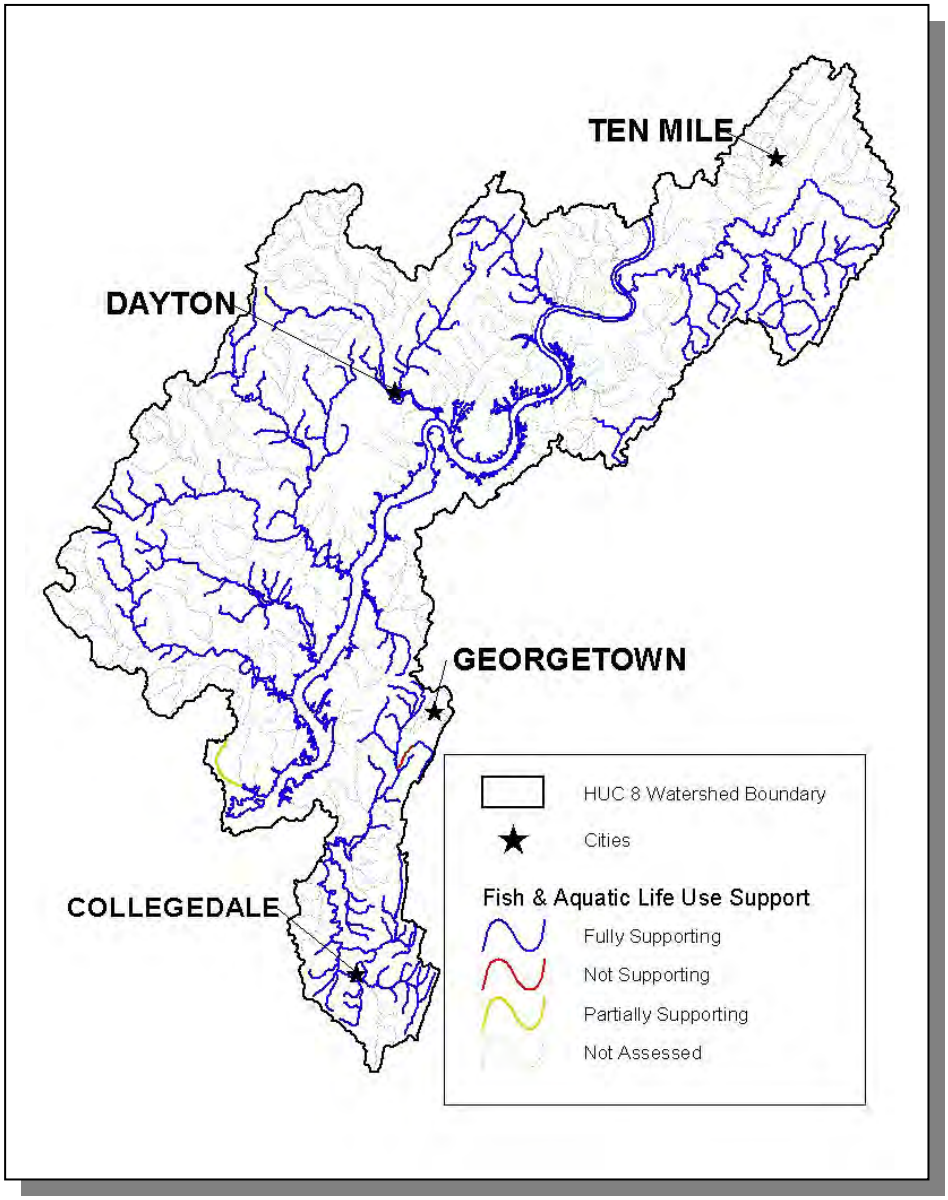


Figure 3-6b. Fish and Aquatic Life Use Support Attainment in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

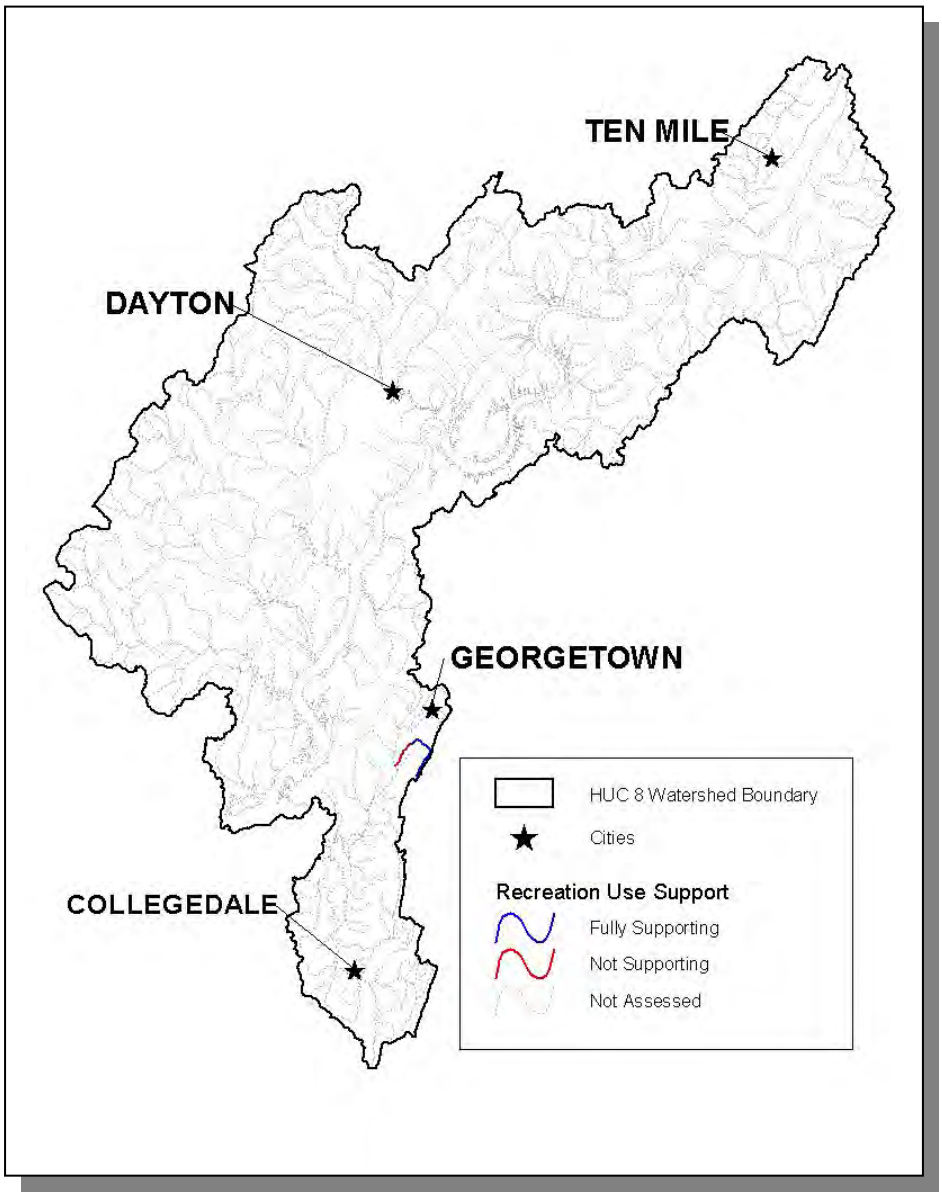


Figure 3-6c. Recreation Use Support Attainment in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

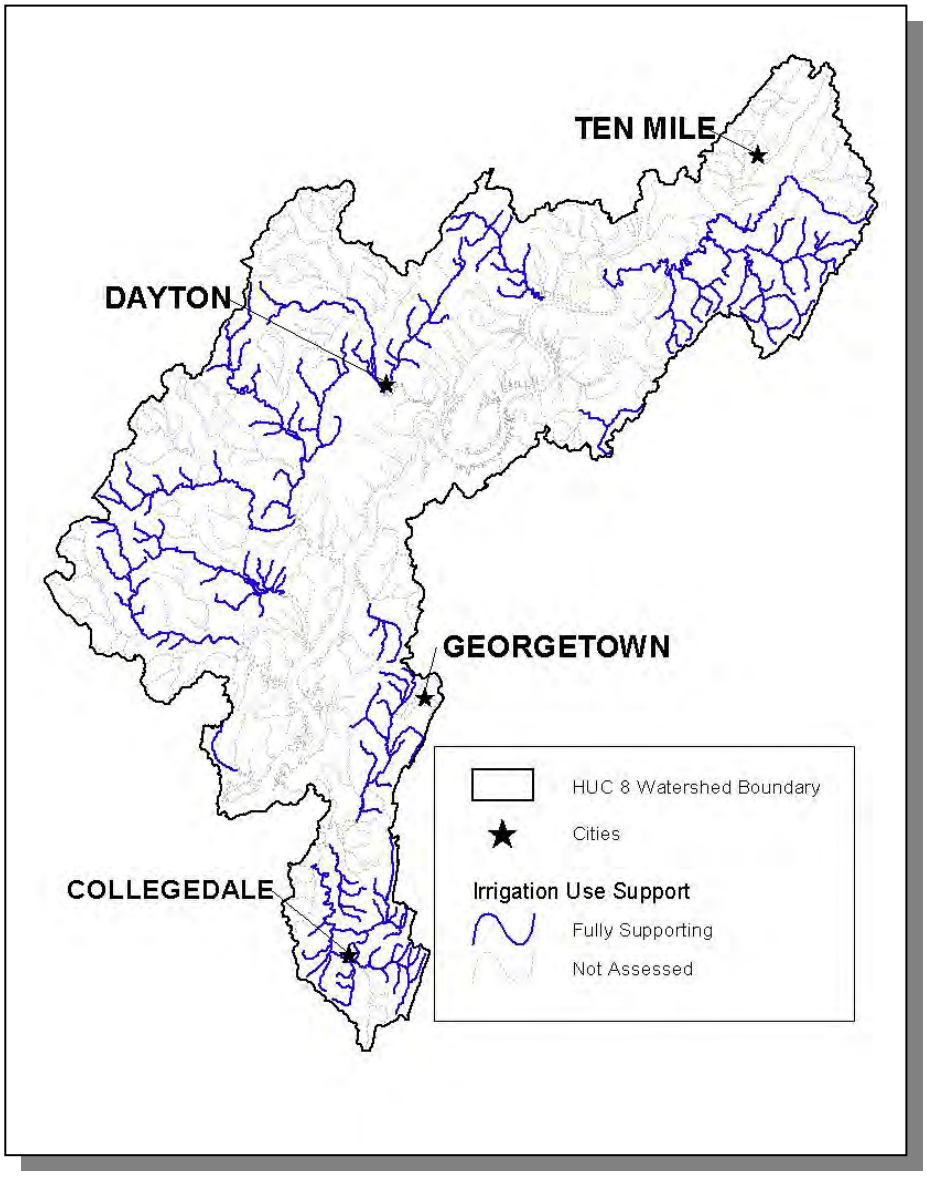


Figure 3-6d. Irrigation Use Support Attainment in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

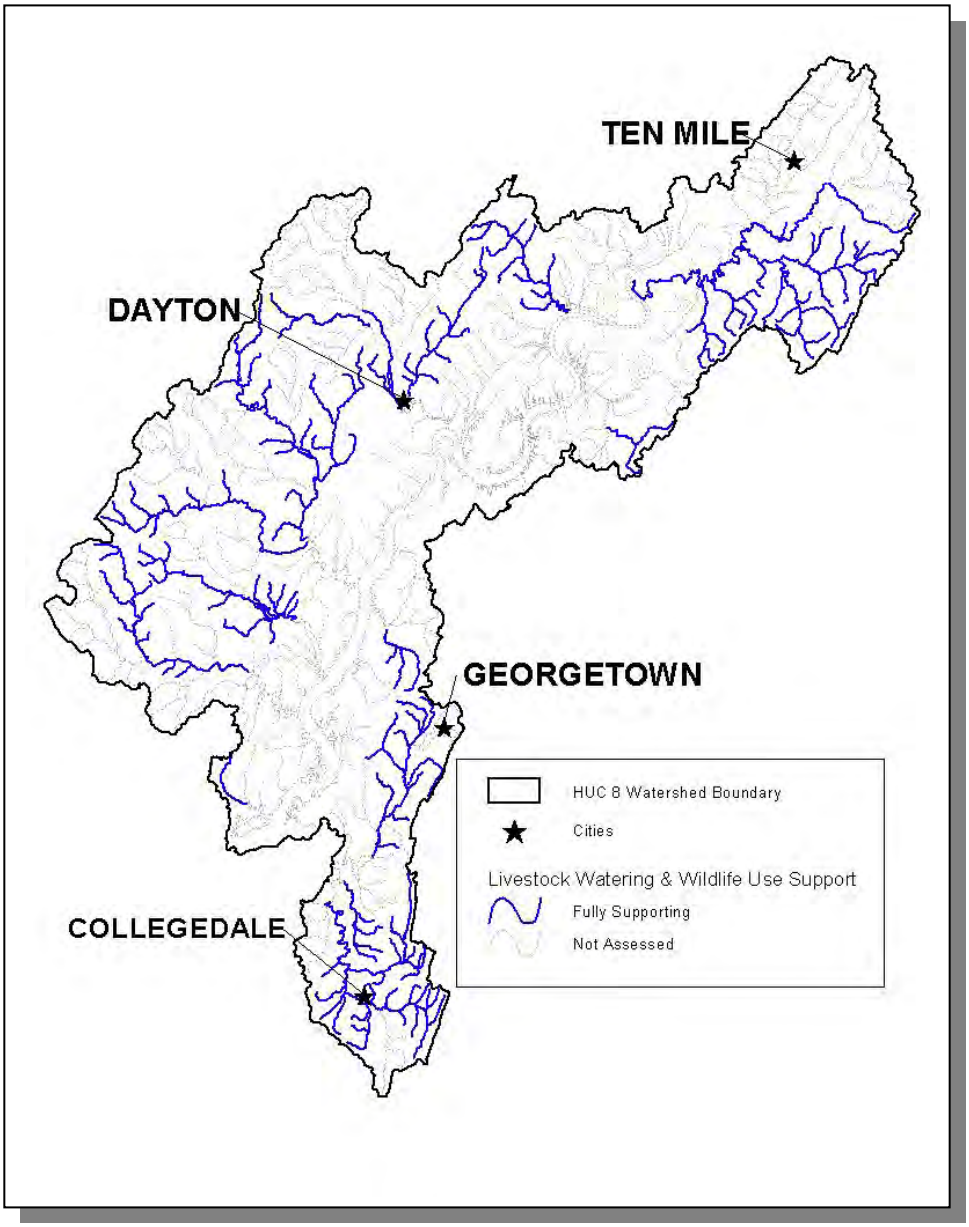


Figure 3-6e. Livestock Watering and Wildlife Use Support Attainment in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

3.3.B. Use Impairment Summary.

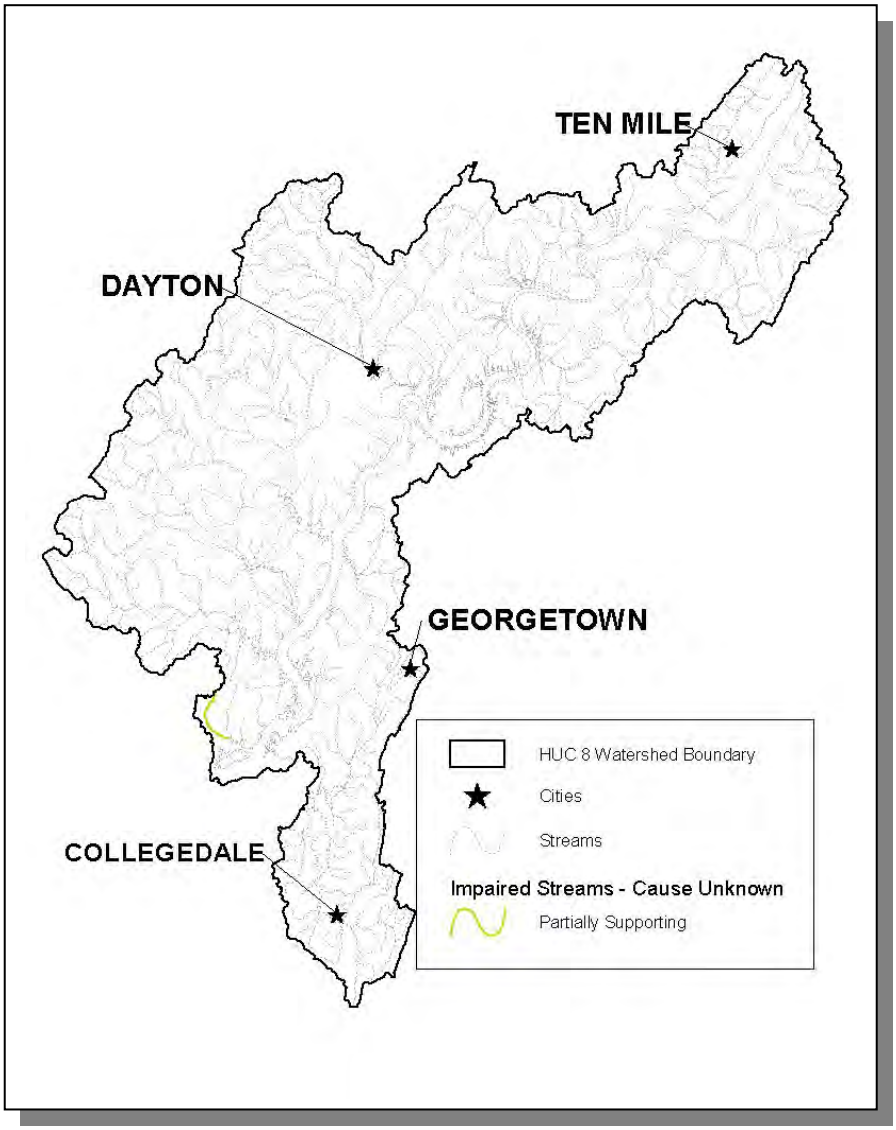


Figure 3-7a. Impaired Streams Due to Unknown Causes in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

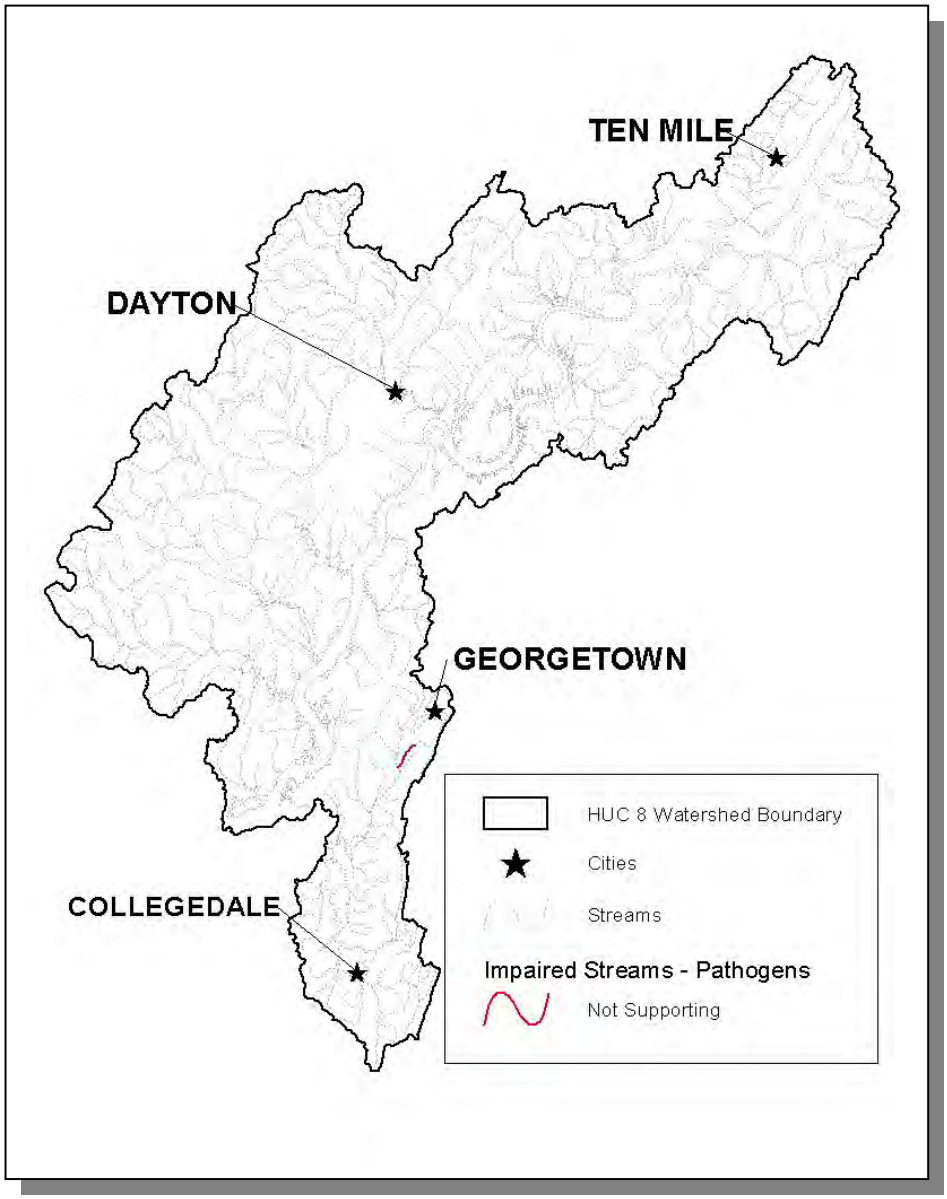


Figure 3-7b. Impaired Streams Due to Pathogens in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

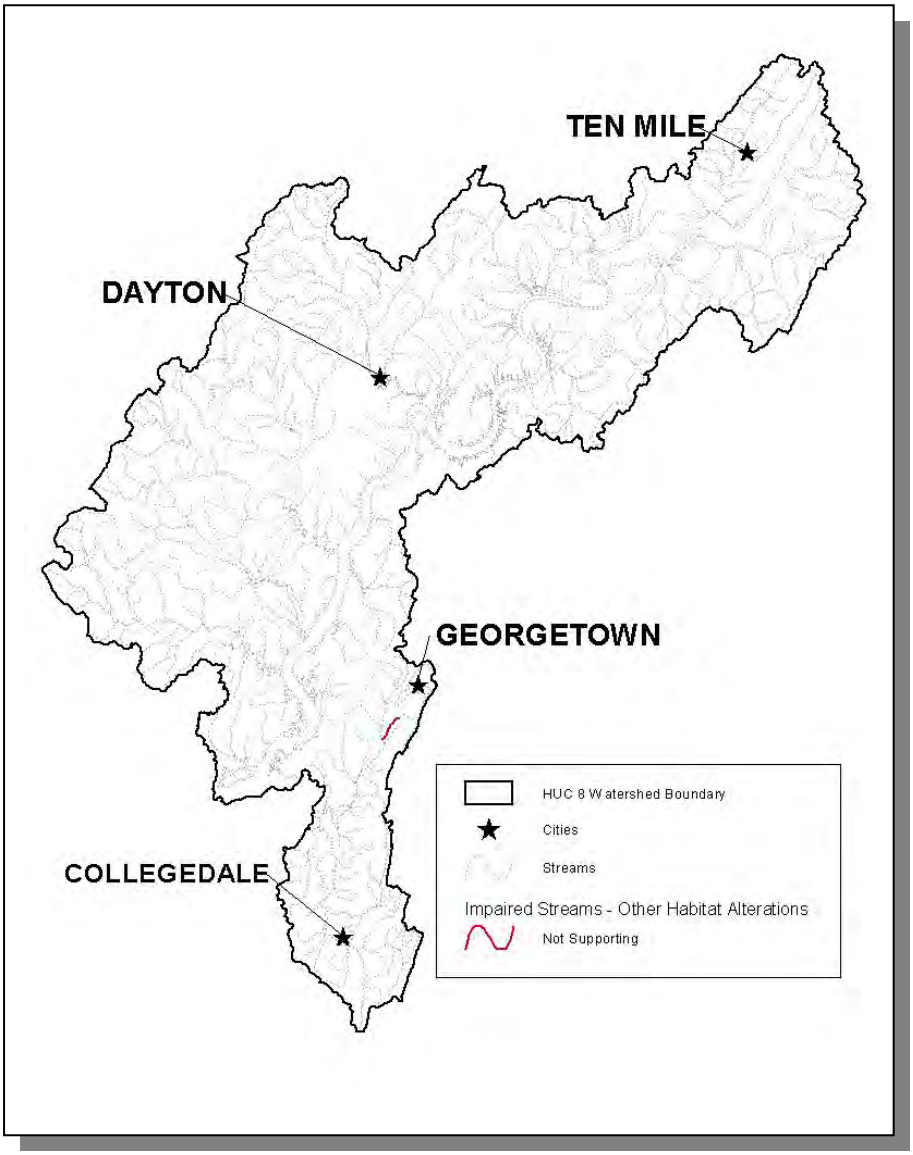


Figure 3-7c. Impaired Streams Due to Habitat Alterations in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Collegedale, Dayton, Georgetown, and Ten Mile are shown for reference. More information is provided in Appendix III.*

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.

Since the year 2002, the 303(d) list is compiled by using EPA's ADB (Assessment Database) software developed by RTI (Research Triangle Institute). The ADB allows for a 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.

The ADB was used to create maps that illustrate water quality. These maps may be viewed on TDEC's homepage at http://www.state.tn.us/environment/water.htm,

CHAPTER 4

POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE LOWER TENNESSEE RIVER WATERSHED

4.1. BACKGROUND. This chapter is organized by HUC-10 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 2002 303(d) list
iii. Description of nonpoint source contributions

The Tennessee portion of the Lower Tennessee River Watershed (HUC 06020001) has been delineated into five HUC 10-digit subwatersheds.

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 2.0 (developed by Tetra Tech, Inc for EPA Region 4) released in 2003.

WCS integrates with ArcView® v3.x 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.

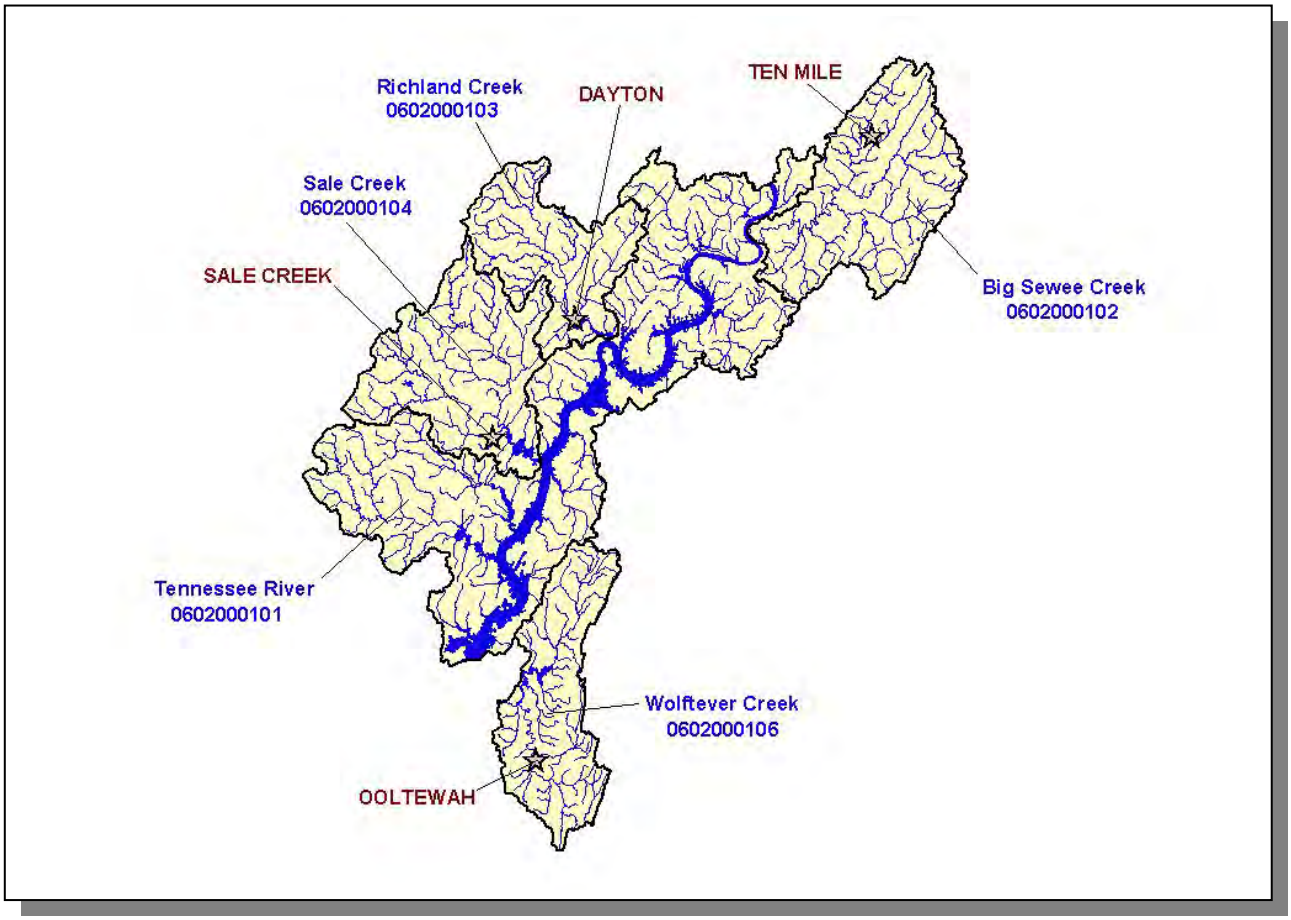


Figure 4-1. The Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed is Composed of Five USGS-Delineated Subwatersheds (10-Digit Subwatersheds). *Locations of Dayton, Ooltewah, Sale Creek, and Ten Mile are shown for reference.*

4.2. CHARACTERIZATION OF HUC-10 SUBWATERSHEDS. The Watershed Characterization System (WCS) software and data sets provided by EPA Region IV were used to characterize each subwatershed in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed.

HUC-10	HUC-12
0602000101	060200010101 (Tennessee River)
	060200010102 (Tennessee River)
	060200010103 (Goodfield Creek)
	060200010104 (Tennessee River
	060200010105 (Possum Creek)
	060200010106 (Soddy Creek)
	060200010107 (Tennessee River)
0602000102	060200010201 (Big Sewee Creek)
	060200010202 Little Sewee Creek)
	060200010203 (Sewee Creek)
0602000103	060200010301 (Richland Creek)
	060200010302 (Little Richland Creek)
0602000104	060200010401 (Roaring Creek)
	060200010402 (Rock Creek)
	060200010403 (Sale Creek)
0602000106	060200010601 (Wolftever Creek)
	060200010602(Savannah Creek)

Table 4-1. HUC-12 Drainage Areas are Nested Within HUC-10 Drainages. *NRCS worked with USGS to delineate the HUC-10 and HUC-12 drainage boundaries.*

4.2.A. 0602000101 (Tennessee River).

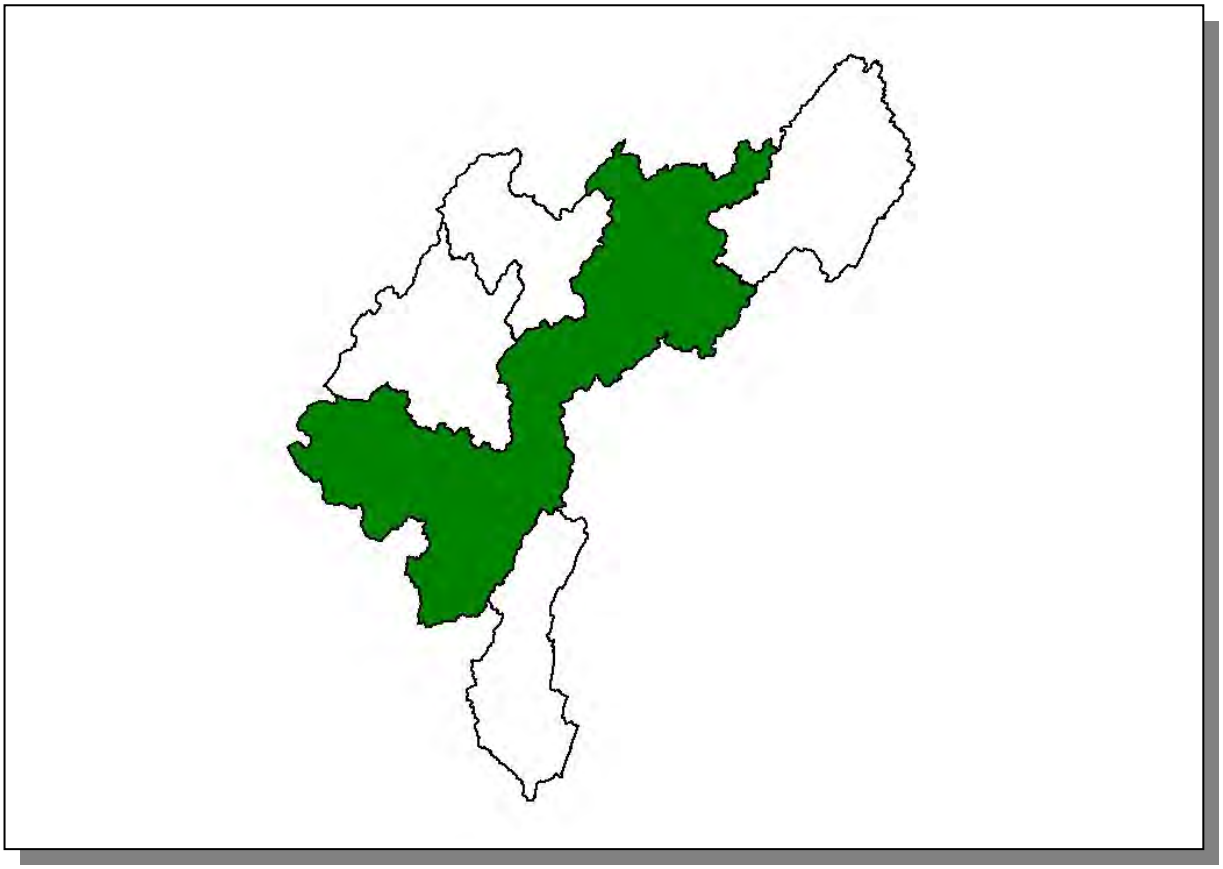


Figure 4-2. Location of Subwatershed 0602000101. *All Lower Tennessee River HUC-10 subwatershed boundaries are shown for reference.*

4.2.A.i. General Description.

