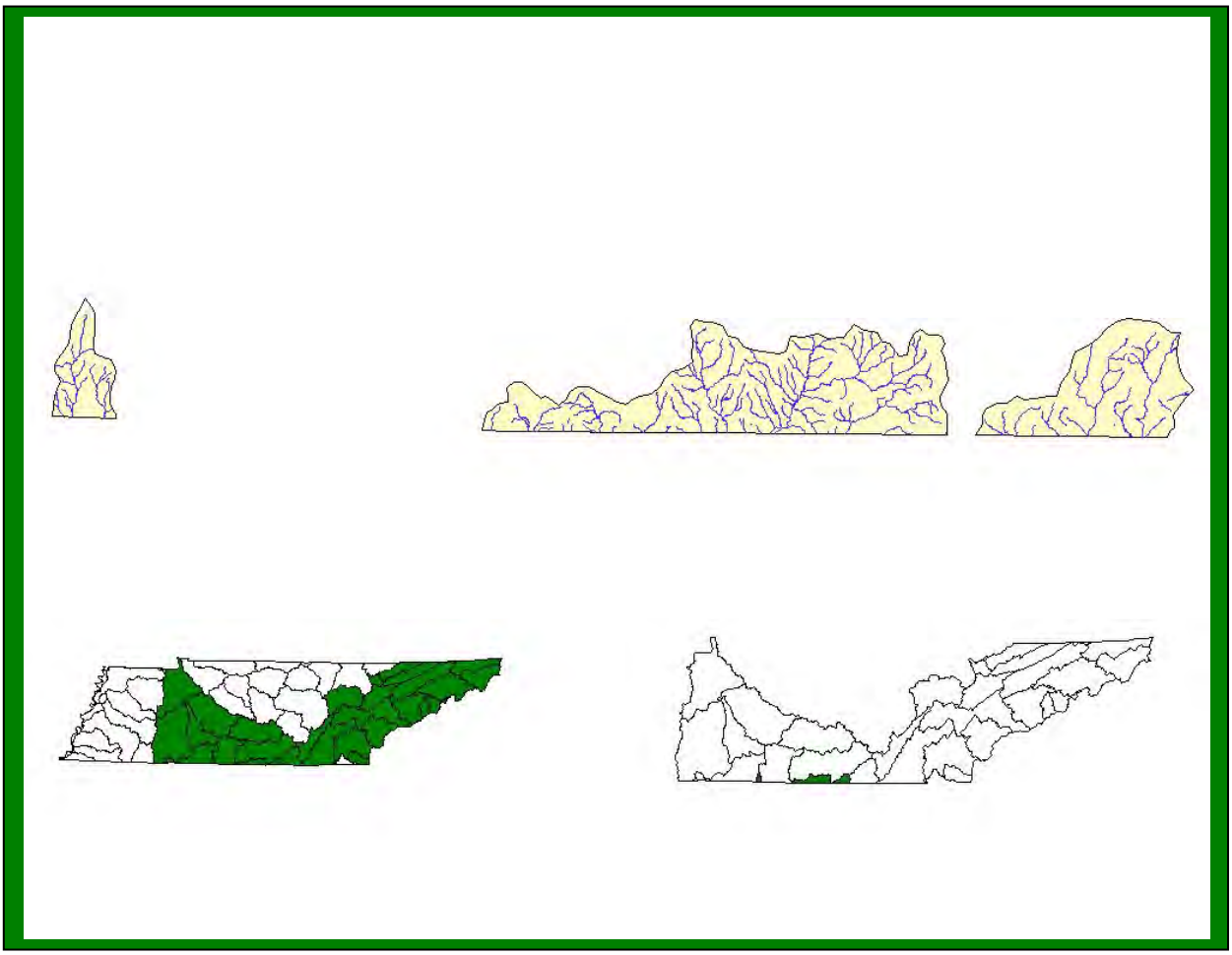
WHEELER LAKE WATERSHED (06030002) OF THE TENNESSEE RIVER BASIN

WATERSHED WATER QUALITY MANAGEMENT PLAN



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

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

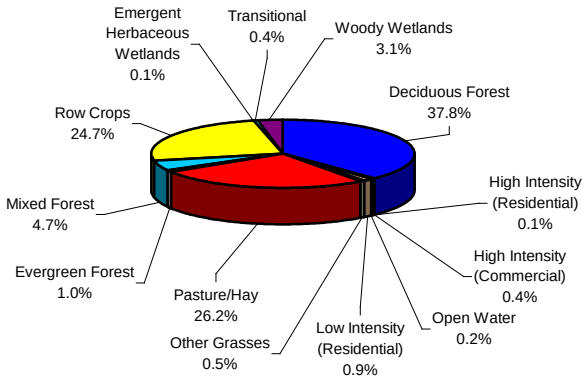
Summary – Wheeler Lake

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 Wheeler Lake 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.

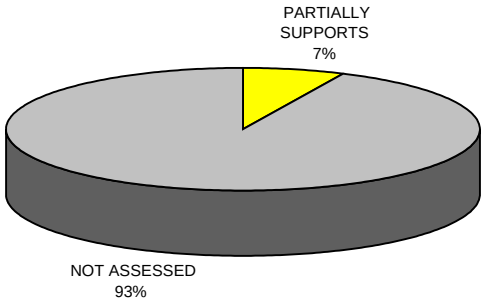
A detailed description of the watershed can be found in Chapter 2. The Tennessee portion of the Wheeler Lake Watershed is approximately 236 square miles and includes parts of four Middle Tennessee counties. A part of the Tennessee River drainage basin, the Tennessee portion of the watershed has 313 stream miles.



Land Use in the Tennessee portion of the Wheeler Lake Watershed is based on MRLC Satellite Imagery.

Many local interpretive areas are located in the watershed. Twenty-six rare plant and animal species have been documented in the watershed, including two rare fish species, four rare mussel species and one rare snail species.

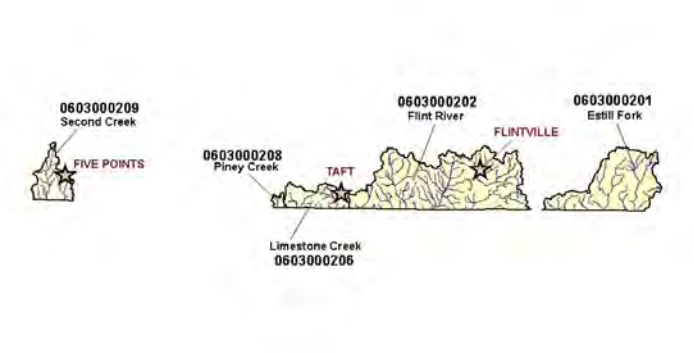
A review of water quality sampling and assessment is presented in Chapter 3. The Watershed Approach to Water Quality is utilized in the Wheeler Lake Watershed. Due to the small size of the watershed and the small amount of populated areas, only 7% of the 313 stream miles have been assessed and those assessed have been found to be partially supporting designated uses.



Water Quality Assessment in theTennessee portion of the Wheeler Lake Watershed is Based on the 1998 303(d) List.

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) Habitat Alteration and Siltation.

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



HUC-10 Subwatersheds in the Wheeler Lake Watershed.

Point source contributions to the Tennessee portion of the Wheeler Lake Watershed consist of Aquatic Resource Alteration Permits (8), Tennessee Multi-Sector Permits (3) and Concentrated Animal Feeding Operation Permits (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 Wheeler Lake 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, Tennessee Department of Agriculture and Alabama Department of Environmental Management) are summarized.

Point and Nonpoint source approaches to water quality problems in the Wheeler Lake 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 Wheeler Lake 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.

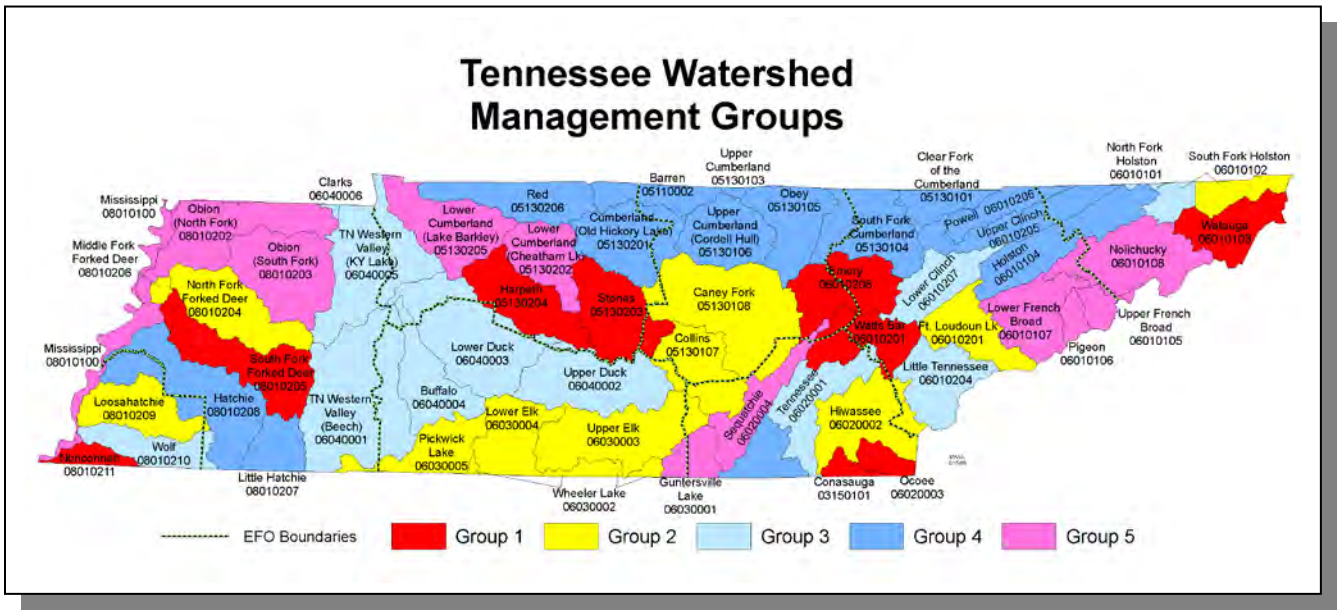


Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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.

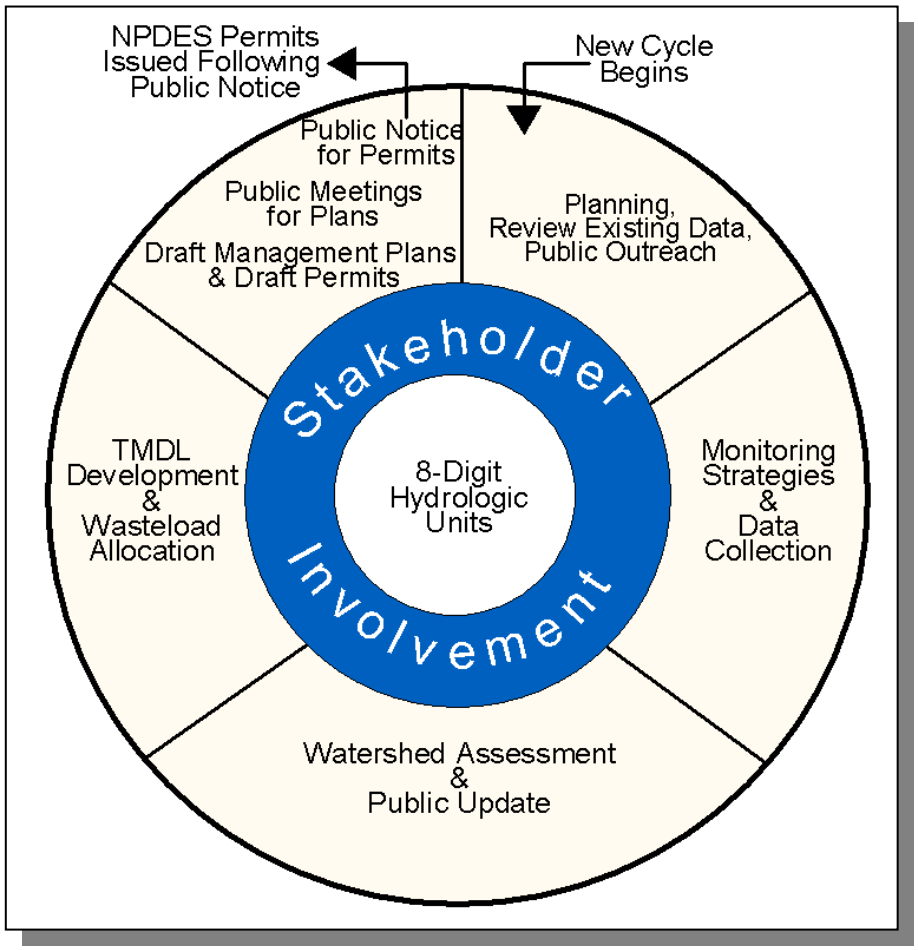


Figure 1-2. The Watershed Approach Cycle.

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 WHEELER LAKE WATERSHED

2.1. BACKGROUND. Upper elevations of the Wheeler Lake Watershed contain many beautiful streams flowing toward the Alabama border to the Elk River. Swine and dairy farms dot the landscape, and the area's rich timber supply supports lumber mills as a basic industry.

Barrens and former prairie areas are now mostly oak thickets or pasture and cropland. Numerous springs and spring-associated fish fauna typify the region.

This Chapter describes the location and characteristics of the Tennessee portion of the Wheeler Lake Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Wheeler Lake Watershed is located in Middle Tennessee and Alabama. The Tennessee portion includes parts of Franklin, Giles, Lawrence, and Lincoln Counties.

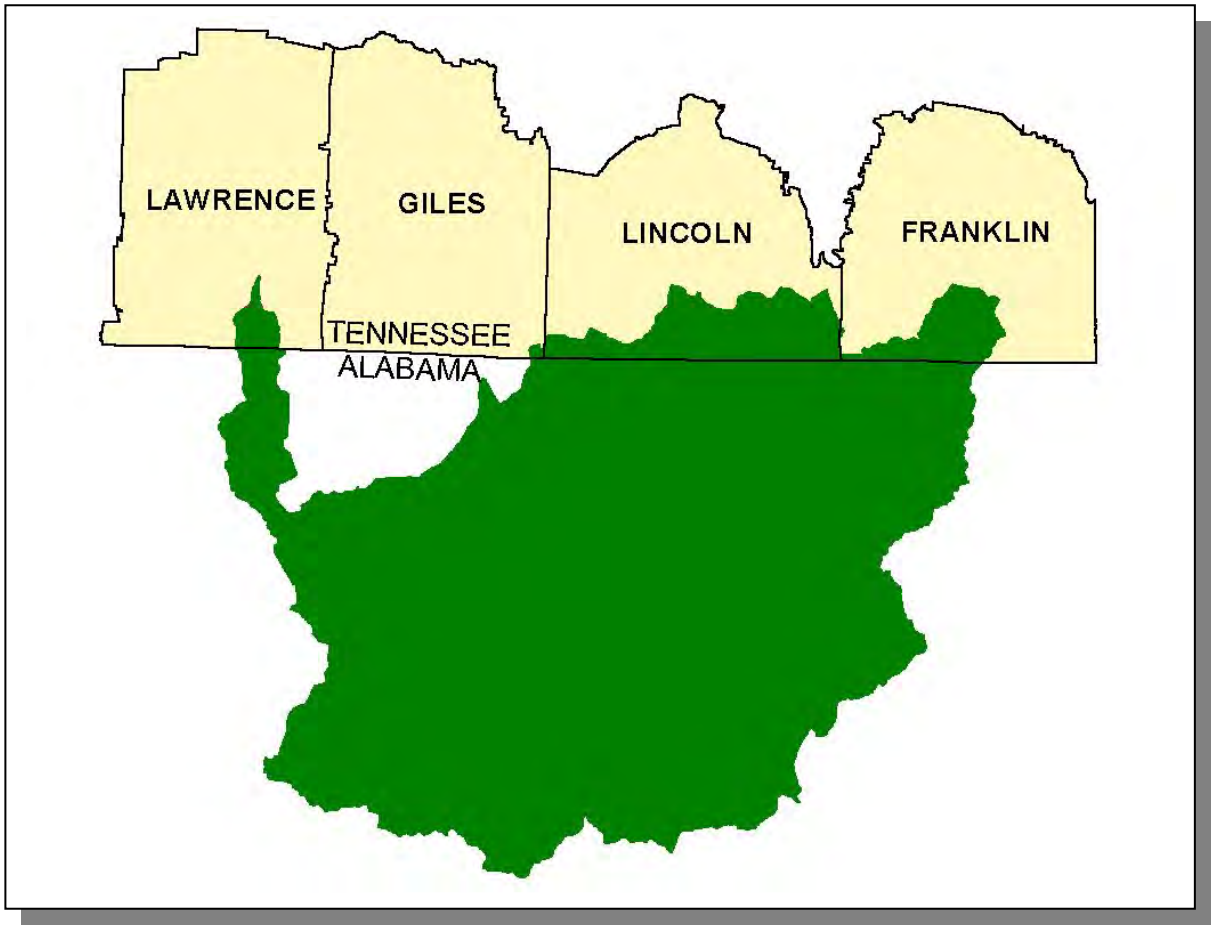


Figure 2-1. General Location of the Wheeler Lake Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Lincoln	67.2
Franklin	31.4
Lawrence	9.9
Giles	1.3

Table 2-1. The Wheeler Lake Watershed Includes Parts of Four Middle Tennessee Counties.

2.2.B. Population Density Centers. Two state highways serve the major communities in the Tennessee portion of the Wheeler Lake Watershed.