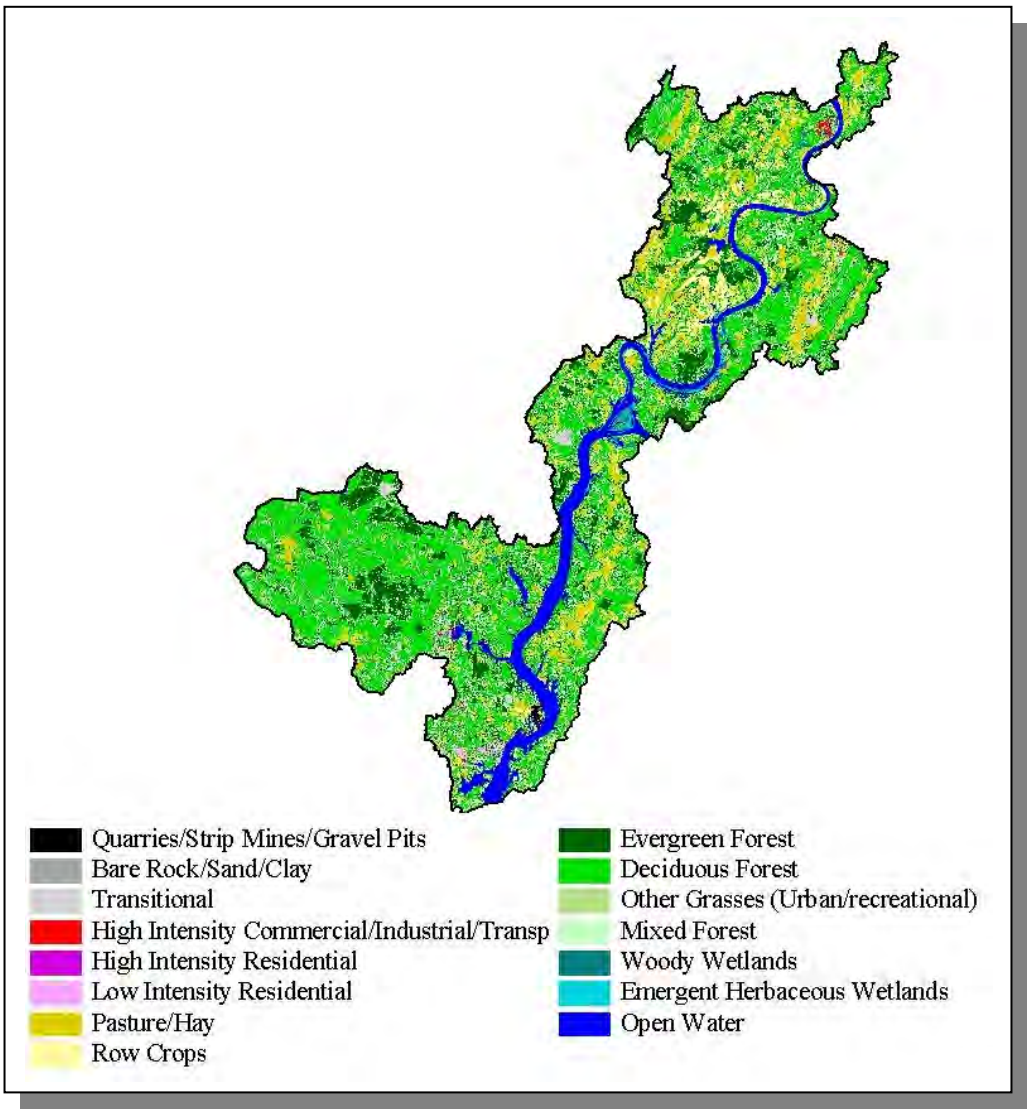


Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0602000101.

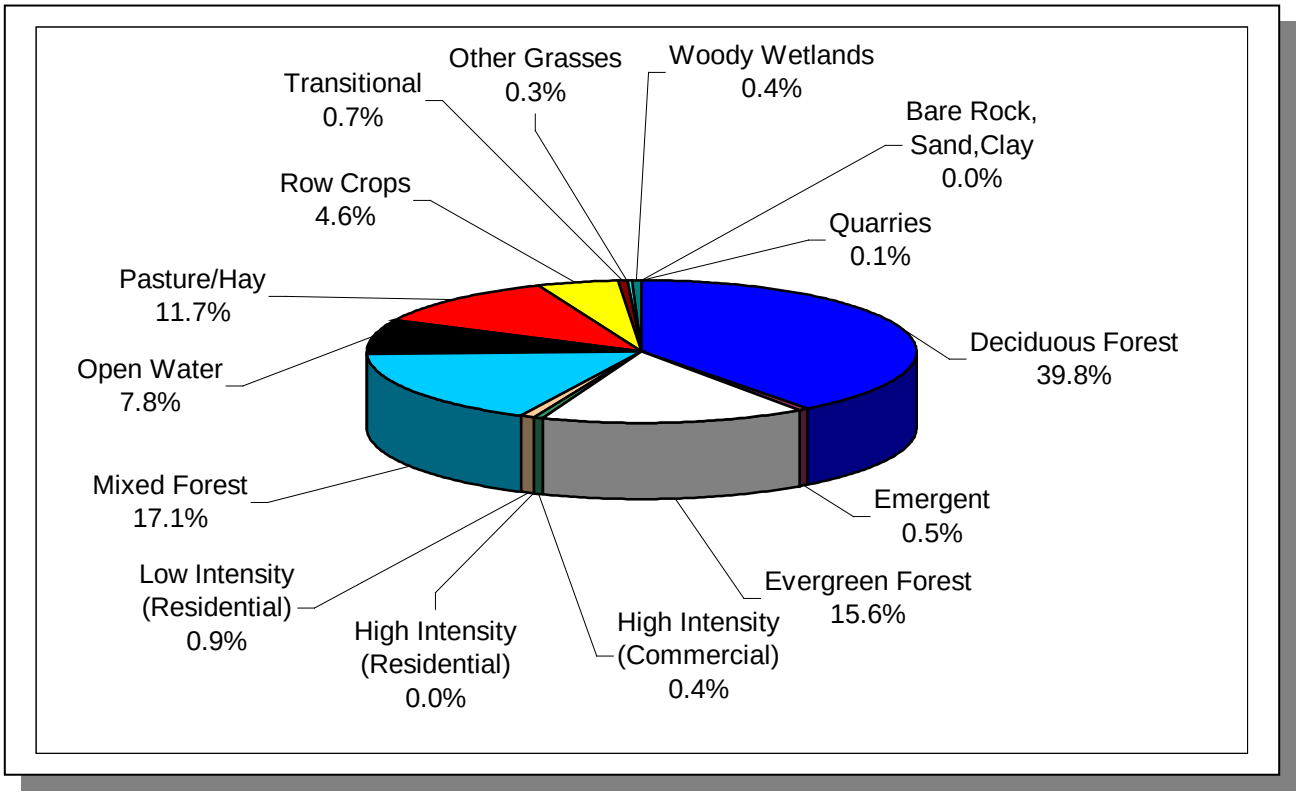


Figure 4-4. Land Use Distribution in Subwatershed 0602000101. *More information is provided in Appendix IV.*

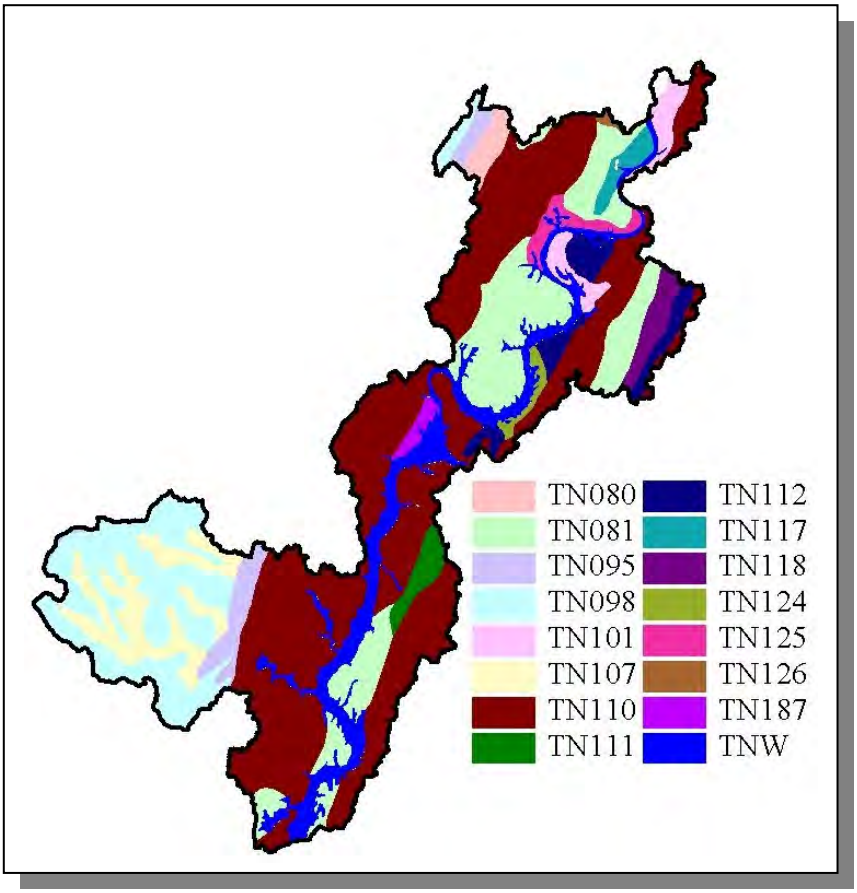


Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000101.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN080	1.00	C	1.38	5.16	Loam	0.35
TN081	5.00	C	1.41	5.48	Silty Loam	0.35
TN095	0.00	B	2.35	5.12	Loam	0.31
TN098	1.00	C	3.98	4.82	Loam	0.32
TN101	0.00	B	1.71	5.39	Loam	0.35
TN107	1.00	C	6.34	4.84	Loam	0.28
TN110	0.00	B	2.22	4.69	Loam	0.31
TN111	0.00	C	1.41	5.10	Loam	0.34
TN112	6.00	C	2.36	5.09	Loam	0.35
TN117	6.00	C	2.06	5.16	Loam	0.37
TN118	0.00	C	6.52	5.12	Loam	0.29
TN124	0.00	B	1.77	5.33	Loam	0.33
TN125	0.00	C	8.50	5.00	Sandy Loam	0.20
TN126	19.00	C	1.30	5.12	Loam	0.33
TN187	0.00	B	1.26	5.12	Loam	0.27

Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000101. *More details are provided in Lower Tennessee Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Bledsoe	9,669	10,650	12,367	1.28	124	137	159	28.2
Hamilton	285,536	194,856	307,896	25.7	73,397	75,795	79,145	7.8
McMinn	42,383	46,000	49,015	0.02	7	7	8	143
Meigs	8,033	9,690	11,086	3,222	2,588	3,122	3,572	38.0
Rhea	24,344	27,672	28,400	28.05	6,829	7,762	7,966	16.6
Sequatchie	8,863	10,119	11,370	9.09	806	920	1,034	28.3
Totals	**378,828**	**398,996**	**420,134**		**83,751**	**87,743**	**91,884**	**9.7**

Table 4-3. Population Estimates in Subwatershed 0602000101.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Dayton	Rhea	5,671	2,306	1,710	596	0
Decatur	Meigs	1,361	550	387	159	4
Lakesite	Hamilton	781	326	65	261	0
Soddy-Daisy	Hamilton	8,240	3,356	305	2,998	53
Totals		**16,053**	**6,538**	**2,467**	**4,014**	**57**

Table 4-4. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0602000101.

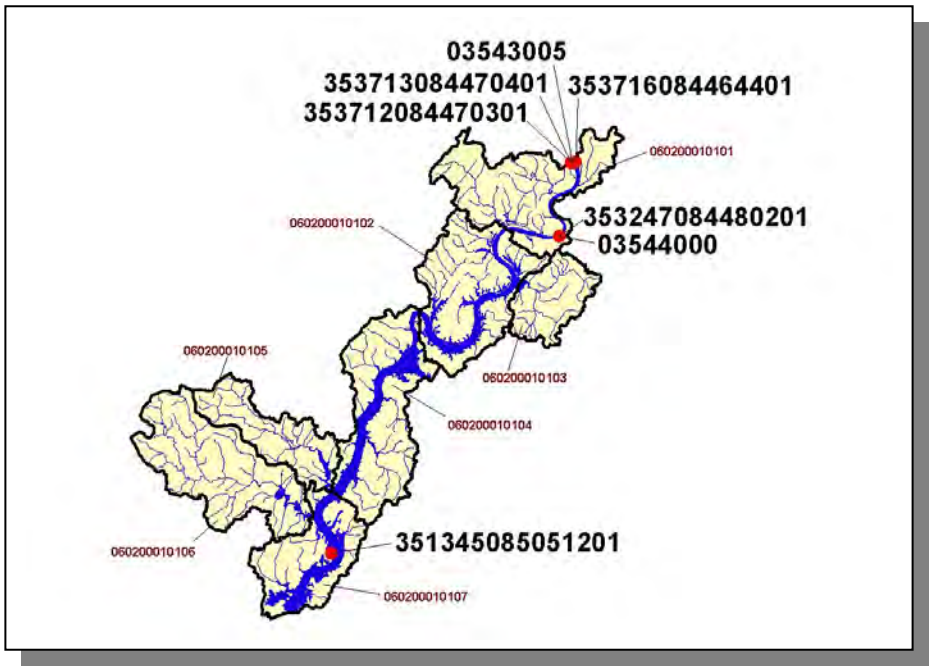


Figure 4-6. Location of Historical Streamflow Data Collection Sites in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106 and 060200010107 boundaries are shown for reference. More information is provided in Appendix IV.*

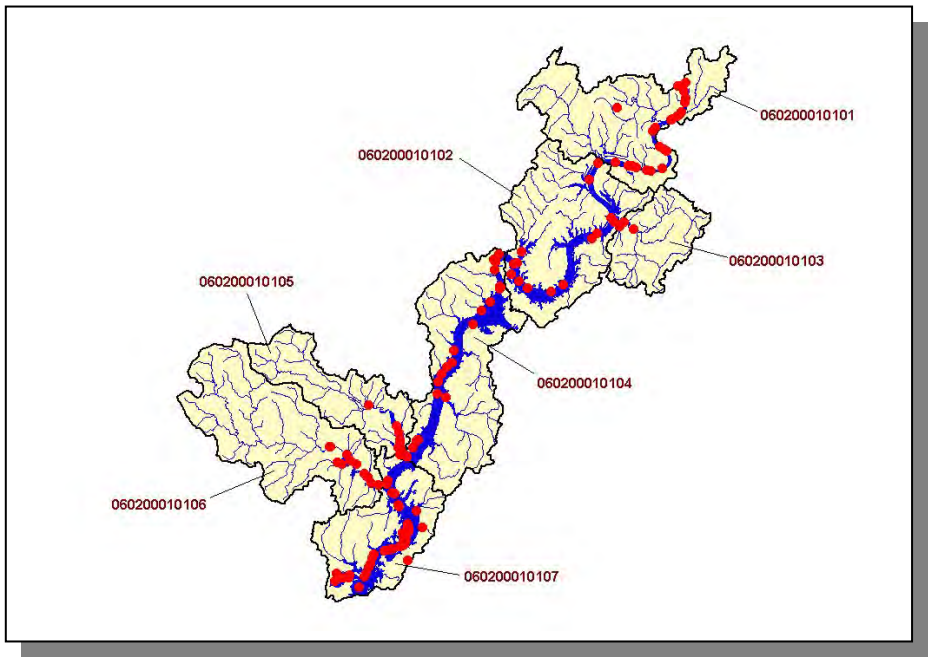


Figure 4-7. Location of STORET Monitoring Sites in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.A.ii Point Source Contributions.

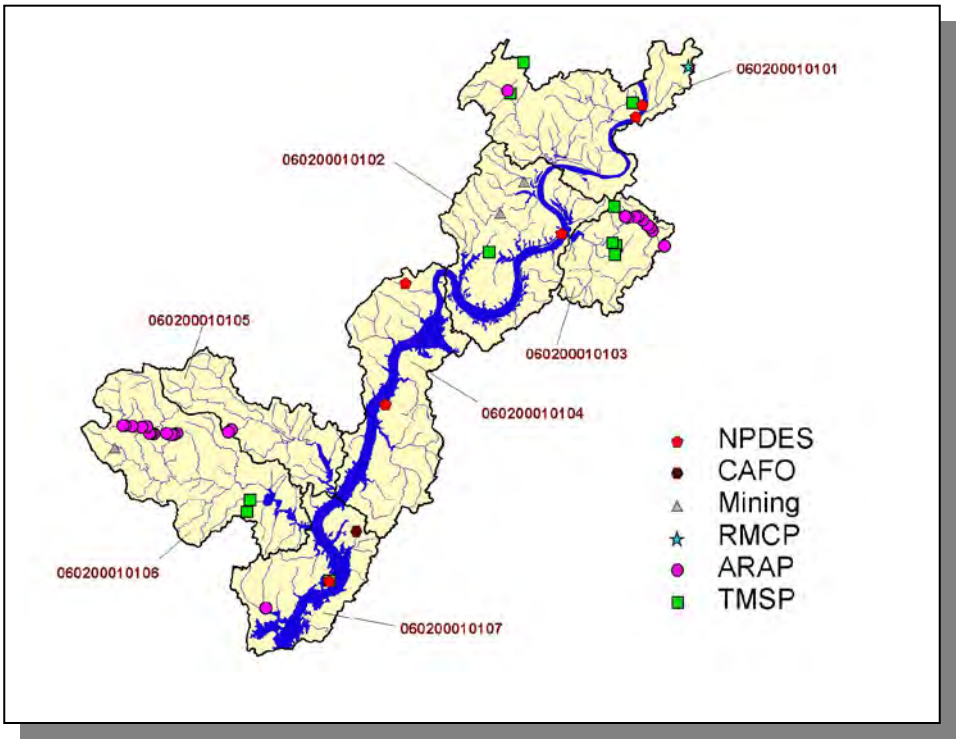


Figure 4-8. Location of Active Point Source Facilities in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

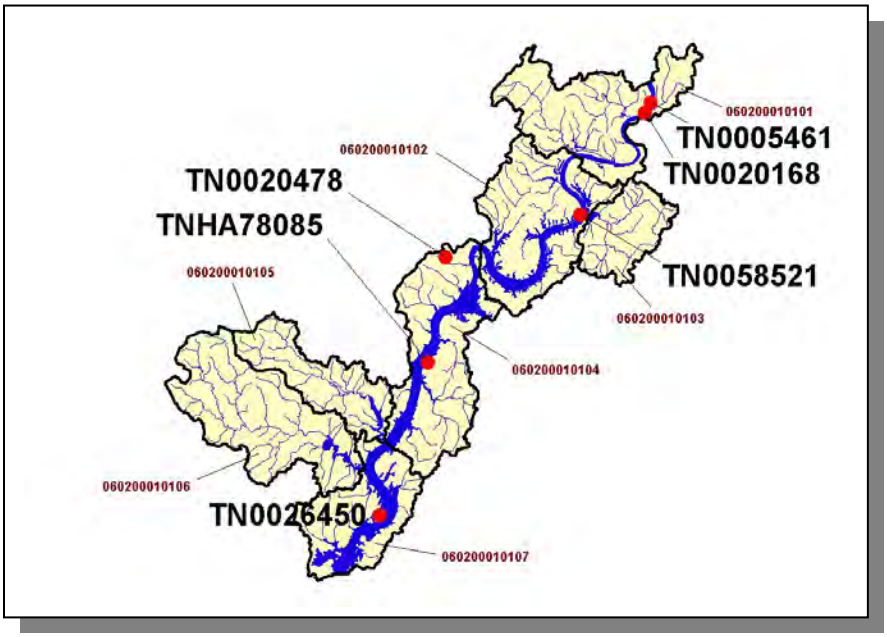


Figure 4-9. Location of NPDES Facilities in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

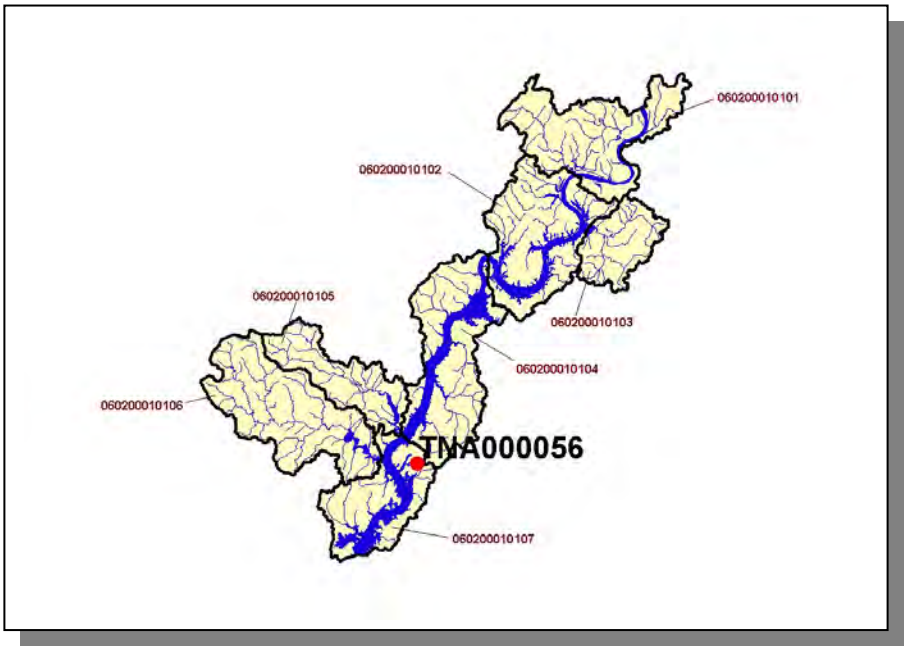


Figure 4-10. Location of Concentrated Animal Feeding Operations (CAFO) in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

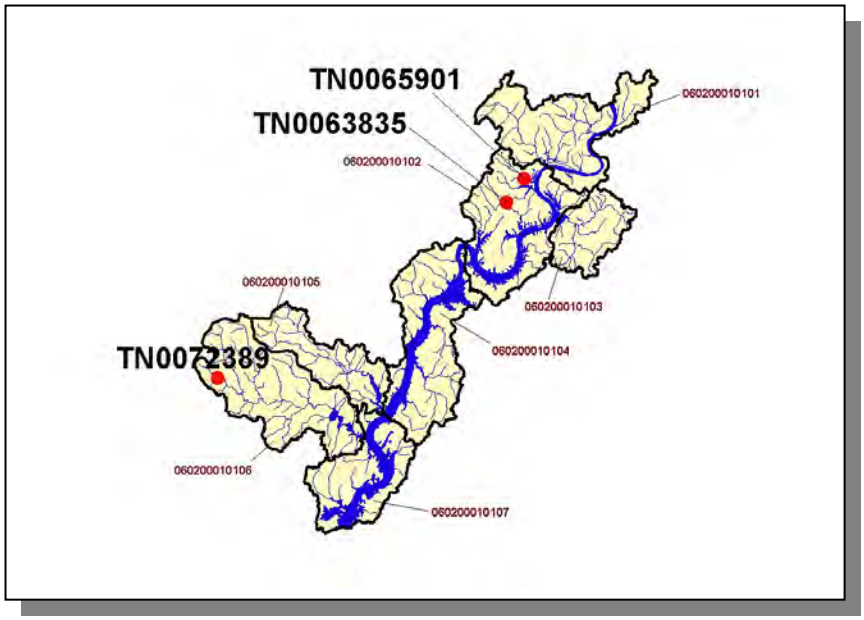


Figure 4-11. Location of Active Mining Facilities in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

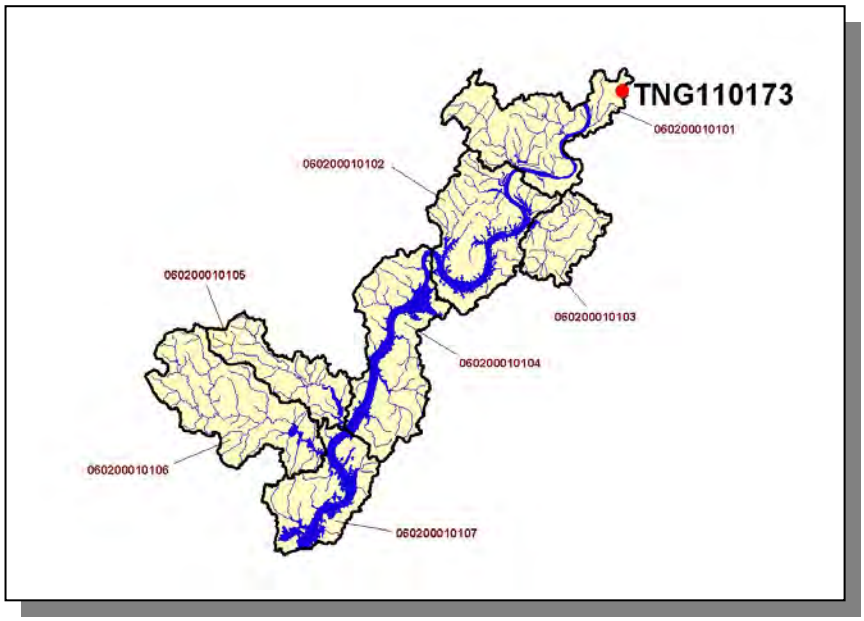


Figure 4-12. Location of Ready Mix Concrete Plants in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

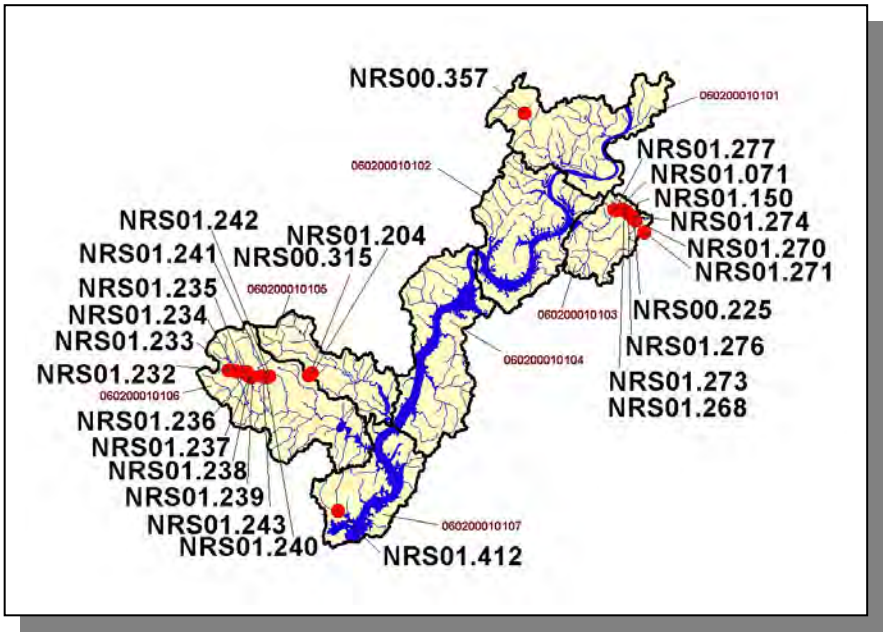


Figure 4-13. Location of ARAP Sites (Individual Permits) in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

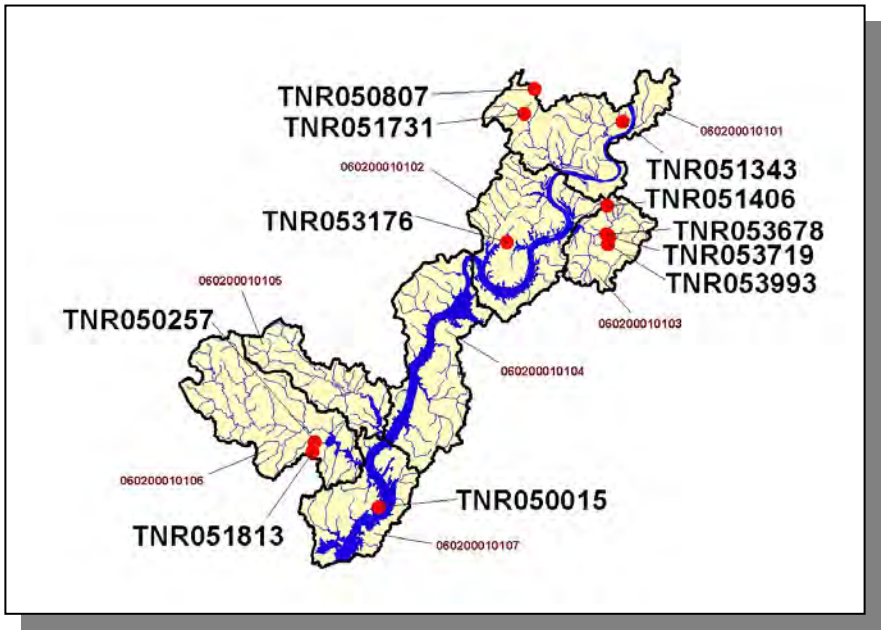


Figure 4-14. Location of TMSP Facilities in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

4.2.A.ii.a. Dischargers to Water Bodies Listed on the 2002 303(d) List

There are two NPDES facilities discharging to water bodies listed on the 2002 303(d) list in Subwatershed 0602000101:

- TN0058521 (Decatur STP) discharges to Tennessee River @ RM 514.8
- TN0020478 (Dayton STP) discharges to Tennessee River @ RM 504

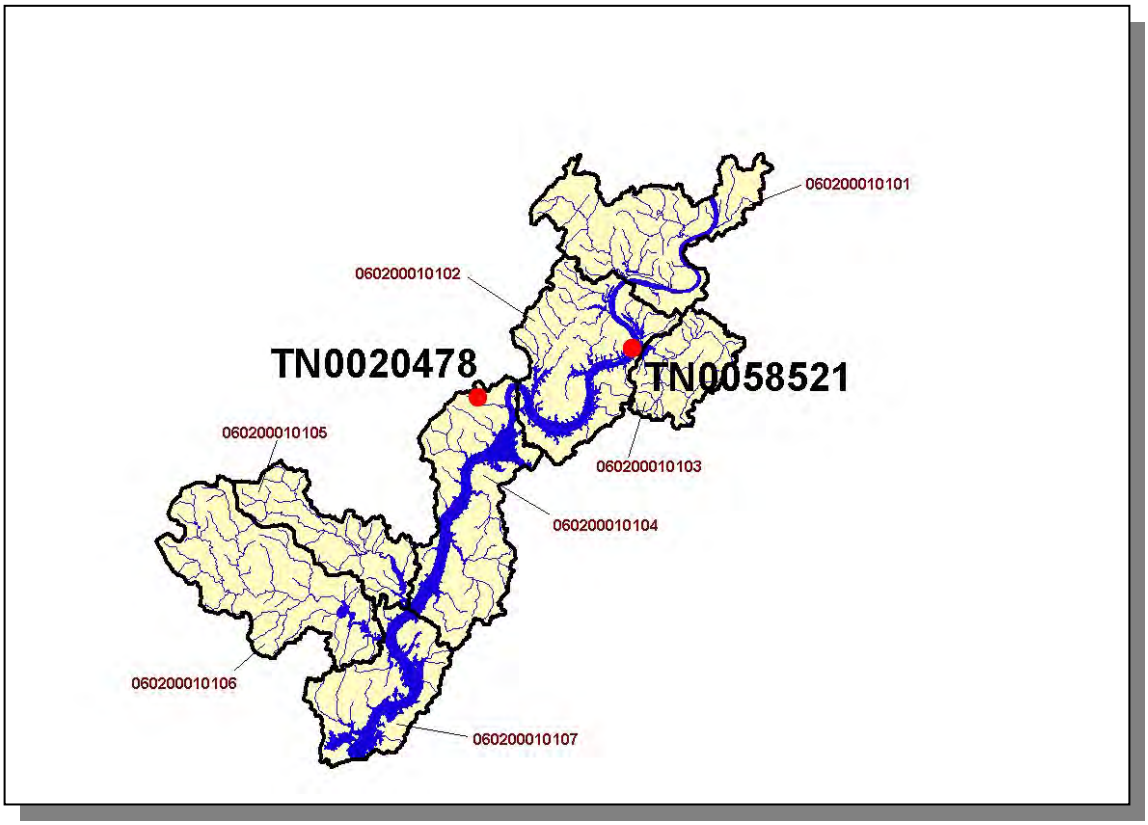


Figure 4-15. Location of NPDES Dischargers to Water Bodies Listed on the 2002 303(d) List in Subwatershed 0602000101. *Subwatershed 060200010101, 060200010102, 060200010103, 060200010104, 060200010105, 060200010106, and 060200010107 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

PERMIT #	1Q10	3Q10	7Q10	3Q20	QDESIGN
TN0058521	3,610	4,340	4,910	3,680	0.34
TN0020478	3,610	4,340	4,910	3,680	2.69

Table 4-5. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0602000101. *Data are in million gallons per day (MGD). Data were obtained from the USGS publication Flow Duration and Low Flows of Tennessee Streams Through 1992 or from permit files.*

PERMIT #	$CBOD_5$	FECAL COLIFORM	TRC	TSS	SETTLEABLE SOLIDS	DO	pH
TN0058521	X	X	X	X	X	X	X
TN0020478	X	X	X	X	X	X	X

Table 4-6. Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0602000101. *$CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); TRC, Total Residual Chlorine; TSS, Total Suspended Solids.*

4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens (Broilers Sold)	Hogs	Sheep
5,385	11,560	658	20	298,515	560	28

Table 4-7. Summary of Livestock Count Estimates in Subwatershed 0602000101. *According to the 1997 Census of Agriculture (http://www.nass.usda.gov/census/), "Cattle" includes heifers, heifer calves, steers, bulls and bull calves; "Chickens" are layers 20 weeks and older; "Chickens Sold" are all chickens used to produce meat.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Bledsoe	186.2	186.2	0.9	2.3
Hamilton	210.7	210.7	2.2	6.0
Meigs	83.0	83.0	0.2	0.0
Rhea	126.5	126.4	1.7	4.7
Total	**606.4**	**606.3**	**5.0**	**13.0**

Table 4-8. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0602000101.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.39
Legumes (Pastureland)	0.77
Grass (Hayland)	2.02
Legumes, Grass (Hayland)	0.17
Grass, Forbs, Legumes (Mixed Pasture)	0.31
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	3.67
Soybeans (Row Crops)	4.10
Tobacco (Row Crops)	5.65
All Other Row Crops	4.45
Oats (Close-Grown Cropland)	3.13
Wheat (Close-Grown Cropland)	5.15
All Other Close-Grown Cropland)	1.99
Non-Agricultural Land Use	0.00
Conservation Reserve Program Lands	1.00
Other Land in Farms	0.00
Farmsteads and Ranch Headquarters	0.20

Table 4-9. Annual Estimated Total Soil Loss in Subwatershed 0602000101.

4.2.B. 0602000102 (Big Sewee Creek).

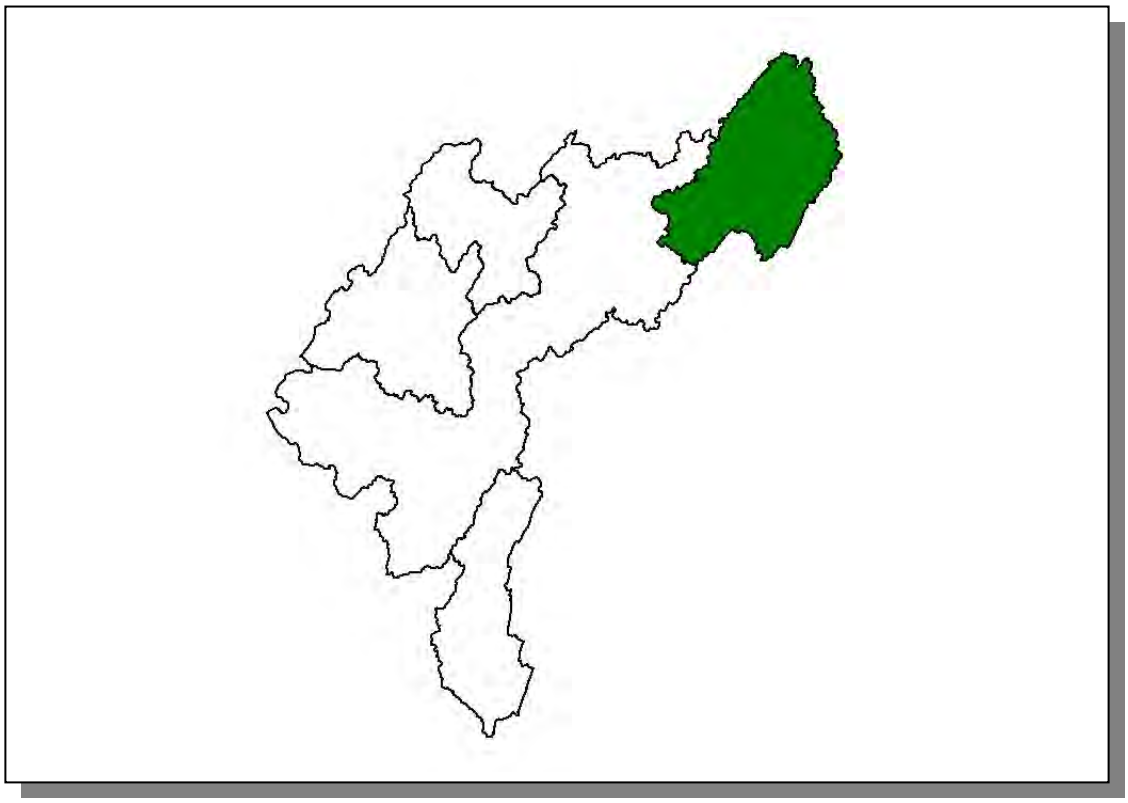


Figure 4-16. Location of Subwatershed 0602000102. *All Lower Tennessee HUC-10 subwatershed boundaries are shown for reference.*

4.2.B.i. General Description.

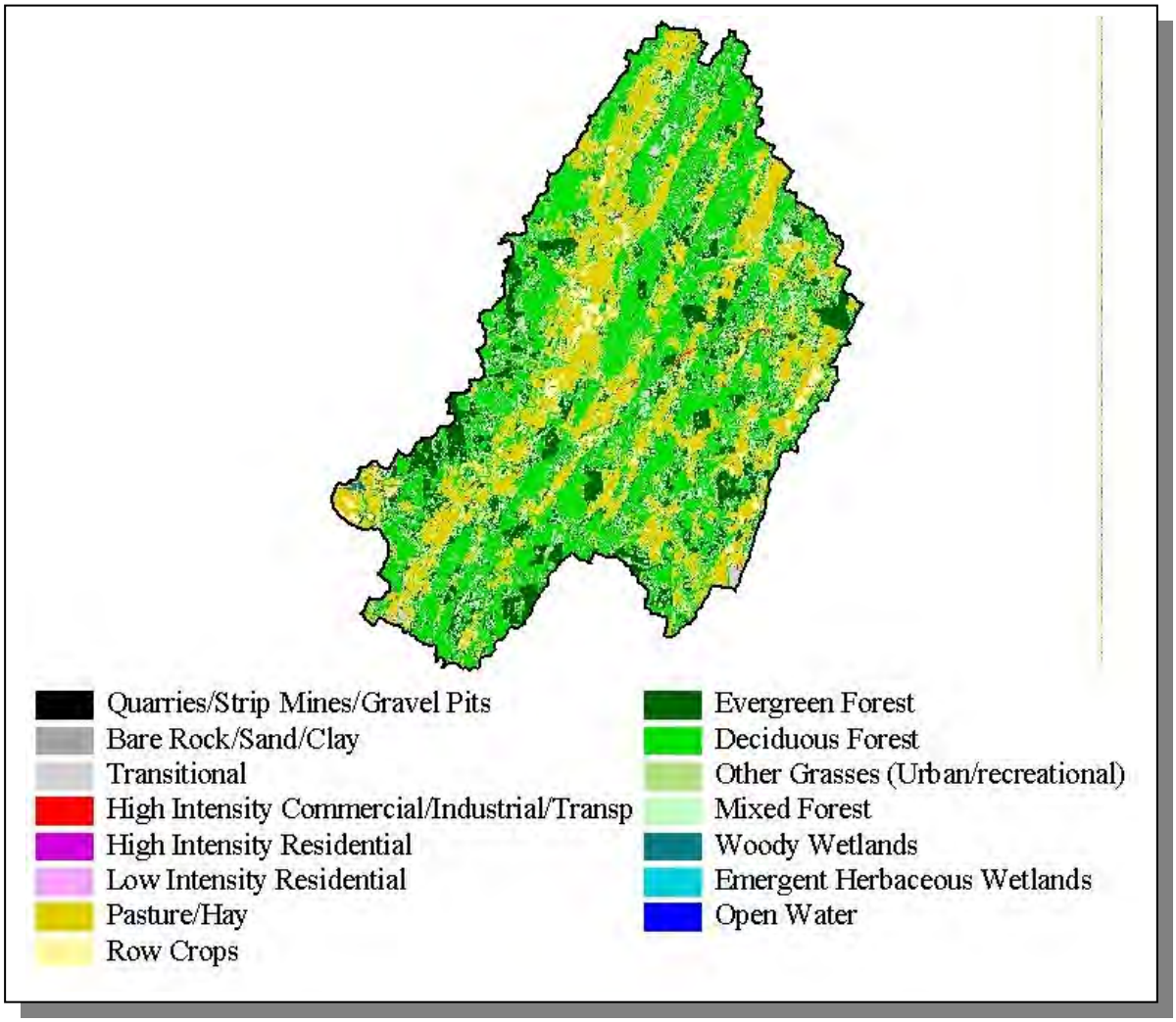


Figure 4-17. Illustration of Land Use Distribution in Subwatershed 0602000102.

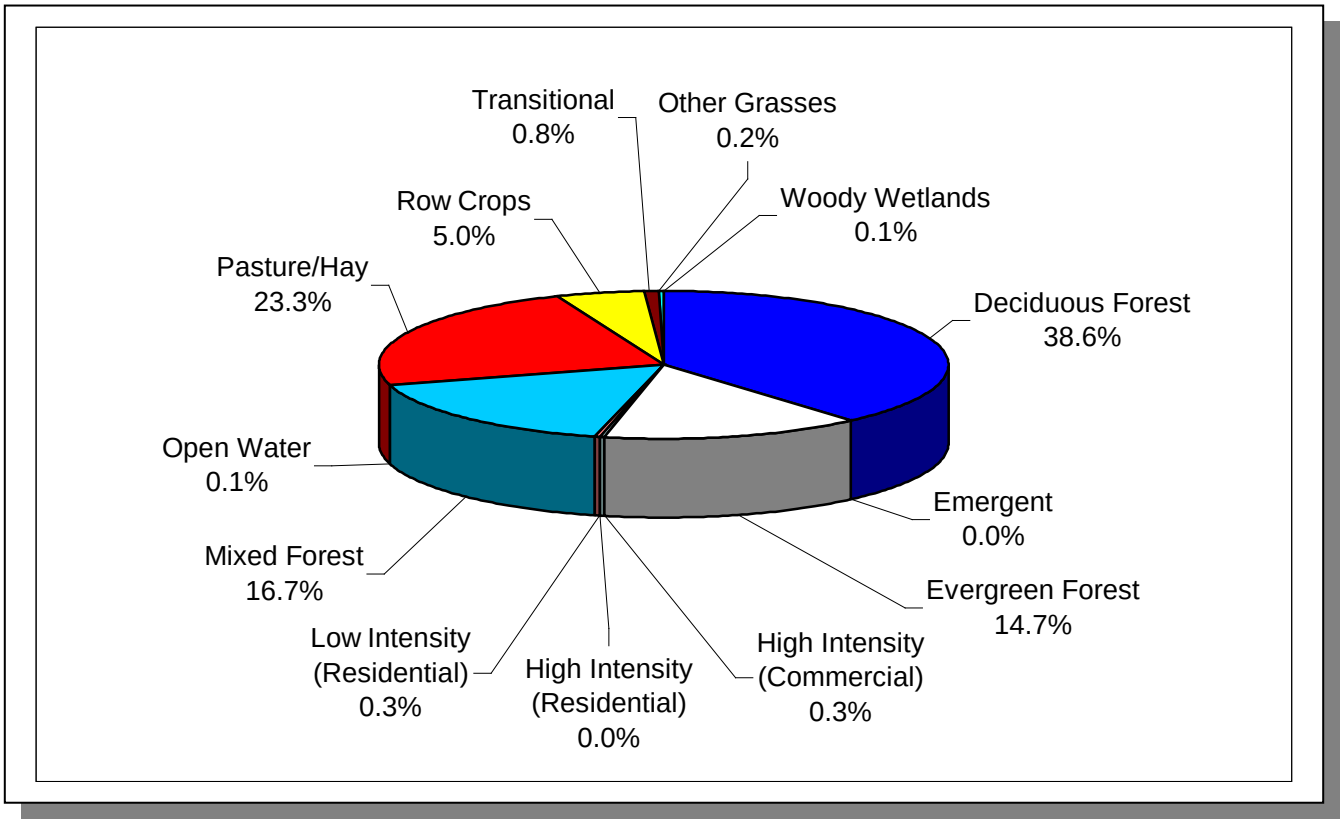


Figure 4-18. Land Use Distribution in Subwatershed 0602000102. *More information is provided in Appendix IV.*

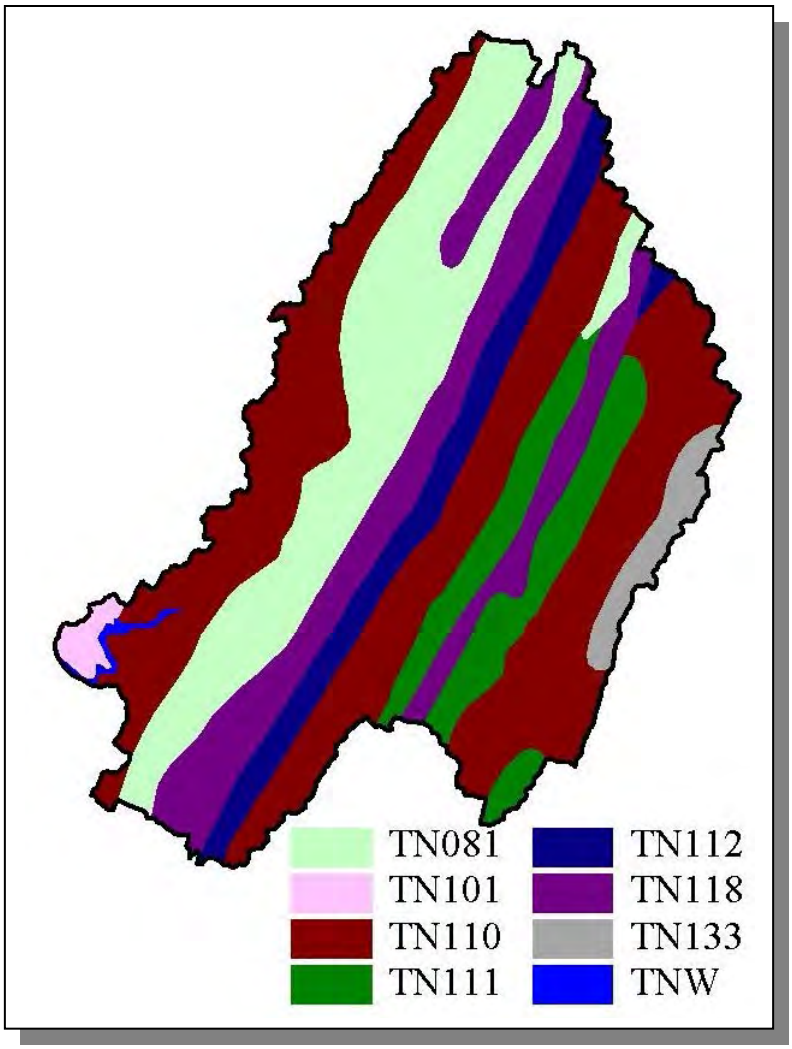


Figure 4-19. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000102.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN081	5.00	C	1.41	5.48	Silty Loam	0.35
TN101	0.00	B	1.71	5.39	Loam	0.35
TN110	0.00	B	2.22	4.96	Loam	0.31
TN111	0.00	C	1.41	5.10	Loam	0.34
TN112	6.00	C	2.36	5.09	Loam	0.35
TN118	0.00	C	6.52	5.12	Loam	0.29
TN133	0.00	C	1.35	6.04	Clayey Loam	0.27

Table 4-10. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000102. *More information is provided in Lower Tennessee Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Loudon	31,255	38,245	39,086	0.56	175	214	219	25.1
McMinn	42,383	46,000	49,015	9.09	3,854	4,183	4,457	15.6
Meigs	8,033	9,690	11,086	32.74	2,630	3,172	3,629	38.0
Rhea	24,344	27,672	28,400	0.15	36	41	43	19.4
Roane	47,227	49,885	51,910	3.09	1,460	1,543	1,605	9.9
Totals	**153,242**	**171,492**	**179,497**		**8,155**	**9,153**	**9,953**	**22.0**

Table 4-11. Population Estimates in Subwatershed 0602000102.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Decatur	Meigs	1,361	550	387	159	4

Table 4-12. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0602000102.

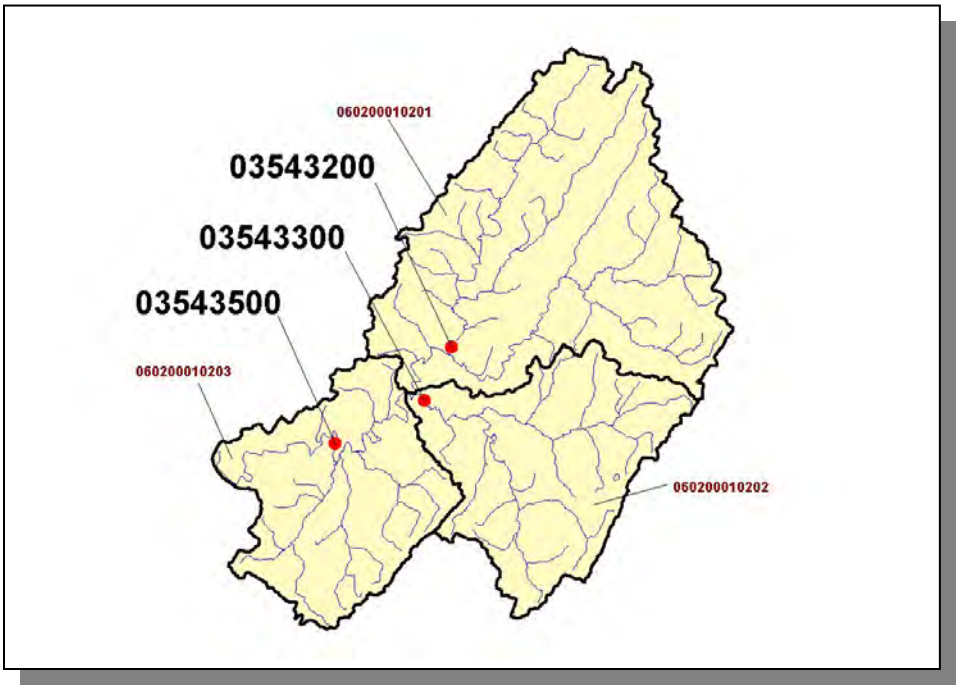


Figure 4-20. Location of Historical Streamflow Data Collection Sites in Subwatershed 0602000102. *Subwatershed 060200010201, 060200010202, and 060200010203 boundaries are shown for reference. More information is provided in Appendix IV.*

4.2.B.ii. Point Source Contributions.

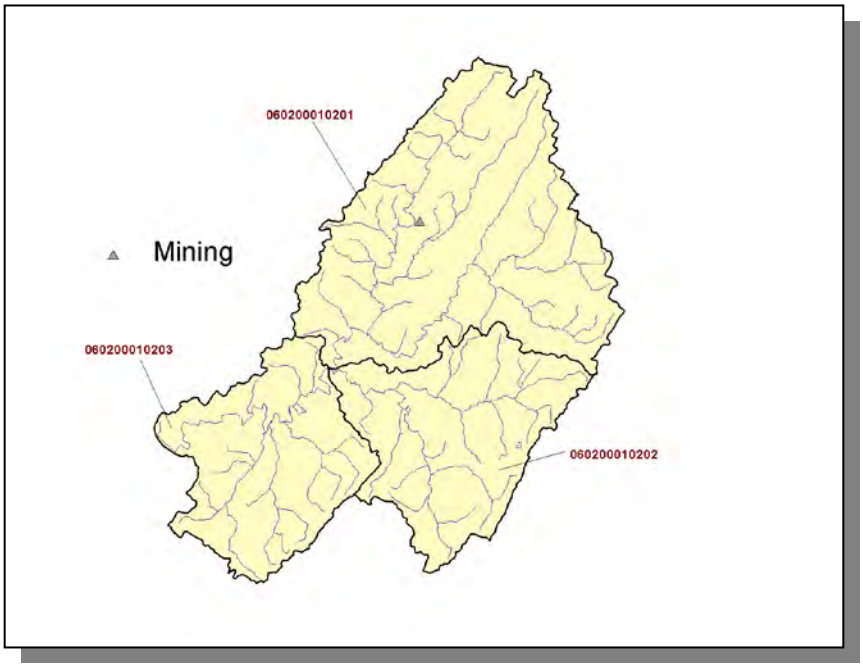


Figure 4-21. Location of Active Point Source Facilities in Subwatershed 0602000102. *Subwatershed 060200010201, 060200010202, and 060200010203 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

Figure 4-22. Location of Active Mining Facilities in Subwatershed 0602000102. *Subwatershed 060200010201, 060200010202, and 060200010203 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

4.2.B.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens (Broilers Sold)	Hogs	Sheep
5,515	11,903	1,138	16	462,027	69	36

Table 4-13. Summary of Livestock Count Estimates in Subwatershed 0602000102. *According to the 1997 Census of Agriculture (http://www.nass.usda.gov/census/), "Cattle" includes heifers, heifer calves, steers, bulls and bull calves; "Chickens" are layers 20 weeks and older; "Chickens Sold" are all chickens used to produce meat.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Loudon	62.3	62.3	1.1	3.5
Meigs	83.0	83.0	0.2	0.0
Rhea	126.5	126.4	1.7	4.7
Roane	153.1	153.1	1.7	5.1
Total	**424.9**	**424.8**	**4.7**	**13.1**

Table 4-14. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0602000102.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.47
Legumes (Pastureland)	0.23
Grass (Hayland)	0.38
Legumes (Hayland)	0.77
Legumes, Grass (Hayland)	0.18
Grass, Forbs, Legumes (Mixed Pasture)	0.36
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	4.14
Soybeans (Row Crops)	4.06
Tobacco (Row Crops)	5.56
Wheat (Close-Grown Cropland)	4.31
Non-Agricultural Land Use	0.00
Farmsteads and Ranch Headquarters	0.70

Table 4-15. Annual Estimated Total Soil Loss in Subwatershed 0602000102.

4.2.C. 0602000103 (Richland Creek).

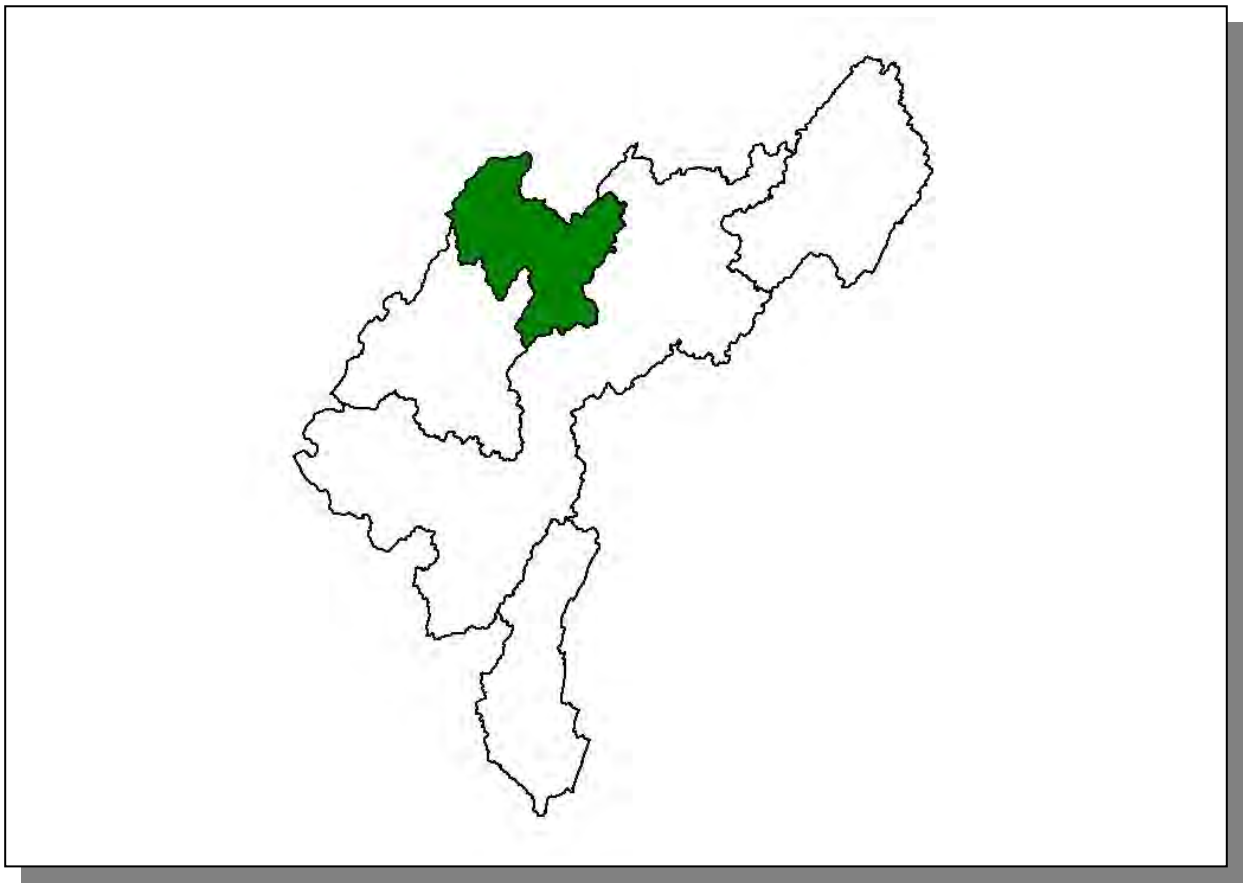


Figure 4-23. Location of Subwatershed 0602000103. *All Lower Tennessee HUC-10 subwatershed boundaries are shown for reference.*

4.2.C.i. General Description.

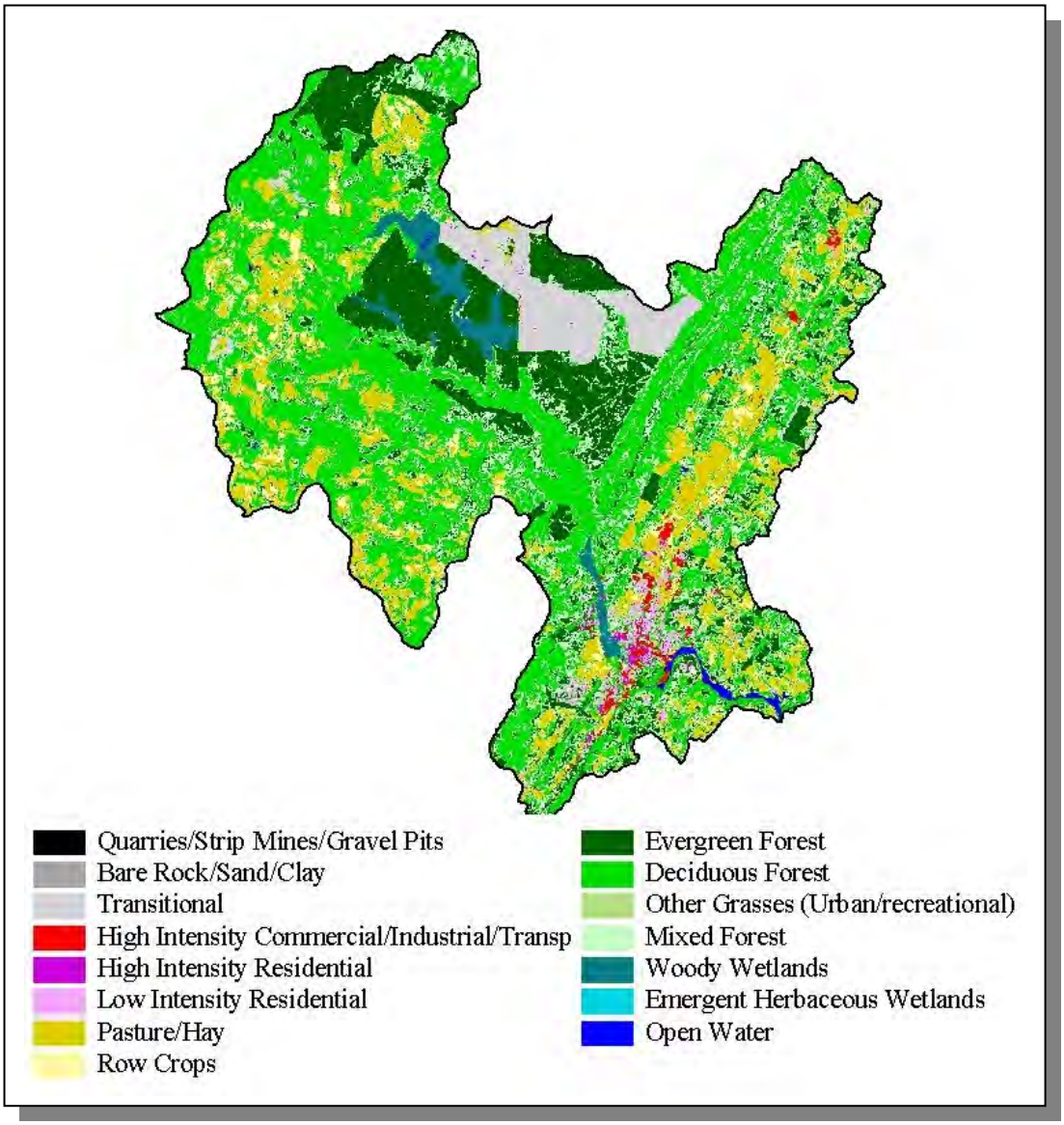


Figure 4-24. Illustration of Land Use Distribution in Subwatershed 0602000103.

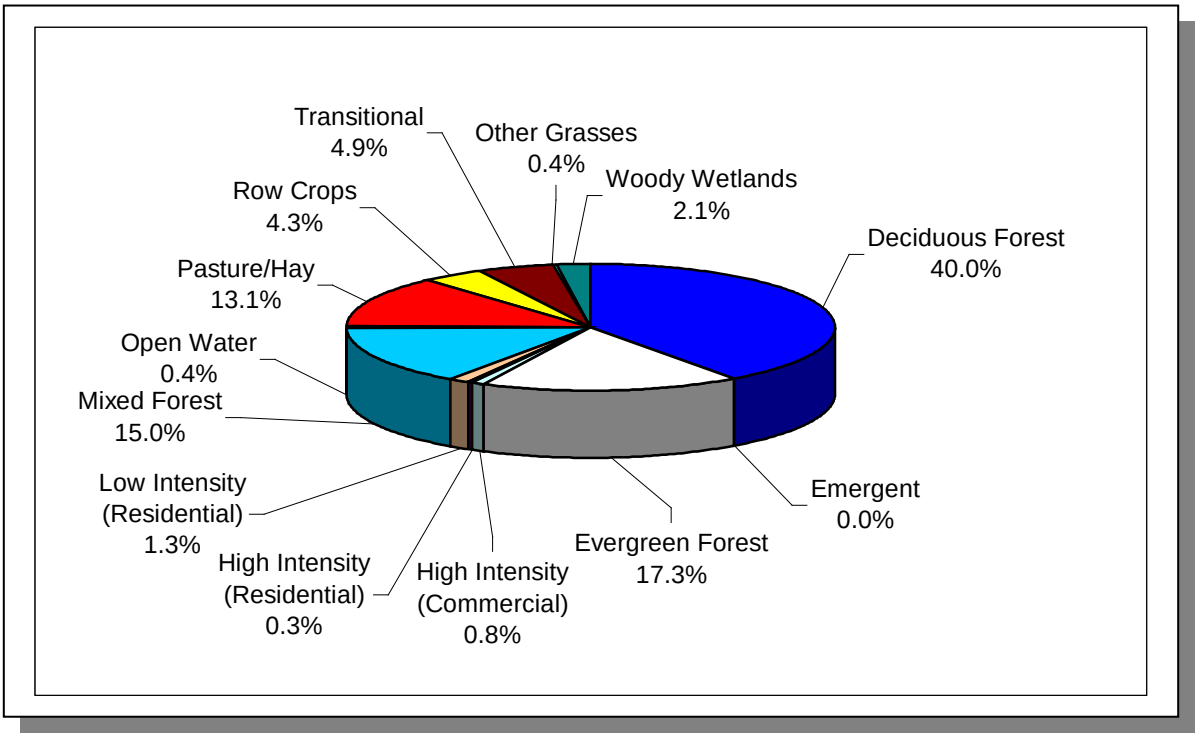


Figure 4-25. Land Use Distribution in Subwatershed 0602000103. *More information is provided in Appendix IV.*

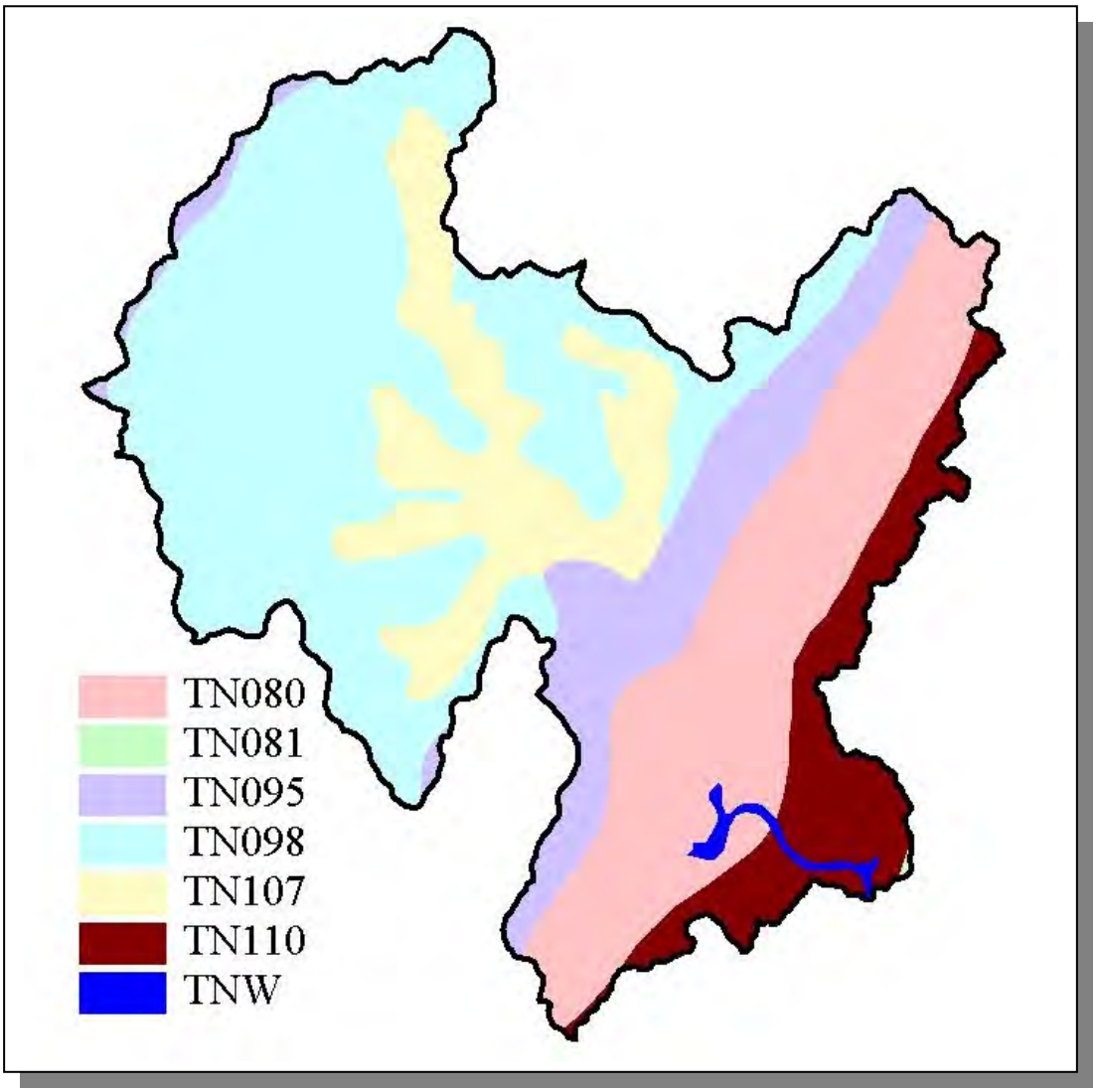


Figure 4-26. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000103.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN080	1.00	C	1.38	5.16	Loam	0.35
TN081	5.00	C	1.41	5.48	Silty Loam	0.35
TN095	0.00	B	2.35	5.12	Loam	0.31
TN098	1.00	C	3.98	4.82	Loam	0.32
TN107	1.00	C	6.34	4.84	Loam	0.28
TN110	0.00	B	2.22	4.96	Loam	0.31

Table 4-16. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000103. *More information is provided in Lower Tennessee Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Bledsoe	9,669	10,650	12,367	4.21	407	448	520	27.8
Rhea	24,344	27,672	28,400	19.04	4,635	5,268	5,407	16.7
Totals	**34,013**	**38,322**	**40,767**		**5,042**	**5,716**	**5,927**	**17.6**

Table 4-17. Population Estimates in Subwatershed 0602000103.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Dayton	Rhea	5,671	2,306	1,710	596	0

Table 4-18. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0602000103.