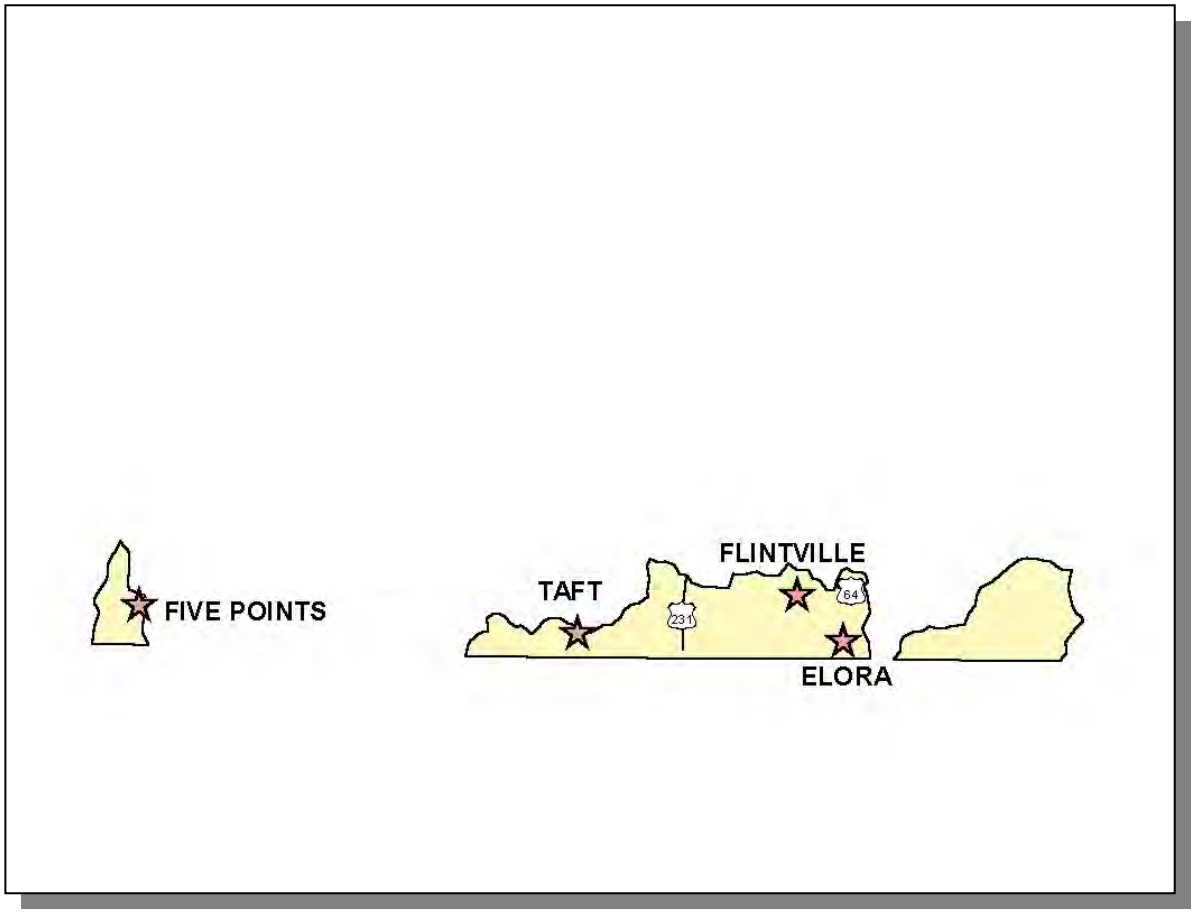


Figure 2-2. Municipalities and Roads in the Tennessee Portion of Wheeler Lake Watershed.

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Wheeler Lake Watershed, designated 06030002 by the USGS, drains approximately 2,876 square miles, 236 of which are in Tennessee, and empties to the Tennessee River.

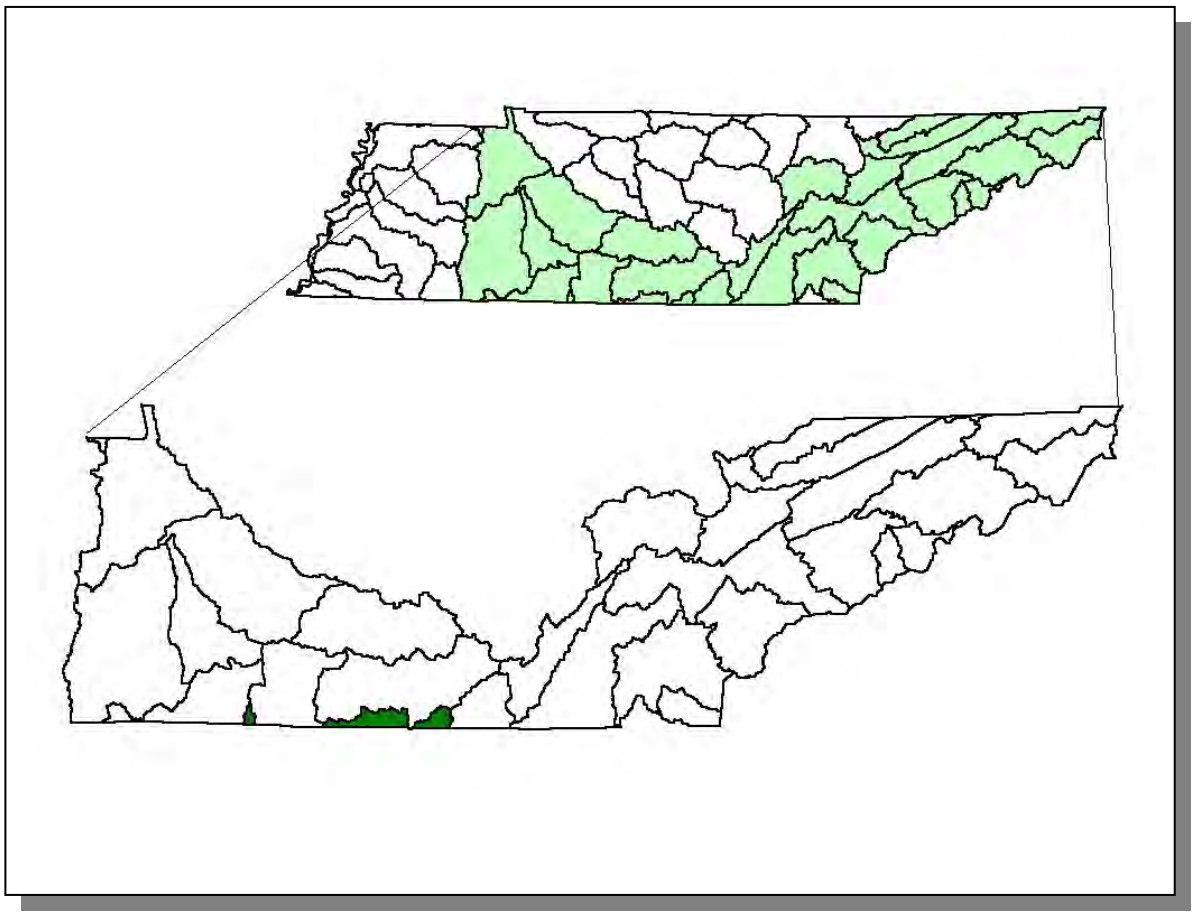


Figure 2-3. The Wheeler Lake Watershed is Part of the Tennessee River Basin.

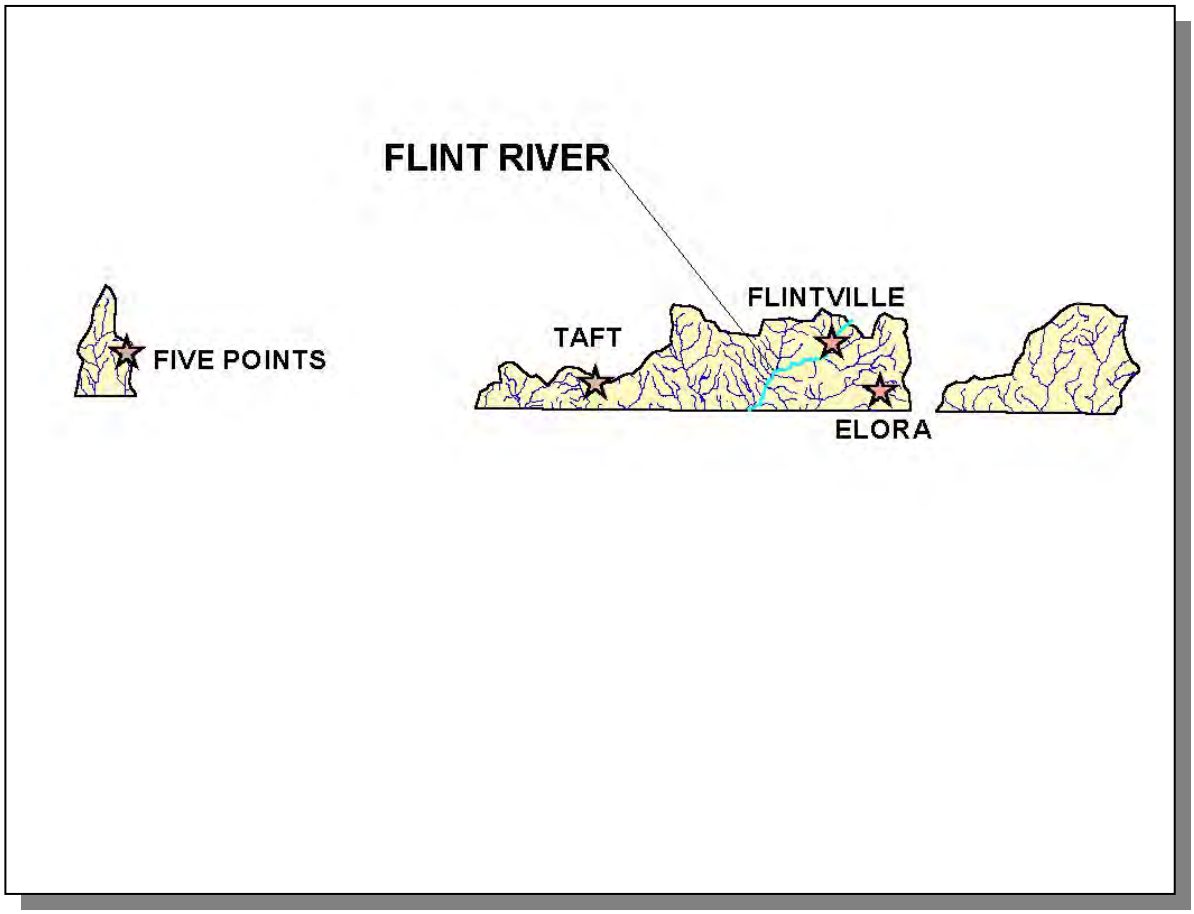


Figure 2-4. Hydrology in the Tennessee Portion of the Wheeler Lake Watershed. *There are 3,767 total stream miles recorded in River Reach File 3 in the Wheeler Watershed. 313 stream miles are recorded in Tennessee. Location of Flint River and the cities of Elora, Five Points, Flintville, and Taft are shown for reference.*

2.3.B. Dams. There are 5 dams inventoried by TDEC Division of Water Supply in the Wheeler Lake Watershed. These dams either retain 30 acre-feet of water or have structures at least 20 feet high.

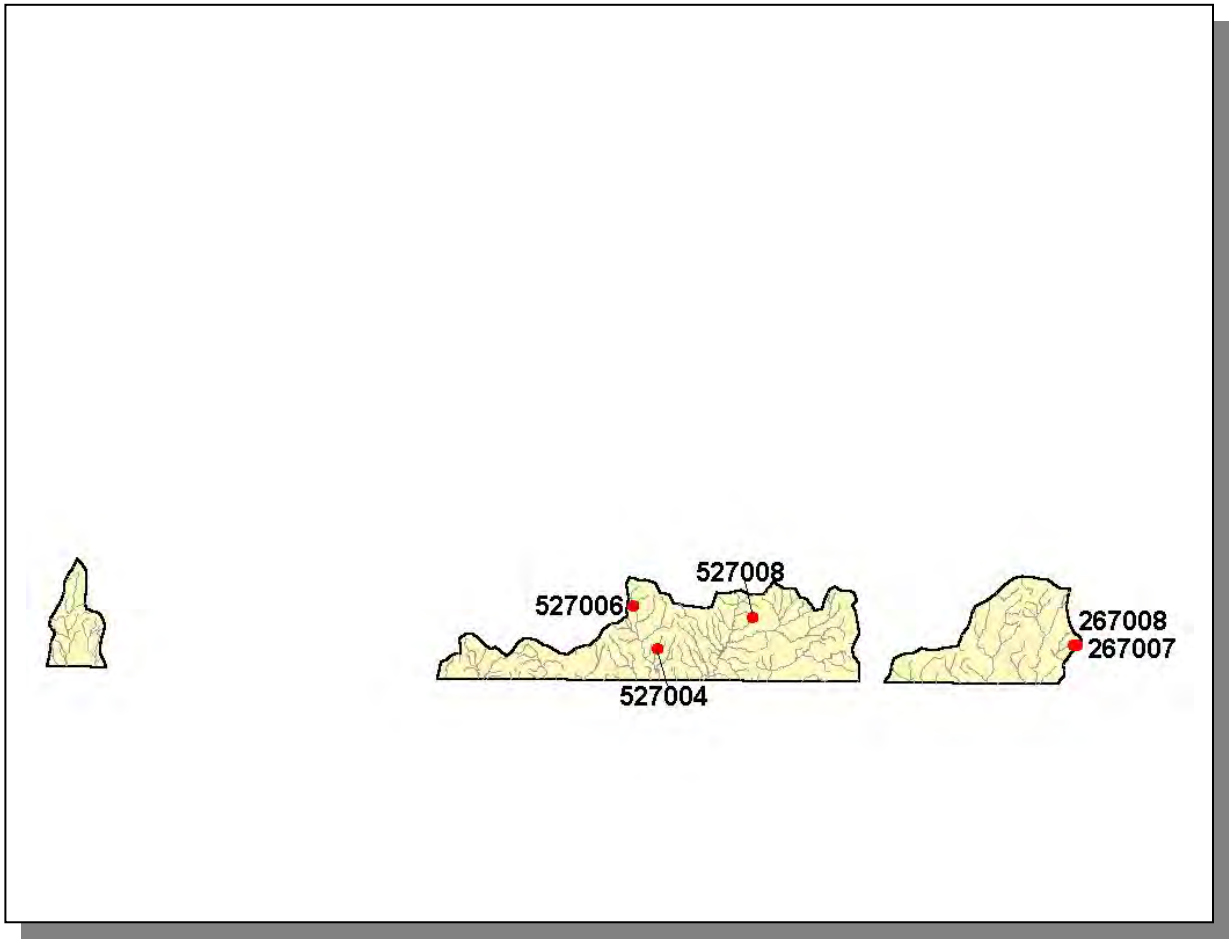


Figure 2-5. Location of Inventoried Dams in the Tennessee Portion of the Wheeler Lake Watershed. *More information is provided in Wheeler-Appendix II and on the TDEC homepage at: http://gwidc.gwi.memphis.edu/website/dams/viewer.htm*

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

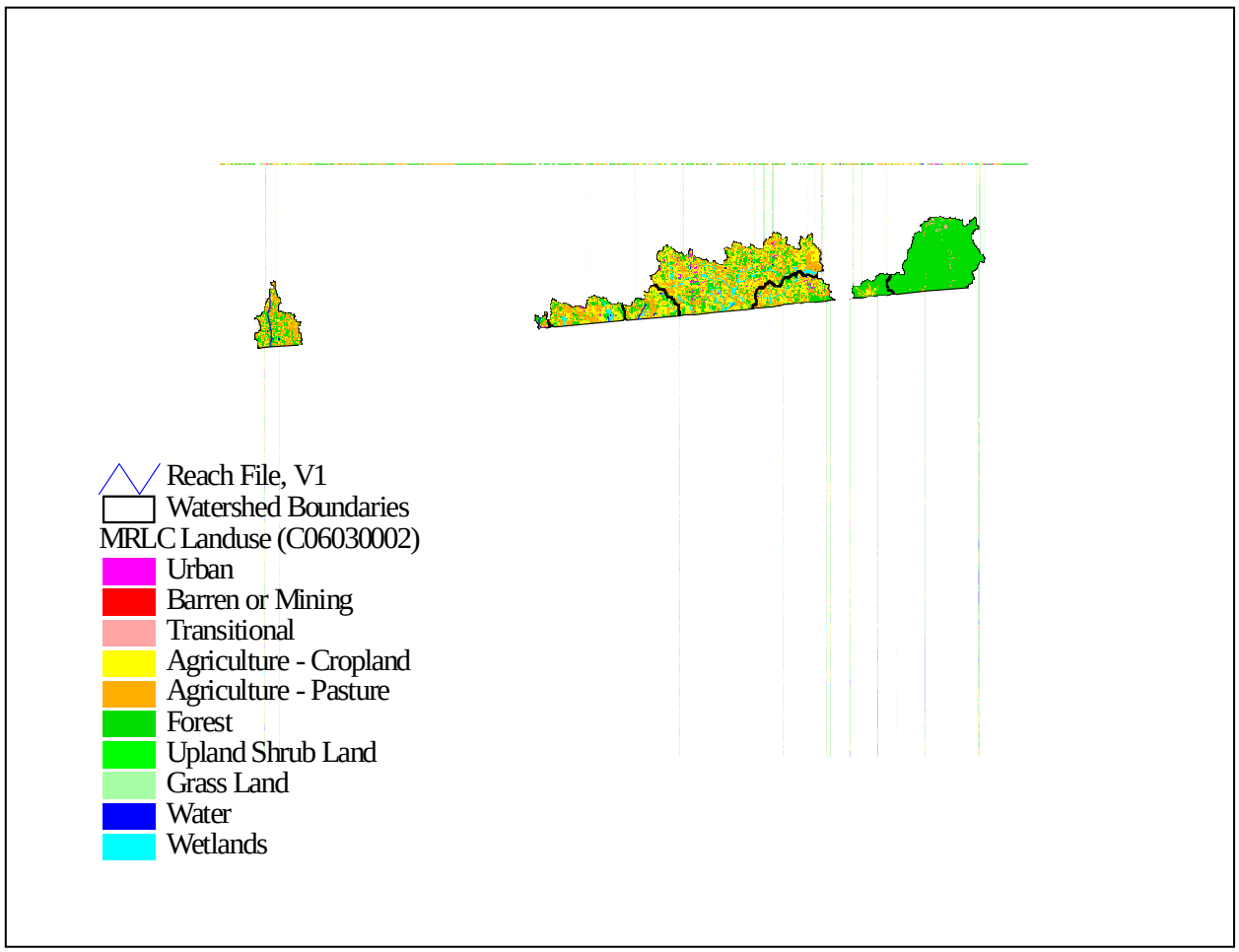


Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.

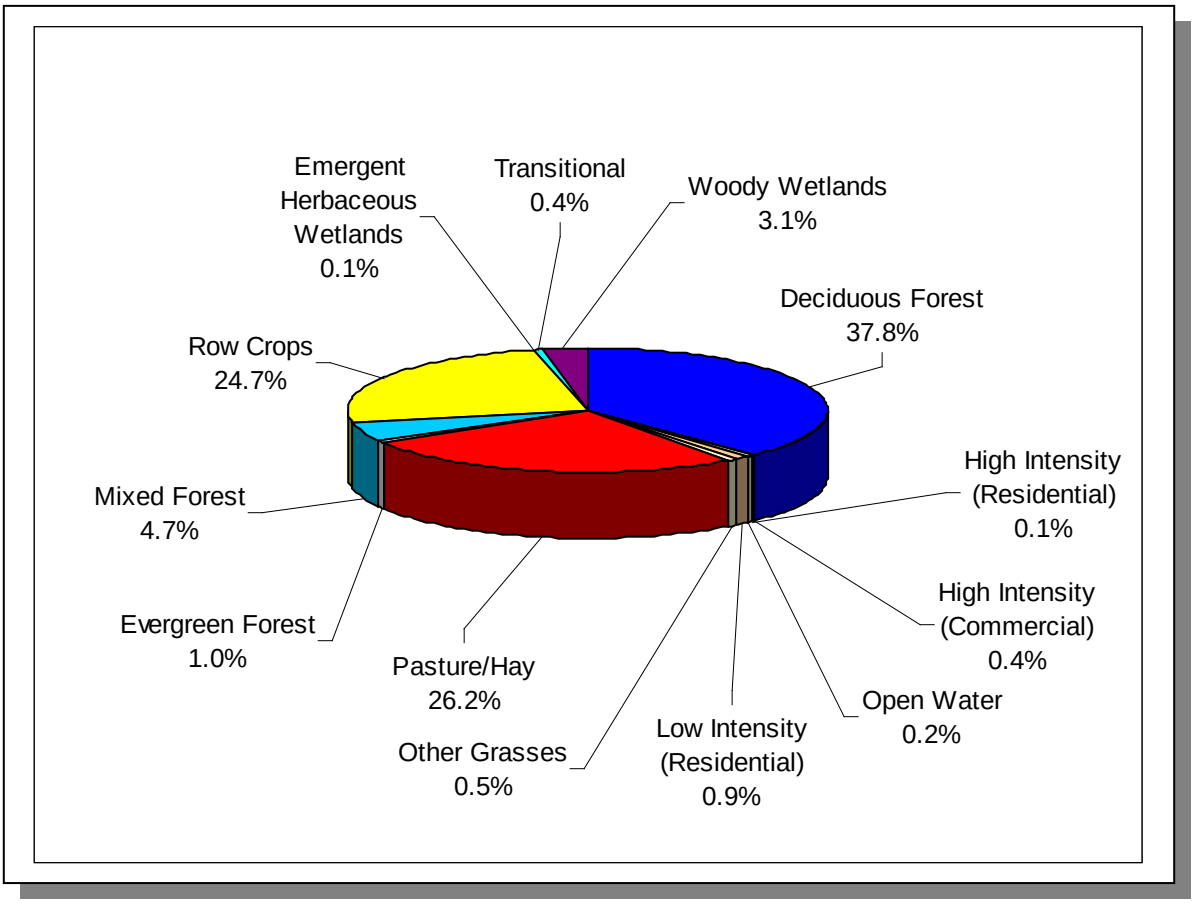


Figure 2-7. Land Use Distribution in the Tennessee Portion of the Wheeler Lake Watershed. *More information is provided in Wheeler-Appendix II.*

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 Wheeler Watershed lies within 2 Level III ecoregions (Interior Plateau and Southwestern Appalachians) and contains 5 Level IV subecoregions (Griffen, Omernik, Azavedo):

- The Cumberland Plateau (68a)'s tablelands and open low mountains are about 1000 feet higher than surrounding lower-level ecoregions. The plateau surface is less dissected with lower relief compared to the Cumberland Mountains or the Plateau Escarpment. 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 mostly well-drained, acid soils of low fertility. The region is forested, with some agriculture and coal mining activities.

- The 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 strat 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, more 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.

- The Western Highland Rim (71f) is characterized by dissected, rolling terrain of open hills, with elevations of 400-1000 feet. The geologic base of Mississippian-age limestone, chert, and shale is covered by soils that tend to be cherty, acid, and low to moderate in fertility. Streams are characterized by coarse chert gravel and sand substrates with areas of bedrock, moderate gradients, and relatively clear water. The oak-hickory natural vegetation was mostly deforested in the mid to late 1800's, in conjunction with the iron-ore related mining and smelting of the mineral limonite, but now the region is again heavily forested. Some agriculture occurs on the flatter interfluves and in the stream and river valleys: mostly hay, pasture, and cattle, with some cultivation of corn and tobacco.

- The Eastern Highland Rim (71g) has more level terrain than the Western Highland Rim (71f), with landforms characterized as tablelands of moderate relief and irregular plains. Mississippian-age limestone, chert, shale, and dolomite predominate, and karst terrain sinkholes and depressions are especially noticable between Sparta and McMinnville, Numerous springs and spring-associated fish fauna also typify the region. Natural vegetation for the region is transitional between the oak-hickory type

to the west and the mixed mesophytic forests of the Appalachian ecoregions to the east. Bottomland hardwoods forests were once abundant in some areas, although much of the original bottomland forest has been inundated by several large impoundments. Barrens and former prairie areas are now mostly oak thickets or pasture and cropland.

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

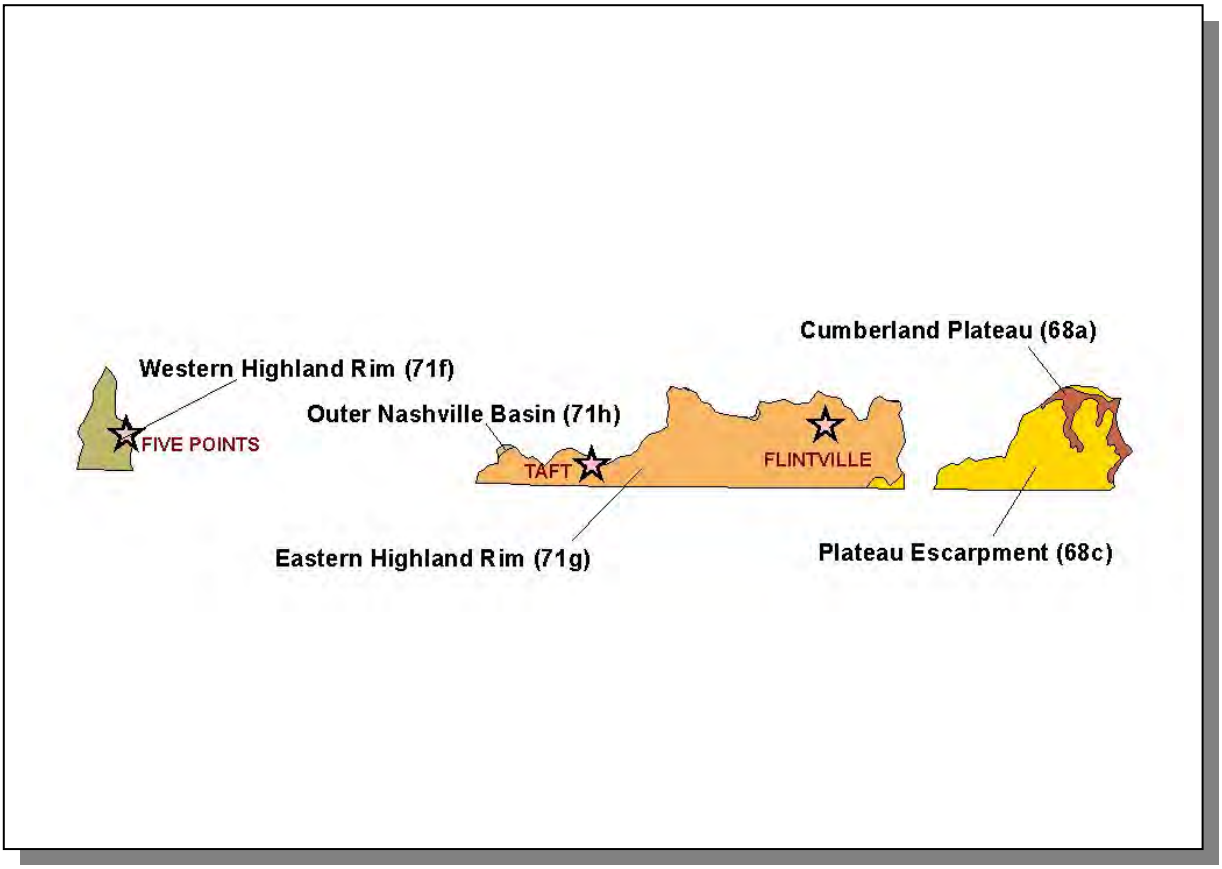


Figure 2-8. Level IV Ecoregions in the Tennessee Portion of the Wheeler Lake Watershed.
Locations of Five Points and Flintville are shown for reference.

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

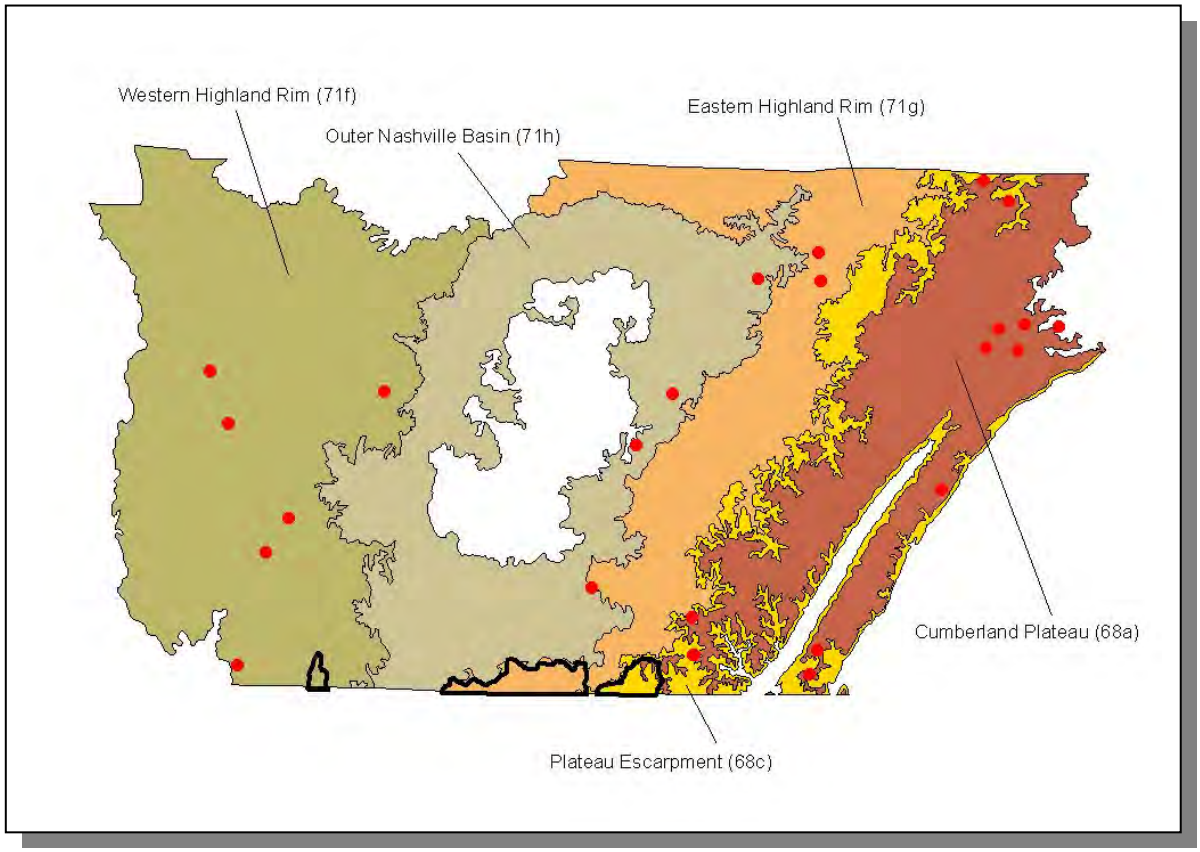


Figure 2-9. Ecoregion Monitoring Sites in Level IV Ecoregions 68a, 68c, 71f, and 71h. *The Wheeler Lake Watershed is shown for reference. More information is provided in Wheeler-Appendix II.*

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	0
Insects	0
Mussels	4
Snails	1
Amphibians	0
Birds	2
Fish	2
Mammals	0
Reptiles	0
Plants	17
Total	**26**

Table 2-2. There are 26 Rare Plant and Animal Species in the Tennessee Portion of the Wheeler Lake Watershed.

In the Tennessee portion of the Wheeler Lake Watershed, there are two rare fish species and four rare mussel species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Etheostoma boschungi	Slackwater darter	LT	T
Percina burtoni	Blotchside darter	MC	D
Lampsilis virescens	Alabama lampmussel	LE	E
Pleurobema oviforme	Tennessee clubshell		
Toxolasma cylinderellus	Pale lilliput	LE	E
Toxolasma lividum	Purple lilliput		

Table 2-3. Rare Aquatic Species in the Tennessee Portion of the Wheeler Lake 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/tnanimal.html*

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/epo/wetlands/strategy.zip.

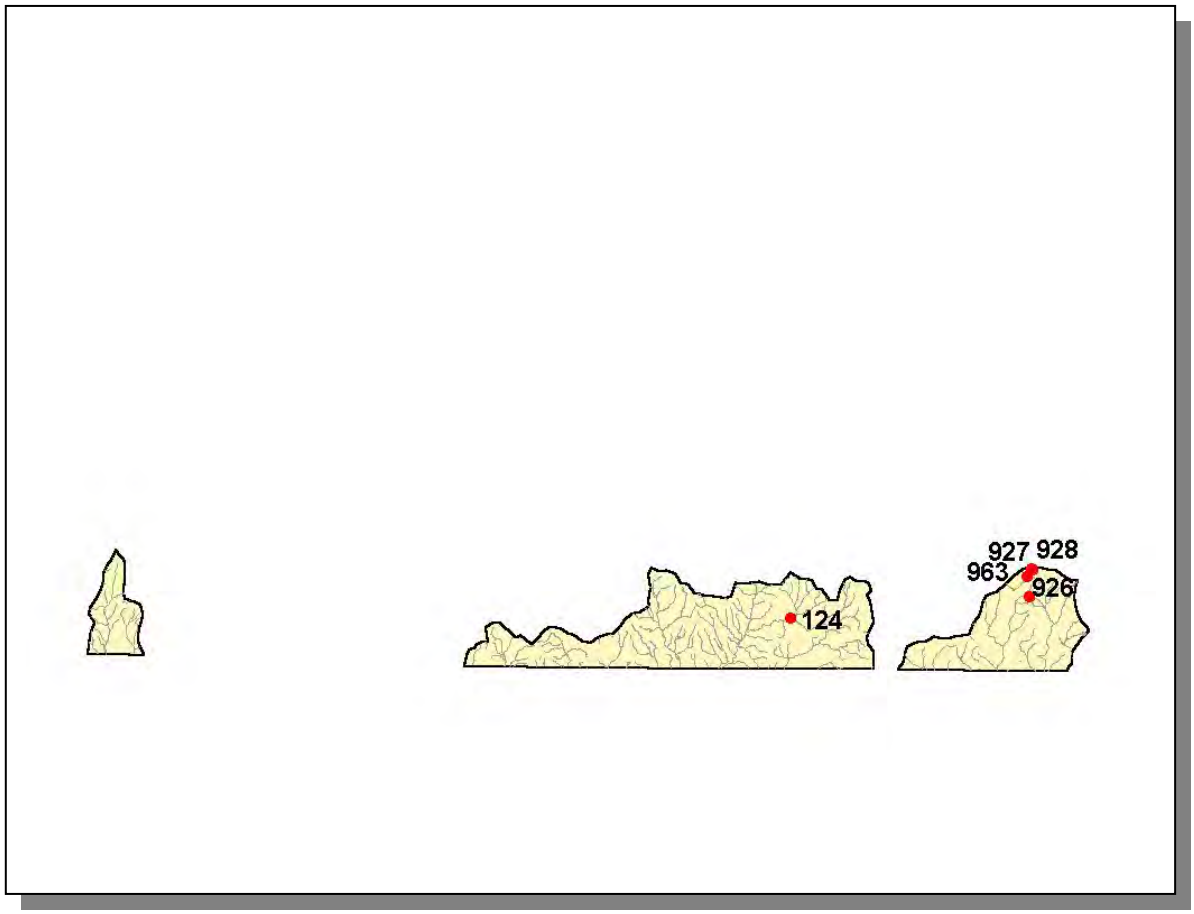


Figure 2-10. Location of Wetland Sites in TDEC Division of Natural Heritage Database in the Tennessee Portion of the Wheeler Lake Watershed. This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands in the watershed*. More information is provided in Wheeler-Appendix II.*

2.7. CULTURAL RESOURCES.

2.7.A. Interpretive Areas.

Many local interpretive areas are common, most notably, John W. Barnes Area Park and Wells Hill Park.

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/

	NSQ	RB	RF	STREAM	NSQ	RB	RF
Bingham Cove Branch Grays Cove Creek	1			Harbin Branch Flint River	2		
Burks Branch	1			Hester Creek			3
Colts Creek	3			Horse Cove Creek	1		
Cottrell Springs Branch Flint River	2			Huckleberry Creek	2		
Dry Creek	1			Keller Creek	1		
Estill Fork Creek	1			Larkin Spring Branch Creek	1		
Flint River	2	2		Second Creek	3		1
Grays Cove Creek	1			Turkey Creek	1		
				Walker Creek	2		

Table 2-4. Stream Scoring from the Tennessee Rivers Assessment Project.