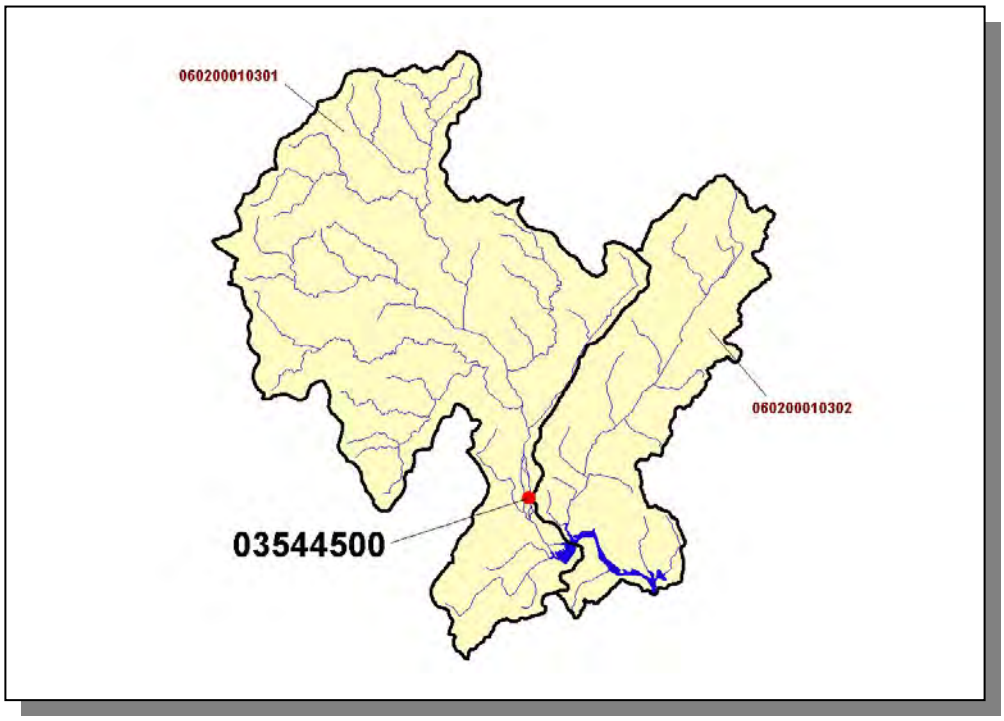


Figure 4-27. Location of Historical Streamflow Data Collection Sites in Subwatershed 0602000103. *Subwatershed 060200010301 and 060200010302 boundaries are shown for reference. More information is provided in Appendix IV.*

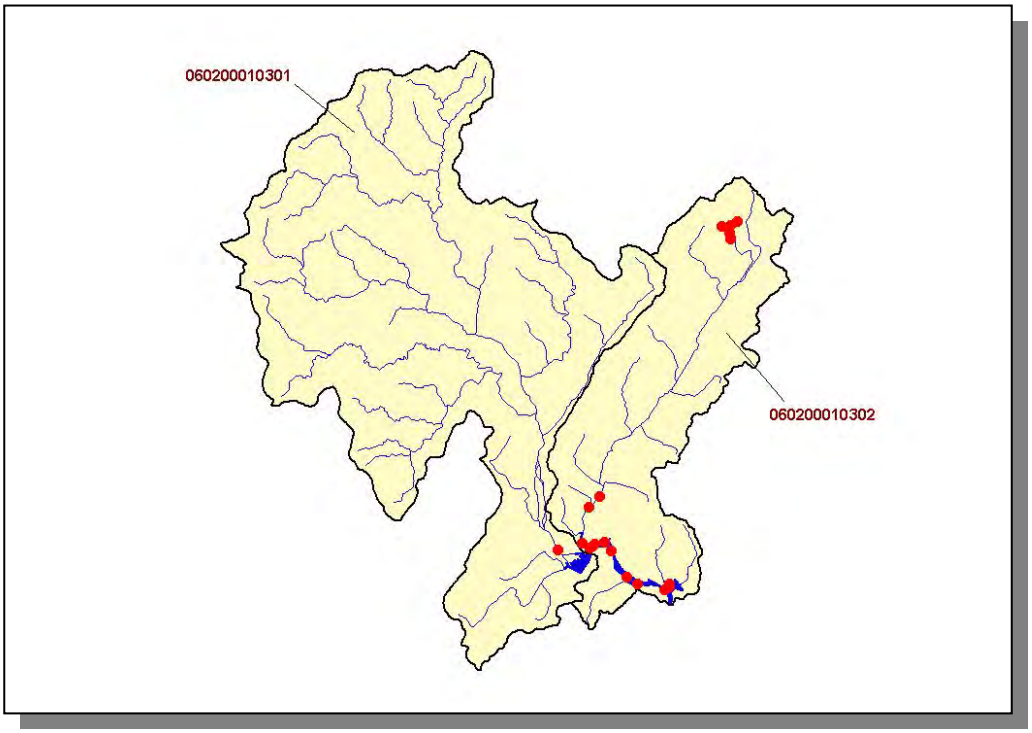


Figure 4-28. Location of STORET Monitoring Sites in Subwatershed 0602000103. *Subwatershed 060200010301 and 060200010302 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.C.ii. Point Source Contributions.

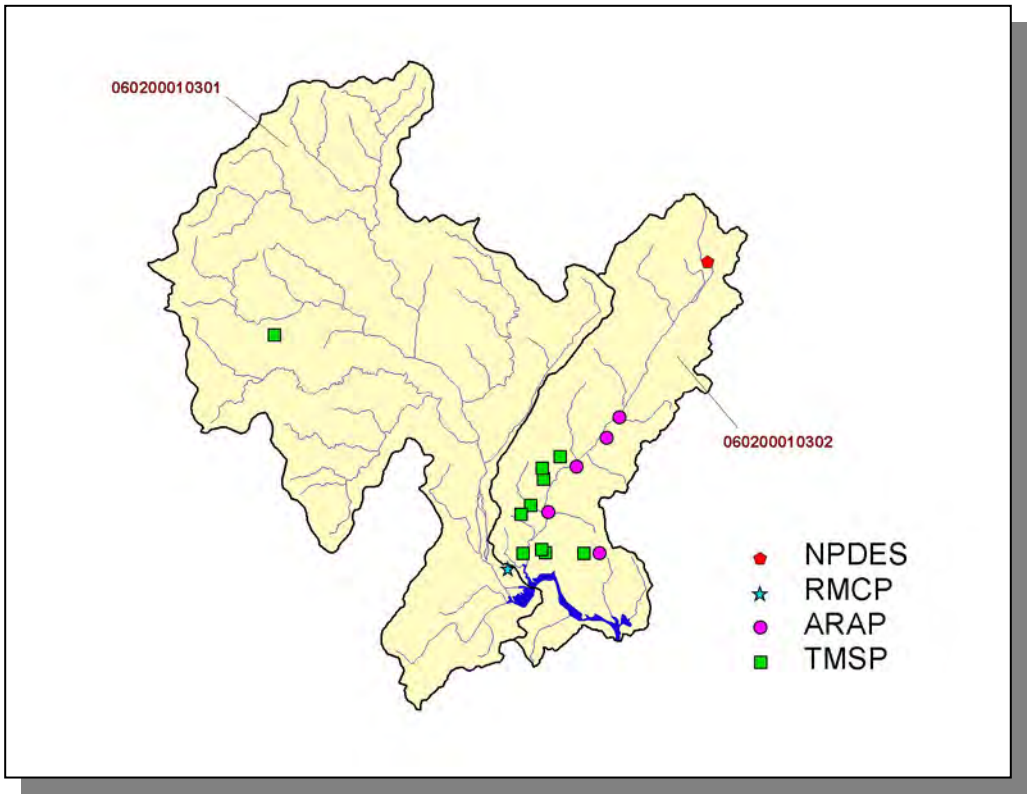


Figure 4-29. Location of Active Point Source Facilities in Subwatershed 0602000103. *Subwatershed 060200010301 and 060200010302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

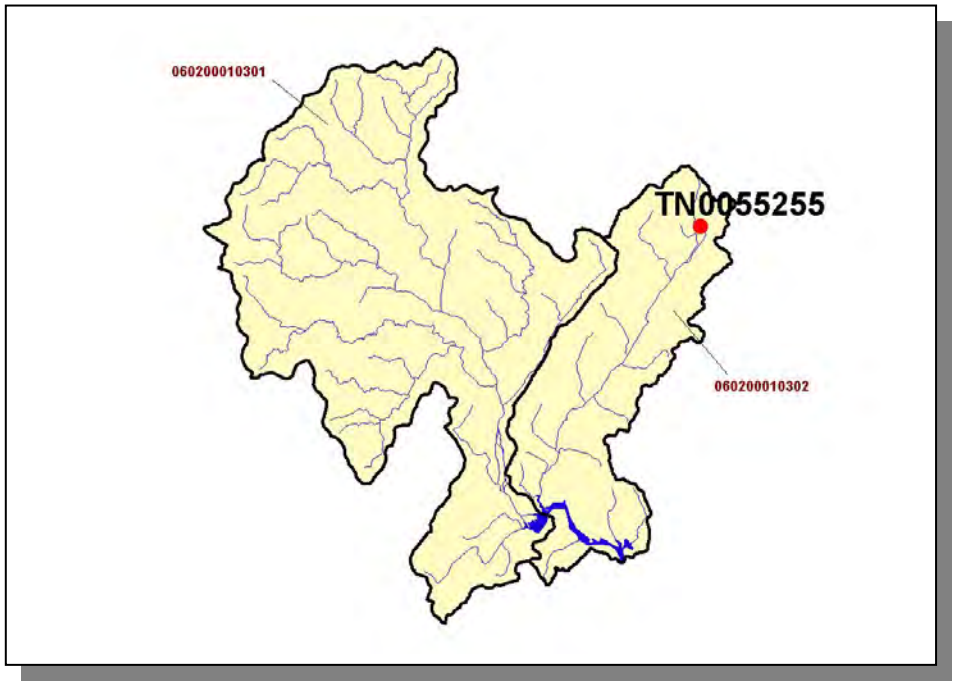


Figure 4-30. Location of NPDES Facilities in Subwatershed 0602000103. *Subwatershed 060200010301 and 060200010302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

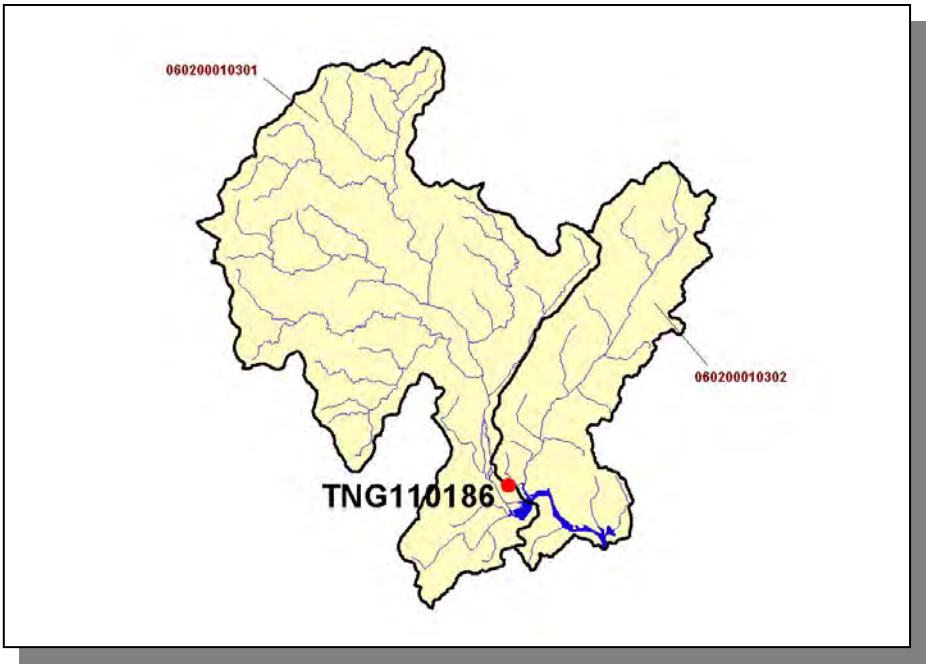


Figure 4-31. Location of Ready Mix Concrete Plants in Subwatershed 0602000103. *Subwatershed 060200010301 and 060200010302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

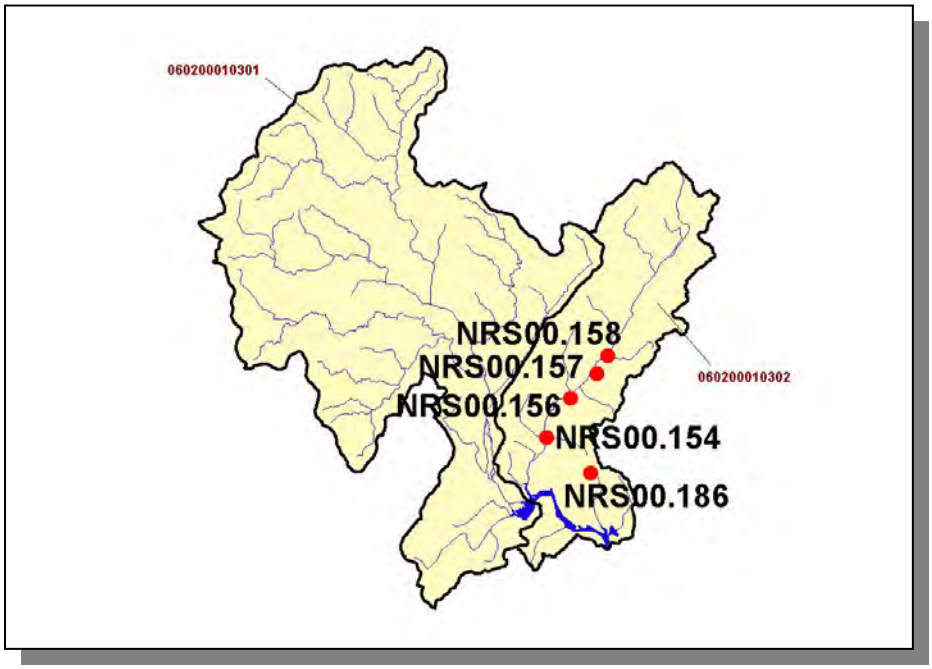


Figure 4-32. Location of ARAP Sites (Individual Permits) in Subwatershed 0602000103. *Subwatershed 060200010301 and 060200010302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

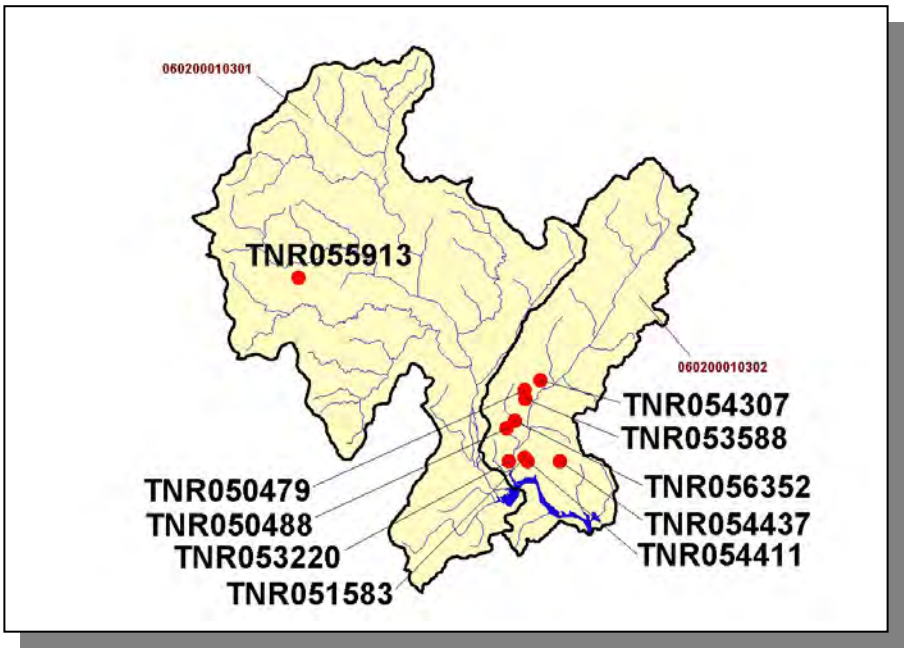


Figure 4-33. Location of TMSP Facilities in Subwatershed 0602000103. *Subwatershed 060200010301 and 060200010302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

4.2.C.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens Sold	Hogs	Sheep
1,459	3,239	187	5	<5	151	8

Table 4-19. Summary of Livestock Count Estimates in Subwatershed 0602000103. *According to the 1997 Census of Agriculture (http://www.nass.usda.gov/census/), "Cattle" includes heifers, heifer calves, steers, bulls and bull calves; "Chickens" are layers 20 weeks and older; "Chickens Sold" are all chickens used to produce meat.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Bledsoe	186.2	186.2	0.9	2.3
Rhea	126.5	126.4	1.7	4.7
Totals	**312.7**	**312.6**	**2.6**	**7.0**

Table 4-20. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0602000103.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.49
Grass (Hayland)	0.17
Legumes, Grass (Hayland)	0.30
Grass, Forbs, Legumes (Mixed Pasture)	0.31
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	2.83
Soybeans (Row Crops)	4.23
All Other Row Crops	4.45
Wheat (Close-Grown Cropland)	7.30
Conservation Reserve Program Lands	1.00
Farmsteads and Ranch Headquarters	0.41

Table 4-21. Annual Estimated Total Soil Loss in Subwatershed 0602000103.

4.2.D. 0602000104 (Sale Creek).

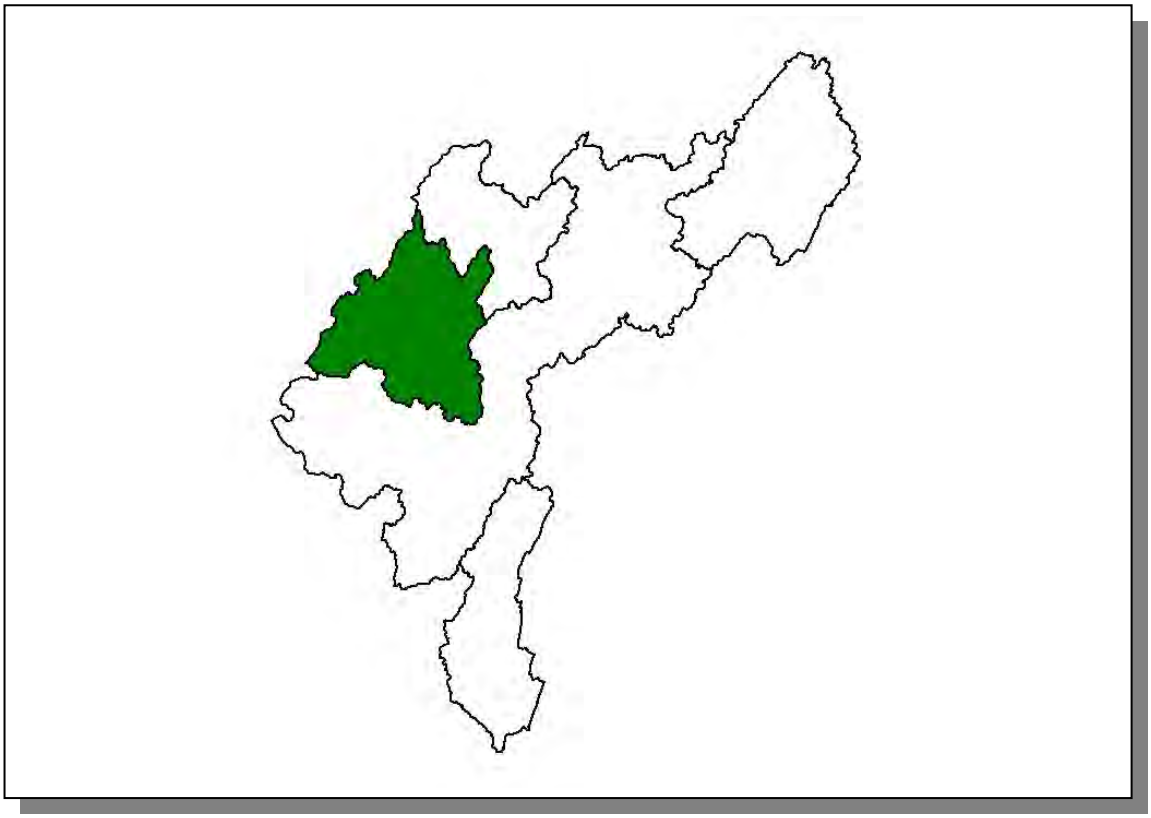


Figure 4-34. Location of Subwatershed 0602000104. *All Lower Tennessee HUC-10 subwatershed boundaries are shown for reference.*

4.2.D.i. General Description.

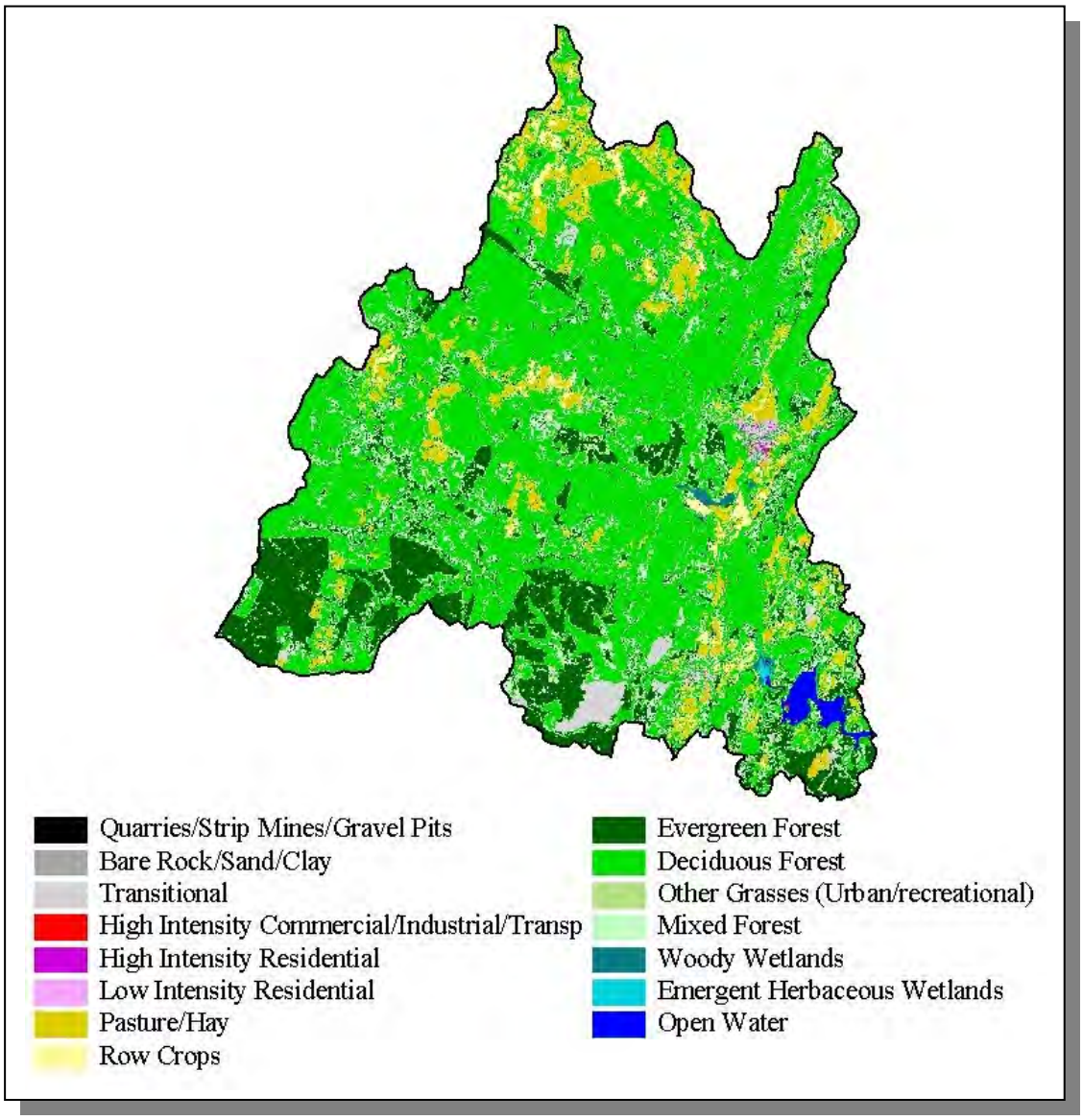


Figure 4-35. Illustration of Land Use Distribution in Subwatershed 0602000104.

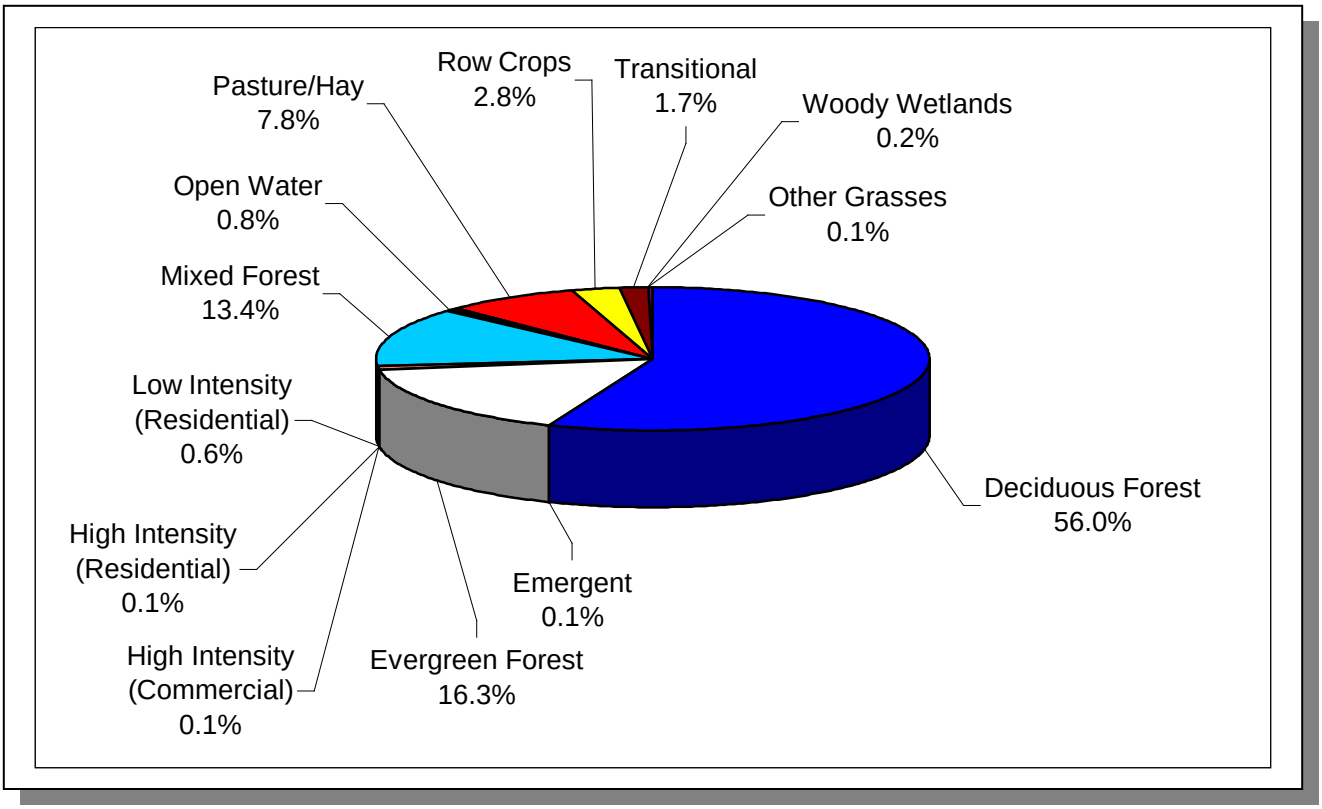


Figure 4-36. Land Use Distribution in Subwatershed 0602000104. *More information is provided in Appendix IV.*

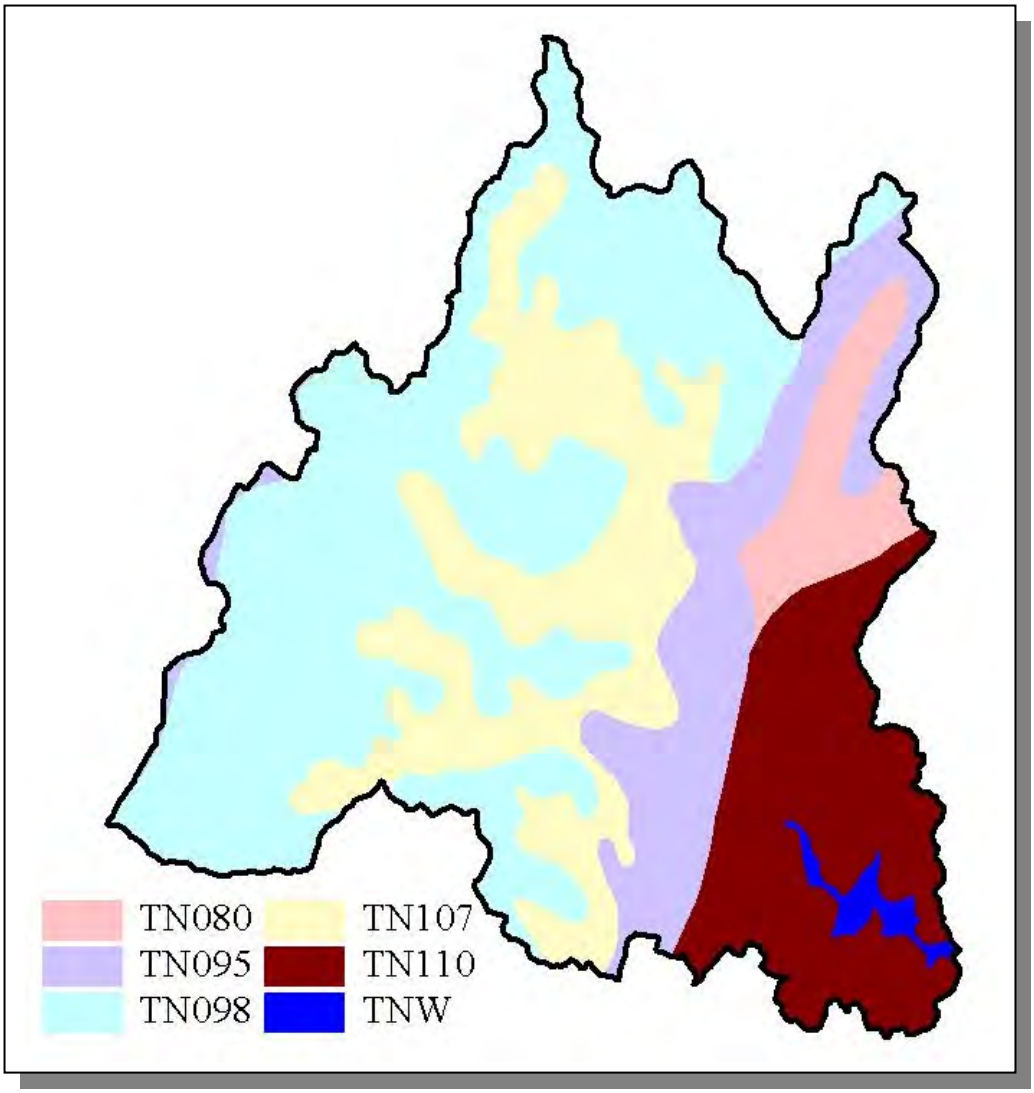


Figure 4-37. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000104.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN080	1.00	C	1.38	5.16	Loam	0.35
TN095	0.00	B	2.35	5.12	Loam	0.31
TN098	1.00	C	3.98	4.82	Loam	0.32
TN107	1.00	C	6.34	4.84	Loam	0.28
TN110	0.00	B	2.22	4.96	Loam	0.31

Table 4-22. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000104. *More information is provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Bledsoe	9,669	10,650	12,367	11.08	1,071	1,180	1,370	27.9
Hamilton	285,536	294,865	307,896	7.67	21,886	22,601	23,600	7.8
Rhea	24,344	27,672	28,400	7.28	1,773	2,015	2,068	16.6
Totals	**319,549**	**333,187**	**348,663**		**24,730**	**25,796**	**27,038**	**9.3**

Table 4-23. Population Estimates in Subwatershed 0602000104.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Graysville	Rhea	1,301	532	75	453	4

Table 4-24. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0602000104.

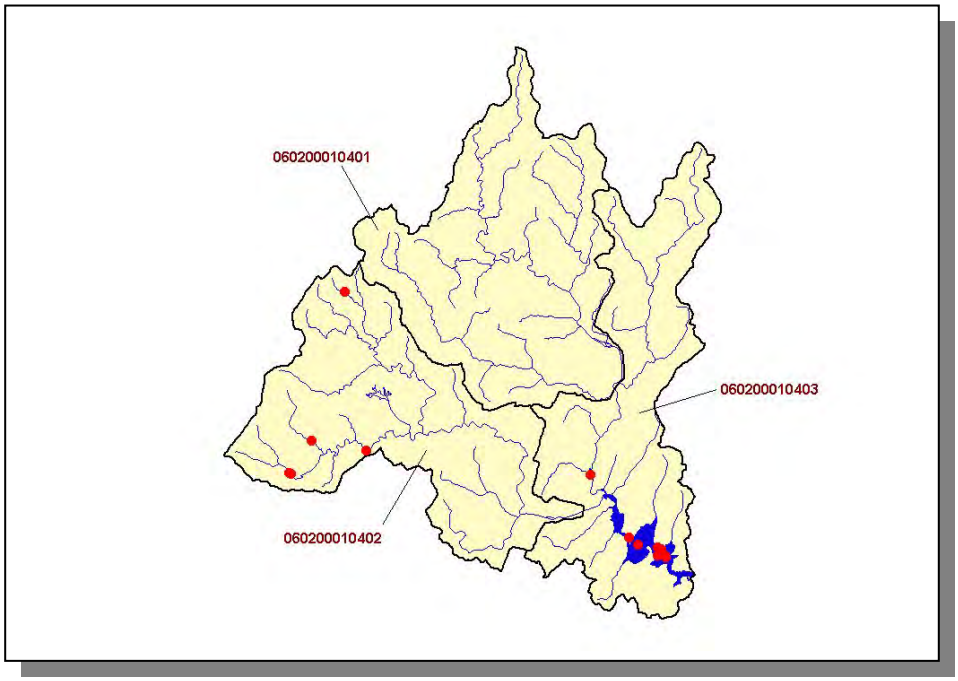


Figure 4-38. Location of STORET Monitoring Sites in Subwatershed 0602000104. *Subwatershed 060200010401, 060200010402, and 060200010403 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.D.ii. Point Source Contributions.