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

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

CHAPTER 3

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

Once a stream is placed on the 303(d) list, it is considered a priority for water quality improvement efforts. These efforts not only include traditional regulatory approaches such as permit issuance, but also include efforts to control pollution sources that have historically been exempted from regulations, such as certain agricultural and forestry activities. If a stream is on the 303(d) list, the Division of Water Pollution Control cannot use its regulatory authority to allow additional sources of the same pollutant(s) 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/2002303dpropfinal.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 Wheeler Lake Watershed, summarizes data collection and assessment results, and describes impaired waters.

3.2. DATA COLLECTION. Comprehensive water quality monitoring in the Wheeler Watershed was conducted in 1999. Data were collected from sites and are from one of four types of sites: 1)Ambient sites, 2)Ecoregion sites, 3)Watershed sites or 4)Special Survey sites.

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Assistance Center-Nashville and Environmental Assistance Center-Columbia 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 Wheeler Lake Watershed are provided in Appendix IV.

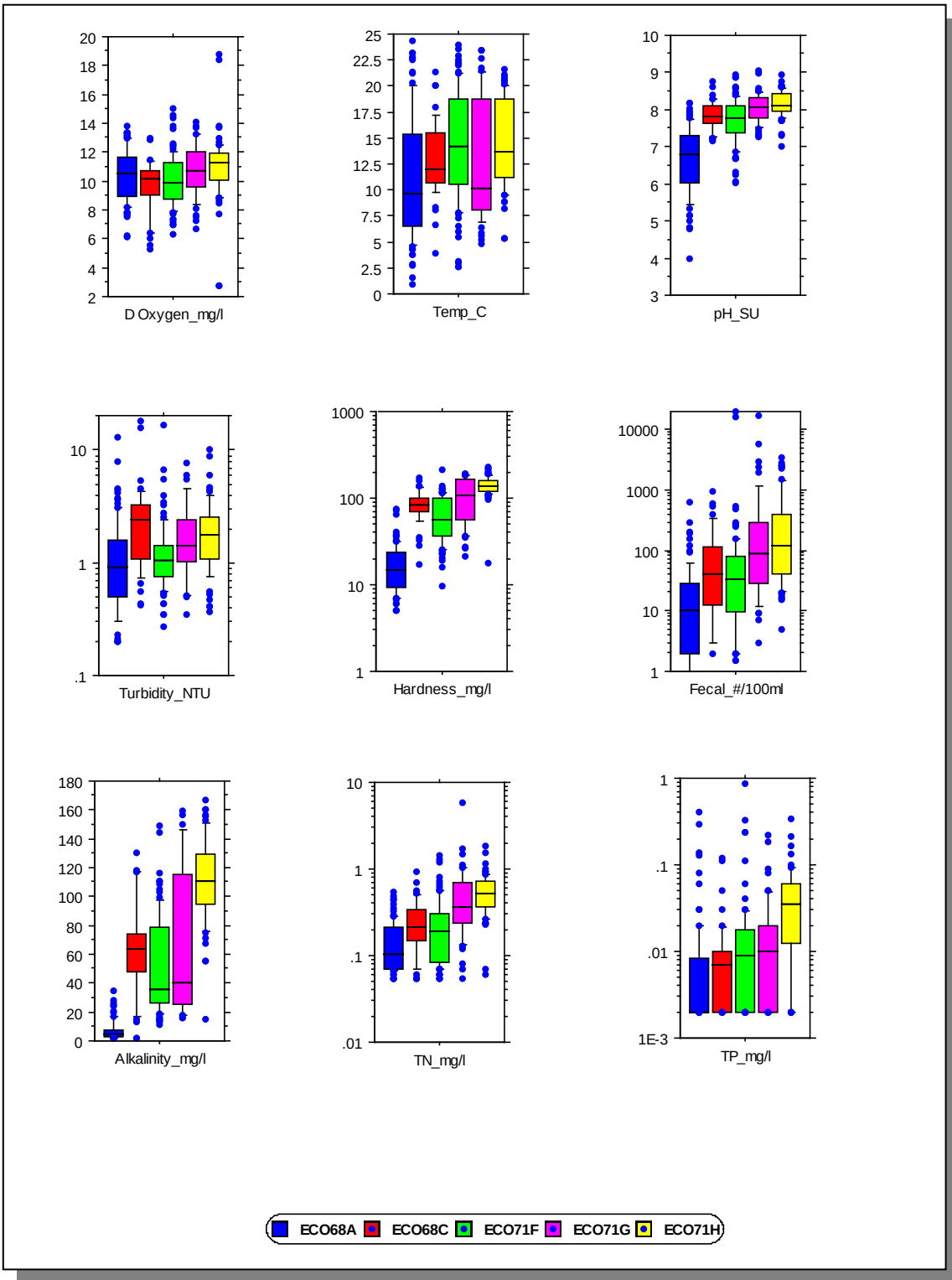
Data from ambient monitoring stations are entered into the STORET (Storage and Retrieval) system administered by EPA. Some ambient monitoring stations are scheduled to be monitored as watershed sampling sites.

3.2.B. Ecoregion Sites. Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plants and animals. The delineation phase of the Tennessee Ecoregion Project was completed in 1997 when the ecoregions and subecoregions were mapped and summarized (EPA/600/R-97/022). There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee (see Chapter 2 for more details). The Wheeler Watershed lies within 2 Level III ecoregions (Southwestern Appalachians and Interior Plateau) and contains 5 subecoregions (Level IV):

- Cumberland Plateau (68a)
- Plateau Escarpment (68c)
- Western Highland Rim (71f)
- Eastern Highland Rim (71g)
- Outer Nashville Basin (71h)

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

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



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.

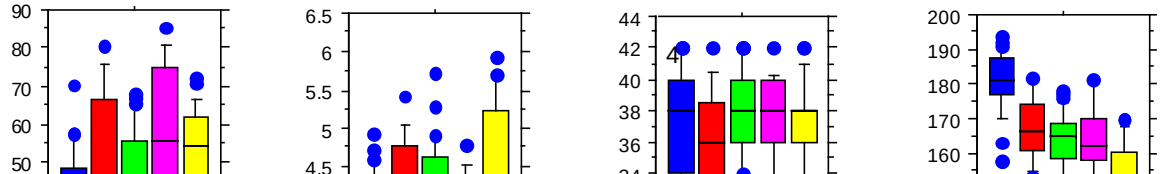


Figure 3-2. Benthic Macroinvertebrate and Habitat Scores for Tennessee Portion of Wheeler Lake Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score and Habitat Riffle/Run 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 Assistance Centers, Tennessee Department of Health (Aquatic Biology Section of Laboratory Services), Tennessee Wildlife Resources Agency, National Park Service, Tennessee Valley Authority, U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Geological Survey, U.S. Forest Service, universities and colleges, the regulated community, and the private sector.

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

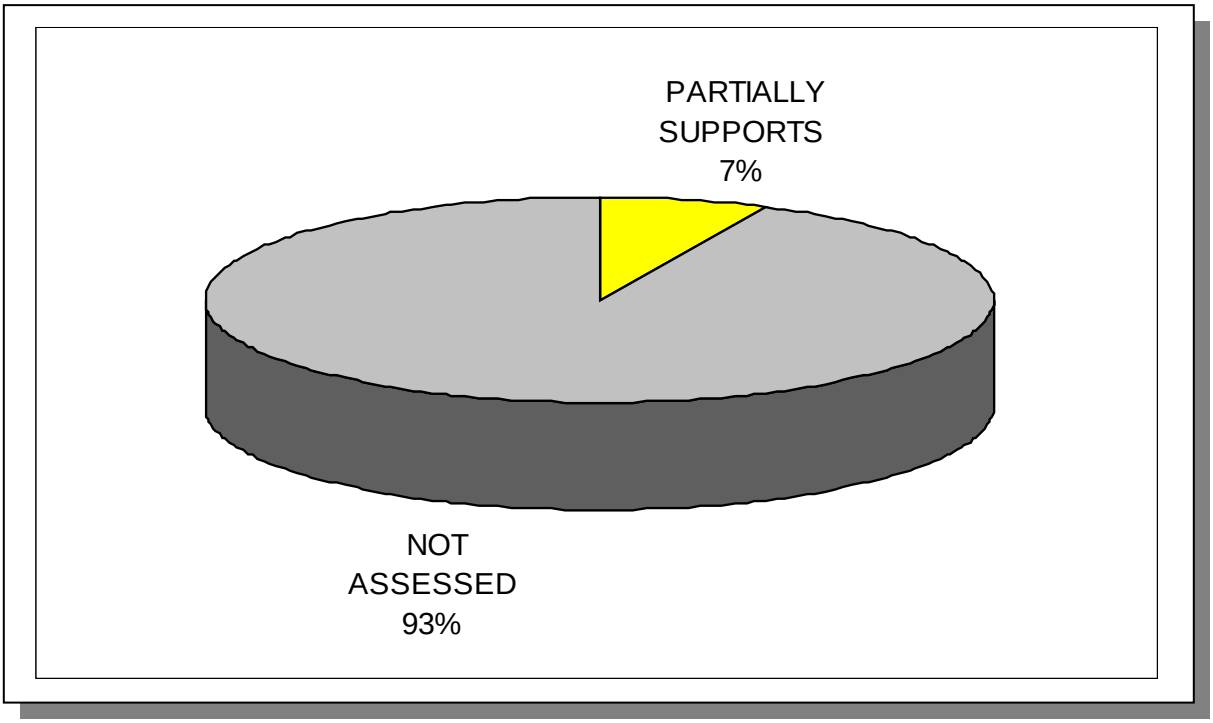


Figure 3-3. Water Quality Assessment for Streams and Rivers in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. More information is provided in Appendix III.*

3.3.A. Assessment Summary.

Figure 3-4a. Overall Use Support Attainment in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Five Points and Flintville are shown for reference. More information is provided in Appendix III.*

Figure 3-4b. Fish and Aquatic Life Use Support Attainment in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Five Points and Flintville are shown for reference. More information is provided in Appendix III.*

Figure 3-4c. Recreation Use Support Attainment in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Five Points and Flintville are shown for reference. More information is provided in Appendix III.*

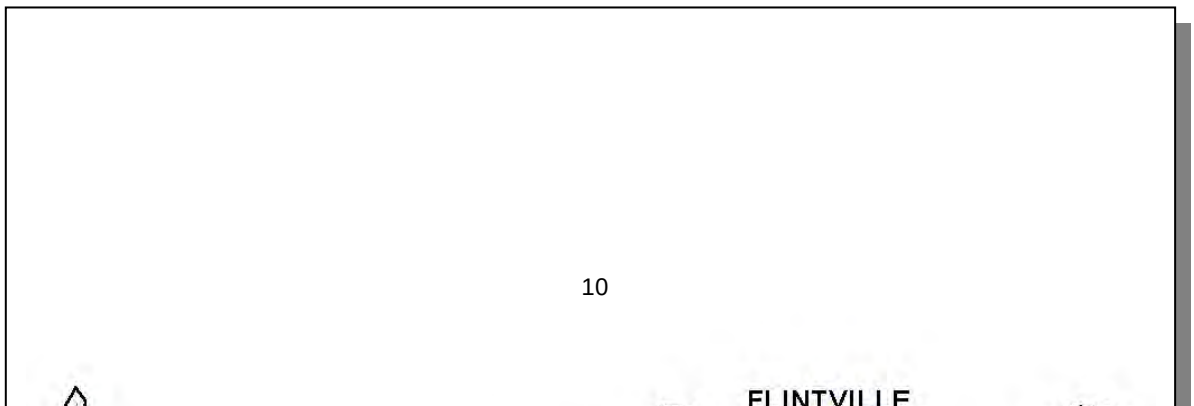


Figure 3-4d. Irrigation Use Support Attainment in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Five Points and Flintville are shown for reference. More information is provided in Appendix III.*

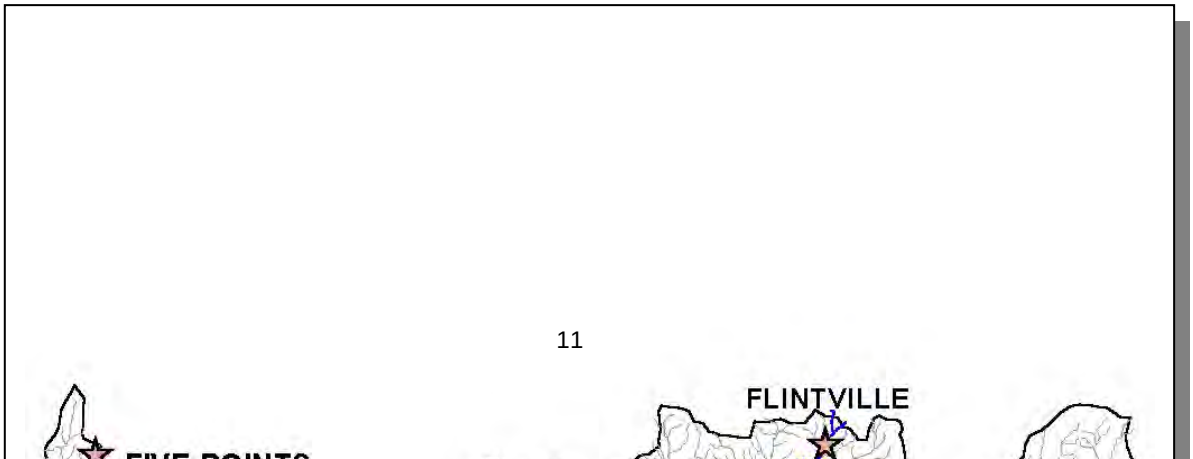


Figure 3-4e. Livestock Watering and Wildlife Use Support Attainment in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Five Points and Flintville are shown for reference. More information is provided in Appendix III.*

3.3.B. Use Impairment Summary.

Figure 3-5a. Impaired Streams Due to Habitat Alterations in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use. Five Points and Flintville are shown for reference. More information is provided in Appendix III.*

Figure 3-5b. Impaired Streams Due to Siltation in the Tennessee Portion of the Wheeler Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use. Five Points and Flintville 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

In the year 2002 and beyond, the 303(d) list will be compiled by using EPA's ADB (Assessment Database) software developed by RTI (Research Triangle Institute). The ADB allows for 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, Summary maps of each watershed may be viewed at http://www.state.tn.us/environment/wpc/watershed/mapsummary.htm.

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

A fluvial geomorphic curve illustrates relationships between drainage area, bankful dimensions of width, depth and cross-sectional area, and bankful discharge of stream systems that are in dynamic equilibrium. It is a tool to evaluate and predict the physical impacts of channel modifications, flow alterations, and other watershed changes, as well

as determining appropriate physical parameters for stream and riparian restoration. Regional curves have been developed and applied in various regions of the country since the mid-1970's (Dunne and Leopold, 1978).

There are several benefits to using regional curves:

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

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

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CHAPTER 4

POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE WHEELER LAKE 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 1998 303(d) list
iii. Description of nonpoint source contributions

The Tennessee portion of the Wheeler Lake Watershed (HUC 06030002) 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 1.1 beta (developed by Tetra Tech, Inc for EPA Region 4) released in 2000.

WCS integrates with ArcView® v3.2 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.

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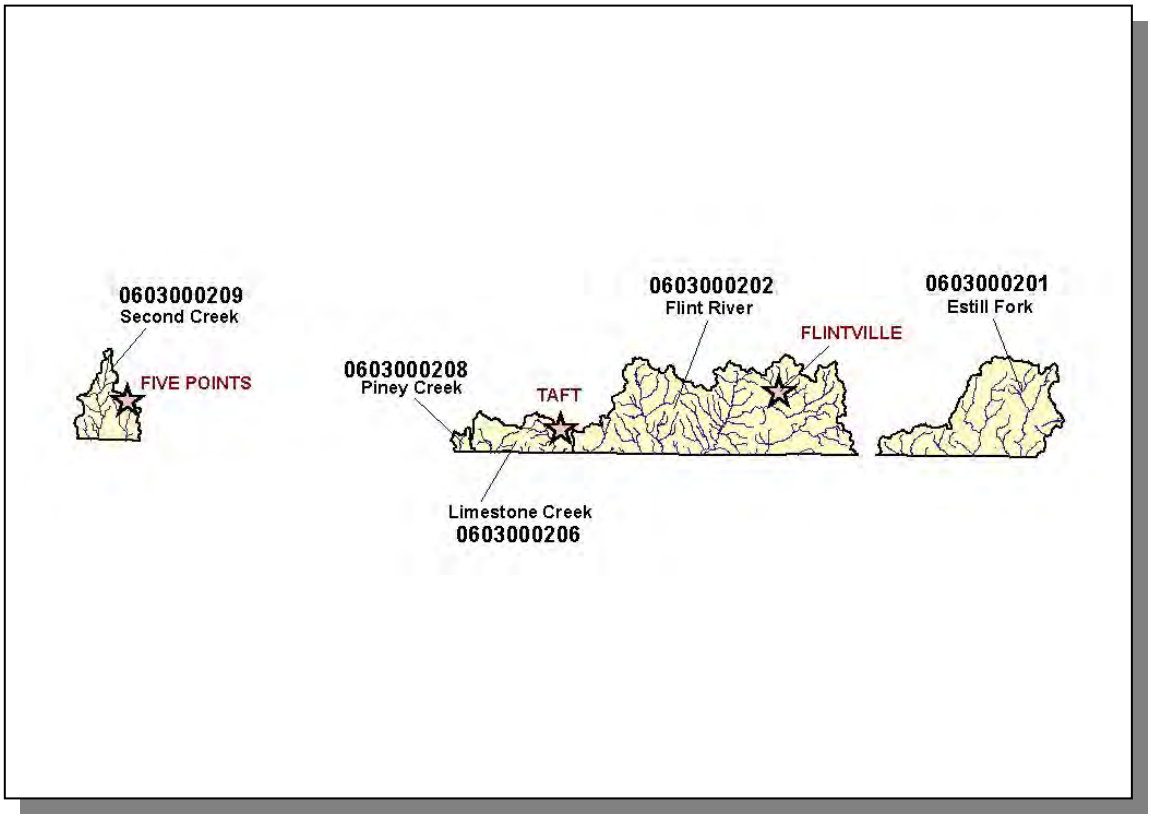

Figure 4-1. The Tennessee Portion of the Wheeler Lake Watershed is Composed of Five USGS-Delineated Subwatersheds (10-Digit Subwatersheds). *Locations of Five Points, Flintville, and Taft are shown for reference.*

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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 Tennessee portion of the Wheeler Lake Watershed.