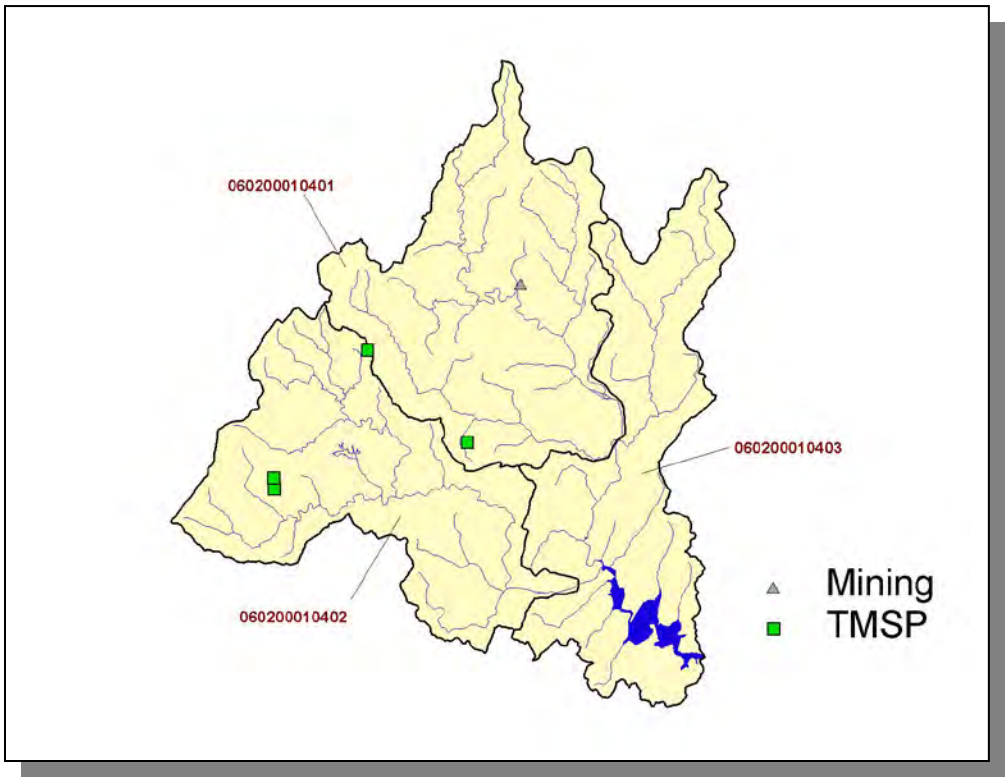


Figure 4-39. Location of Active Point Source Facilities in Subwatershed 0602000104. *Subwatershed 060200010401, 060200010402, and 060200010403 boundaries are shown for reference. More information is provided in Appendix IV.*

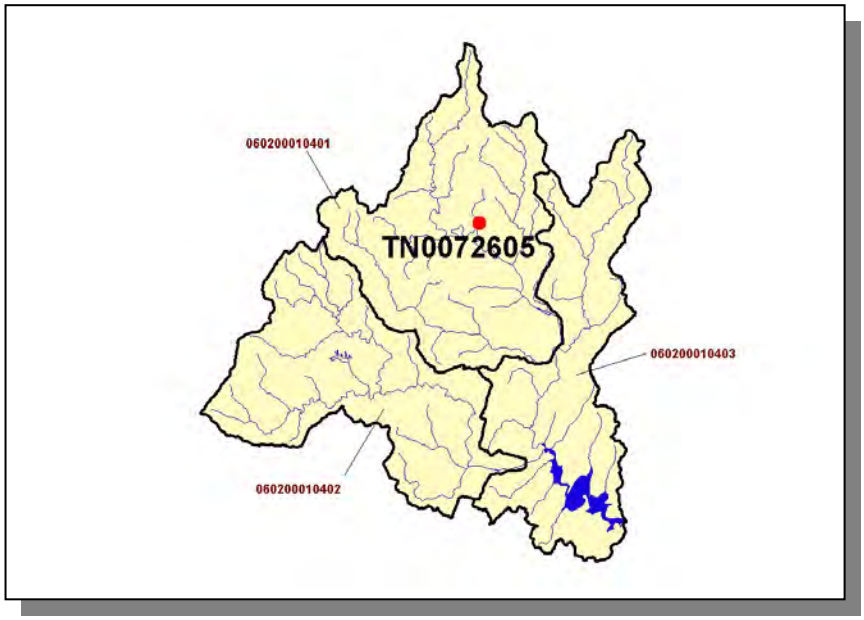


Figure 4-40. Location of Active Mining Facilities in Subwatershed 0602000104. *Subwatershed 060200010401, 060200010402, and 060200010403 boundaries are shown for reference. More information is provided in Appendix IV.*

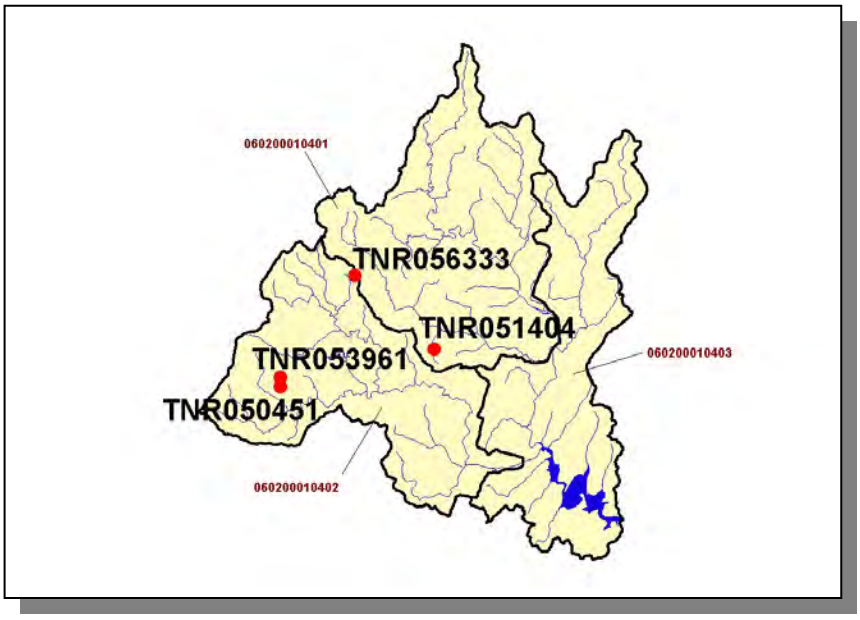


Figure 4-41. Location of TMSP Facilities in Subwatershed 0602000104. *Subwatershed 060200010401, 060200010402, and 060200010403 boundaries are shown for reference. More information is provided in Appendix IV.*

4.2.D.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens (Layers)	Chickens (Broilers Sold)	Hogs	Sheep
1,400	174	3,038	<5	44,952	114	16

Table 4-25. Summary of Livestock Count Estimates in Subwatershed 0602000104*. According to the 1997 Census of Agriculture (http://www.nass.usda.gov/census/), "Cattle" includes heifers, heifer calves, steers, bulls and bull calves; "Chickens" are layers 20 weeks and older; "Chickens Sold" are all chickens used to produce meat.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Bledsoe	186.2	186.2	0.9	2.3
Hamilton	210.7	210.7	2.2	6.0
Rhea	126.5	126.4	1.7	4.7
Total	**523.4**	**523.3**	**4.8**	**13.0**

Table 4-26. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0602000104.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.49
Legumes (Pastureland)	0.07
Grass (Hayland)	1.25
Legumes, Grass (Hayland)	0.55
Grass, Forbs, Legumes (Mixed Pasture)	0.37
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	6.61
Soybeans (Row Crops)	4.57
All Other Row Crops	4.45
Oats (Close-Grown Cropland)	3.13
Wheat (Close-Grown Cropland)	4.16
All Other Close-Grown Cropland)	1.99
Non-Agricultural Land Use	0.00
Conservation Reserve Program Lands	1.00
Other Land in Farms	0.00
Farmsteads and Ranch Headquarters	0.55

Table 4-27. Annual Soil Loss in Subwatershed 0602000104.

4.2.E. 0602000106 (Wolftever Creek).

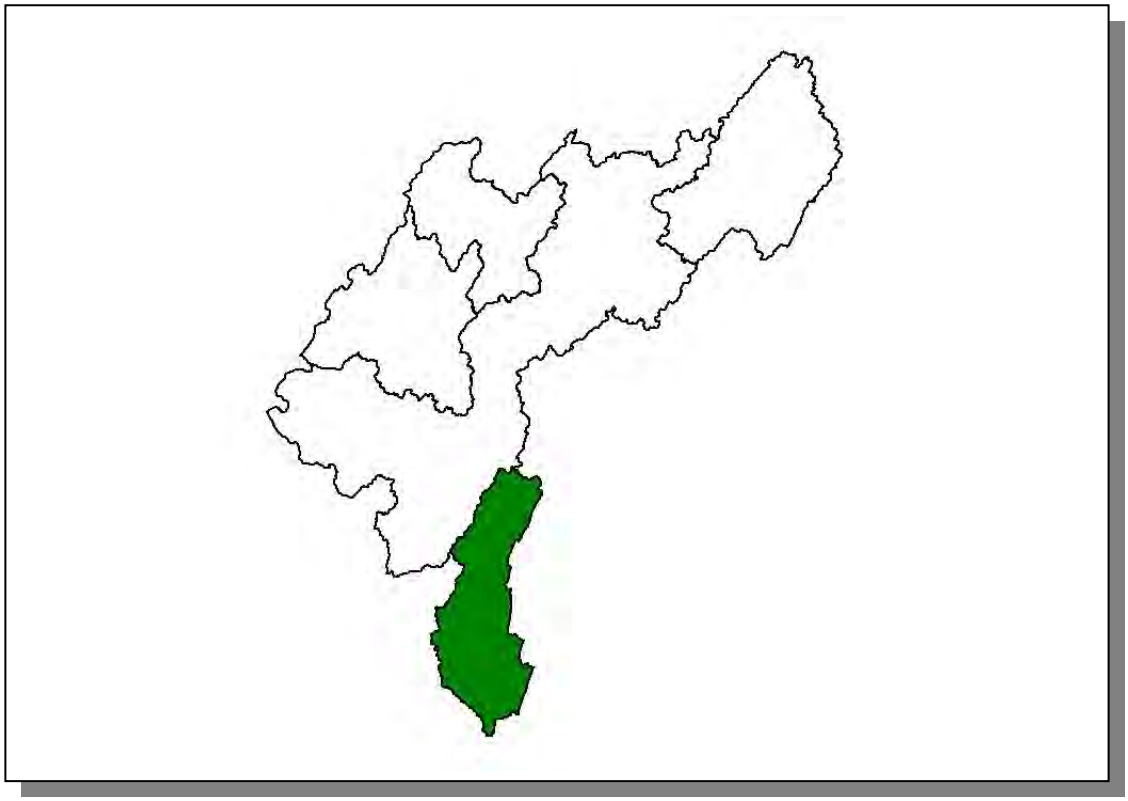


Figure 4-42. Location of Subwatershed 0602000106. *All Lower Tennessee HUC-10 subwatershed boundaries are shown for reference.*

4.2.E.i. General Description.

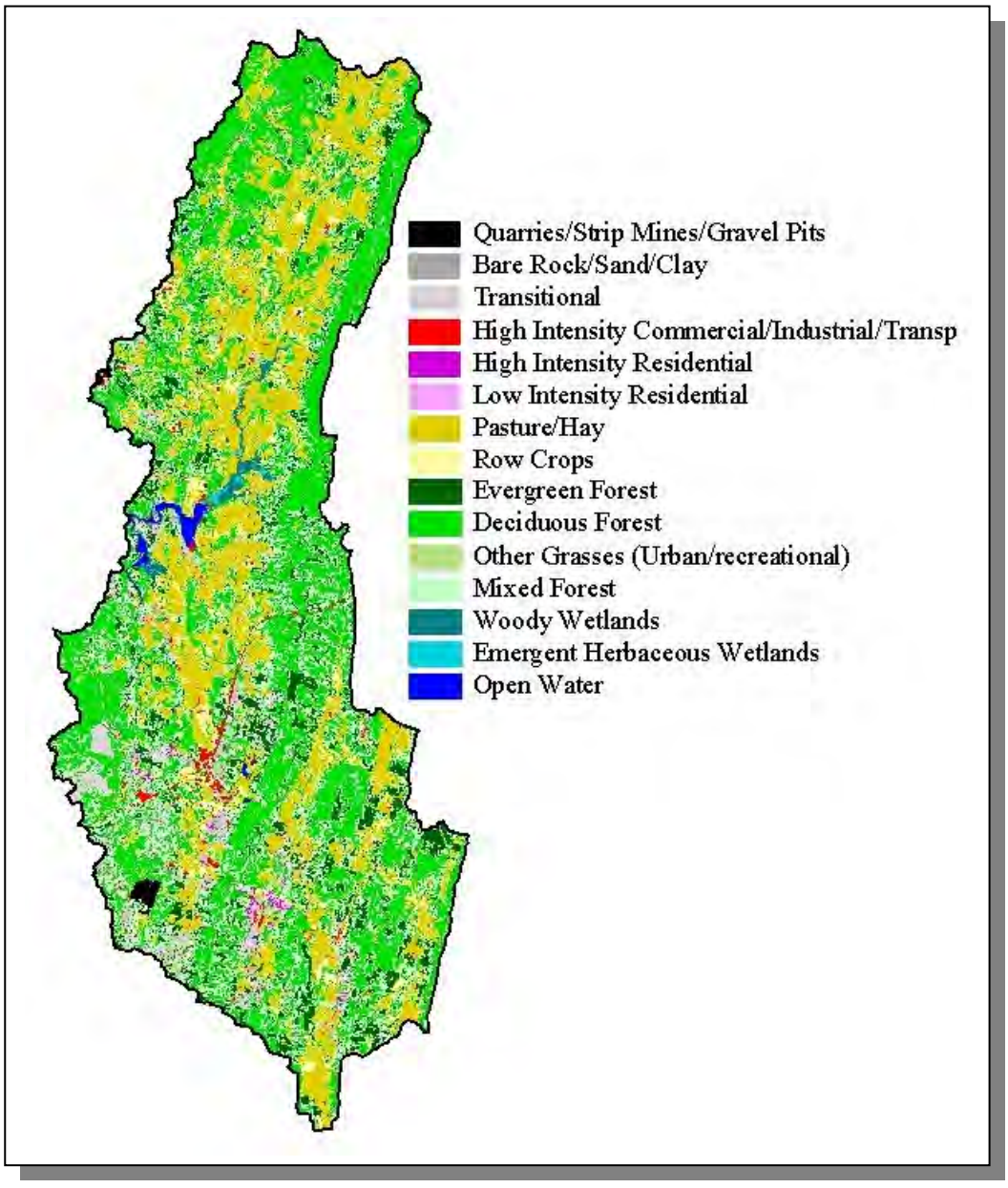


Figure 4-43. Illustration of Land Use Distribution in Subwatershed 0602000106.

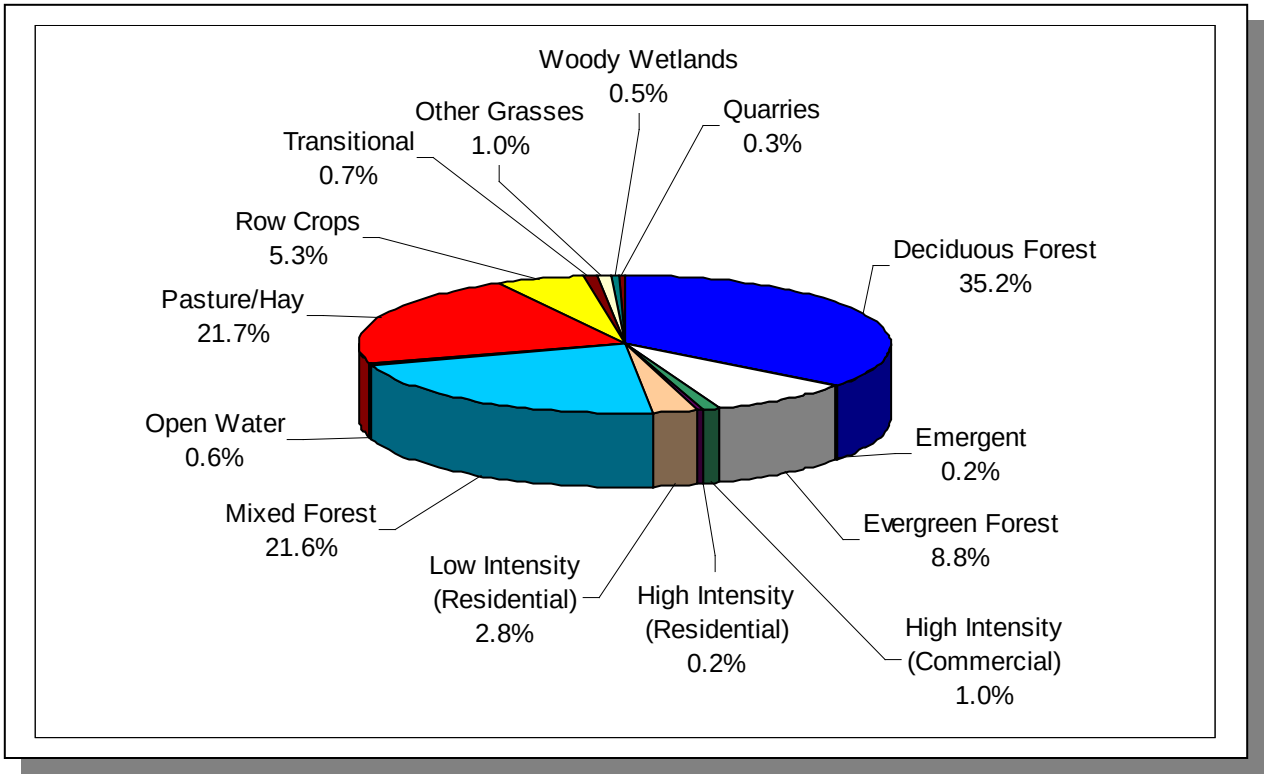


Figure 4-44. Land Use Distribution in Subwatershed 0602000106. *More information is provided in Appendix IV.*

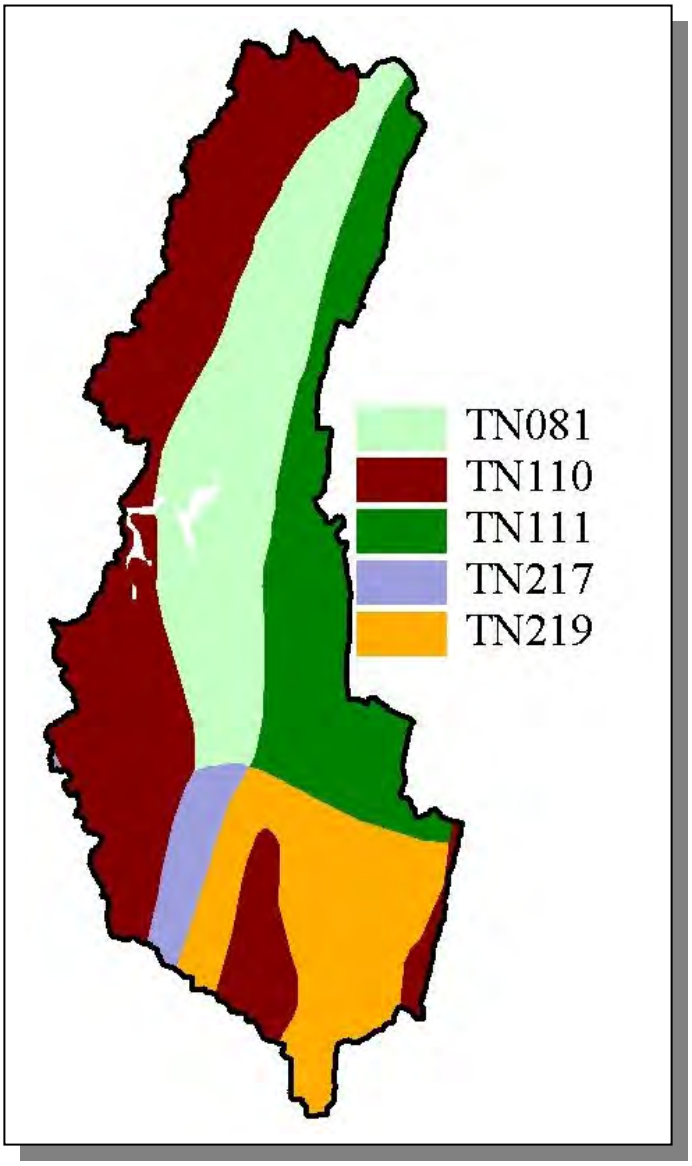


Figure 4-45. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000106.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN081	5.00	C	1.41	5.48	Silty Loam	0.35
TN110	0.00	B	2.22	4.96	Loam	0.31
TN111	0.00	C	1.41	5.10	Loam	0.34
TN217	0.00	C	2.34	5.32	Loam	0.35
TN219	0.00	C	1.35	4.95	Loam	0.33

Table 4-28. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0602000106. *More information is provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Bradley	73,712	80,800	87,965	1.11	815	893	972	19.3
Hamilton	285,536	294,865	307,896	14.85	42,388	43,773	45,708	7.8
Totals	**359,248**	**375,665**	**395,861**		**43,203**	**44,666**	**46,680**	**8.0**

Table 4-29. Population Estimates in Subwatershed 0602000106.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Collegedale	Hamilton	5,048	1,641	681	917	43

Table 4-30. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0602000106.

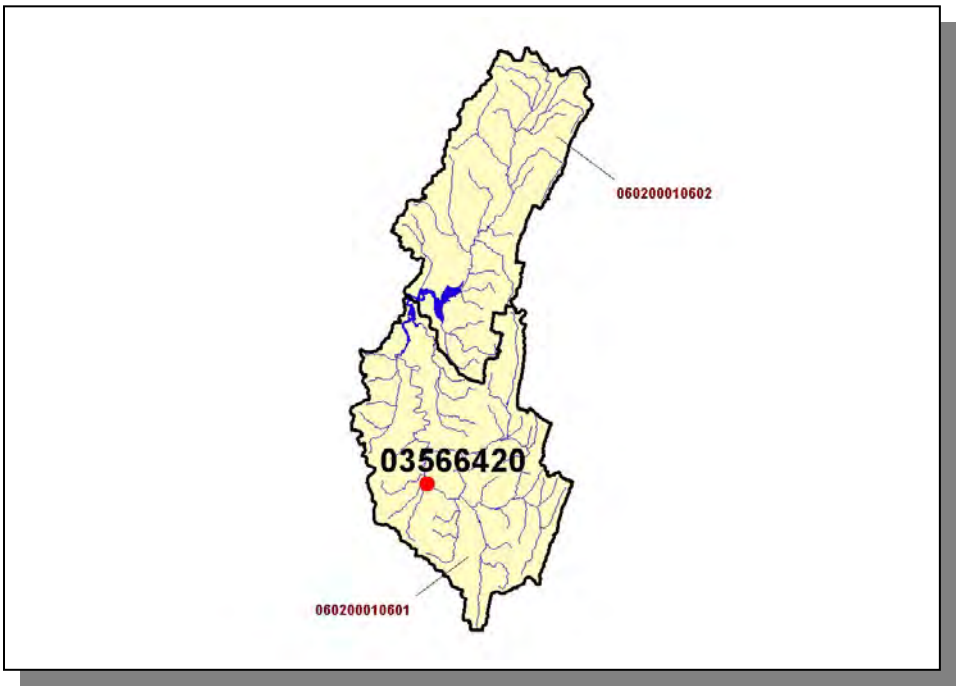


Figure 4-46. Location of Historical Streamflow Data Collection Sites in Subwatershed 0602000106. *Subwatershed 060200010601 and 060200010602 boundaries are shown for reference. More information is provided in Appendix IV.*

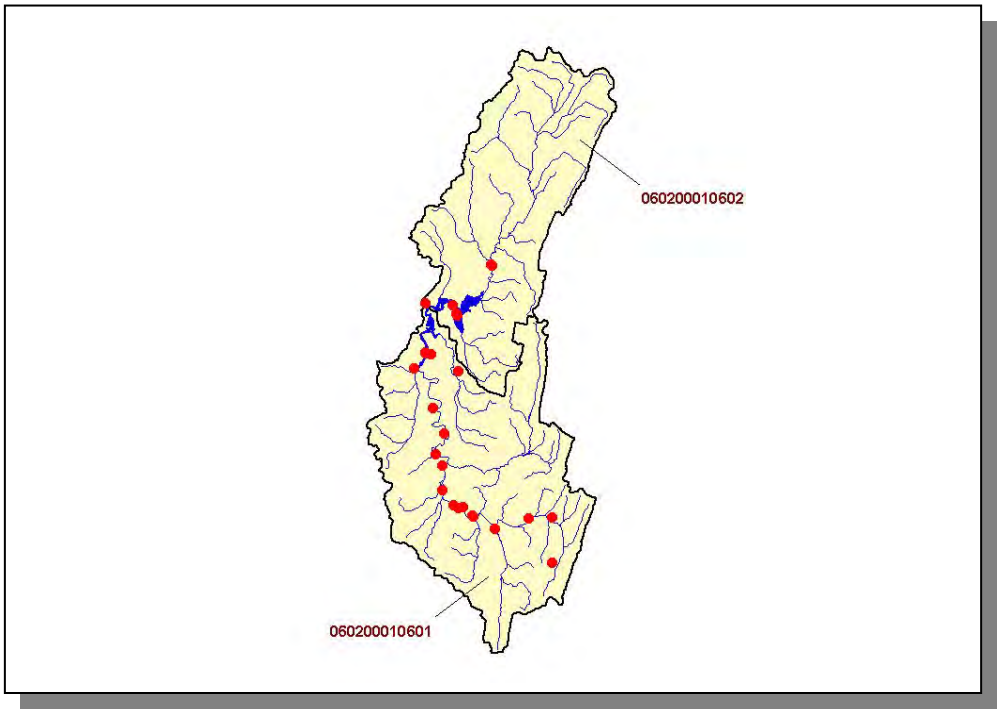


Figure 4-47. Location of STORET Monitoring Sites in Subwatershed 0602000106. *Subwatershed 060200010601 and 060200010602 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.E.ii. Point Source Contributions.

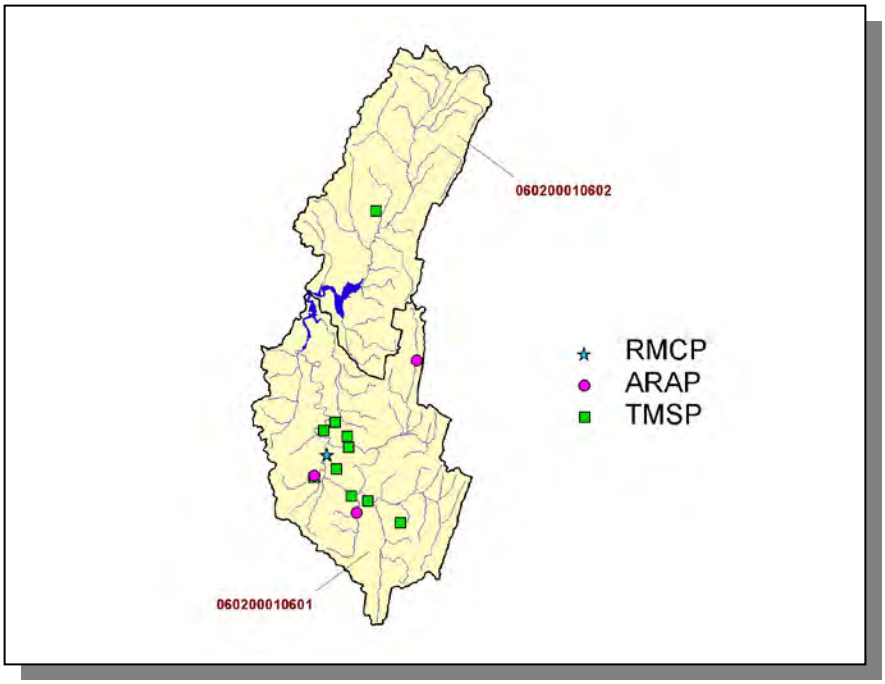


Figure 4-48. Location of Active Point Source Facilities in Subwatershed 0602000106. *Subwatershed 060200010601 and 060200010602 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

Figure 4-49. Location of Ready Mix Concrete Plants in Subwatershed 0602000106. *Subwatershed 060200010601 and 060200010602 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

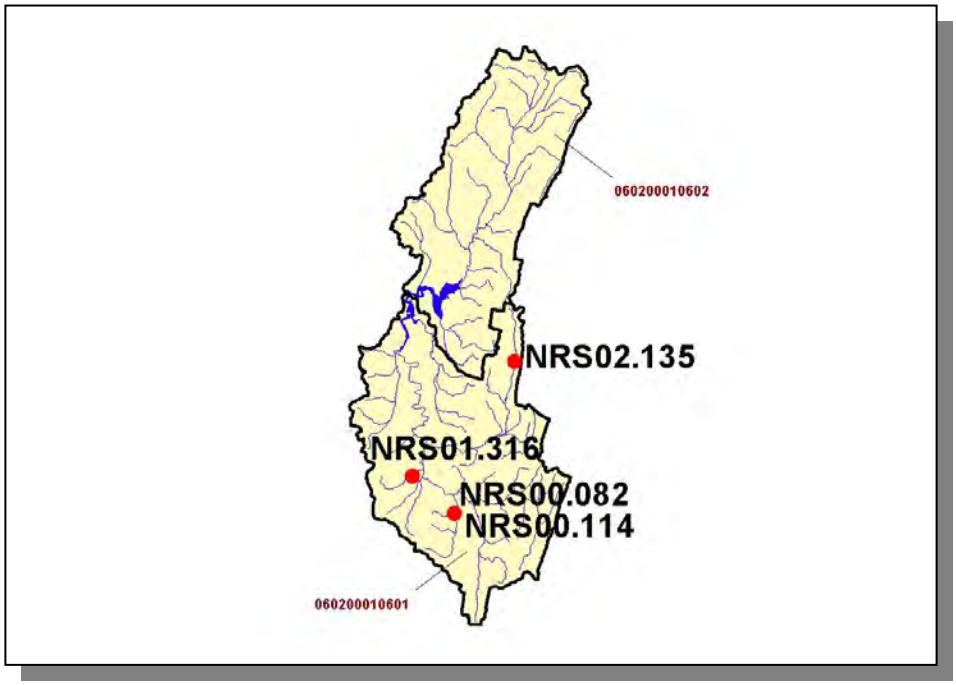


Figure 4-50. Location of ARAP Sites (Individual Permits) in Subwatershed 0602000106. *Subwatershed 060200010601 and 060200010602 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

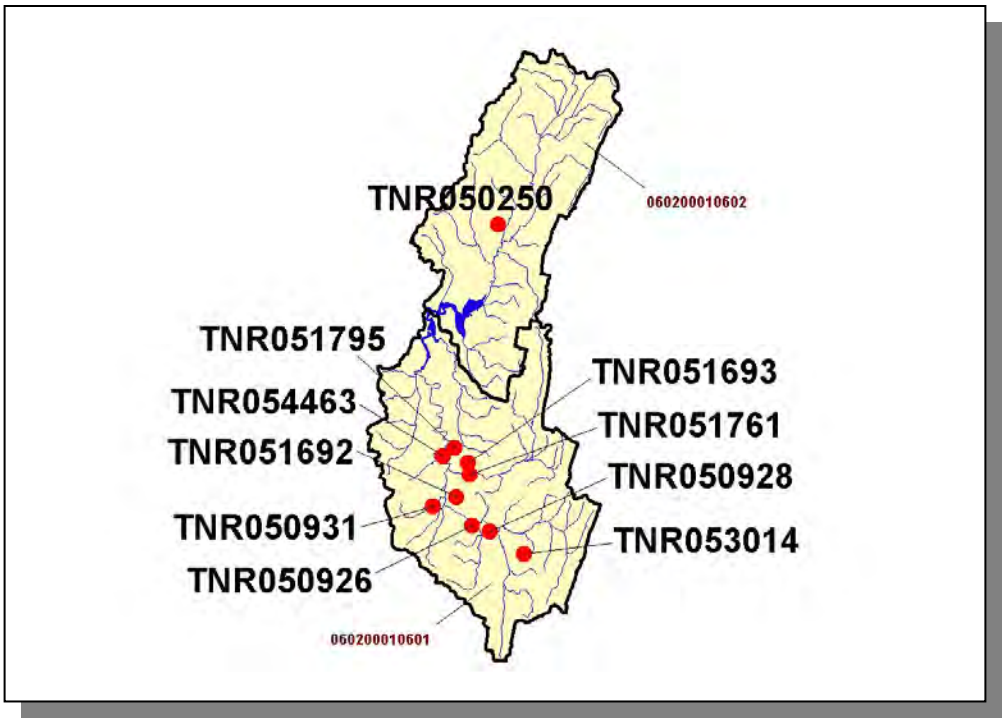


Figure 4-51. Location of TMSP Facilities in Subwatershed 0602000106. *Subwatershed 060200010601 and 060200010602 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

4.2.E.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens (Layers)	Chickens (Broilers Sold)	Hogs	Sheep
2,648	322	5,687	11	487,912	382	42

Table 4-31. Summary of Livestock Count Estimates in Subwatershed 0602000106. *According to the 1997 Census of Agriculture (http://www.nass.usda.gov/census/), "Cattle" includes heifers, heifer calves, steers, bulls and bull calves; "Chickens" are layers 20 weeks and older; "Chickens Sold" are all chickens used to produce meat.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Bradley	92.5	92.5	8.2	18.1
Hamilton	210.7	210.7	2.2	6.0
Total	**303.2**	**303.2**	**10.4**	**24.1**

Table 4-32. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0602000106.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.34
Legumes (Pastureland)	0.07
Grass (Hayland)	2.25
Legumes, Grass (Hayland)	0.20
Grass, Forbs, Legumes (Mixed Pasture)	0.30
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	5.28
Soybeans (Row Crops)	7.48
Oats (Close-Grown Cropland)	3.13
Wheat (Close-Grown Cropland)	3.14
All Other Close-Grown Cropland)	1.99
Other Cropland Not Planted	0.48
Non-Agricultural Land Use	0.00
Conservation Reserve Program Lands	0.27
Other Land in Farms	0.00
Farmsteads and Ranch Headquarters	0.15

Table 4-33. Annual Estimated Total Soil Loss in Subwatershed 0602000106.

CHAPTER 5

WATER QUALITY PARTNERSHIPS IN THE LOWER TENNESSEE RIVER WATERSHED

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 Group 3 portion of the Tennessee portion of the Lower Tennessee 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 System (PRS) 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 PRS may be viewed at http://prms.nrcs.usda.gov/prs. From the opening menu, select "Reports" in the top tool bar. Next, select "2004 Reports" if it's active, and "2003 PRMS Reports" if it's not. Pick the conservation treatment of interest on the page that comes up and reset the date to 2004 Reports if it is not set there. Pick the conservation practice of interest. In the location drop box of the page that comes up, select "Tennessee" and click on the "Refresh" button. In the "By" drop box that comes up, select "Hydrologic Unit" and click on the "Refresh" button. The report of interest can now be viewed.

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.

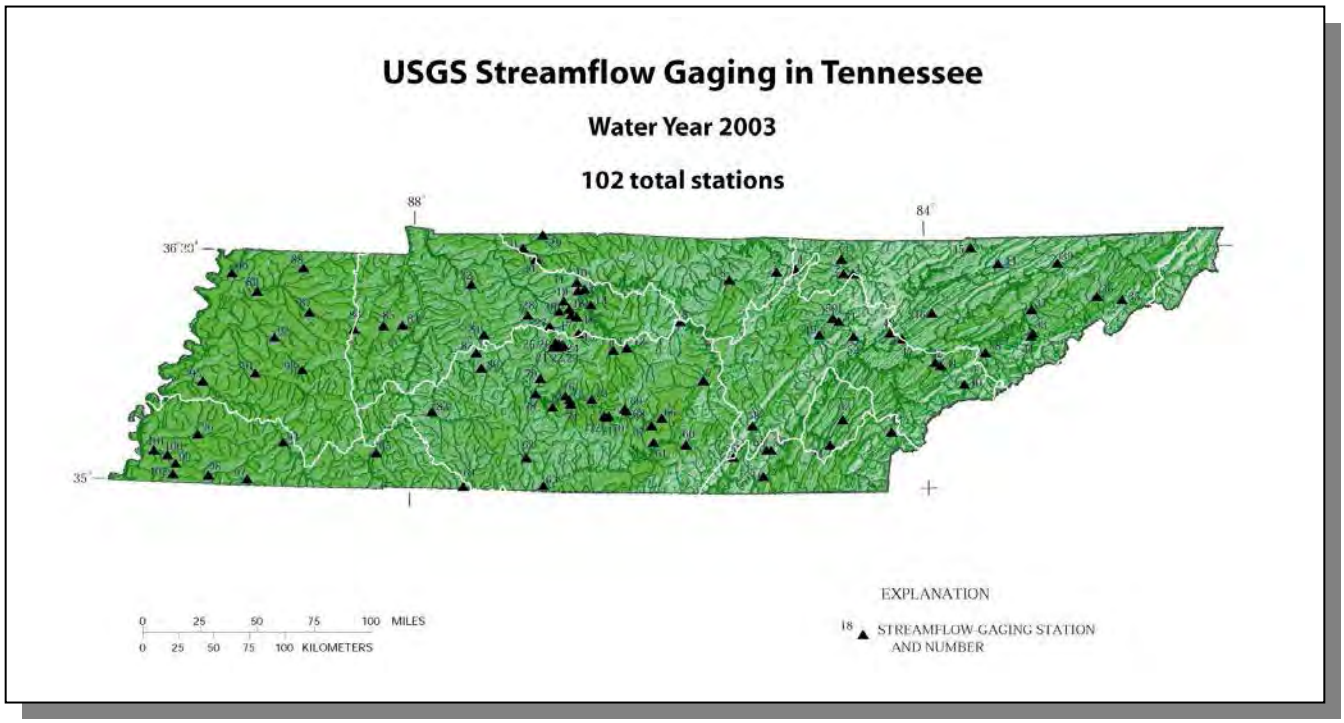
CONSERVATION PRACTICE	TOTAL		
	FEET	ACRES	NUMBER
Comprehensive Nutrient Management Plans		1,756	
Streambank and Shoreline Protection	17,750		
Water Supply	9,985		15
Pest Management		1,885	
Land Treatment: Buffers	27,953	18	
Land Treatment: Surface Water Management		3	
Grazing/Forages Practices	50,982	2,179	

Table 5-1. Landowner Conservation Practices in Partnership with NRCS in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. More information is provided in Appendix V.*

5.2.B. United States Geological Survey Water Resources Programs – Tennessee District The U.S. Geological Survey (USGS) provides relevant and objective scientific studies and information for public use to evaluate the quantity, quality, and use of the Nation's water resources. In addition to providing National assessments, the USGS also conducts hydrologic studies in cooperation with numerous Federal, State, and local agencies to address issues of National, regional, and local concern. Please visit http://water.usgs.gov/ for an overview of the USGS, Water Resources Discipline.