HUC-10	HUC-12
0603000201	060300020101 (Estill Fork)
	060300020102 (Larkin Creek)
0603000202	060300020201 (Flint River)
	060300020202 (Walker Creek)
	060300020203 (Briar Fork Creek)
	060300020204 (Mountain Fork)
0603000206	060300020601 (Limestone Creek)
0603000208	060300020801 (Piney Creek)
0603000209	060300020901 (Second 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.*

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4.2.A. 0603000201.

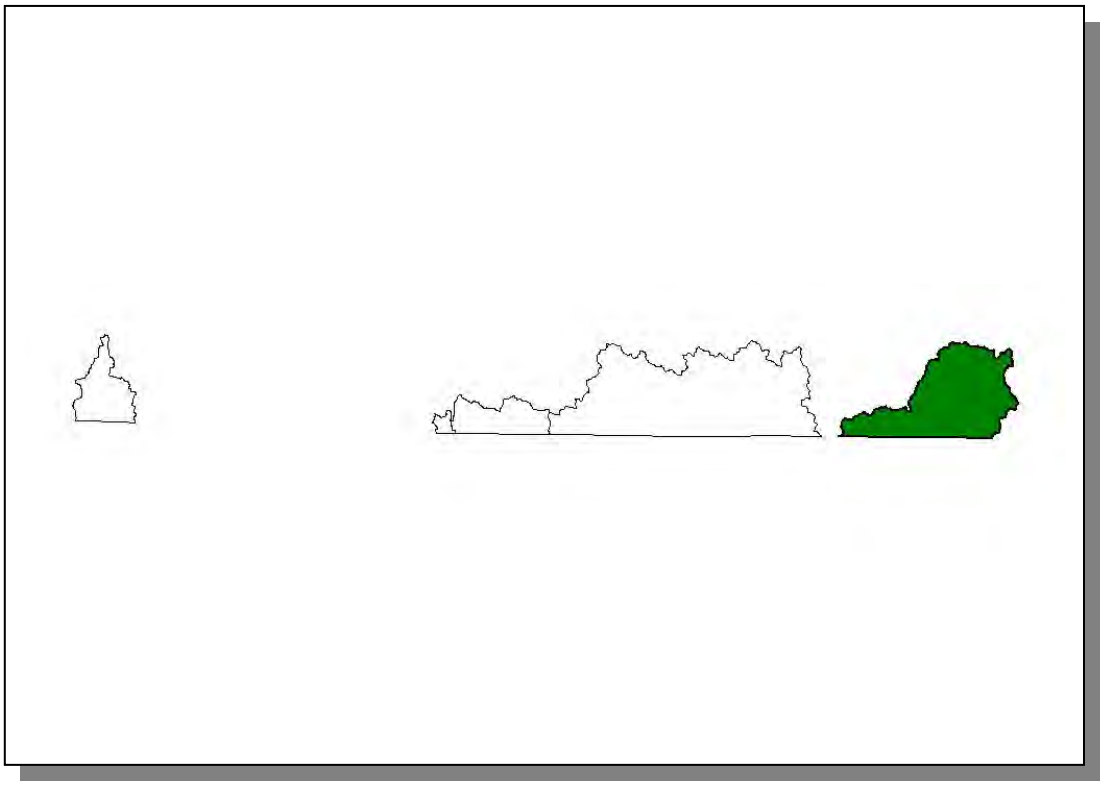

Figure 4-2. Location of Tennessee Portion of Subwatershed 0603000201. *All Wheeler Lake HUC-10 subwatershed boundaries are shown for reference.*

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4.2.A.i. General Description.

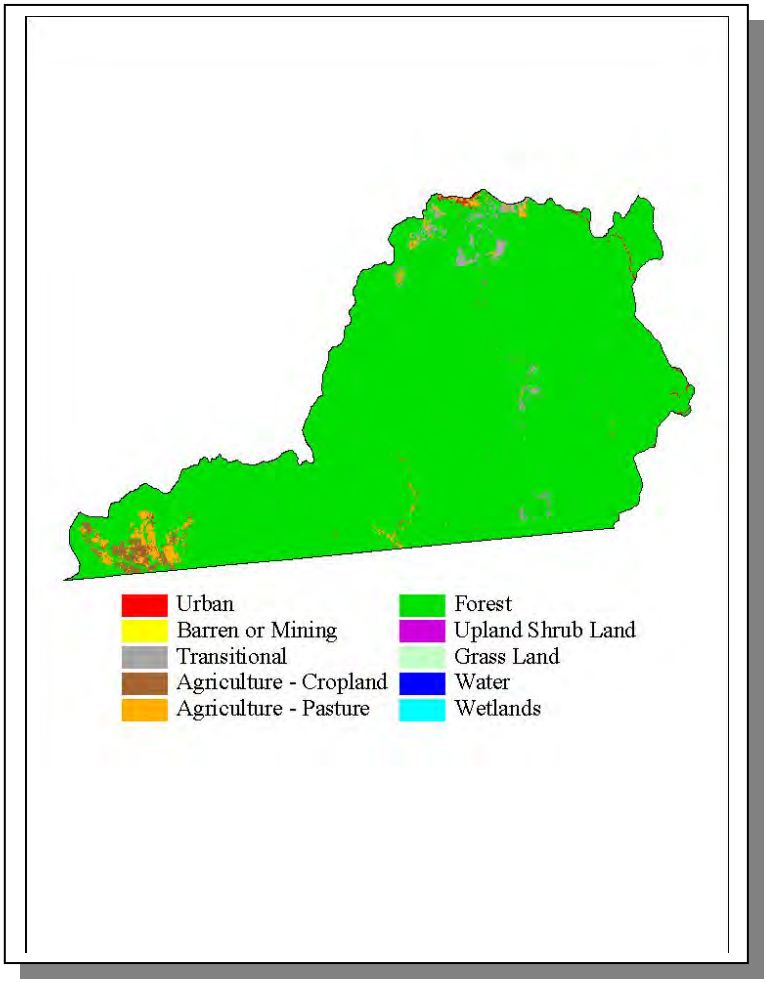

Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0603000201

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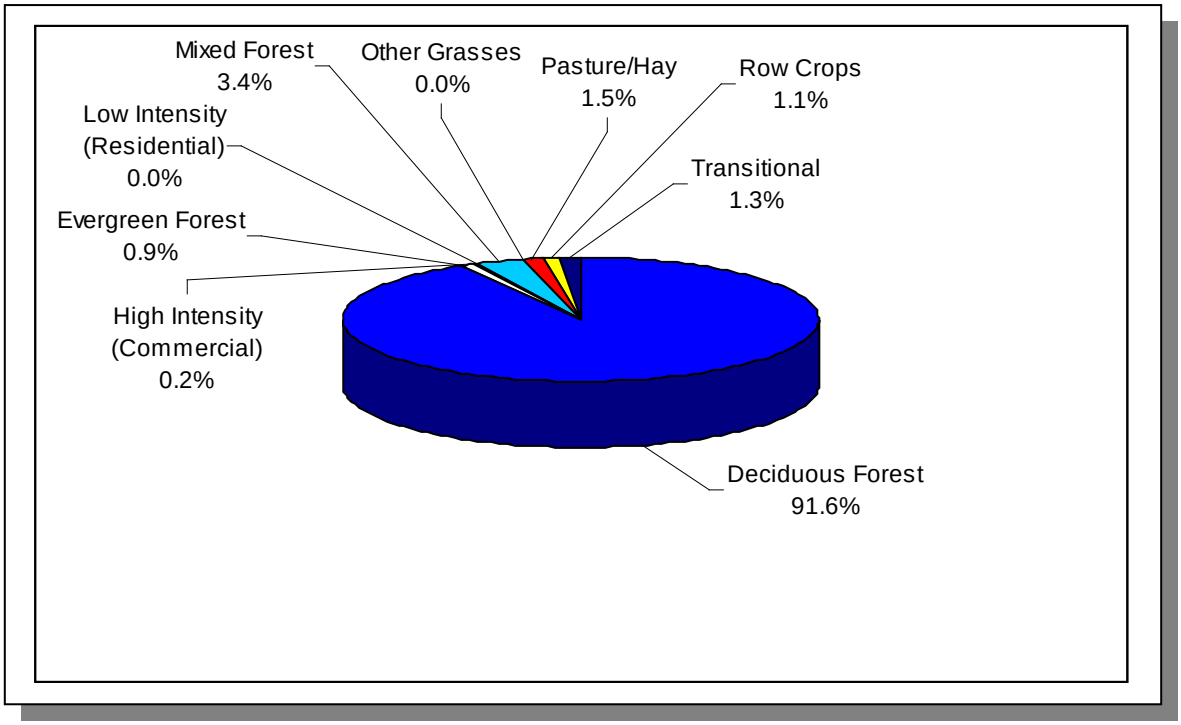

Figure 4-4. Land Use Distribution in Subwatershed 0603000201. *More information is provided in Wheeler-Appendix IV.*

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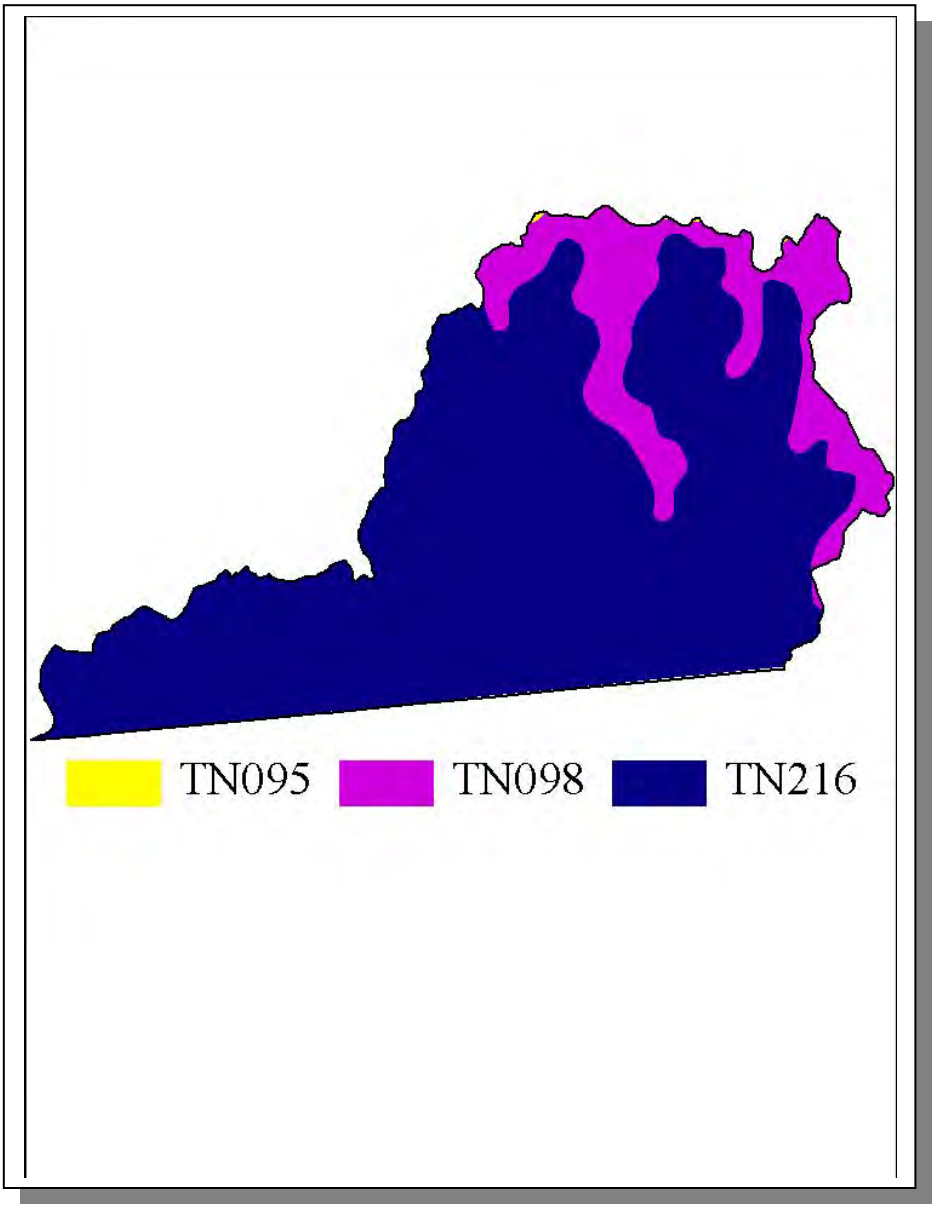

Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000201.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN095	0.00	B	2.35	5.12	Loam	0.31
TN098	1.00	C	3.98	4.82	Loam	0.32
TN216	0.00	C	2.51	4.59	Loam	0.25

Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000201. *More details are provided in Wheeler-Appendix IV.*

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	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Franklin	34,725	37,152	10.52	3,652	3,907	7.0

Table 4-3. Population Estimates in Subwatershed 0602000301.

4.2.A.ii. Point Source Contributions.

There are no point source contributions in subwatershed 0602000301.

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4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
314	681	60	<5	200,144	402	2

Table 4-4. Summary of Livestock Count Estimates in Subwatershed 0603000201. *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)
Franklin	183.4	183.0	6.0	28.7

Table 4-5. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0603000201.

CROPS	TONS/ACRE/YEAR
Corn (Row Crops)	5.57
Soybeans (Row Crops)	3.88
Legume (Hayland)	1.64
Grass (Pastureland)	0.32
Grass,Forbs, Legumes (Mixed Pasture)	0.52
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Conservation Reserve Program Land	0.09
Wheat (Close Grown Cropland)	5.55
All Other Close Grown Cropland	5.82
Other (Horticultural)	1.92
Other Cropland (Not Planted)	2.04
Nonagricultural Land Use	0.00
Farmsteads and Ranch Headquarters	0.13

Table 4-6. Annual Estimated Total Soil Loss in Subwatershed 0603000201.

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4.2.B. 0603000202.

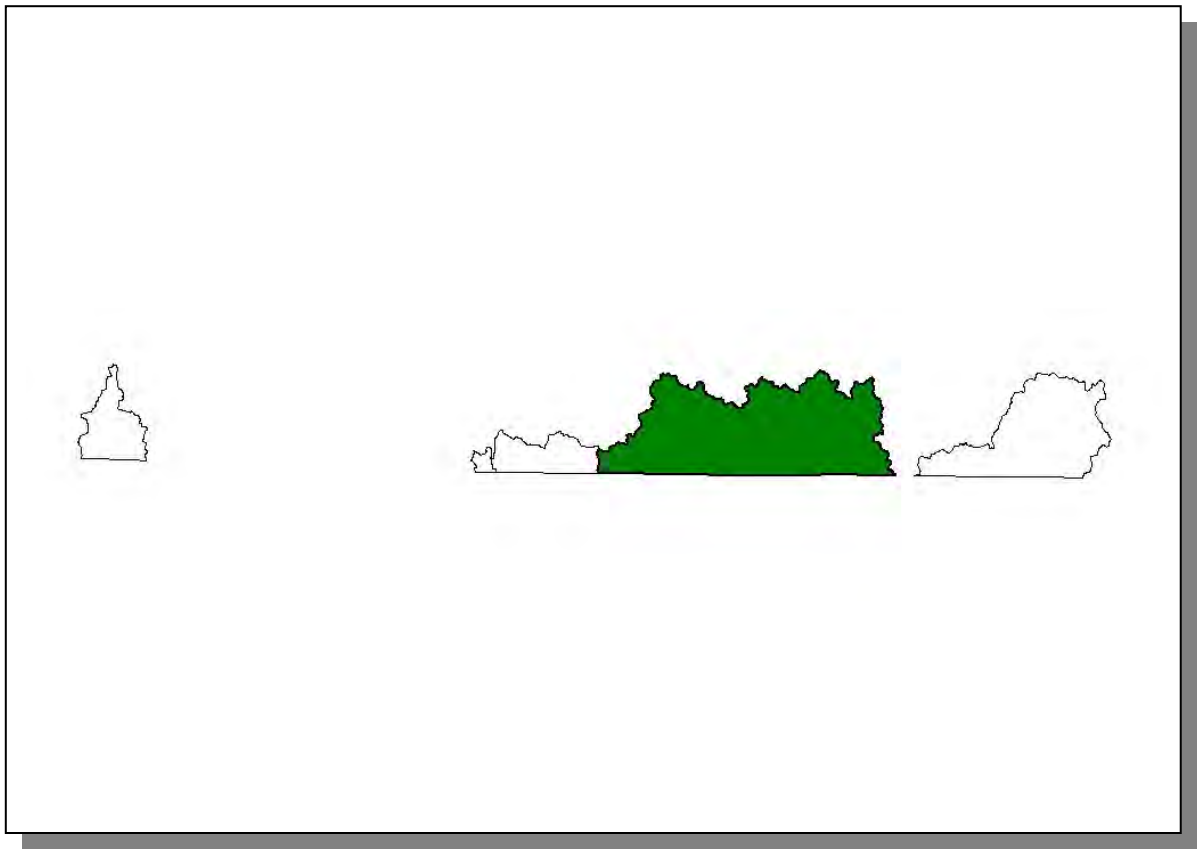

Figure 4-6. Location of Subwatershed 0603000202. *All Wheeler Lake HUC-10 subwatershed boundaries are shown for reference.*

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4.2.B.i. General Description.