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 102 gaging stations equipped with recorders and makes instantaneous measurements of streamflow at many other locations. Ground-water levels are monitored Statewide, and the physical, chemical, and biologic 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 (http://bqs.usgs.gov/acidrain/), National Stream Quality Accounting Network (http://water.usgs.gov/nasqan/), and the National Water-Quality Assessment Program (http://water.usgs.gov/nawqa/). For specific information on the Upper and Lower Tennessee NAWQA studies, please visit http://tn.water.usgs.gov/lten/tenn.html

USGS Water Resources Information on the Internet. Real-time and historical streamflow, water levels, and water-quality data at sites operated by the Tennessee District can be accessed at http://waterdata.usgs.gov/tn/nwis/nwis. Data can be retrieved by county, hydrologic unit code, or major river basin using drop-down menus. Contact Donna Flohr at (615) 837-4730 or dfflohr@usgs.gov for specific information about streamflow data. Recent publications by the USGS staff in Tennessee can be accessed by visiting http://tn.water.usgs.gov/pubpg.html. This web page provides searchable bibliographic information to locate reports and other products about specific areas.



5.2.C. U.S. Fish and Wildlife Service. The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. Sustaining our nation's fish and wildlife resources is a task that can be accomplished only through the combined efforts of governments, businesses, and private citizens. The U.S. Fish and Wildlife Service (Service) works with State and Federal agencies and Tribal governments, helps corporate and private landowners conserve habitat, and cooperates with other nations to halt illegal wildlife trade. The Service also administers a Federal Aid program that distributes funds annually to States for fish and wildlife restoration, boating access, hunter education, and related projects across America. The funds come from Federal excise taxes on fishing, hunting, and boating equipment.

Endangered Species Program

Through the Endangered Species Program, the Service consults with other federal agencies concerning their program activities and their effects on endangered and threatened species. Other Service activities under the Endangered Species Program include the listing of rare species under the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.) and the recovery of listed species. Once listed, a species is afforded the full range of protections available under the ESA, including prohibitions on killing, harming or otherwise taking a species. In some instances, species listing can be avoided by the development of Candidate Conservation Agreements, which may remove threats facing the candidate species, and funding efforts such as the Private Stewardship Grant Program. Federally endangered and threatened species in the Tennessee River watershed in Hamilton and Marion Counties, Tennessee, include the bald eagle (*Haliaeatus leucocephalus*), snail darter (*Percina tanasi*), rough pigtoe (*Pleurobenum plenum*), pink mucket (*Lampsilis abrupta*), gray bat (*Myotis grisescens*), Indiana bat (*Myotis sodalis*), royal marstonia (snail) (*Pyrgulopsis ogmorhaphe*), and large-flowered skullcap (*Scutellaria montana*). For a complete listing of endangered and threatened species in Tennessee, please visit the Service's website at http://www.fws.gov/cookeville/.

Recovery is the process by which the decline of an endangered or threatened species is stopped and reversed, and threats to the species' survival are eliminated, so that long-term survival in nature can be ensured. The goal of the recovery process is to restore listed species to a point where they are secure and self-sustaining in the wild and can be removed from the endangered species list. Under the ESA, the Service and National Marine Fisheries Service were delegated the responsibility of carrying out the recovery program for all listed species.

In a partnership with the Tennessee Nature Conservancy (TNC), Tennessee Wildlife Resources Agency (TWRA), and Tennessee Department of Environment and Conservation (TDEC) Division of Natural Heritage, the Service developed a State Conservation Agreement for Cave Dependent Species in Tennessee (SCA). The SCA targets unlisted but rare species and protects these species through a suite of proactive conservation agreements. The goal is to preclude the need to list these species under the ESA. This agreement covers middle and eastern Tennessee and will benefit water quality in many watersheds within the State.

In an effort to preclude the listing of a rare species, the Service engages in proactive conservation efforts for unlisted species. The program covers not only formal candidates but other rare species that are under threat. Early intervention preserves management options and minimizes the cost of recovery.

Partners for Fish and Wildlife Program

The U.S. Fish and Wildlife Service established the Partners for Fish and Wildlife Program to restore historic habitat types that benefit native fishes and wildlife. The program adheres to the concept that restoring or enhancing habitats such as wetlands or other unique habitat types will substantially benefit federal trust species on private lands by providing food and cover or other essential needs. Federal trust species include threatened and endangered species, as well as migratory birds (e.g. waterfowl, wading birds, shorebirds, neotropical migratory songbirds).

Participation is voluntary and various types of projects are available. Projects include livestock exclusion fencing, alternate water supply construction, streambank stabilization, restoration of native vegetation, wetland restoration/enhancement, riparian zone reforestation, and restoration of in-stream aquatic habitats.

The Service is actively involved with the Natural Resources Conservation Service and private landowners in the Tennessee River watershed in Hamilton and Marion Counties to protect habitat for the Federally endangered royal marstonia (snail) (*Pyrgulopsis ogmorhaphe*).

HOW TO PARTICIPATE

- Interested landowners contact a Partners for Fish and Wildlife Biologist to discuss the proposed project and establish a site visit.
- A visit to the site is then used to determine which activities the landowner desires and how those activities will enhance habitat for trust resources. Technical advice on proposed activities is provided by the Service, as appropriate.
- Proposed cost estimates are discussed by the Service and landowner.
- A detailed proposal which describes the proposed activities is developed by the Service biologist and the landowner. Funds are competitive, therefore the proposal is submitted to the Service's Ecosystem team for ranking and then to the Regional Office for funding.
- After funding is approved, the landowner and the Service co-sign a Wildlife Extension Agreement (minimum 10-year duration).
- Project installation begins.
- When the project is completed, the Service reimburses the landowner after receipts and other documentation are submitted according to the Wildlife Extension Agreement.

For more information regarding the Endangered Species and Partners for Fish and Wildlife programs, please contact the Tennessee Ecological Services Field Office at (931)-528-6481 or visit their website at http://www.fws.gov/cookeville/.

5.2.D. Tennessee Valley Authority (TVA). TVA's goals for the 21st century are to generate prosperity for the Tennessee Valley by promoting economic development, supplying low-cost, reliable power, and supporting a thriving river system. TVA is committed to the sustainable development of the region and is engaged in a wide range of watershed protection activities. TVA has 7 multidisciplinary Watershed Teams located throughout the Tennessee Valley to help communities actively develop and implement protection and restoration activities in their local watersheds. These teams work in partnership with business, industry, government agencies, and community groups to manage, protect, and improve the quality of the Tennessee River and its tributaries. TVA also operates a comprehensive monitoring program to provide real-time information to the Watershed Teams and other entities about the conditions of these resources. The following is a summary of TVA's resource stewardship activities in the Chickamauga Reservoir.

Reservoir Monitoring

Reservoir Ecological Health. TVA's Reservoir Ecological Health Monitoring program is designed to provide the necessary information from five key ecological indicators (dissolved oxygen, chlorophyll, fish community, benthic macroinvertebrates, and sediment contaminants [PCBs, Pesticides, and Metals]) to evaluate current conditions, provide data for comparing future water quality conditions, and provide for assessments as needed for current and future operations and development.

A part of this monitoring program has been to communicate the data in an easily understandable format. TVA's approach has been to use a Reservoir Ecological Health Score. The ecological health scoring process is designed such that results from each of the five indicators are evaluated based on TVA's reservoir evaluation system and assigned a rating ranging from 1 (poor) to 5 (excellent). To arrive at an overall health evaluation for a reservoir, the sum of the ratings from all sites are totaled, divided by the maximum possible rating for that reservoir, and expressed as a percentage.

TVA monitors ecological conditions at 69 sites on 31 reservoirs. TVA monitored the quality of water resources in Chickamauga Reservoir annually from 1991 through 1995 to establish baseline data on ecological health under a range of weather and flow conditions. These reservoirs are now monitored every other year. Monitoring is conducted at four locations on Chickamauga Reservoir: forebay (TRM 472.3), mid-reservoir (TRM 490.5), inflow (TRM 518-529), and Hiwassee River mile 8.5.

The following charts present Reservoir Ecological Health scores for each year for which data are comparable.

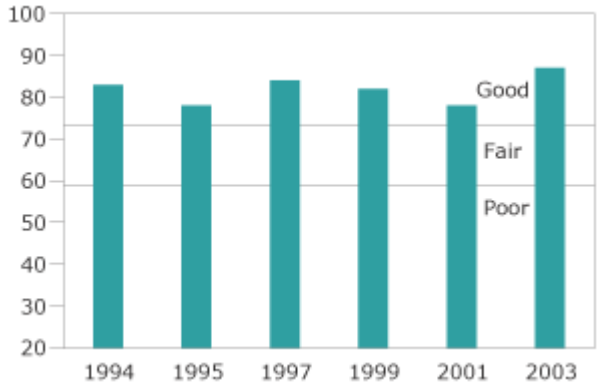


Figure 5-1. Reservoir Ecological Health Ratings for Chickamauga Reservoir (1994-2003)

As in previous years, the ecological health of Chickamauga Reservoir rated good in 2003. However, overall ecological conditions were better in 2003 than in recent years due to the higher-than-normal rainfall and increased reservoir flows, which helped to improve two ecological indicators; DO and chlorophyll. The improved DO likely contributed to the improved bottom life, which rated good at all locations.

Public and Industrial Water Supplies. Adequate water of good quality is essential for sustained population growth and economic development. In conjunction with routine water quality monitoring efforts conducted as part of Reservoir Ecological Health Monitoring, TVA collects additional water samples to be analyzed for parameters of interest to public and industrial water supplies. The purpose of these additional collections is to provide data for use in siting new water supply facilities and determining appropriate design for treatment components. Also, data are available to domestic water suppliers to assist in water treatment operations and diagnosis of abnormal conditions. By combining with routine monitoring, TVA can make these valuable data available to others and incur only the incremental cost associated with laboratory analyses.

More information about Reservoir Ecological Health Monitoring on Chickamauga Reservoir can be obtained by contacting Tyler Baker at (423)-876-6733 or tfbaker@tva.gov or http://www.tva.gov.

Bacteriological Monitoring. Recreation is one of TVA's major objectives of the integrated river resource management system. TVA develops, maintains, and promotes public use of several recreational sites. Increased public knowledge about bacterial contamination has heightened the interest in bacteriological levels in recreational waters by both TVA and our stakeholders. Each summer, about 250 swimming areas and informal water contact recreational sites throughout the Tennessee Valley are tested for fecal coliform and/or *Escherichia coli* (*E. coli*) bacteria by TVA's Resource Stewardship. These sites include those operated by TVA and many operated by other agencies. The site list is reexamined annually by the appropriate watershed teams and other TVA organizations to ensure the most heavily used sites are monitored. Bacteriological water sampling is conducted between Memorial Day and Labor Day when people are most likely to be

recreating. Data from this sampling effort is shared in a timely manner with TDEC's Division of Water Pollution Control.

TVA sampled *E. coli* bacteria levels on or around Chickamauga Reservoir in 2004.

On Chickamauga reservoir, the results of the following sites were within the state's guidelines:

Waconda Bay informal recreation area/TWRA boat ramp

Chester Frost Park beach

Harrison Bay Informal Recreation Area

Eldridge boat ramp

Grasshopper Creek beach

Blythe Ferry Landing Site boat ramp

Cottonport Campground informal swim area

Frazier Park

Hixson Greenway Canoe Access-Put-In

One site, Hixson Greenway Canoe Access-Take-Out, had an elevated geometric mean and exceeded the single sample maximum at least one time when compared to the state of Tennessee's guidelines for water contact.

The following sites exceeded the single sample maximum at least one time:

Savannah Bay Informal Recreation Area boat access site

Harrison Bay State Park informal swimming area

Harrison Bay State Park informal swimming area (Inside Park)

Skull Island Recreation Area
Possum Creek (East) boat ramp
Chickamauga Dam TVA beach

Sale Creek beach

Armstrong Ferry beach

Some of the elevated *E. coli* concentrations found at these sites may be related to waterfowl presence or collection following a rainfall event.

Fish Flesh Toxic Contaminants. State agencies are responsible for advising the public of health risks from eating contaminated fish. TVA assists the states by collecting fish from TVA reservoirs and checking the tissue for metals, pesticides, PCBs, and other chemicals that could affect human health.

TVA collected channel catfish and largemouth bass from Chickamauga Reservoir for tissue analysis in fall 2003. The results, which were provided to state agencies in Tennessee, were similar to previous years.

More information on bacteriological and fish tissue monitoring on Chickamauga Reservoir can be obtained by contacting Rebecca Hallman at (423)-876-6736 or rlhallman@tva.gov or http://www.tva.gov.

Spring Sportfish Survey. TVA conducts its annual spring (March through early June) sportfish survey to help determine the number, age, and general health of black bass and crappie populations in TVA reservoirs. The survey includes twelve 30-minute electrofishing runs covering the various habitat types present. An electric current is used to temporarily stun the fish so that they float to the surface, where they are collected by TVA crews. The fish are then weighed, measured, marked, and released.

This approach to determining fish abundance is used by state game and fish agencies and academia. In addition to accommodating state databases, the surveying method aligns with TVA Watershed Team and Reservoir Operations Study objectives, since the sample sites are selected using the shoreline habitat characteristics employed by the Watershed Teams. The results from the 2004 survey, which will be provided to state agencies in Tennessee, are expected in fall 2004.

Spring Sportfish Survey Results for Chickamauga Reservoir from 2000 through 2003:

Parameter	**2003**	**2002**	**2001**	**2000**
Hours electrofished	18	18	9	16
Total number of black bass	1,118	1,034	208	377
Percent harvestable (over 10 inches)	65.8	59.4	45.2	51
Number of largemouth bass	847	719	170	316
Number of smalllmouth bass	32	43	2	0
Number of spotted bass	239	272	36	60
Number of crappie	N/A	108	N/A	N/A
Number of white crappie	N/A	16	N/A	N/A
Number of black crappie	N/A	92	N/A	N/A
Electrofishing catch rate (per hour)	62	57.4	34.5	34
Average weight (pounds)	1.3	1.1	0.81	1
Largest black bass (pounds)	6.4	6.6	2.8	5
Number of fish with disease/parasites	N/A	34	10	11

More information about fish sampling on Chickamauga Reservoir can be obtained by contacting Donny Lowery at (256)-386-2729 or drlowery@tva.gov or http://www.tva.gov

Stream Bioassessment

Conditions of water resources in streams within the Chickamauga watershed is measured using three independent methods; Index of Biotic Integrity (IBI), number of mayfly, stonefly, and caddisfly taxa (EPT), and Habitat Assessment. Not all of these tools were used at each stream sample site.

IBI. The index of biotic integrity (IBI) assesses the quality of water resources in flowing water by examining a stream's fish assemblage. Fish are useful in determining long-term (several years) effects and broad habitat conditions because they are relatively long-lived and mobile. Twelve metrics address species richness and composition, trophic structure (structure of the food chain), fish abundance, and fish health. Each metric reflects the condition of one aspect of the fish assemblage and is scored against reference streams in the region known to be of very high quality. Potential scores for each of the twelve metrics are 1-poor, 3-intermediate, or 5-the best to be expected. Scores for the 12 metrics are summed to produce the IBI for the site. The following table associates IBI ranges with attributes of fish assemblages.

Attribute	IBI Range
Comparable to the best situations without influence of man; all regionally expected species for the habitat and stream size, including the most intolerant forms, are present with full array of age and sex classes; balanced trophic structure.	58-60
Species richness somewhat below expectation, especially due to loss of most intolerant forms; some species with less than optimal abundance or size distribution; trophic structure shows some signs of stress.	48-52
Signs of additional deterioration include fewer intolerant forms, more skewed trophic structure (e.g., increasing frequency of omnivores); older age classes of top predators may be rare.	40-44
Dominated by omnivores, pollution-tolerant forms, and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; hybrids and diseased fish often present.	28-34
Few fish present, mostly introduced or tolerant forms; hybrids common; disease, parasites, fin damage, and other anomalies regularly.	12-22

EPT. The number and types of aquatic insects, like fish, are indicative of the general quality of the environment in which they live. Unlike fish, aquatic insects are useful in determining short-term and localized impacts because they are short-lived and have limited mobility. The method TVA uses involves only qualitative sampling and field identification of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) to the family taxonomic level (EPT). The score for each site is simply the number of EPT families. The higher EPT scores are indicative of high quality streams because these insect larvae are intolerant of poor water quality.

Habitat Assessment. The quality and quantity of habitat (physical structure) directly affect aquatic communities. Habitat assessments are done at most stream sampling sites to help interpret IBI and EPT results. If habitat quality at a site is similar to that found at a good reference site, any impacts identified by IBI and EPT scores can reasonably be attributed to water quality problems. However, if habitat at the sample site differs considerably from that at a reference site, lower than expected IBI and EPT scores might be due to degraded habitat rather than water quality impacts.

The habitat assessment method used by TVA (modified EPA protocol) compares observed instream, channel, and bank characteristics at a sample site to those expected at a similar high-quality stream in the region. Each of the stream attributes listed below is given a score of 1 (poorest condition) to 4 (best condition). The habitat score for the sample site is simply the sum of these attributes. Scores can range from a low of 10 to a high of 40.

1. Instream cover (fish)
2. Epifaunal substrate
3. Embeddedness
4. Channel Alteration
5. Sediment Deposition
6. Frequency of Riffle
7. Channel Flow Status
8. Bank vegetation protection - Left bank and right bank, separately
9. Bank stability - Left bank and right bank, separately
10. Riparian vegetation zone width - Left bank and right bank, separately

Sample Site Selection. EPT sampling and fish community assessment (IBI) are conducted at the same sites. Site selection is governed primarily by study objectives, stream physical features, and stream access. TVA's objective is to characterize the quality of water resources within a watershed (11-digit hydrologic unit). Sites are typically located in the lower end of sub-watersheds and at intervals on the mainstem to integrate the effects of land use. A total of 19 sites are sampled in the Lower Chickamauga watershed. These sites are typically sampled every five years to keep a current picture of watershed condition.

Details about Stream Bioassessment and Fixed Station Monitoring (sites and scores) can be obtained by writing Amy Wales at Tennessee Valley Authority, 1101 Market Street, Chattanooga TN 37402 or calling her at (423)-876-6748. E-mail address is akwales@tva.gov

Watershed Assistance-Coalition Support

Citizen Based Organizations. Citizen based watershed organizations can play a critical role in watershed protection. TVA's watershed teams work to strengthen these organizations by providing assistance in the areas of understanding the local watershed, its conditions, impacts, and threats; developing and implementing strategies to protect or improve resource quality; fundraising; river issues; and organizational development.

Interagency Partnerships. The benefits of watershed partnerships are well documented. No one unit of government, agency, group or individual has all the knowledge, expertise or resources to address all watershed issues. Partnerships can tap a diversity of energy, talent, and ideas. Watershed Partnerships can also promote a more efficient use of limited financial and human resources and can identify innovative and efficient means of improving or protecting water quality. TVA's Chickamauga-Hiwassee Watershed Team contributes to several interagency partnerships, including the NCCC Water Quality Team and the Hiwassee Interagency Team.

Outreach

The National Clean Boating Campaign highlights the importance of clean water so boating will continue to be fun and safe for future generations. The program demonstrates how boaters can be good stewards of their water environment through best boating and marina practices. TVA supports Clean Boating events each summer at area marinas and boat ramps.

The Tennessee Valley Clean Marina Initiative is an effort by TVA to promote environmentally-responsible marina practices. A voluntary program, established in support of the National Clean Boating Campaign, helps marina operators protect the resource that provides them with their livelihood. Three marinas in Chickamauga Reservoir have achieved Clean Marina status, and several others are working toward certification.

Protection and Restoration Activities

Promote Best Management Practices. TVA provides funding and technical expertise to assist with installation of best management practices (BMPs) that will reduce non-point pollution. As an example, over the past 5 years the Chickamauga-Hiwassee Watershed Team has partnered with the Hamilton County Soil Conservation District, Natural Resources Conservation Service, and 34 farmers and producers in several watersheds draining into Chickamauga Reservoir. Through this partnership, over 70 BMPs to protect water quality have been installed on area farmlands. Several of the farms were highlighted in the 2004 Hamilton County Farm Tour.

Support Clean Up Efforts. Tennessee River Rescue is a community action event that is in its 16th year. TVA helps sponsor this event, which focuses on shoreline clean-up at 16 sites in the Chickamauga and Nickjack watersheds, attracts 600-700 volunteers and collects 50-60 tons of trash annually, in addition to the retrieval and recycling of tires from our waterways.

Shoreline Stabilization and Riparian Restoration. Working closely with cooperators and partners, the Chickamauga-Hiwassee Watershed Team has implemented innovative and cost effective methods for minimizing the erosion from public lands in Chickamauga Reservoir. During 2003 and 2004 1.73 miles of shoreline was stabilized and protected in Chickamauga Reservoir.

In addition, the team provides technical assistance to stakeholders through individual landowner meetings and public workshops for those interested in learning and applying bio-stabilization and riparian restoration techniques. In the spring of 2004, the team partnered with the City of Collegedale to address a critical erosion problem along the Wolftever Creek Greenway. Through a TVA-funded, hands-on workshop, Collegedale Public Works staff learned and applied appropriate stabilization materials and techniques to stop the erosion and rebuild an undercut section of the Greenway trail along the creek. Native vegetation was then planted along this section of the Greenway to protect the soil from future erosion and serves as a demonstration to Greenway users of the benefits of native vegetation along waterways.

TVA has also developed a series of 11 fact sheets that will enable riparian property owners to restore, manage, and be better stewards of riparian land. The fact sheets are available on the TVA internet site: (http://www.tva.com/river/landandshore/index.htm).

Further information on TVA's Watershed Assistance activities in the Chickamauga Watershed can be obtained by writing the Chickamauga-Hiwassee Watershed Team at: Tennessee Valley Authority; 1101 Market Street, PSC-1E; Chattanooga, TN 37402 or calling them at (423)-876-6701.

5.3. STATE PARTNERSHIPS.

5.3.A. TDEC Division of Water Supply. The Source Water Protection Program, authorized by the 1996 Amendments to the Safe Drinking Water Act, outline a comprehensive plan to achieve maximum public health protection. According to the plan, it is essential that every community take these six steps:

1) Delineate the drinking water source protection area
2) Inventory known and potential sources of contamination within these areas
3) Determine the susceptibility of the water supply system to these contaminants
4) Notify and involve the public about threats identified in the contaminant source inventory and what they mean to their public water system
5) Implement management measures to prevent, reduce or eliminate threats
6) Develop contingency planning strategies to deal with water supply contamination or service interruption emergencies (including natural disaster or terrorist activities).

Source water protection has a simple objective: to prevent the pollution of the lakes, rivers, streams, and ground water (wells and springs) that serve as sources of drinking water before they become contaminated. This objective requires locating and addressing potential sources of contamination to these water supplies. There is a growing recognition that effective drinking water system management includes addressing the quality and protection of the water sources.

Source Water Protection has a significant link with the Watershed Management Program goals, objectives and management strategies. Watershed Management looks at the health of the watershed as a whole in areas of discharge permitting, monitoring and protection. That same protection is important to protecting drinking water as well. Communication and coordination with a multitude of agencies is the most critical factor in the success of both Watershed Management and Source Water Protection.

Watershed management plays a role in the protection of both ground water and surface water systems. Watershed Management is particularly important in areas with karst (limestone characterized by solution features such as caves and sinkholes as well as disappearing streams and spring), since the differentiation between ground water and surface water is sometimes nearly impossible. What is surface water can become ground water in the distance of a few feet and vice versa.

Source water protection is not a new concept, but an expansion of existing wellhead protection measures for public water systems relying on ground water to now include surface water. This approach became a national priority, backed by federal funding, when the Safe Drinking Water Act amendments (SDWA) of 1996 were enacted. Under this Act, every public drinking water system in the country is scheduled to receive an assessment of both the sources of potential contamination to its water source of the threat these sources may pose by the year 2003 (extensions were available until 2004). The assessments are intended to enhance the protection of drinking water supplies within existing programs at the federal, state and local levels. Source water assessments were mandated and funded by Congress. Source water protection will be

left up to the individual states and local governments without additional authority from Congress for that progression.

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.

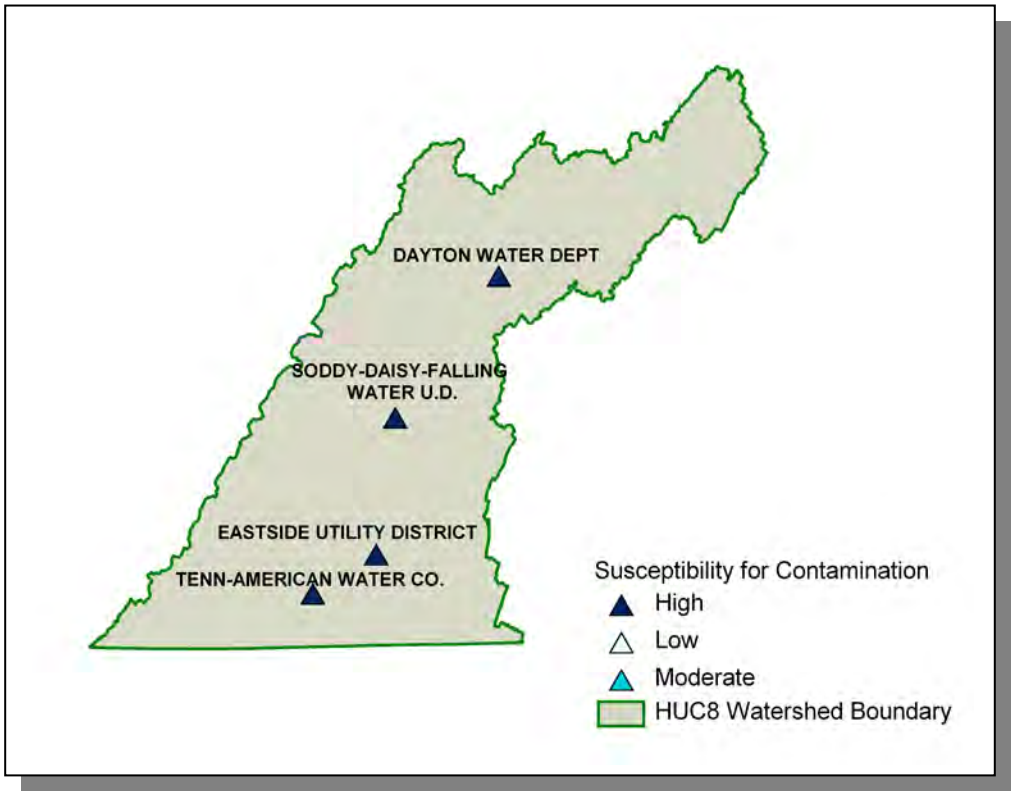


Figure 5-2. Susceptibility for Contamination in the Tennessee River Watershed.

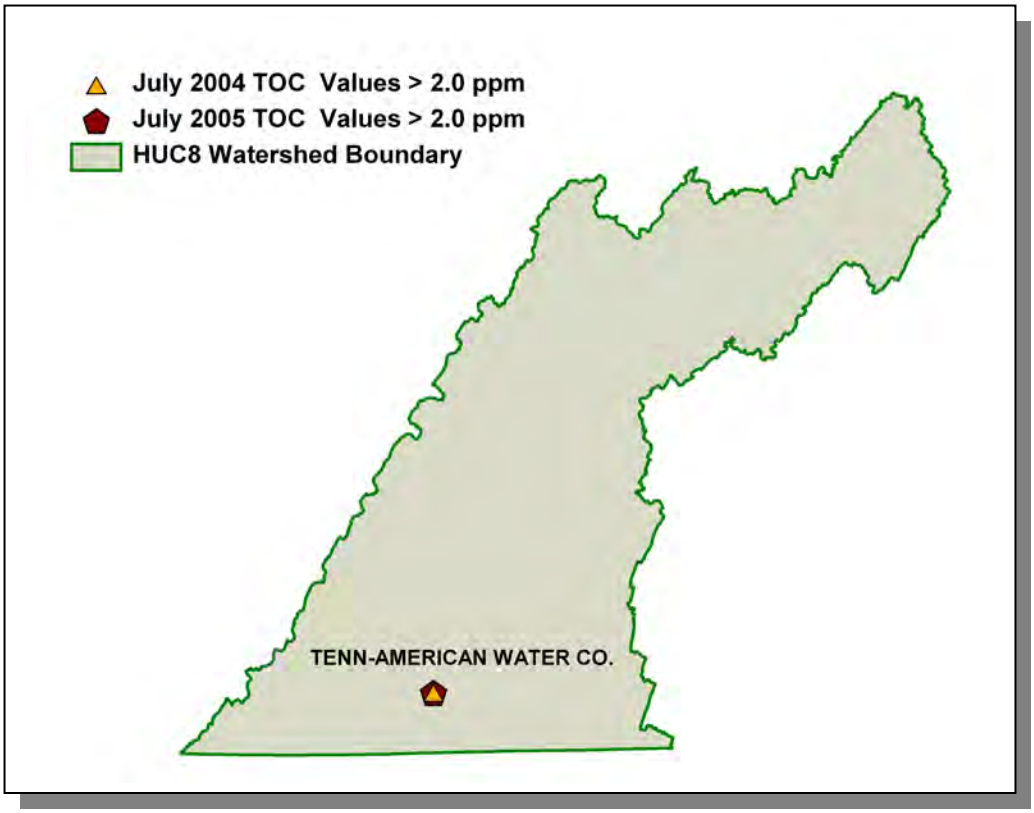


Figure 5-3. July 2004 and 2005 Raw Water Total Organic Carbon (TOC) Analysis in the Tennessee River Watershed.

For further discussion on ground water issues in Tennessee, the reader is referred to the Ground Water Section of the 305(b) Water Quality Report at http://www.tdec.net/water.shtml.