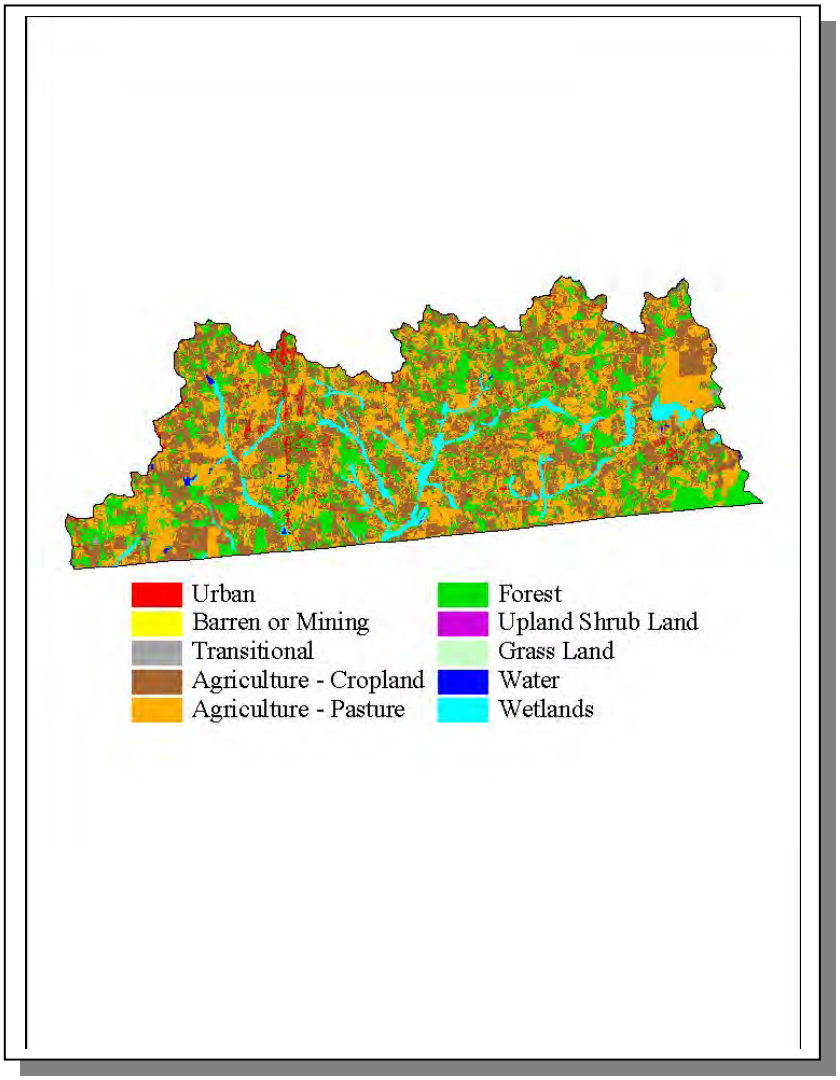

Figure 4-7. Illustration of Land Use Distribution in Subwatershed 0603000202.

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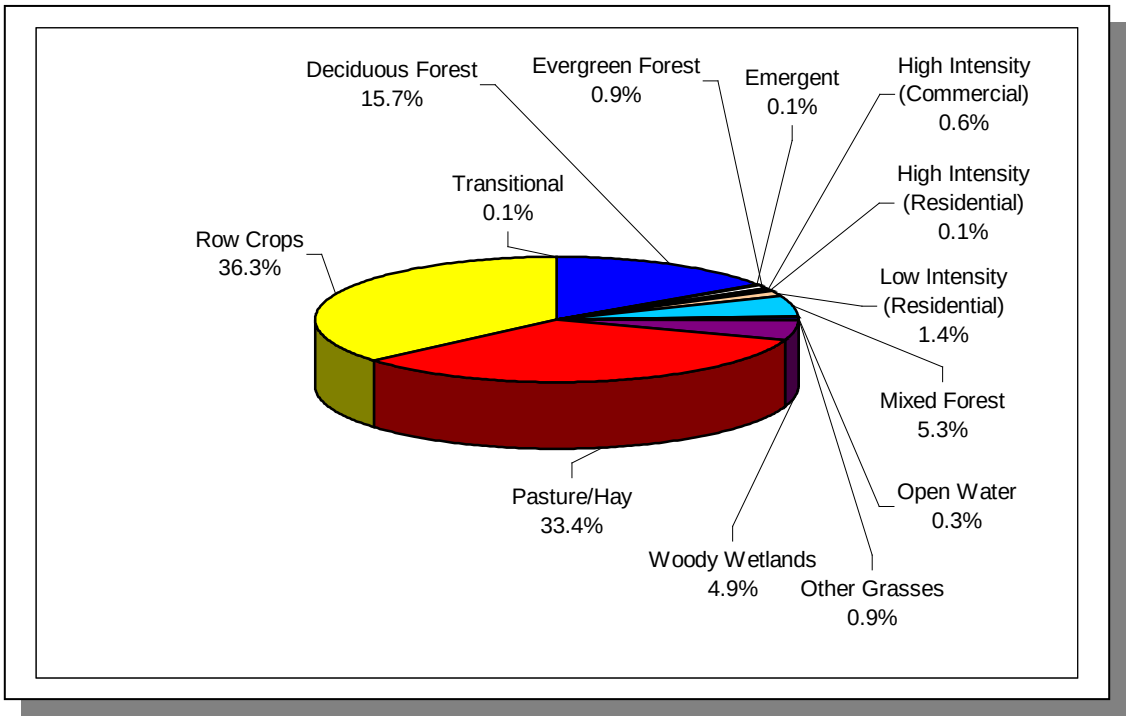

Figure 4-8. Land Use Distribution in Subwatershed 0603000202. *More information is provided in Wheekler -Appendix IV.*

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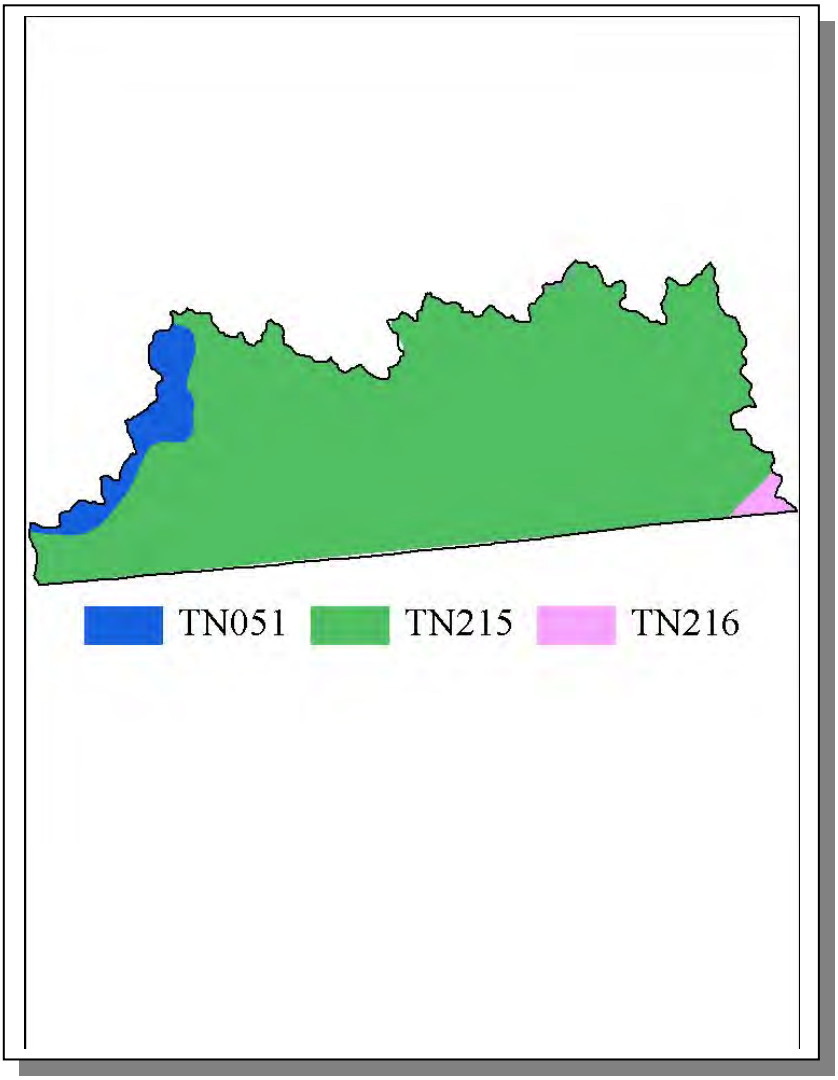

Figure 4-9. STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000202.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN051	1.00	C	1.73	5.44	Loam	0.33
TN066	0.00	B	2.62	4.75	Loam	0.28
TN215	9.00	C	1.57	5.02	Silty Loam	0.39
TN216	0.00	C	2.51	4.59	Loam	0.25

Table 4-7. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000202. *More information is provided in Wheeler-Appendix IV.*

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	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Lincoln	18,157	29,336	19.77	5,565	5,798	4.2

Table 4-8. Population Estimates in Tennessee Portion of Subwatershed 0603000202.

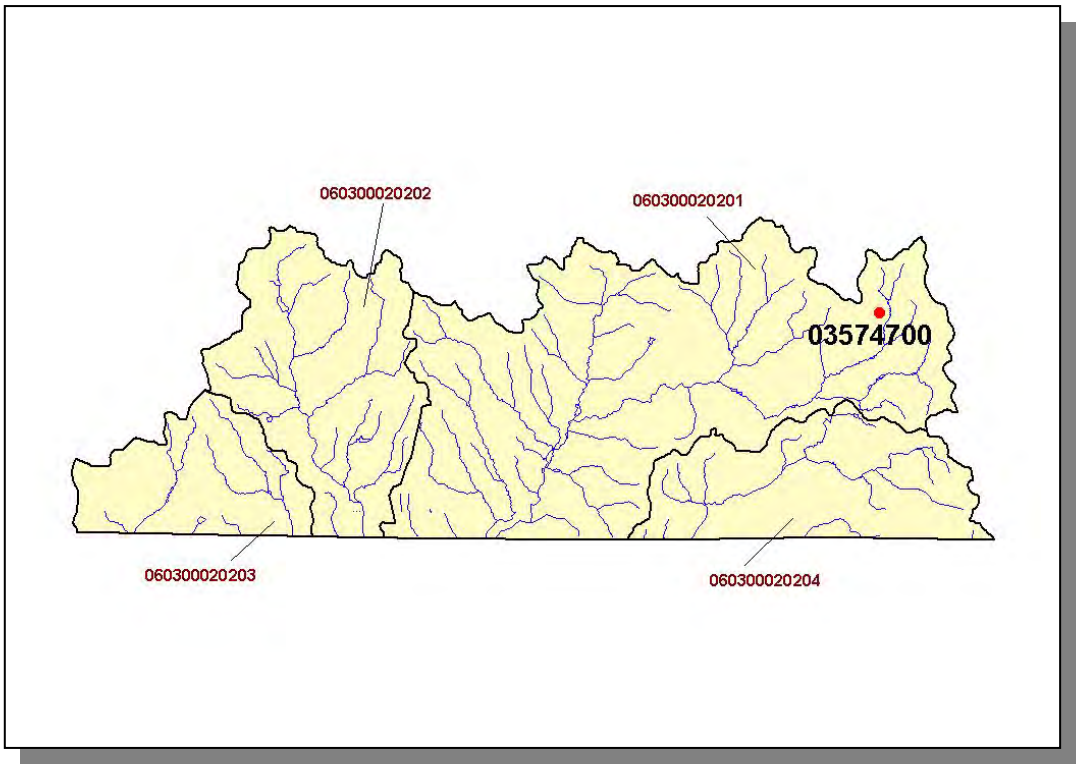

Figure 4-10. Location of Historical Streamflow Data Collection Sites in Tennessee Portion of Subwatershed 0603000202. *Subwatershed 060300020201, 060300020202, 060300020203, and 060300020204 boundaries are shown for reference. More information is provided in Wheeler -Appendix IV.*

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4.2.B.ii. Point Source Contributions.

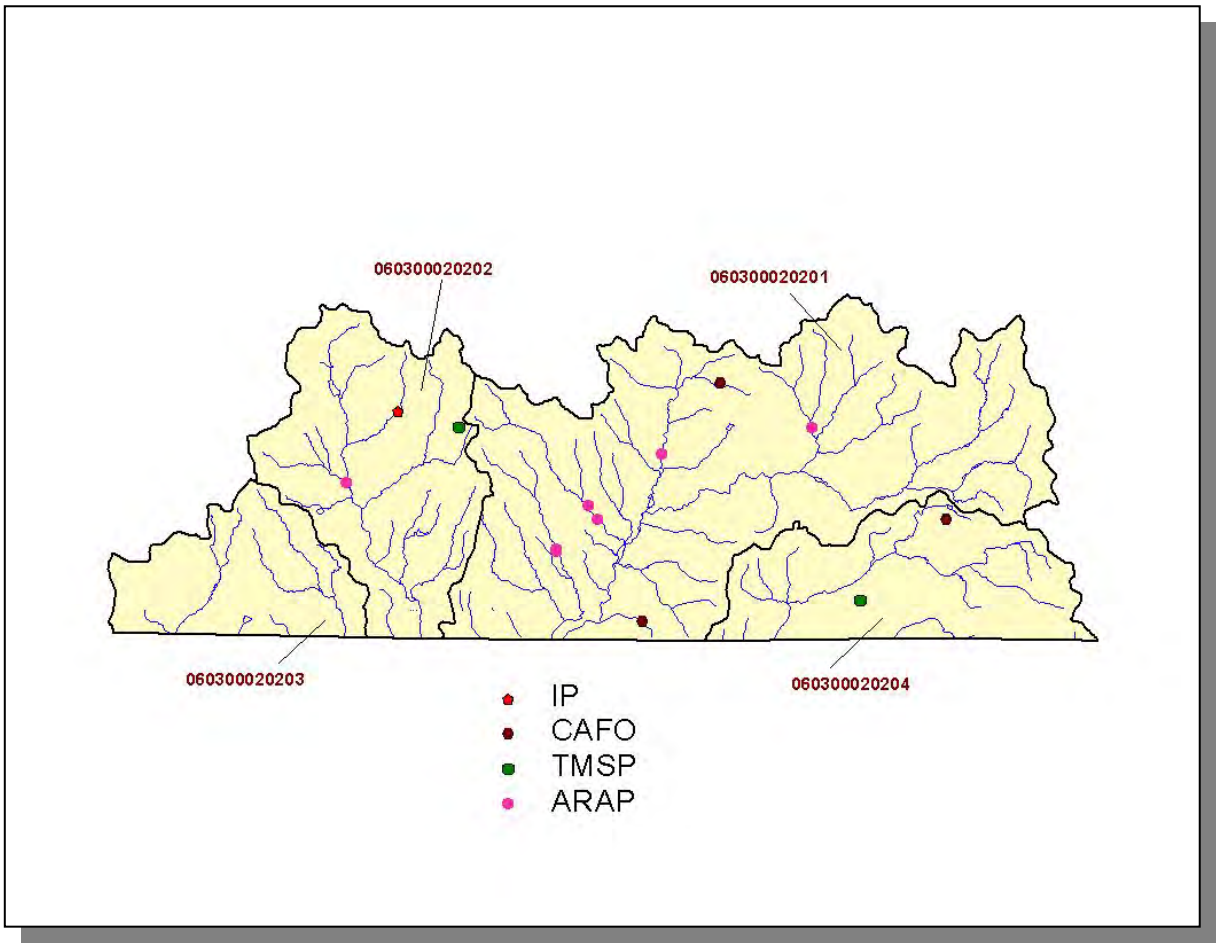

Figure 4-11. Location of Active Point Source Facilities in Tennessee Portion of Subwatershed 0603000202. *Subwatershed 060300020201, 060300020202, 060300020203, and 060300020204 boundaries are shown for reference. More information is provided in the following charts.*

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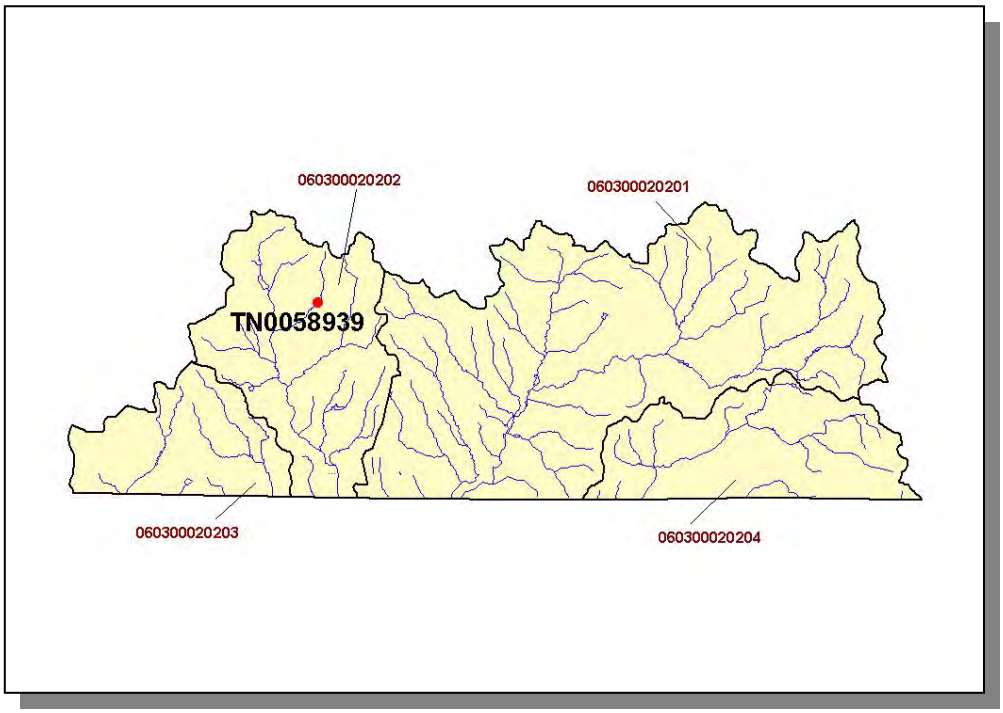

Figure 4-12. Location of Active Point Source Facilities (Individual Permits) in Tennessee Portion of Subwatershed 0603000202. *Subwatershed 060300020201, 060300020202, 060300020203, and 060300020204 boundaries are shown for reference. More information, including the names of facilities, is provided in Wheeler-Appendix IV.*