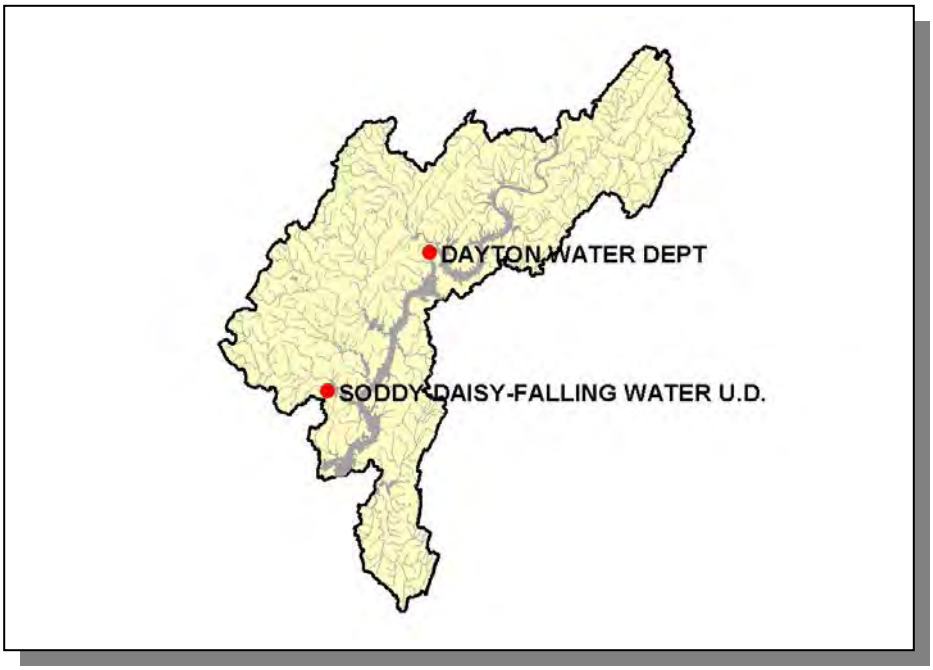


Figure 5-4. Locations of Community and Non-Community Public Water Supply Intakes in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

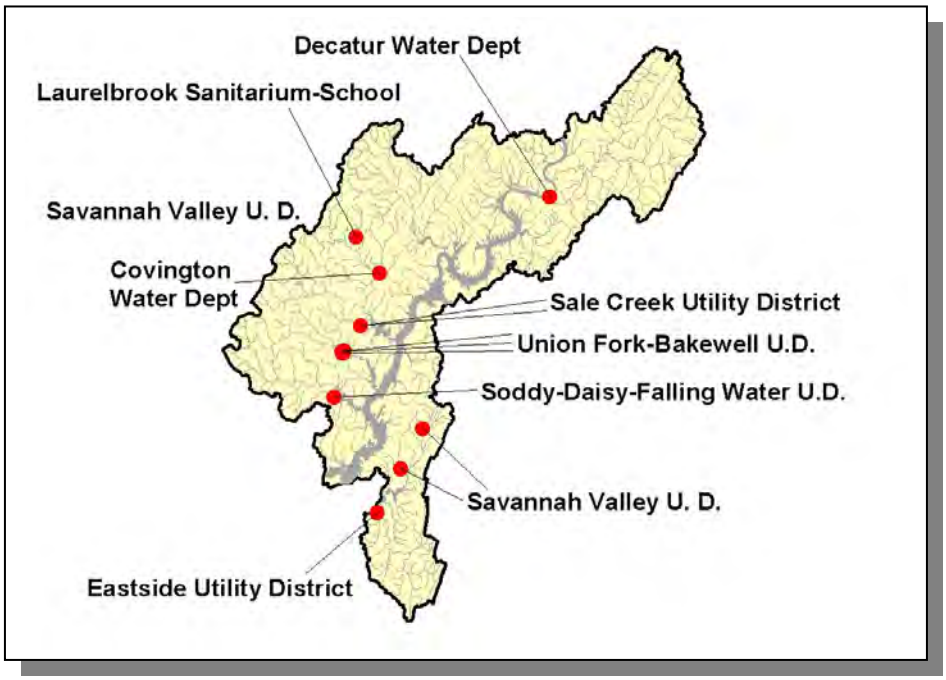


Figure 5-5. Locations of Community and Public Groundwater Supply Intakes in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

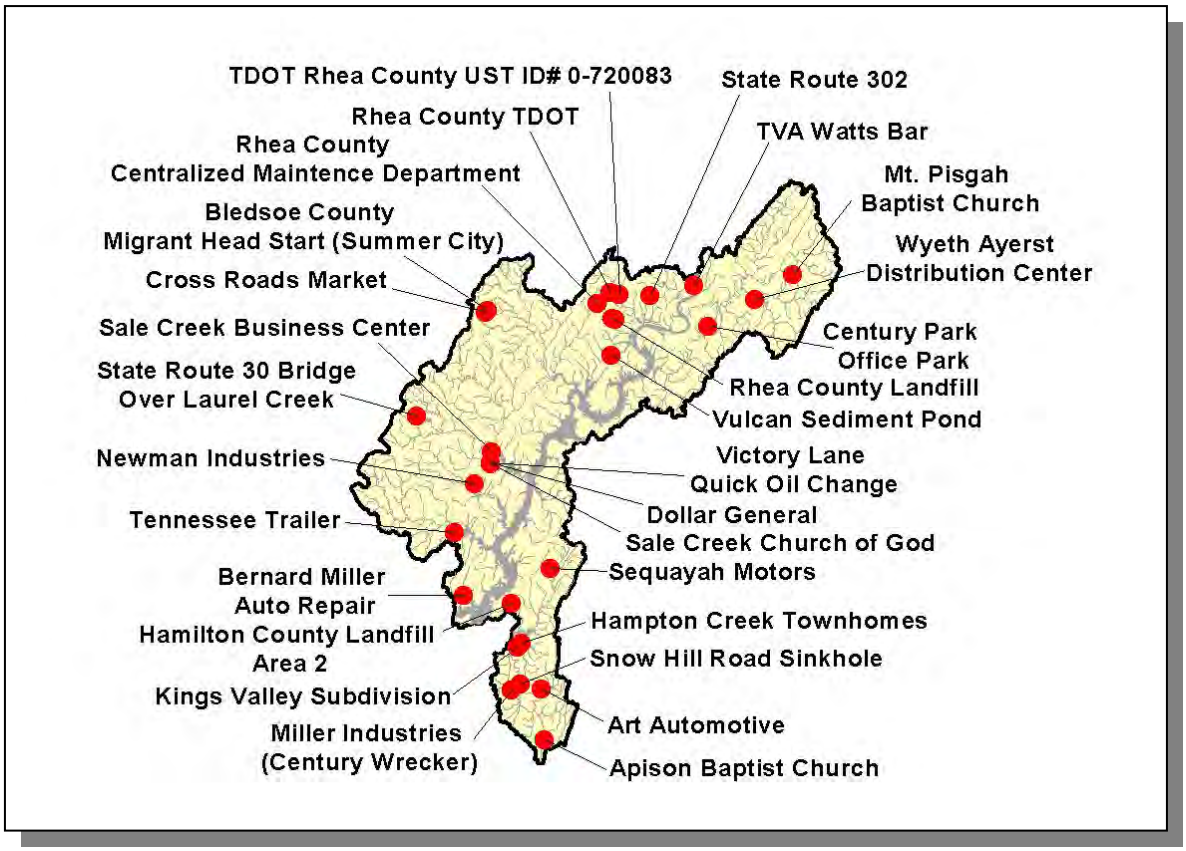


Figure 5-6. Locations of UIC (Underground Injection Control) Sites in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *Injection wells include stormwater sinkholes modified for drainage, commercial/industrial septic tanks, and large capacity septic tanks.*

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 $550 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.

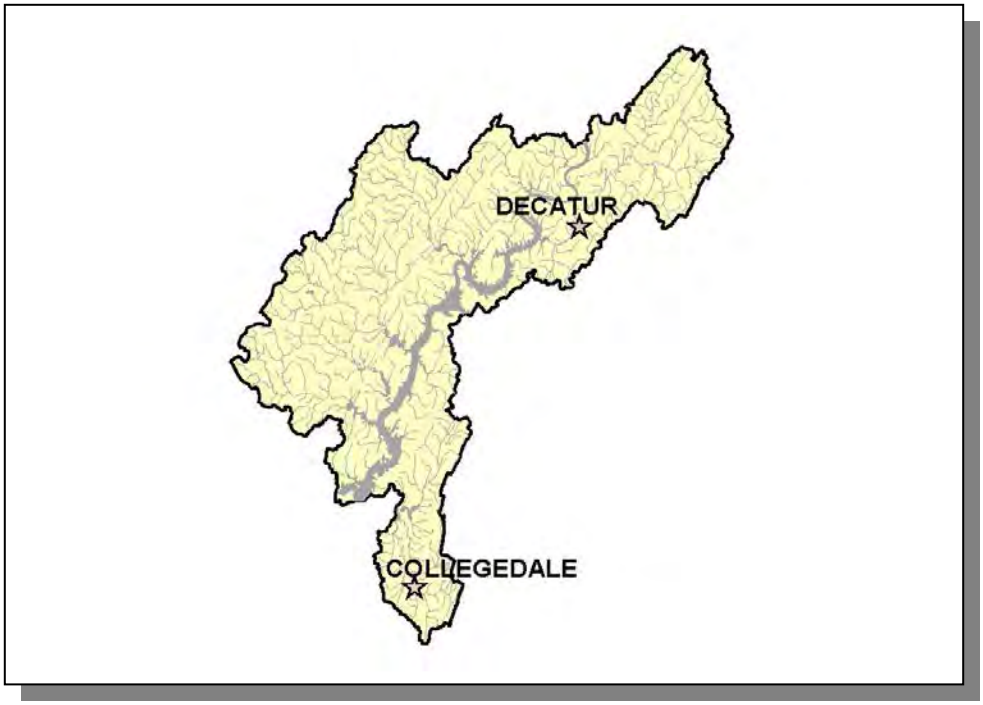


Figure 5-7. Location of Communities Receiving SRF Loans or Grants in the Lower Tennessee River Watershed. *More information is provided in Appendix V.*

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. Some monitoring in the Lower Tennessee River Watershed was funded under an agreement with the Tennessee Department of Agriculture, Nonpoint Source Program (U.S. Environmental Protection Agency Assistance Agreements C9994674-00-0, C9994674-01-0, and C9994674-02-0).

- 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.

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. More information forestry BMPs is available at:
http://tennessee.gov/agriculture/forestry/BMPs.pdf, and the complaint form is available at: http://tennessee.gov/environment/wpc/logform.php.

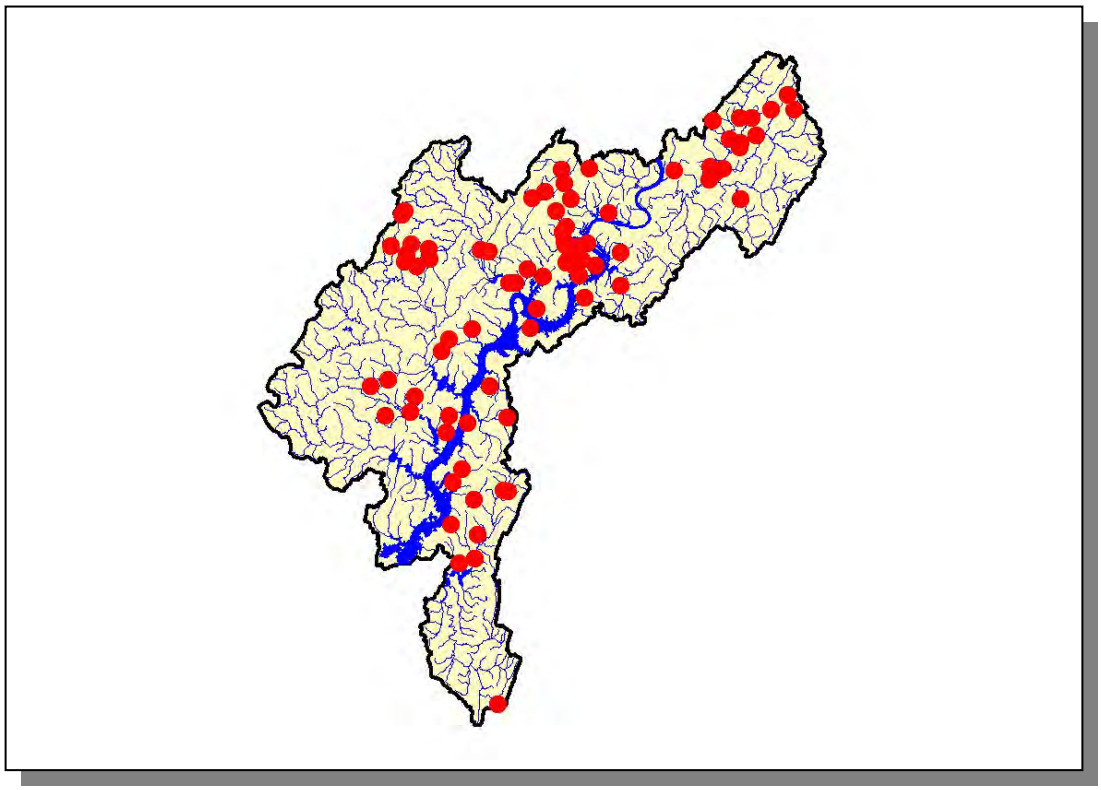


Figure 5-8. Location of BMPs installed from 1999 through 2003 in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed with Financial Assistance from the Tennessee Department of Agriculture's Nonpoint Source and Agricultural Resources Conservation Fund Grant Programs. *More information is provided in Appendix V.*

CHAPTER 6

RESTORATION PRIORITIES IN THE LOWER TENNESSEE RIVER WATERSHED

6.1. BACKGROUND.

The Watershed Water Quality 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 storm water rules (implemented under the NPDES program) have transitioned from Phase 1 to Phase 2. More information on storm water 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 Group 3 portion of the Tennessee portion of the Lower Tennessee 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 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: The times and locations of watershed meetings are posted at: http://www.state.tn.us/environment/wpc/watershed/public.php.

6.2.A. Year 1 Public Meeting. The first Lower Tennessee River Watershed public meeting was held September 22, 1998 at Sale Creek High School. 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 strategies, and (4) solicit input from the public.

Major Concerns/Comments

- Well water quality and availability
- Water supply infrastructure planning
- Lake draw down effects on fish and other aquatic organisms
- Lack of a management plan for development
- Plans to place a landfill too close to the Tennessee River, Sale Creek and individual wellheads
- Citizens in this watershed have no power in comparison to Chattanooga. Ability to maintain quality of life and high water quality may be lost
- Pollution leading to health concerns and to impacts on fish and aquatic life

6.2.B. Year 3 Public Meeting. The second Lower Tennessee River Watershed public meeting was held March 27, 2001 at the Chattanooga TDEC Field Office.. 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

- Loss of riparian habitat and runoff from residential construction
- Loss of riparian zones from rip-rap
- Loss of land and soil associated with raising TVA lake levels
- Large hulled pleasure boats causing bank instability

- Industrial forestry sprawl leading to loss of soil and to nutrient and sediment problems in lakes
- More low flow streams than ever
- Lake stratification and partial eutrophication of lakes in summer
- Aquatic weeds, especially during drought conditions

6.2.C. Year 5 Public Meeting. The third scheduled Lower Tennessee River Watershed public meeting was held November 14, 2005 at the Rhea County Welcome Center in Dayton. The meeting featured six educational components:

- Overview of draft Watershed Water Quality Management Plan slide show
- Benthic macroinvertebrate samples and interpretation
- SmartBoard™ with interactive GIS maps
- "How We Monitor Streams" self-guided slide show
- "Why We Do Biological Sampling" self-guided slide show
- TVA display

In addition, citizens had the opportunity to make formal comments on the draft Watershed Water Quality Management Plan.

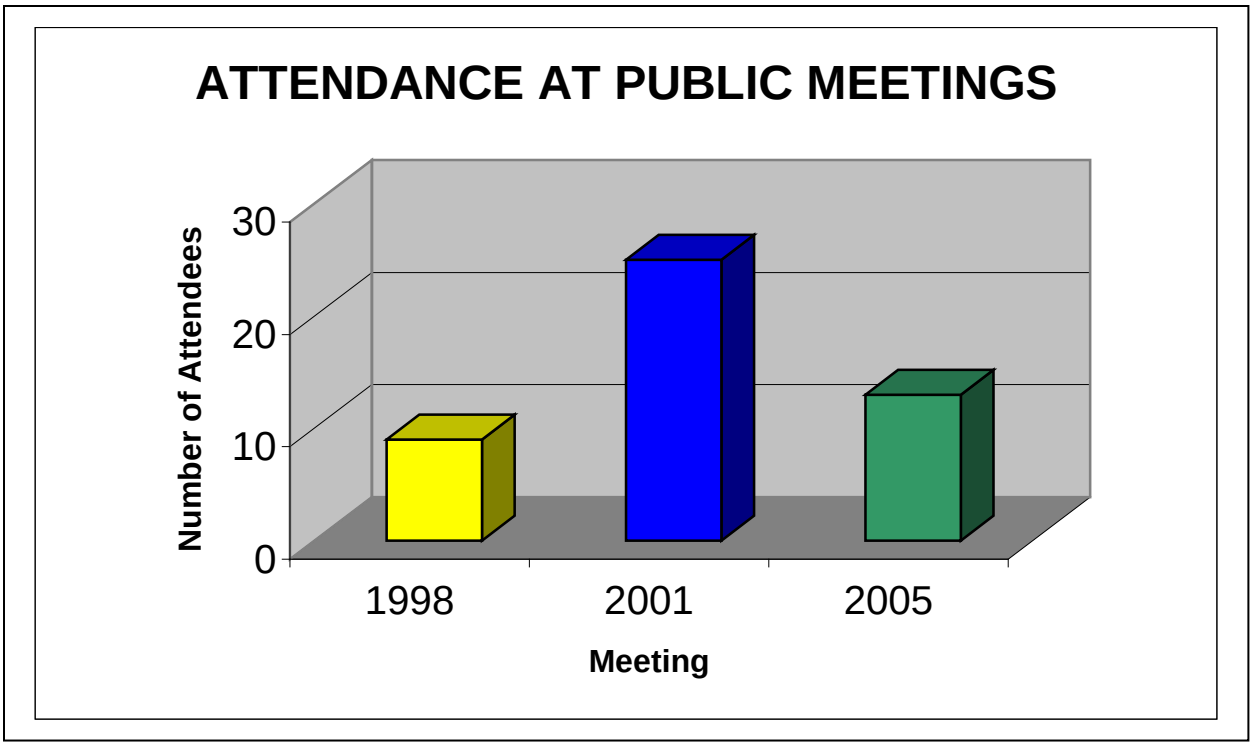


Figure 6-1. Attendance at Public Meetings in the Lower Tennessee River Watershed. *Attendance numbers do not include TDEC personnel.*

Figure 6-2. The SmartBoard™ is an Effective Interactive Tool to Teach Citizens About the Power of GIS.

Figure 6-3. Watershed Meetings are a Good Opportunity for TDEC Staff to meet with Local and County Planning Officials to Discuss Watershed Protection.

6.3. APPROACHES USED.

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/. 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/.

TMDLs are prioritized for development based on many factors.

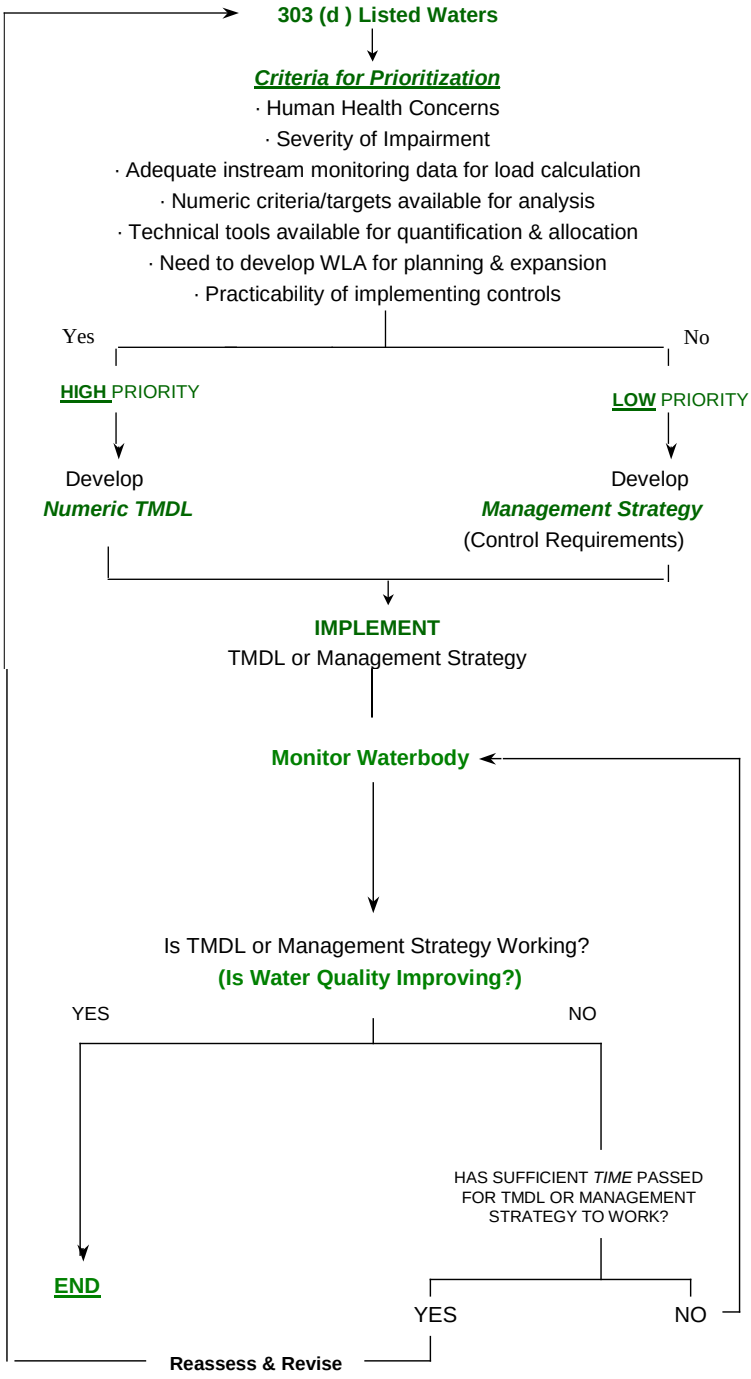


Figure 6.4. Prioritization Scheme for TMDL Development.

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, existing point source regulations can have only a limited effect. Other measures are, therefore, necessary.

There are several state and federal regulations that address some of the contaminants impacting waters in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed. Most of these are limited to only point sources: a pipe or ditch. Often, controls of point sources are not sufficient to protect waters, so other measures are necessary. Some measures include efforts by landowners and volunteer groups and the possible implementation of new regulations. Many agencies, such as the Tennessee Department of Agriculture (TDA) and the Natural Resources Conservation Service (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 types of impairments, possible causes, and suggested improvement measures. Restoration efforts should not be limited to only those streams and measures suggested below.

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 were being disturbed. In the spring of 2003, that threshold became 1 acre. The general permit issued for such construction sites establishes conditions for maintenance of the sites to minimize pollution from storm water runoff, including requirements for installation and inspection of erosion controls. Also, the general permit imposes more stringent inspection and self-monitoring requirements on sites in the watershed of streams that are affected by sedimentation.

Construction sites within a sediment-impaired watershed may also have higher priority for inspections by WPC personnel, and are likely to have enforcement actions for failure to control erosion.

The same requirements apply to sites that drain into high quality waters. Sewee Creek, Rock Creek, Hall Creek, Whites Creek, Laurel Creek, Little Laurel Creek, Piney River, Piney Creek, Soak Creek, Richland Creek, and Tigues Creek are examples of high quality streams in the Group 3 portion of the Lower Tennessee River Watershed.

6.3.B.i.b. From Channel and/or Bank Erosion. Many streams within the Lower Tennessee River Watershed exhibit streambank erosion. When steam channels are altered, or large tracts of land are cleared, storm water runoff, will cause banks to become unstable and highly erodable. Heavy livestock traffic can also severely disturb banks. Additionally, streams that flow off the Cumberland Plateau may exhibit braiding and widening of the streambed and highly erodable banks that may be especially severe during rain events. Destabilized banks contribute to sediment load and to the loss of beneficial riparian vegetation to the stream. This is especially problematic in certain areas of the Lower Tennessee River Watershed where the very sandy plateau soils and shallow rooted trees are especially vulnerable. Streambank destabilization in this area may be hastened by rock harvesting operations on the escarpment and by inappropriate agricultural practices.

In response to citizen and local government concerns related to streambank stability in both Hamilton and Rhea Counties, the Commissioner of TDEC encouraged the formation of the Hamilton-Rhea Stream Task Force. The task force is comprised of federal agencies (USGS, NRCS, FEMA, USACOE, and TVA), state agencies (TDEC-WPC and TDOT), local agencies (Hamilton County, Rhea County, Town of Graysville, and Town of Soddy-Daisy), and citizens living in the watershed. The goals of the task force are to seek sound solutions to immediate problems and to develop a long-term strategy for resolving the threat to life and property caused by the aggressively eroding streambanks. The task force identified locations on each of the streams where problems are occurring. These include Falling Water Creek, North Chickamauga Creek, Big Soddy Creek, Possum Creek, Rock Creek, Roaring Creek, and Richland Creek. Each location identified was then prioritized according to severity of threat. Potential mitigation options were determined and evaluated. Funding availability was analyzed, and a grant was obtained to address the situations classified as the highest priorities (more imminent threats).

Voluntary activities

- Re-establish bank vegetation.
- Establish off-channel watering areas for livestock by moving watering troughs and feeders back from stream banks (examples: Piney River, Little Piney Creek, Richland Creek, Little Richland Creek, White Creek, Lewis Creek, Long Savannah Creek, Sale Creek, Rogers Branch, and Grasshopper Creek).
- Limit cattle access to streams and bank vegetation through the use of cross fencing and heavy-use area protection (examples: Piney River, Little Piney Creek, Richland Creek, Little Richland Creek, White Creek, Lewis Creek, Long Savannah Creek, Sale Creek, Rogers Branch, and Grasshopper Creek).
- Educate potential and existing homeowners to the drawbacks of living in an area susceptible to damage from flooding and erosion.

Additional strategies

- Increase efforts in the Master Logger program to recognize impaired streams and require more effective management practices.
- Better community planning for the impacts of development on small streams, especially development in growing areas (examples: Roaring Creek, Rock Creek, Possum Creek, Piney River, Richland Creek, Soddy Creek, and Sale Creek).

- Limit livestock access to streams and bank vegetation (examples: Piney River, Little Piney Creek, Richland Creek, Little Richland Creek, White Creek, Lewis Creek, Long Savannah Creek, Sale Creek, Sewee Creek, Little Sewee Creek, and Grasshopper Creek).
- Require post-construction run-off rates to be no greater than pre-construction rates in order to avoid in-channel erosion (examples: Richland Creek, Soddy Creek, and Roaring Creek).
- Implement additional restrictions on logging in streamside management zones (examples: Sewee Creek, Piney River, and Rock Creek).
- Limit clearing of stream and ditch banks (examples: Roaring Creek, Rock Creek, Possum Creek, and Sale Creek). *Note: Permits may be required for any work along streams.*
- Limit road and utilities crossings of streams (examples: Sewee Creek, Rock Creek, Hall Creek, Whites Creek, Laurel Creek, Little Laurel Creek, Piney River, Piney Creek, Soak Creek, Richland Creek, Laurel Creek, and Tigues Creek).
- Restrict the use of off-highway vehicles on stream banks and in stream channels (examples: Sewee Creek, Rock Creek, Hall Creek, Whites Creek, Laurel Creek, Little Laurel Creek, Piney River, Piney Creek, Soak Creek, Richland Creek, Laurel Creek, and Tigues Creek).

6.3.B.i.c. From Agriculture and Silviculture. The Water Quality Control Act exempts normal agricultural and silvicultural practices that do not result in a point source discharge. Nevertheless, efforts are being made to address impacts due to these exempted practices.

The Master Logger Program has been in place for several years to train loggers how to install Best Management Practices that lessen the impact of logging activities on streams. Recently, laws and regulations were enacted which established that these BMPs must be used or the Commissioners of the Departments of Environment and Conservation and of Agriculture would be permitted to stop the logging operation that, upon failing to install these BMPs, was causing impacts to streams.

Since the Dust Bowl era, the agriculture community has strived to protect the soil from wind and soil erosion. Agencies such as the Natural resources Conservation Service (NRCS), the University of Tennessee Agricultural Extension Service, and the Tennessee Department of Agriculture have worked to identify better ways of farming, to educate the farmers, and to install the methods that address the sources of some of the impacts due to agriculture. Cost sharing is available for many of these measures. Lewis Branch, Rogers Branch, Wolftever Creek, Long Savannah Creek, Sale Creek, and Grasshopper Creek have already had, or are currently installing, several BMPs that address the sediment pollution in this watershed.

Many sediment problems traceable to agricultural practices also involve riparian loss due to close row cropping or pasture clearing for grazing. Agriculturally impacted streams which could benefit from the establishment of riparian buffer zones include Lewis Branch, Bivins Branch, and Little Sewee Creek.

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 from pets, livestock and wildlife washed into streams and storm drains. Permits issued by the Division of Water Pollution Control regulate discharges from point sources and 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. The Division of Ground Water Protection within the Chattanooga Field Office and delegated county health departments regulate septic tanks and field lines. 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 water disposal.

Streams in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed known to have excessive pathogen contamination include Lewis Creek, Bivins Branch, and Little Sewee Creek. The bacterial contamination is from inappropriate agricultural practices.

Other measures that may be necessary to control pathogens are:

Voluntary activities

- Off-channel watering of livestock (examples: Piney River, Little Piney Creek, Richland Creek, Little Richland Creek, White Creek, Lewis Creek, Long Savannah Creek, Sale Creek, Rogers Branch, and Grasshopper Creek).
- Limit livestock access to streams (examples: Piney River, Little Piney Creek, Richland Creek, Little Richland Creek, White Creek, Lewis Creek, Long Savannah Creek, Sale Creek, Rogers Branch, and Grasshopper Creek).
- Improve and educate on the proper management of animal waste from feeding operations (examples: Bivins Branch and Lewis Creek).

Enforcement strategies

- Strengthen enforcement of regulations governing on-site wastewater treatment.
- Determine timely and appropriate enforcement for non-complying sewage treatment plants, large and small, and their collection systems.
- Identify Concentrated Animal Feeding Operations not currently permitted.

Additional strategies

- Develop intensive planning in areas where sewer is not available and treatment by subsurface disposal is not an option due to poor soils, floodplains, or high water tables.
- Greater efforts by sewer utilities to identify leaking lines or overflowing manholes (examples: Spring City, Dayton, and Decatur).

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, from fertilized lawns and croplands, and faulty sewage disposal processes. Nutrients are often transported with sediment, so many of the measures designed to reduce sediment runoff will also aid in preventing organic enrichment of streams and lakes.

Other sources of nutrients can be addressed by:

Voluntary activities

- 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. Examples of streams that could benefit are Little Richland Creek, Lewis Creek, Wolftever Creek, and Bivins Branch.
- Use grassed drainage ways 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. As a general rule, all stream channels suffer from some canopy removal. An intact riparian zone also acts as a buffer to filter out nutrient loads before they enter the water.
- Discourage impoundments. Ponds and lakes do not aerate water. *Note: Permits may be required for any work on a stream, including impoundments.*

Regulatory strategies.

- Strengthen enforcement of regulations governing on-site wastewater ttreatment.
- Impose more stringent permit limits for nutrients discharged from sewage treatment plants (including Tennesse River downstream of Dayton STP outfall and Spring City STP in Piney River embayment).
- Timely and appropriate enforcement for noncomplying sewage treatment plants, large and small, and their collection system.
- Identify Concentrated Animal Feeding Operations not currently permitted.

6.3.B.iv. Toxins and Other Materials.

Although some toxic substances are discharged directly into waters of the state from a point source, much of these materials are washed in during rainfalls from an upland location, or via improper waste disposal that contaminates groundwater. In the Lower Tennessee River Watershed, a number of streams are damaged by storm water runoff from industrial facilities or urban areas. More stringent inspection and regulation of permitted industrial facilities, and local strormwater quality initiatives and regulations, could help reduce the amount of contaminated runoff reaching state waters. Examples of streams and waterbodies that could benefit from these measures include the many small, urbanized tributaries feeding Chickamauga Lake Reservoir.

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 of these problems can be addressed by:

Voluntary activities

- Provide public education.
- Paint warnings on storm drains that connect to a stream. (This would benefit Richland Creek, Little Richland Creek, Sale Creek, Soddy Creek, Little Soddy Creek, Hickman Branch, and Wolftever Creek).
- Sponsor community clean-up days (This would benefit Little Richland Creek, Little Soddy Creek, Poe Branch, Wolftever Creek, and Chickamauga Lake).
- Landscape public areas.
- Encourage public surveillance of their streams and reporting of dumping activities to their local authorities.

Enforcement Strategies

- Prohibit illicit discharges to storm drains.
- Strengthen litter law 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.

Individual landowners and developers are responsible for the vast majority of stream alterations. Some measures that can help address these problems are:

Voluntary activities

- Sponsor litter pickup days to remove litter that might enter streams
- Organize stream cleanups removing trash, limbs and debris before they cause blockage.
- Avoid use of heavy equipment to “clean out” streams (Possum Creek, Roaring Creek, and Rock Creek exhibit the effects from such activities).
- Plant native vegetation along streams to stabilize banks and provide habitat (especially in the downstream portions of Rock Creek, Possum Creek, and Roaring Creek).
- Encourage developers to avoid extensive use of culverts in streams (Little Richland Creek and Broyles Branch are examples pf streams with large amounts of culverting).

Current regulations

- Restrict modification of streams by such means as culverting, lining, or impounding.
- Require mitigation for impacts to streams and wetlands when modifications are allowed.

Additional Enforcement

- Increased enforcement may be needed when violations of current regulations occur.

6.3.B.v. Acid Mine Runoff.

The Cumberland Plateau has had a long history of coal mining, much of which was done prior to any type of environmental regulation. Unfortunately, the legacy of many of these old mining sites is severe impacts to the streams that drain them in the form of pollution from metals and low pH from sulfuric acid.

APPENDIX II

ID	NAME	HAZARD
047005	Carmack	3
727001	Sinclair	3
727002	Lake Hill	3
727004	Porter	3
777007	Johnston	2
337012	Honors Lake	1
777008	Lake Tahoo	3
777009	Lake Daniel	3
047016	Hawkins	S

Table A2-1. Inventoried Dams in the Group 3 Portion of the Tennessee Portion of the Lower Tennesseee River Watershed. *Hazard Codes (1), High; (S, 2), Significant; (3). TDEC only regulates dams indicated by a numeric hazard score.*

LAND COVER/LAND USE	ACRES	% OF WATERSHED
Open Water	18,421	3.80
Other Grasses	1,643	0.34
Pasture/Hay	69,601	14.36
Row Crops	21,609	4.46
Woody Wetlands	2,557	0.53
Emergent Herbaceous Wetlands	1,206	0.25
Deciduous Forest	201,415	41.56
Mixed Forest	81,326	16.78
Evergreen Forest	72,268	14.91
High Intensity: Commercial/Industrial	2,285	0.47
High Intensity: Residential	451	0.09
Low Intensity: Residential	4,951	1.02
Quarries/Strip Mines/Gravel Pits	399	0.08
Bare Rock/Sand/Clay	35	0.01
Transitional	6,450	1.33
Total	**484,607**	**100.00**

Table A2-2. Land Use Distribution in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee 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)	
Ridge and Valley (67)	Big Creek (6701)	Holston River	06010104
	Fisher Creek (6702)	Holston River	06010104
Southern Sedimentary Ridges (66e)	Gee Creek (66E18)	Hiwassee River	06020002
Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)	Clear Creek (67F06)	Lower Clinch River	06010207
	White Creek (67F13)	Upper Clinch River	06010205
	Powell River (67F14)	Powell River	06010206
	Big war Creek (67F17)	Upper Clinch River	06010205
	Martin Creek (67F23)	Powell River	06010206
	Powell River (67F25)	Powell River	06010206
Southern Shale Valleys (67g)	Brymer Creek (67G08)	Hiwassee River	06020002
	Harris Creek (67G09)	Hiwassee River	06020002
Cumberland Plateau (68a)	Rock Creek (68A01)	Harpeth River	05130204
	Laurel Fork (68A03)	South Fork Cumberland	05130104
	Clear Creek (68A08)	Emory River	06010208
	Piney Creek (68A13)	Watts Bar/Fort Loudoun	06010201
	Daddys Creek (68A26)	Emory River	06010208
	Island Creek (68A27)	Emory River	06010208
	Mullens Creek (68A20)	Lower Tennessee River	06020001
	Rock Creek (68A28)	Emory River	06010208
Plateau Escarpment (68c)	Ellis Gap Branch (68C12)	Lower Tennessee River	06020001
Cumberland Mountains (69d)	Flat Creek (69D03)	Emory River	06010208
Inner Nashville Basin (71i)	Mill Branch (71I02)	Lower Clinch River	06010207

Table A2-3. Ecoregion Monitoring Sites in Ecoregions 67, 66e, 67f, 67g, 68a, 68c, 69d, and 71i.