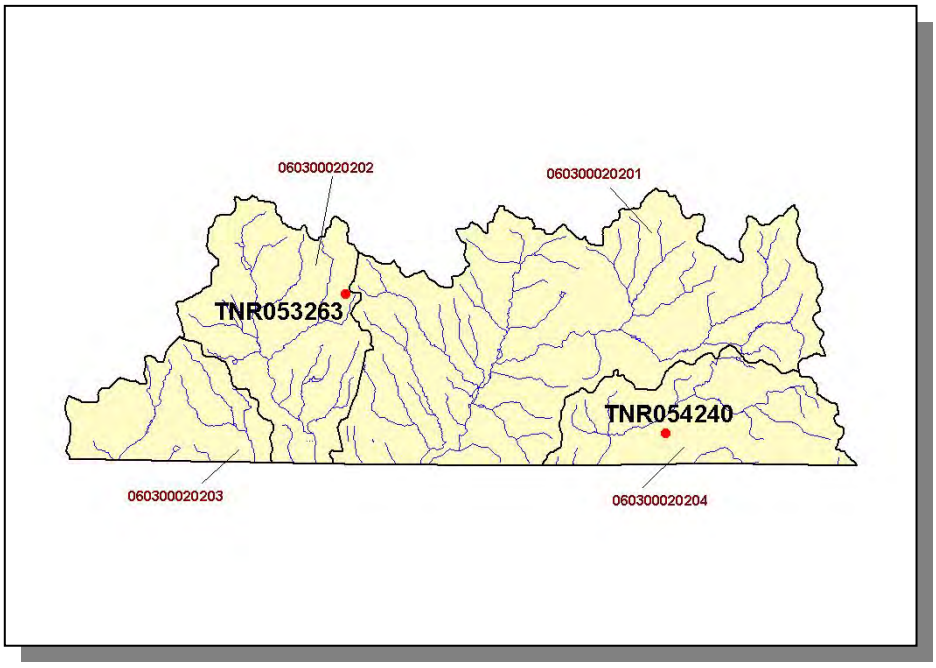

Figure 4-13. Location of TMSP Facilities in Tennessee Portion of Subwatershed 0603000202. *Subwatershed 060300020201, 060300020202, 060300020203, and 060300020204 boundaries are shown for reference. More information, including the names of facilities, is provided in Wheeler-Appendix IV.*

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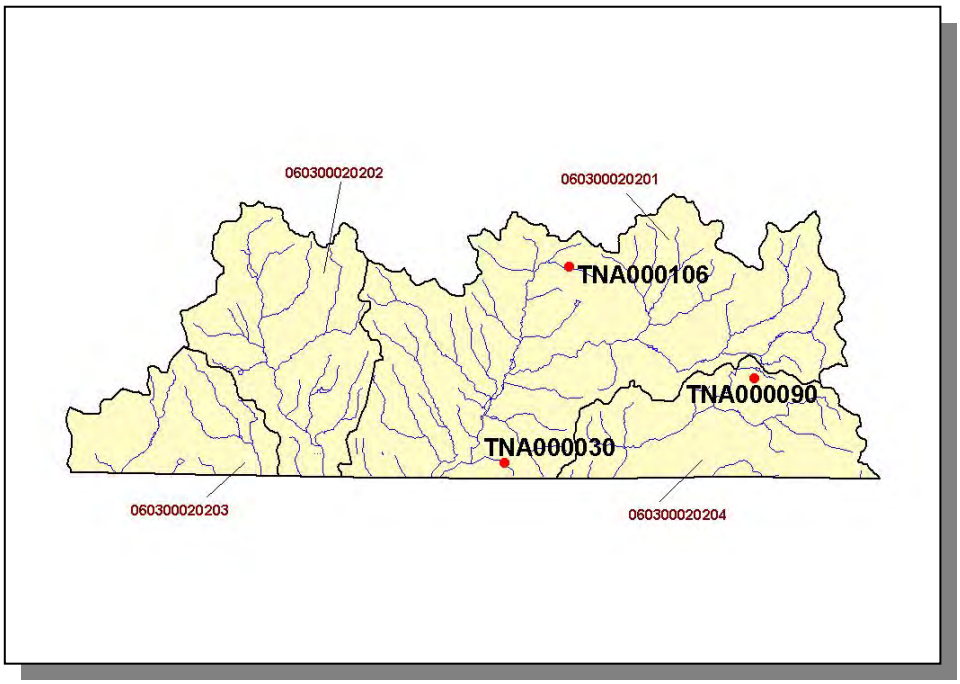

Figure 4-14. Location of CAFO Facilities in Tennessee Portion of Subwatershed 0603000202. *Subwatershed 060300020201, 060300020202, 060300020203, and 060300020204 boundaries are shown for reference. CAFO rules may be found at http://cfpub.epa.gov/npdes/afo/cafofinalrule.cfm. More information, including the names of facilities, is provided in Wheeler-Appendix IV.*

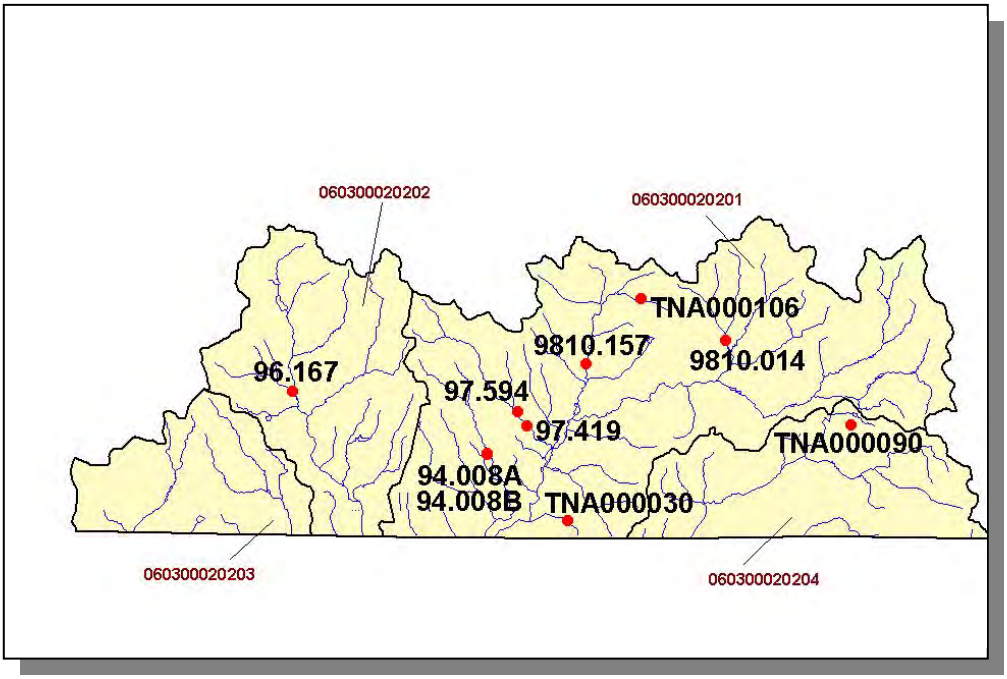

Figure 4-15. Location of ARAP Sites (Individual Permits) in Tennessee Portion of Subwatershed 0603000202. *Subwatershed 060300020201, 060300020202, 060300020203, and 060300020204 boundaries are shown for reference. More information, including the names of facilities, is provided in Wheeler-Appendix IV.*

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4.2.B.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
9,212	18,601	1,208	16	1,385,006	1,031	140

Table 4-9. Summary of Livestock Count Estimates in Tennessee Portion of Subwatershed 0603000202. *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)
Lincoln	136.7	136.7	1.1	3.2

Table 4-10. Forest Acreage and Average Annual Removal Rates (1987-1994) in Tennessee Portion of Subwatershed 0603000202.

CROPS	TONS/ACRE/YEAR
Legume/Grass (Hayland)	0.37
Legume (Hayland)	0.12
Grass (Hayland)	0.22
Grass (Pastureland)	1.13
Grass, Forbs, Legumes (Mixed Pasture)	0.95
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Corn (Row Crops)	3.68
Soybeans (Row Crops)	7.21
Potatoes (Row Crops)	3.04
Tobacco (Row Crops)	9.27
Wheat (Close Grown Cropland)	3.28
Conservation Reserve Program Lands	0.30
Other Land in Farms (Other Farmland)	0.28
Other Vegetable and Truck Crops	2.52
Farmsteads and Ranch Headquarters	0.41

Table 4-11. Annual Estimated Total Soil Loss in Tennessee Portion of Subwatershed 0603000202.

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4.2.C. 0603000206.

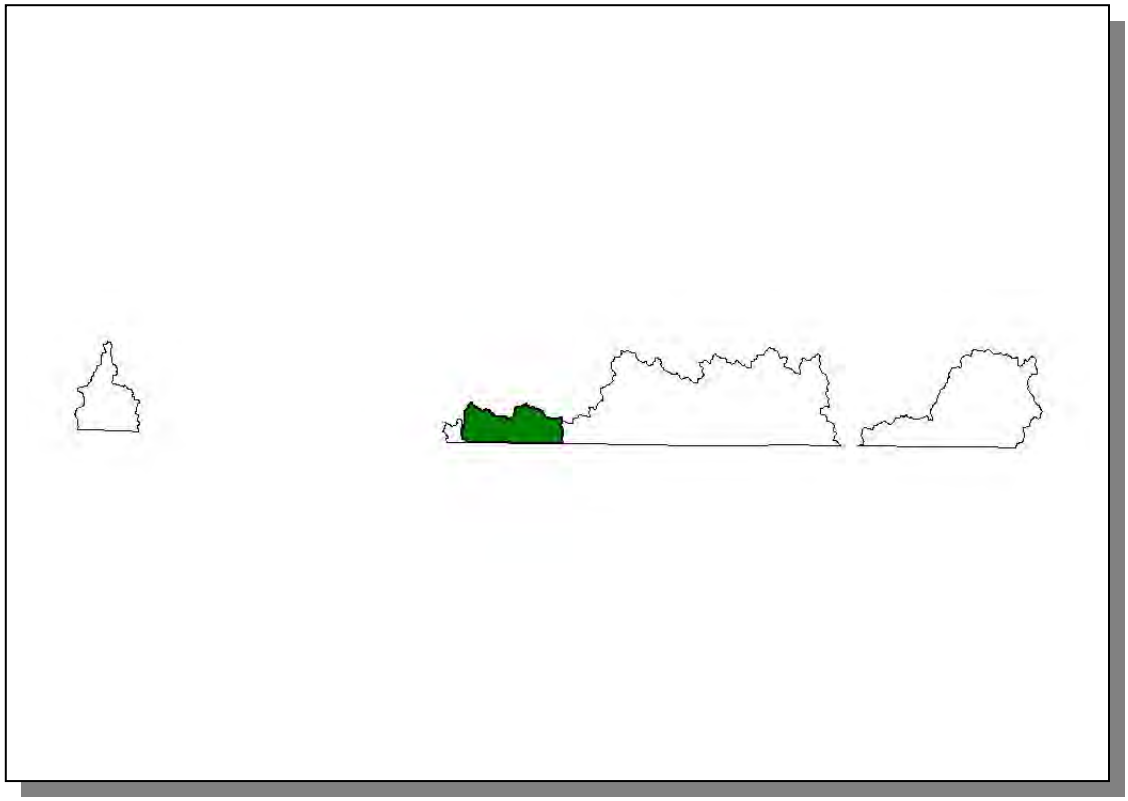

Figure 4-16. Location of Tennessee Portion of Subwatershed 0603000206. *All Wheeler Lake HUC-10 subwatershed boundaries are shown for reference.*

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4.2.C.i. General Description.

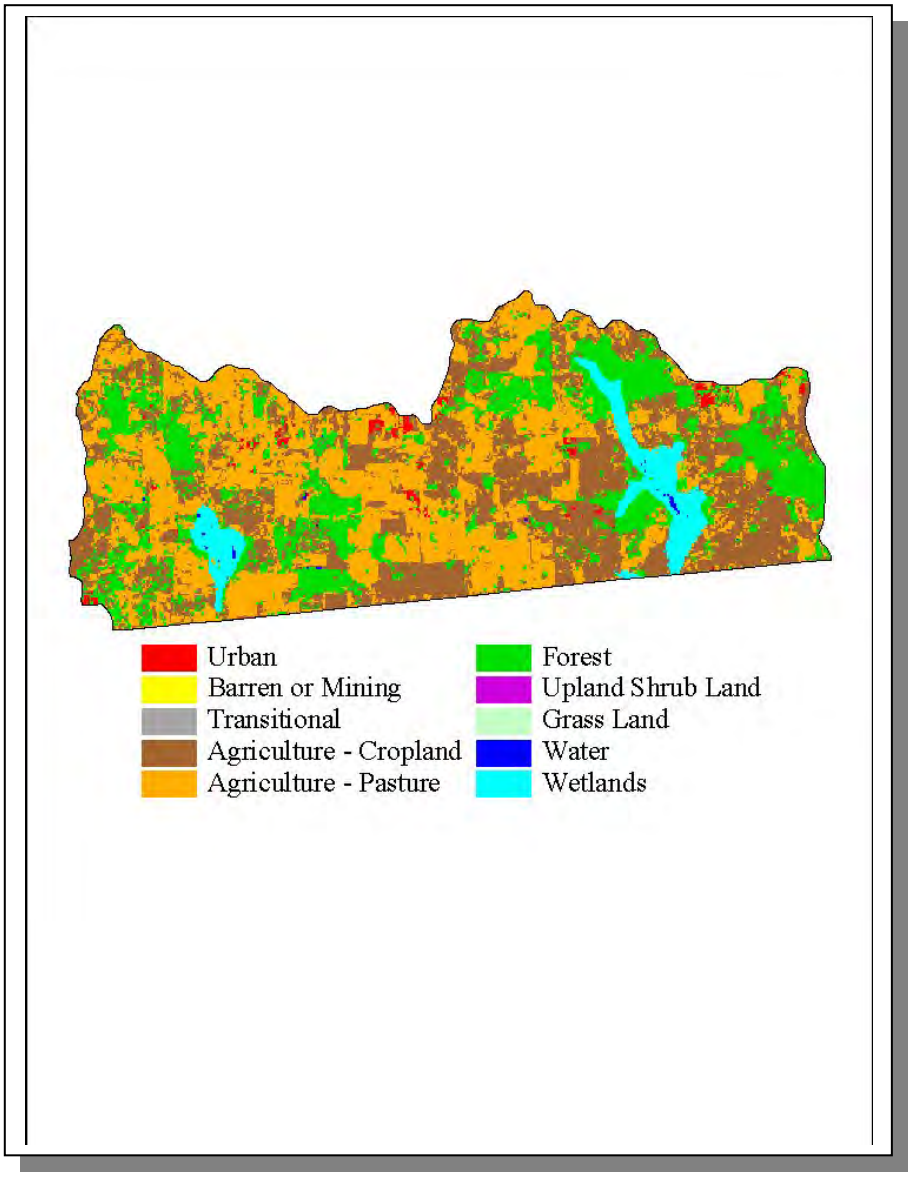

Figure 4-17. Illustration of Land Use Distribution in Subwatershed 0603000206.

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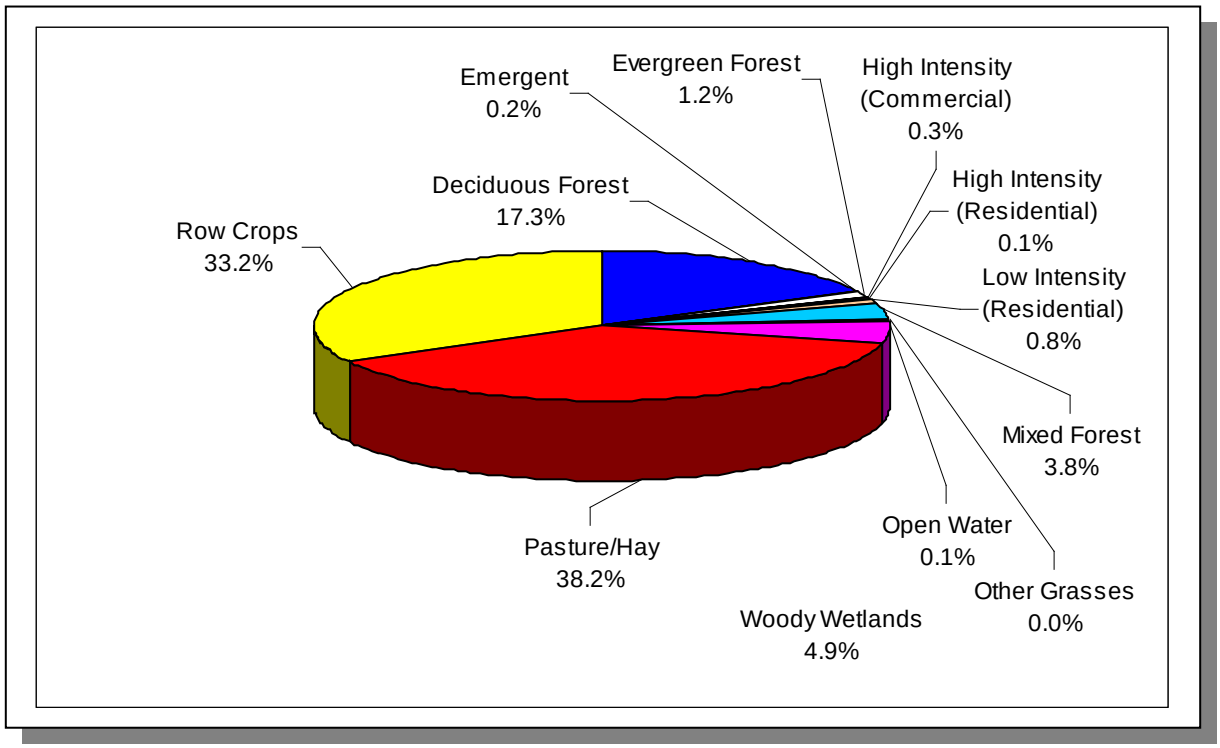

Figure 4-18. Land Use Distribution in Tennessee Portion of Subwatershed 0603000206. *More information is provided in Wheeler-Appendix IV.*