CODE	NAME	AGENCY	AGENCY ID
86	TDEC/DNH Huckleberry Pond Site	TDEC/DNH	
116	TDEC/DNH Possum Creek Springs Site	TDEC/DNH	Awl report
117	TDEC/DNH Retro Hughes Road Pond Site	TDEC/DNH	
284	TDOT SR 29 Mitigation/Permit Site	TDOT	
285	TDOT SR 29 Mitigation/Permit Site	TDOT	
306	TDOT Collegedale Connector Mitigation/Permit Site	TDOT	
307	TDOT Collegedale Connector Mitigation/Permit Site	TDOT	
337	TDOT SR 30 Mitigation Site	TDOT	
373	TDOT McAllie Ferry Road Mitigation/Permit Site	TDOT	
393	TDOT SR 30 permit Site	TDOT	
422	TDEC/WPC E. Brainerd/Hurricane Creek Rd Permit Site	TDEC/WPC	
425	TDEC/WPC Winn-Dixie WPC Permit Site	TDEC/WPC	
430	TDEC/WPC SW Hixson Pike/Camp Columbus Rd Permit	TDEC/WPC	
496	TDEC/WPC Ooltewah Permit/Mitigation Site	TDEC/WPC	
525	TDOT Chestnut Creek Permit/Mitigation Site	TDOT	
1211	TWRA Armstrong Bend Site	TWRA	
2011	TWRA Hiwassee Refuge Site	TWRA	
2012	TWRA Hiwassee Refuge Site	TWRA	
2105	TWRA Sinate-Mead Site	TWRA	
2423	TWRA Mead Inholding Site	TWRA	
2424	TWRA Mead Inholding Site	TWRA	
2425	TWRA Mead Site	TWRA	
2426	TWRA Mead Site	TWRA	
2427	TWRA Mead Site	TWRA	
2726	USACOE Tennessee River 406.2 R Site	USACOE-Nashville	960048025
2746	TVA Pond 6	TDEC/DNH	

Table A2-4. Wetland Sites in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed in TDEC Database. *TDEC, Tennessee Department of Environment and Conservation; USACOE-Nashville, United States Army Corps of Engineers-Nashville District; WPC, Water Pollution Control; TDOT, Tennessee Department of Transportation; TWRA, Tennessee Wildlife Resources Agency; DNH, Division of Natural Heritage.* ***This table represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands in the watershed.***

APPENDIX III

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE
Black Ankle Creek	TN06020001041_0500	9.1
Clear Creek	TN06020001047_1000	23.3
Coldwater Branch	TN06020001038_0210	6.8
Davis Creek	TN06020001041_0400	9.2
Grasshopper Creek	TN06020001086_1000	8.1
Lewis Creek	TN06020001029_0350	2.9
Little Ooltewah Creek	TN06020001889_0110	6.6
Little Richland Creek	TN06020001049_1000	20.4
Little Sewee Creek	TN06020001041_0300	28
Little Wolftever Creek	TN06020001889_0100	11.9
Possum Creek	TN06020001062_1000	31.9
Richland Creek	TN06020001048_1000	11.4
Richland Creek	TN06020001048_1000	11.4
Roaring Creek	TN06020001057_0200	29.3
Rock Creek	TN06020001060_1000	22.9
Rogers Branch	TN06020001880_1000	10.4
Sale Creek	TN06020001057_1000	26
Sewee Creek	TN06020001041_1000	31.2
Soddy Creek	TN06020001064_1000	26.6
South Fork Spring Creek	TN06020001041_0310	20.9
Tigues Creek	TN06020001048_0110	9.8
Wilkerson Branch	TN06020001889_0300	5.8
Wolftever Creek	TN06020001889_1000	20.299999

Table A3-1a. Streams Fully Supporting Designated Uses in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Unnamed tributary to Chickamauga Reservoir	TN06020001497_1000	3.500000

Table A3-1b. Streams Partially Supporting Designated Uses in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Lewis Creek	TN06020001029_0300	1.500000

Table A3-1c. Streams Not Supporting Designated Uses in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE
Board Camp Creek	TN06020001064_0400	8.500000
Brush Creek	TN06020001057_0220	12.500000
Bush Creek	TN06020001717_0100	5.800000
Chestnut Creek	TN06020001889_0200	8.100000
Chickamauga Reservoir misc. tribs	TN06020001020T_1000	180.600006
Cupp Creek	TN06020001057_0210	6.000000
Decatur Creek	TN06020001038_1000	16.500000
Deep Creek	TN06020001064_0100	8.800000
Double Branch	TN06020001048_0320	7.100000
Dry Fork	TN06020001041_0200	5.600000
Dry Fork Creek	TN06020001041_0600	12.000000
Goodfield Creek	TN06020001038_0200	9.700000
Gray Creek	TN06020001064_0200	18.799999
Hall Creek	TN06020001060_0200	16.799999
Hardin Creek	TN06020001038_0100	3.600000
Henderson Creek	TN06020001048_0300	10.600000
Hurricane Creek	TN06020001041_0110	12.900000
Laurel Creek	TN06020001048_0400	10.100000
Little Possum Creek	TN06020001062_0100	10.700000
Lowery Creek	TN06020001048_0310	9.100000
McGill Creek	TN06020001057_0100	17.200001
Misc. tribs to Sewee Creek	TN06020001041_0999	28.200001
Morgan Creek	TN06020001048_0100	12.800000
Paine Creek	TN06020001048_0500	6.000000
Polebridge Creek	TN06020001048_0200	14.900000
Runyon Spring Branch	TN06020001029_0200	8.400000
Sawmill Creek	TN06020001064_0210	7.200000
Suzanne Creek	TN06020001060_0210	3.700000
Tadpole Branch	TN06020001047_0100	11.200000
Taliaferro Branch	TN06020001029_0400	3.200000
Ten Mile Creek	TN06020001041_0100	30.100000
Unnamed Trib to Chickamauga Reservoir	TN06020001498_1000	3.200000
Unnamed trib to Rock Creek	TN06020001060_0100	8.800000
Unnamed trib to Wolftever Creek	TN06020001889_0400	9.200000
Walker Branch	TN06020001064_0300	3.100000
Wolfe Branch	TN06020001029_0100	6.300000
Yarborough Branch	TN06020001049_0100	2.200000
Yellow Creek	TN06020001717_1000	13.300000

Table A3-1d. Streams Not Assessed in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (ACRES)
Chickamauga Reservoir	TN06020001020_1000	35,400

Table A3-1e Lakes Fully Supporting Designated Uses in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE
Unnamed tributary to Chickamauga Reservoir	TN06020001497	3.500000

Table A3-2a. Stream Impairment Due to Unknown Causes in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Lewis Creek	TN06020001029_0300	1.500000	Lewis Creek

Table A3-2b. Stream Impairment Due to Pathogens in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Lewis Creek	TN06020001029_0300	1.500000	Lewis Creek

Table A3-2c. Stream Impairment Due to Other Habitat Alterations in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.

APPENDIX IV

LAND USE/LAND COVER	AREAS IN HUC-10 SUBWATERSHEDS (ACRES)				
	01	02	03	04	06
Bare Rock/Sand/Clay	35				
Deciduous Forest	88,115	30,468	20,907	41,282	20,633
Emergent Herbaceous Wetlands	1,024	1	17	50	115
Evergreen Forest	34,457	11,553	9,029	12,048	5,182
High Intensity: Commercial/Industrial/Transportation	976	215	431	65	598
High Intensity: Residential	109	1	159	54	128
Low Intensity: Residential	1,964	205	704	436	1,642
Mixed Forest	37,781	13,131	7,850	9,920	12,644
Open Water	17,210	47	220	613	332
Other Grasses: Urban/Recreational	602	139	228	68	607
Pasture/Hay	25,865	18,421	6,844	5,779	12,692
Row Crops	10,205	3,928	2,270	2,082	3,124
Transitional	1,617	619	2,585	1,220	409
Woody Wetlands	935	42	1,093	166	322
Quarries/Strip Mines	225				174
Total	**221,119**	**78,769**	**52,336**	**73,782**	**58,600**

Table A4-1. Land Use Distribution in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed by HUC-10. *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.
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.
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.
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-10	AGENCY	STREAM NAME	AREA (SQ MILES)	LOW FLOW (CFS)		
					1Q10	7Q10	3Q20
03543005	0602000101	USGS	Tennessee River	17,310	3,610	4,910	3,680
03544000	0602000101	USGS	Tennessee River	17,460			
351345085051201	0602000101	TVA	Tennessee River				
353247084480201	0602000101	TVA	Tennessee River				
353712084470301	0602000101	TVA	Tennessee River				
353713084470401	0602000101	TVA	Tennessee River				
353716084464401	0602000101	TVA	Tennessee River				
03543200	0602000102	USGS	Ten Mile Creek	26.4	0.42	0.48	0.35
03543300	0602000102	USGS	Little Sewee Creek	32.3	5.5	5.9	5.0
03543500	0602000102	USGS	Sewee Creek	117	12.7	13.6	11.6
03544500	0602000103	USGS	Richland Creek	50.2	0	0	0
03566420	0602000106	USGS	Wolftever Creek	18.8	1.56	1.69	1.32

Table A4-3. Historical Streamflow Data Summary Based on Mean Daily Flows in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *USGS, United States Geological Survey; TVA, Tennessee Valley Authority. Additional information may be found at* http://nwis.waterdata.usgs.gov/tn/nwis/discharge

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TDEC	BSODD005.8HM	BSODDY005.8	Big Soddy Creek @ RM 5.8	0602000101
TDEC	LSODD000.7HM	LSODDY000.7	Little Soddy Creek @ RM 0.7	0602000101
TDEC	POSSU002.0HM	POSSUM002.0	Possum Creek @ RM 2.0	0602000101
TDEC	POSSU006.0HM	POSSUM005.1	Possum Creek @ RM 6.0	0602000101
TDEC	SODDY001.5HM	SODDY001.5	Soddy Creek @ RM 1.5	0602000101
TDEC	TENNE528.8ME	003150	Tennessee River @ RM 528.8	0602000101
TDEC	TENNE501.9ME	003160	Tennessee River @ RM 501.9	0602000101
TDEC	TENNE495.5HM	003170	Tennessee River	0602000101
TDEC	TENNE489.8HM	003180	Tennessee River	0602000101
TDEC	TENNE481.7HM	003190	Tennessee River	0602000101
TDEC	TENNE515.0ME	TENNESSEE515	Tennessee River @ RM 515.0	0602000101
TVA	477305		Armstrong Slough @ RM 0.01	0602000101
TVA	477304		Dallas Bay - Middle Slough	0602000101
TVA	476679		Dallas Bay @ RM 0.4	0602000101
TVA	477302		Dallas Bay @ RM 0.4	0602000101
TVA	476243		Dallas Bay @ RM 0.5	0602000101
TVA	477232		Dallas Bay @ RM 0.9	0602000101
TVA	477303		Dallas Bay @ RM 1.4	0602000101
TVA	477282		Goodfield Creek @ RM 0.1	0602000101
TVA	477283		Goodfield Creek @ RM 0.5	0602000101
TVA	477240		Goodfield Creek @ RM 0.9	0602000101
TVA	476669		Grasshopper Creek @ RM 0.2	0602000101
TVA	477284		Mud Creek @ RM 0.1	0602000101
TVA	477285		Mud Creek @ RM 0.5	0602000101
TVA	477239		Mud Creek @ RM 1.3	0602000101
TVA	476680		Norman Branch @ RM 0.2	0602000101
TVA	477291		Possum Creek @ RM 0.5	0602000101
TVA	475894		Possum Creek @ RM 1.0	0602000101
TVA	476670		Possum Creek @ RM 1.5	0602000101
TVA	477235		Possum Creek @ RM 2.0	0602000101
TVA	477292		Possum Creek @ RM 2.5	0602000101
TVA	477293		Possum Creek @ RM 3.0	0602000101
TVA	477087		Sequoyah Nuclear Plant Discharge	0602000101
TVA	477052		Sequoyah Nuclear Plant Intake Pond	0602000101
TVA	477294		Soddy Creek @ RM 0.5	0602000101
TVA	477295		Soddy Creek @ RM 1.0	0602000101
TVA	475893		Soddy Creek @ RM 1.6	0602000101
TVA	477233		Soddy Creek @ RM 1.7	0602000101
TVA	477296		Soddy Creek @ RM 3.5	0602000101
TVA	477234		Soddy Creek @ RM 4.0	0602000101
TVA	477297		Soddy Creek @ RM 4.5	0602000101
TVA	476675		Soddy Creek @ RM 4.7	0602000101
TVA	476992		Tennessee River @ RM 479.4	0602000101
TVA	475359		Tennessee River @ RM 480.2	0602000101

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	476991		Tennessee River @ RM 480.4	0602000101
TVA	475303		Tennessee River @ RM 480.82	0602000101
TVA	477558		Tennessee River @ RM 481.1	0602000101
TVA	476990		Tennessee River @ RM 481.4	0602000101
TVA	476989		Tennessee River @ RM 482.4	0602000101
TVA	476493		Tennessee River @ RM 482.6	0602000101
TVA	476988		Tennessee River @ RM 482.9	0602000101
TVA	475304		Tennessee River @ RM 483.40	0602000101
TVA	477031		Tennessee River @ RM 483.45	0602000101
TVA	475305		Tennessee River @ RM 483.54	0602000101
TVA	477030		Tennessee River @ RM 483.55	0602000101
TVA	475850		Tennessee River @ RM 483.6	0602000101
TVA	477029		Tennessee River @ RM 483.65	0602000101
TVA	477028		Tennessee River @ RM 483.7	0602000101
TVA	477027		Tennessee River @ RM 483.8	0602000101
TVA	475823		Tennessee River @ RM 484.0	0602000101
TVA	475306		Tennessee River @ RM 484.10	0602000101
TVA	475023		Tennessee River @ RM 484.5	0602000101
TVA	476374		Tennessee River @ RM 484.7	0602000101
TVA	477560		Tennessee River @ RM 484.8	0602000101
TVA	477552		Tennessee River @ RM 484.9	0602000101
TVA	477099		Tennessee River @ RM 486.0	0602000101
TVA	477553		Tennessee River @ RM 486.1	0602000101
TVA	477337		Tennessee River @ RM 486.9	0602000101
TVA	475360		Tennessee River @ RM 487.7	0602000101
TVA	476583		Tennessee River @ RM 487.9	0602000101
TVA	477561		Tennessee River @ RM 489.8	0602000101
TVA	475265		Tennessee River @ RM 490.47	0602000101
TVA	475824		Tennessee River @ RM 491.0	0602000101
TVA	477554		Tennessee River @ RM 491.1	0602000101
TVA	475825		Tennessee River @ RM 495.0	0602000101
TVA	477555		Tennessee River @ RM 496.10	0602000101
TVA	475266		Tennessee River @ RM 496.50	0602000101
TVA	475361		Tennessee River @ RM 497.2	0602000101
TVA	476681		Tennessee River @ RM 499.5	0602000101
TVA	477398		Tennessee River @ RM 500.4	0602000101
TVA	477556		Tennessee River @ RM 501.1	0602000101
TVA	477562		Tennessee River @ RM 501.9	0602000101
TVA	477328		Tennessee River @ RM 502.0	0602000101
TVA	477557		Tennessee River @ RM 503.1	0602000101
TVA	477123		Tennessee River @ RM 503.6	0602000101
TVA	475362		Tennessee River @ RM 503.7	0602000101
TVA	477336		Tennessee River @ RM 504.1	0602000101
TVA	477216		Tennessee River @ RM 505.6	0602000101

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	477559		Tennessee River @ RM 506.1	0602000101
TVA	475804		Tennessee River @ RM 506.6	0602000101
TVA	475826		Tennessee River @ RM 508.0	0602000101
TVA	476584		Tennessee River @ RM 509.0	0602000101
TVA	476682		Tennessee River @ RM 513.0	0602000101
TVA	477122		Tennessee River @ RM 513.5	0602000101
TVA	475363		Tennessee River @ RM 518.0	0602000101
TVA	477121		Tennessee River @ RM 519.2	0602000101
TVA	477101		Tennessee River @ RM 520.2	0602000101
TVA	477120		Tennessee River @ RM 521.0	0602000101
TVA	477119		Tennessee River @ RM 521.2	0602000101
TVA	477118		Tennessee River @ RM 521.3	0602000101
TVA	477135		Tennessee River @ RM 521.5	0602000101
TVA	477117		Tennessee River @ RM 522.2	0602000101
TVA	477116		Tennessee River @ RM 522.5	0602000101
TVA	477115		Tennessee River @ RM 523.2	0602000101
TVA	477114		Tennessee River @ RM 524.4	0602000101
TVA	477112		Tennessee River @ RM 524.6	0602000101
TVA	477111		Tennessee River @ RM 524.9	0602000101
TVA	477329		Tennessee River @ RM 526.0	0602000101
TVA	477070		Tennessee River @ RM 526.3	0602000101
TVA	475803		Tennessee River @ RM 527.4	0602000101
TVA	475802		Tennessee River @ RM 527.5	0602000101
TVA	477131		Tennessee River @ RM 527.8	0602000101
TVA	476096		Tennessee River @ RM 528.0	0602000101
TVA	477109		Tennessee River @ RM 528.2	0602000101
TVA	476683		Tennessee River @ RM 528.8	0602000101
TVA	477108		Tennessee River @ RM 529.0	0602000101
TVA	476061		Tennessee River @ RM 529.5	0602000101
TVA	477107		Tennessee River @ RM 529.8	0602000101
TVA	477391		Tennessee River @ RM 529.86	0602000101
TVA	477392		Tennessee River @ RM 529.87	0602000101
TVA	475364		Tennessee River @ RM 529.9	0602000101
TVA	475429		Wolftever Creek @ RM 16.15	0602000101
USEPA			Candies Creek	0602000101
USEPA	470803		Chickamauga Lake	0602000101
USEPA	470804		Chickamauga Lake	0602000101
USEPA	470806		Chickamauga Lake	0602000101
USEPA			Goodfield Creek	0602000101
USEPA			Soddy Creek	0602000101
TDEC	RICHL000.1RN	002220	Richland Creek @ RM 0.1	0602000103
TDEC	RICHL002.5BR	002224	Richland Creek @ RM 2.5	0602000103
TDEC	RICHL1T0.4DA		UT To Little Richland Creek	0602000103
TVA	476964		Richland Creek @ 0.35	0602000103

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	477286		Richland Creek @ 1.0	0602000103
TVA	477287		Richland Creek @ 2.0	0602000103
TVA	477288		Richland Creek @ RM 2.5	0602000103
TVA	476671		Richland Creek @ RM .035	0602000103
TVA	477219		Richland Creek @ RM 0.4	0602000103
TVA	475909		Richland Creek @ RM 0.5	0602000103
TVA	477076		Richland Creek @ RM 1.5	0602000103
TVA	477238		Richland Creek @ RM 2.8	0602000103
TVA	476672		Richland Creek @ RM 2.9	0602000103
TVA	476956		Richland Creek @ RM 2.9	0602000103
USEPA			Little Richland Creek	0602000103
USEPA			Richland Creek	0602000103
TDEC	SALE001.2HM	SALE001.2	Sale Creek @ RM 1.2	0602000104
TVA	476129		Horn Branch @ RM 0.54	0602000104
TVA	477675		Laurel Branch	0602000104
TVA	476128		Laurel Branch @ RM 1.33	0602000104
TVA	477681		Rock Creek	0602000104
TVA	477289		Sale Creek @ RM 1.0	0602000104
TVA	477236		Sale Creek @ RM 1.3	0602000104
TVA	476673		Sale Creek @ RM 1.4	0602000104
TVA	475895		Sale Creek @ RM 1.5	0602000104
TVA	477237		Sale Creek @ RM 2.0	0602000104
TVA	477290		Sale Creek @ RM 2.5	0602000104
USEPA			Sale Creek	0602000104
USOSM			Smith Creek	0602000104
TDEC	DALLA000.0HM	DALLASBAY00.0	Dallas Bay	0602000106
TDEC	SAVAN005.0HM		Savannah Creek @ RM 5.0	0602000106
TDEC	WOLFT000.2HM		Wolftever Creek @ RM 0.2	0602000106
TDEC		WOLFTEVERCRIS01	Wolftever Creek @ RM 19.5	0602000106
TDEC		WOLFTEVERCRIS04	Wolftever Creek @ RM 7.8	0602000106
TVA	475433		Chestnut Creek @ RM 0.3	0602000106
TVA	476674		Long Savannah Creek @ RM 1.6	0602000106
TVA	477231		Savannah Creek @ 2.95	0602000106
TVA	477299		Savannah Creek @ RM 0.1	0602000106
TVA	477300		Savannah Creek @ RM 2.0	0602000106
TVA	475434		Wilkerson Branch @ RM 0.05	0602000106
TVA	477230		Wolftever Creek @ RM 5.65	0602000106
TVA	475427		Wolftever Creek @ RM 10.7	0602000106
TVA	475426		Wolftever Creek @ RM 12.85	0602000106
TVA	475425		Wolftever Creek @ RM 13.85	0602000106
TVA	475428		Wolftever Creek @ RM 14.68	0602000106
TVA	475523		Wolftever Creek @ RM 15.5	0602000106
TVA	475522		Wolftever Creek @ RM 16.5	0602000106
TVA	475521		Wolftever Creek @ RM 16.7	0602000106

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	475430		Wolftever Creek @ RM 17.0	0602000106
TVA	475431		Wolftever Creek @ RM 17.3	0602000106
TVA	475424		Wolftever Creek @ RM 19.72	0602000106
TVA	475423		Wolftever Creek @ RM 7.17	0602000106
USEPA			Long Savannah Creek	0602000106

Table A4-4. STORET Water Quality Monitoring Stations in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed*. RM, River Mile; TDEC, Tennessee Department of Environment and Conservation; USEPA, United States Environmental Protection Agency; TVA, Tennessee Valley Authority; USOSM, National United States Office of Surface Mining. UT, Unnamed Tributary.*

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	MADI	WATERBODY	HUC-10
TN0005461	TVA-Watts Bar Fossil Plant	4911	Electric Services	Minor	Tennessee River @ RM 528-530	0602000101
TN0020168	TVA-Watts Bar Nuclear Plant	4911	Electric Services	Major	Tennesse River @ RM 527.9 and Yellow Creek	0602000101
TN0058521	Decatur STP	4952	Sewerage System	Minor	Tennessee River @ RM 514.8	0602000101
TN0020478	Dayton STP	4952	Sewerage System	Major	Tennessee River @ RM 504	0602000101
TNHA78085	Aquaservices, Inc.	6782	Lawn and Garden Service	Minor	Tennessee River @ RM 496	0602000101
TN0026450	TVA-Sequoyah Nuclear Plant	4911	Electric Services	Major	Tennessee River @ RM 483.65	0602000101
TN0055255	Rhea County High School	4952	Sewerage System	Minor	UT @ RM 0.2 to Little Richland Creek @ RM 8.5	0602000103

Table A4-5. NPDES Permittees in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *RM, River Mile; SIC, Standard Industrial Classification; MADI, Major Discharge Indicator; UT, Unnamed Tributary.*

FACILITY NUMBER	PERMITEE	COUNTY	LIVESTOCK	WATERBODY	HUC-10
TNA00056	Tommy Malone	Hamilton	Poultry	UT to Ware Branch	0602000101

Table A4-6. CAFO Sites in the Group 3 Portion of the Tennessee Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *UT, Unnamed Tributary.*

FACILITY NUMBER	PERMITEE	SIC	SIC NAME	WATERBODY	HUC-10
TN0065901	The Rogers Group (Rhea County Stone)	1422	Limestone-Crushed and Broken	UT to Chickamauga Reservoir	0602000101
TN0072389	Stone Sales Service (Lewis Chapel Quarry)	1422	Dimension Stone, Quarrying	Sawmill Creek and UT to Sawmill Creek	0602000101
TN0063835	Vulcan Construction Materials (Dayton Quarry)	1422	Limestone-Crushed and Broken	Crawford Branch and Unnamed Sinkhole	0602000101
TN0023957	Martin Marrietta Aggregates (Ten Mile Quarry)	1422	Limestone-Crushed and Broken	Ten Mile Creek	0602000102
TN0072605	Majestic Products (Laurel Brook Quarry)	1411	Dimension Stone, Quarrying	Lick Branch	0602000104

Table A4-7. Active Permitted Mining Sites in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *SIC, Standard Industrial Classification; UT, Unnamed Tributary.*

FACILITY NUMBER	FACILITY NAME	WATERBODY	HUC-10
TNG110173	Countryside Concrete, Inc.	UT to Big Sewee Creek	0602000101
TNG110186	Dayton Concrete Products	UT to Chaickamauga Reservoir	0602000103
TNG110202	North Georgia Ready Mix	Wolftever Creek	0602000106
TNG110141	Lambert Concrete	Wolftever Creek	0602000106

Table A4-8. Ready Mix Concrete Plants in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *UT, Unnamed Tributary.*

LOG NUMBER	COUNTY	DESCRIPTION	WATERBODY	HUC-10
NRS00.357	Rhea	Box Culvert		0602000101
NRS01.268	Meigs			0602000101
NRS01.270	Meigs			0602000101
NRS01.271	Meigs			0602000101
NRS00.225	Meigs	Culvert Replacement	UT to McKinley Branch	0602000101
NRS01.274	McMinn	Replace Concrete Deck Bridge	Conasauga Creek	0602000101
NRS01.276	McMinn	Concrete Box Culvert	Unnamed Tributary	0602000101
NRS01.273	McMinn	Concrete Box	Culpepper Branch	0602000101
NRS01.150	Meigs		Tennessee River	0602000101
NRS01.071	McMinn	6' Slab Culvert	Elliott Branch	0602000101
NRS01.277	McMinn	Concrete Box Culvert	Unnamed Tributary	0602000101
NRS01.412	Hamilton	Culvert Extension	UT to Tennessee River	0602000101
NRS01.204	Hamilton	Minor Dredging	Tennessee River	0602000101
NRS00.315	Hamilton	Utility Line Crossing	Johnson Branch and UT(s) to Hurricane Creek	0602000101
NRS01.242	Sequatchie	Culvert Extension	UT to Soddy Creek	0602000101
NRS01.241	Sequatchie	CMP Extension	UT to Soddy Creek	0602000101
NRS01.240	Sequatchie	Channel relocation	UT to Soddy Creek	0602000101
NRS01.243	Sequatchie	RCP extension	Unnamed Tributary	0602000101
NRS01.239	Sequatchie	RCP Extension	UT to Alex Branch	0602000101
NRS01.238	Sequatchie	RCP Extension	UT to Alex Branch	0602000101
NRS01.237	Sequatchie	CMP Extension	UT to Alex Branch	0602000101
NRS01.236	Sequatchie	RCP Extension	UT to Alex Branch	0602000101
NRS01.235	Sequatchie	RCP Extension	UT to Alex Branch	0602000101
NRS01.234	Sequatchie	CMP Extension	UT to Gray Creek	0602000101
NRS01.233	Sequatchie	CMP Extension	UT to Alex Branch	0602000101
NRS01.232	Sequatchie	Box Culvert Extension	Gray Creek	0602000101
NRA00.154	Rhea	Channel Relocation	UT to Little Richland Creek	0602000103
NRS00.156	Rhea	Channel Relocation	UT to Little Richland Creek	0602000103
NRS00.186	Rhea			0602000103
NRS00.157	Rhea	Channel Relocation	UT to Little Richland Creek	0602000103
NRS00.158	Rhea	Channel Relocation	UT to Little Richland Creek	0602000103
NRS00.082	Hamilton	CMP Extension	Wilkerson Branch	0602000106
NRS02.135	Hamilton	Stream Relocation	UT to Wolftever Creek	0602000106
NRS00.114	Hamilton	Bank Stabilization and Headwall Construction	West Chickamauga Creek	0602000106
NRS01.316	Hamilton	Stream Relocation	UT to Wolftever Creek	0602000106

Table A4-9. Individual ARAP Permits Issued January 2000 Through June 2004 in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed. *UT, Unnamed Tributary; CMP, Corrugated Metal Pipe; RCP, Reinforced Concrete Pipe.*

FACILITY NUMBER	FACILITY NAME	SECTOR	RECEIVING STREAM	AREA*	HUC-10
TNR051343	TVA-Watts Bar Nuclear Plant	O, L	Yellow Creek	238	0602000101
TNR053719	Solomon Corporation	N	Decatur Creek	6	0602000101
TNR053993	Polyform, Incorporated	Y	Decatur Creek	4.9	0602000101
TNR051406	Jennings Truck Parts	M	WWC to UT to Hutsel Branch	12	0602000101
TNR053678	Cymer	C	UT to Decatur Creek	10	0602000101
TNR050807	Charlie's Used Auto Parts	M	WWC to Town Creek	0.5	0602000101
TNR051731	Rhea County Landfill	L, P	UT to Tennessee River	134	0602000101
TNR053176	Mark Anton Municipal Airport	S	Mud Creek	0.99	0602000101
TNR050015	TVA-Sequoyah Nuclear Plant	O	Tennessee River	643	0602000101
TNR050257	Tennessee Trailers, Inc.	AB	UT to Soddy Creek	0.9	0602000101
TNR051813	B.A.'s Truck and Auto Salvage	M	Ditch to UT to Soddy Creek	5	0602000101
TNR054411	Rhea Tool and Die Co.	AB	Richland Creek	4.14	0602000103
TNR054437	New Shipley Basket, Inc.	A	Richland Creek	1	0602000103
TNR054307	Goodman Company	AB	Richland Creek	9.5	0602000103
TNR053588	La-Z-Boy Tennessee	W	Richland Creek	44.12	0602000103
TNR050479	Fuji Hunt Photographic Chemicals	C	UT to Little Richland Creek	43	0602000103
TNR051583	Suburban Manufacturing	AA, AB, AC	UT to Richland Creek	16.2	0602000103
TNR056352	Volunteer Pastilles	C	Little Richland Creek	0.3	0602000103
TNR053220	Kayser-Roth Corporation	V	Richland Creek	6.1	0602000103
TNR050488	Polyloom Corporation of America	C	Little Richland Creek	10.4	0602000103
TNR055913	Futrell Auto Salvage	M	Tigues Creek	1.5	0602000103
TNR051404	Price Brothers Company-Bakewell Operations	AA	Little Oppossum Creek, Tennessee River	13.7	0602000104
TNR056333	Kizzar's Automotive	M	Ditch to Branch Creek	1	0602000104
TNR050451	Potts Auto Salvage	M	Horn Branch	4	0602000104
TNR053961	John Henry's Automotive	M	UT(s) to Soddy Creek	6	0602000104
TNR053014	Collegedale Municipal Airport	S	Chestnut Creek, Wolftever Creek	3	0602000106
TNR050250	Birchwood Landfill	L	UT to Frog Level Branch	176	0602000106
TNR050928	McKee Foods Plant #2	U, P	Wolftever Creek	22.91	0602000106
TNR050926	McKee Foods Plant #1	U	Wolftever Creek	4	0602000106
TNR051761	Copeland's, Incorporated	AA	Little Wolftever Creek	3.6	0602000106
TNR051693	Shoffner Industries	A, P	Little Wolftever Creek	7.3	0602000106
TNR051692	Hawker Powersource	AC	Little Wolftever Creek	5.3	0602000106
TNR051795	Collegedale Casework	W	Wolftever Creek	12	0602000106
TNR054463	Dynatronics Corporation	W	Wolftever Creek	3.5	0602000106
TNR050931	Sovex Natural Foods	U	UT to Wolftever Creek	9.56	0602000106

Table A4-10. Active Permitted TMSP Facilities in the Group 3 portion of the Tennessee portion of the Lower Tennessee River Watershed. *Area, acres of property associated with industrial activity; UT, Unnamed Tributary; WWC, Wet Weather Conveyance. Sector details may be found in Table A4-11.*

SECTOR	TMSP SECTOR NAME
A	Timber Products Facilities
AA	Facilities That Manufacture Metal Products including Jewelry, Silverware and Plated Ware
AB	Facilities That Manufacture Transportation Equipment, Industrial or Commercial Machinery
AC	Facilities That Manufacture Electronic and Electrical Equipment and Components, Photographic and Optical Goods
AD	Facilities That Are Not Covered Under Sectors A Thru AC (Monitoring Required)
AE	Facilities That Are Not Covered Under Sectors A Thru AC (Monitoring Not Required)
B	Paper and Allied Products Manufacturing Facilities
C	Chemical and Allied Products Manufacturing Facilities
D	Asphalt Paving, Roofing Materials, and Lubricant Manufacturing Facilities
E	Glass, Clay, Cement, Concrete, and Gypsum Product Manufacturing Facilities
F	Primary Metals Facilities
G	Metal Mines (Ore Mining and Dressing) (RESERVED)
H	Inactive Coal Mines and Inactive Coal Mining-Related Facilities
I	Oil or Gas Extraction Facilities
J	Construction Sand and Gravel Mining and Processing and Dimension Stone Mining and Quarrying Facilities
K	Hazardous Waste Treatment Storage or Disposal Facilities
L	Landfills and Land Application Sites
M	Automobile Salvage Yards
N	Scrap Recycling and Waste and Recycling Facilities
O	Steam Electric Power Generating Facilities
P	Vehicle Maintenance or Equipment Cleaning areas at Motor Freight Transportation Facilities, Passenger Transportation Facilities, Petroleum Bulk Oil Stations and Terminals, the United States Postal Service, or Railroad Transportation Facilities
Q	Vehicle Maintenance Areas and Equipment Cleaning Areas of Water Transportation Facilities
R	Ship or Boat Building and Repair Yards
S	Vehicle Maintenance Areas, Equipment Cleaning Areas or From Airport Deicing Operations located at Air Transportation Facilities
T	Wastewater Treatment Works
U	Food and Kindred Products Facilities
V	Textile Mills, Apparel and other Fabric Product Manufacturing Facilities
W	Furniture and Fixture Manufacturing Facilities
X	Printing and Platemaking Facilities
Y	Rubber and Miscellaneous Plastic Product Manufacturing Facilities
Z	Leather Tanning and Finishing Facilities

Table A4-11. TMSP Sectors and Descriptions.

APPENDIX V

CONSERVATION PRACTICE	AMOUNT	
	FEET	ACRES
Alley Cropping		
Contour Buffer Strips		
Crosswind Trap Strips		
Field Borders	10,200	
Filter Strips		
Grassed Waterways	3	
Hedgerow Plantings		
Herbaceous Wind Barriers		
Riparian Forest Buffers		18
Streambank and Shoreline Protection	17,750	
Windbreaks and Shelterbelts		
Total Conservation Buffers	27,953	18

Table A5-1a. Conservation Buffers Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from Performance & Results Measurement System (PRMS) for October 1, 2003 through September 30, 2004 reporting period. Data represent practices in both the Group 3 and Group 4 portions of the watershed.*

NUTRIENT MANAGEMENT PLANS APPLIED	ACRES
Feed Management	0
Irrigation Management	0
Water Management	0
Nutrient Management	1,708
Waste Utilization	48
Total	**1,756**

Table A5-1b. Nutrient Management Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. Data represent practices in both the Group 3 and Group 4 portions of the watershed.*

PARAMETER	FEET	NUMBER
Pipeline	9,985	
Pond		
Spring Development		1
Watering Facility		14
Total	**9,985**	**15**

Table A5-1c. Water Supply Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. Data represent practices in both the Group 3 and Group 4 portions of the watershed.*

CONSERVATION PRACTICE	FEET	ACRES
Grassed Waterway		3

Table A5-1d. Land Treatment: Surface Water Management Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. Data represent practices in both the Group 3 and Group 4 portions of the watershed.*

PARAMETER	ACRES
Acres of Pest Management Systems Applied	1,885

Table A5-1e. Pest Management Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. Data represent practices in both the Group 3 and Group 4 portions of the watershed.*

CONSERVATION PRACTICE	AMOUNT	
	Feet	**Acres**
Fence	40,977	
Firebreak		
Forest Harvest Management		626
Heavy Use Area Protection		18
Pasture and Hay Planting		499
Prescribed Grazing		1,014
Range Planting		
Use Exclusion		22
Pipeline	9,985	
Prescribed Burning		
Total	**50,982**	**2,179**

Table A5-1f. Grazing/Forages Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Lower Tennessee River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. Data represent practices in both the Group 3 and Group 4 portions of the watershed.*

COMMUNITY	PROJECT DESCRIPTION	AWARD DATE	AWARD AMOUNT
Collegedale	Construction of Sewer Interceptor	06/11/1998	$806,000
Collegedale	Construction of Sewer Interceptors and Pump Station	06/11/1998	$554,810
Decatur	Expansion of Wastewater Plant	06/25/1991	$371,000

Table A5-2. Communities in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed Receiving SRF Grants or Loans.

PRACTICE	NRCS CODE	NUMBER OF BMPs
Critical Area Planting	342	4
Fence	382	16
Heavy Use Area	561	42
Pasture/Hay Planting	512	30
Pipeline	516	7
Pond	378	2
Prescribed Grazing	528	1
Waste Storage Facility	313	3
Watering Facility	614	7

Table A5-3. Best Management Practices Installed by Tennessee Department of Agriculture and Partners in the Group 3 Portion of the Tennessee Portion of the Lower Tennessee River Watershed.