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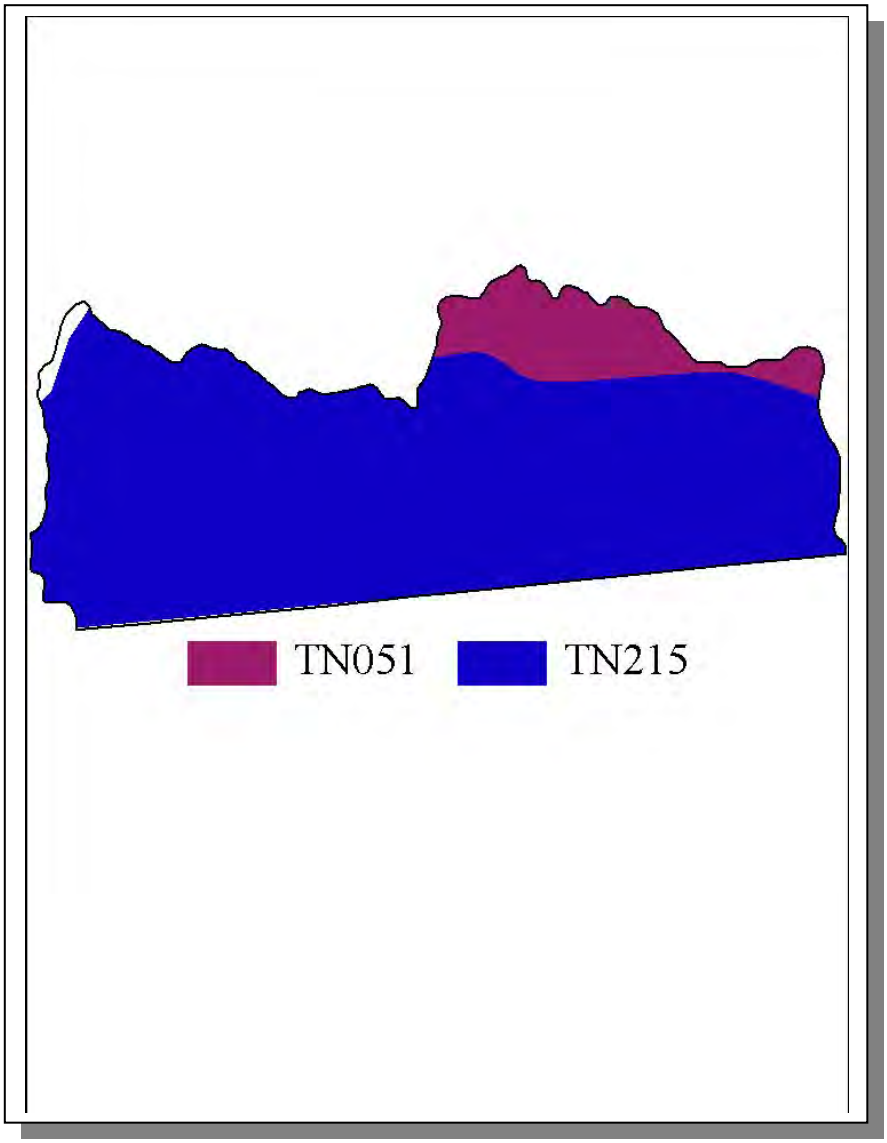

Figure 4-19. STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000206.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN051	1.00	C	1.73	5.44	Loam	0.33
TN066	0.00	B	2.62	4.75	Loam	0.28
TN215	9.00	C	1.57	5.02	Silty Loam	0.39

Table 4-12. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000206. *More information is provided in Wheeler-Appendix IV.*

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	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Giles	25,741	28,515	0.11	27	30	11.1
Lincoln	28,157	29,336	2.68	753	785	4.2
Total	**53,898**	**57,851**		**780**	**815**	**4.5**

Table 4-13. Population Estimates in Tennessee Portion of Subwatershed 0603000206.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Ardmore	Giles	828	342	192	150	0

Table 4-14. Housing and Sewage Disposal Practices of Select Communities in Tennessee Portion of Subwatershed 0603000206.

4.2.C.ii. Point Source Contributions.

There are no Point Source contributions in subwatershed 0603000206.

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4.2.C.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
1,568	3,165	195	<5	237,801	183	24

Table 4-15. Summary of Livestock Count Estimates in Tennessee Portion of Subwatershed 0603000206. *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)
Giles	171.8	171.8	3.3	11.4
Linciln	136.7	136.7	1.1	3.2
Totals	**308.5**	**308.5**	**4.4**	**14.6**

Table 4-16. Forest Acreage and Average Annual Removal Rates (1987-1994) in Tennessee Portion of Subwatershed 0603000206.

CROPS	TONS/ACRE/YEAR
Legume (Hayland)	0.12
Grass (Hayland)	0.22
Legume/Grass (Hayland)	0.36
Grass (Pastureland)	1.13
Grass, Forbs, Legumes (Mixed Pasture)	0.94
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Soybeans (Row Crops)	7.05
Corn (Row Crops)	3.70
Tobacco (Row Crops)	9.27
Potatoes (Row Crops)	3.04
All Other Row Crops	2.70
Wheat (Close Grown Cropland)	3.22
Barley (Close Grown Cropland)	1.08
Conservation Reserve Program Land	0.30
Other Vegetable and Truck Crops	2.59
Fruit (Horticulture)	0.09
Summer Fallow (Other Cropland)	0.35
Other Land in Farms	0.28
Farmsteads and Ranch Headquarters	0.40
Other Cropland not Planted	0.25

Table 4-17. Annual Estimated Total Soil Loss in Tennessee Portion of Subwatershed 0603000206.

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4.2.D. 0603000208.

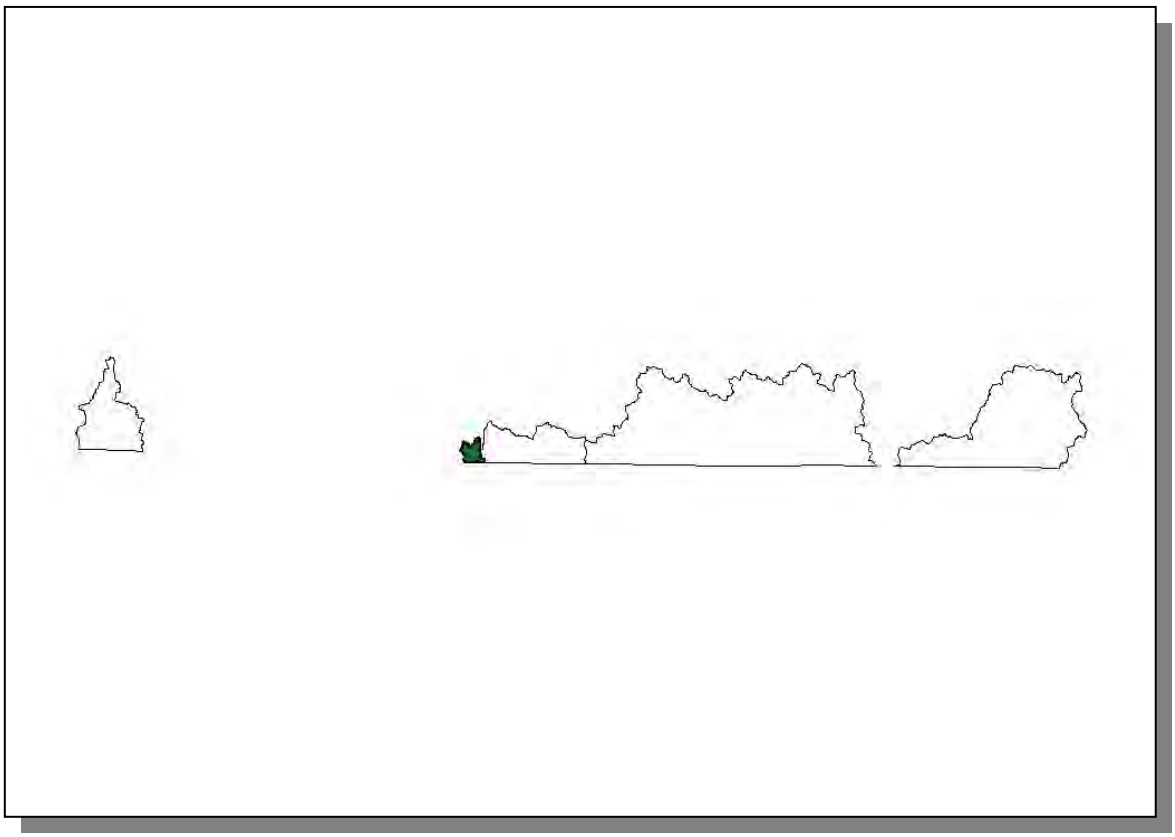

Figure 4-20. Location of Tennessee Portion of Subwatershed 0603000208. *All Wheeler Lake HUC-10 subwatershed boundaries are shown for reference.*

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4.2.D.i. General Description.

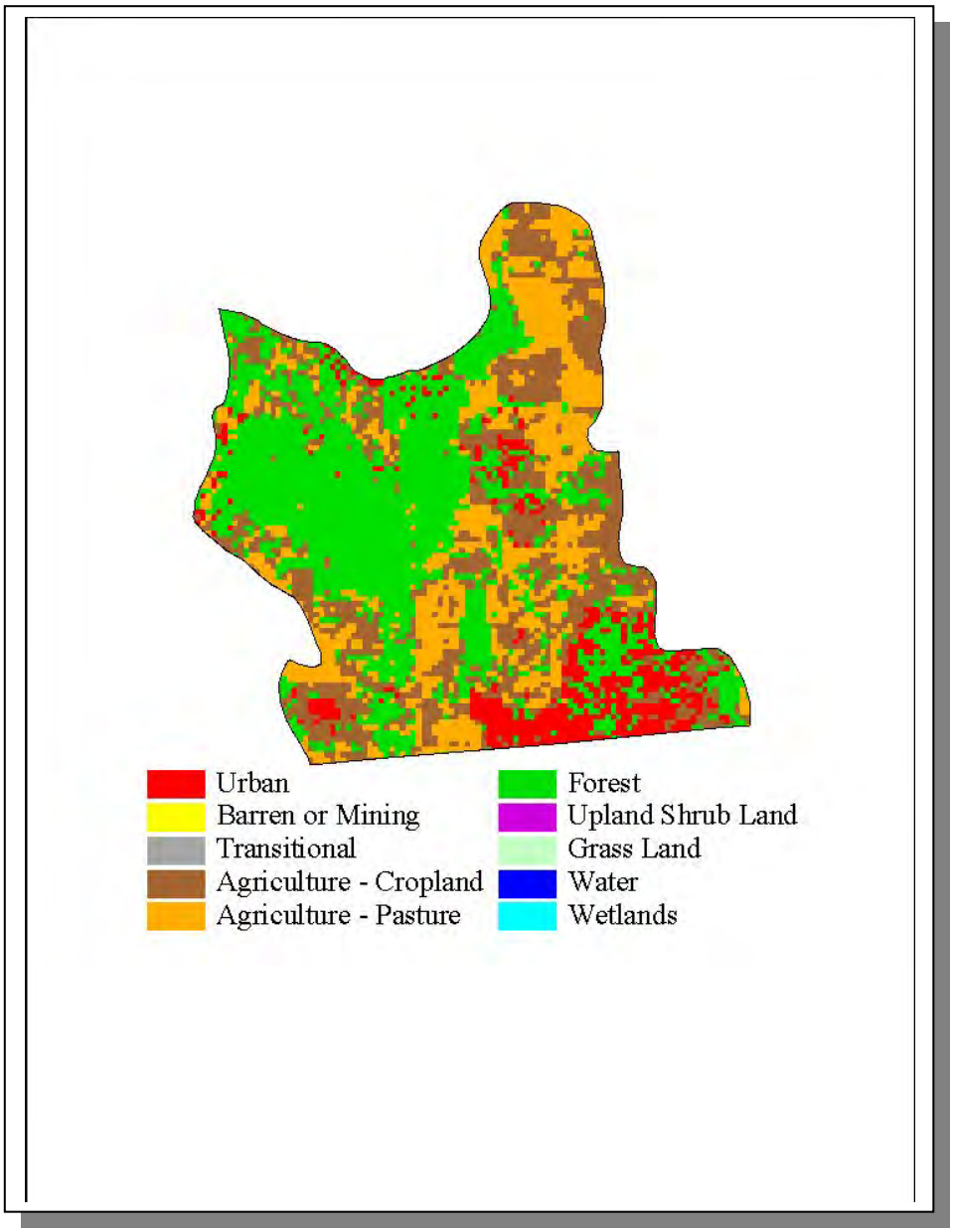

Figure 4-21. Illustration of Land Use Distribution in Subwatershed 0603000208.

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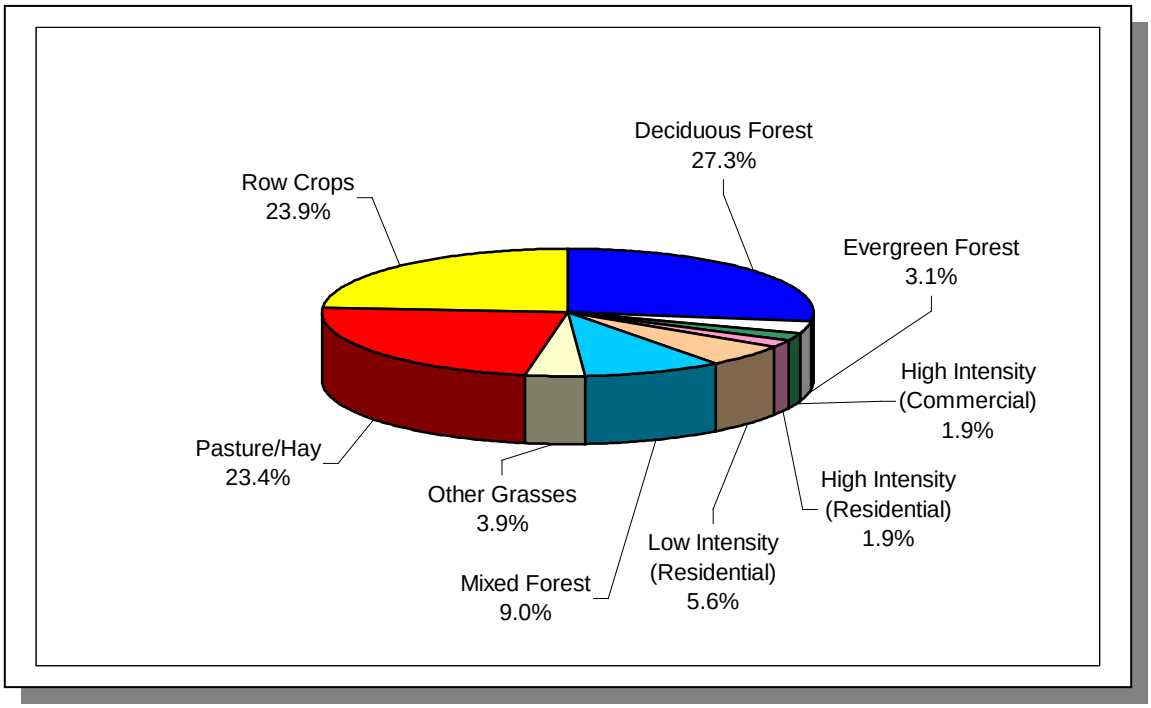

Figure 4-22. Land Use Distribution in Tennessee Portion of Subwatershed 0603000208. *More information is provided in Wheeler-Appendix IV.*

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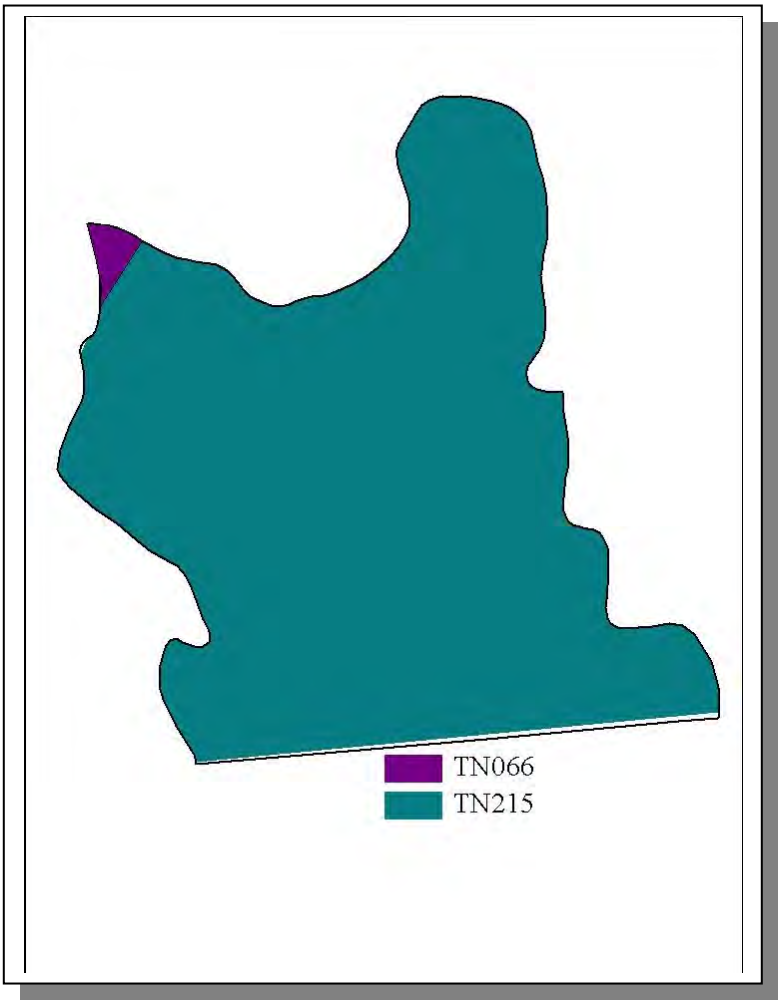

Figure 4-23. STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000208.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN066	0.00	B	2.62	4.75	Loam	0.28
TN215	9.00	C	1.57	5.02	Silty Loam	0.39

Table 4-18. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000208. *More information is provided in Wheeler-Appendix IV.*

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	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Giles	25,741	28,515	0.23	60	66	10.0

Table 4-19. Population Estimates in Tennessee Portion of Subwatershed 0603000208.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Ardmore	Giles	828	342	192	150	0

Table 4-20. Housing and Sewage Disposal Practices of Select Communities in Tennessee Portion of Subwatershed 0603000208.

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4.2.D.ii. Point Source Contributions.

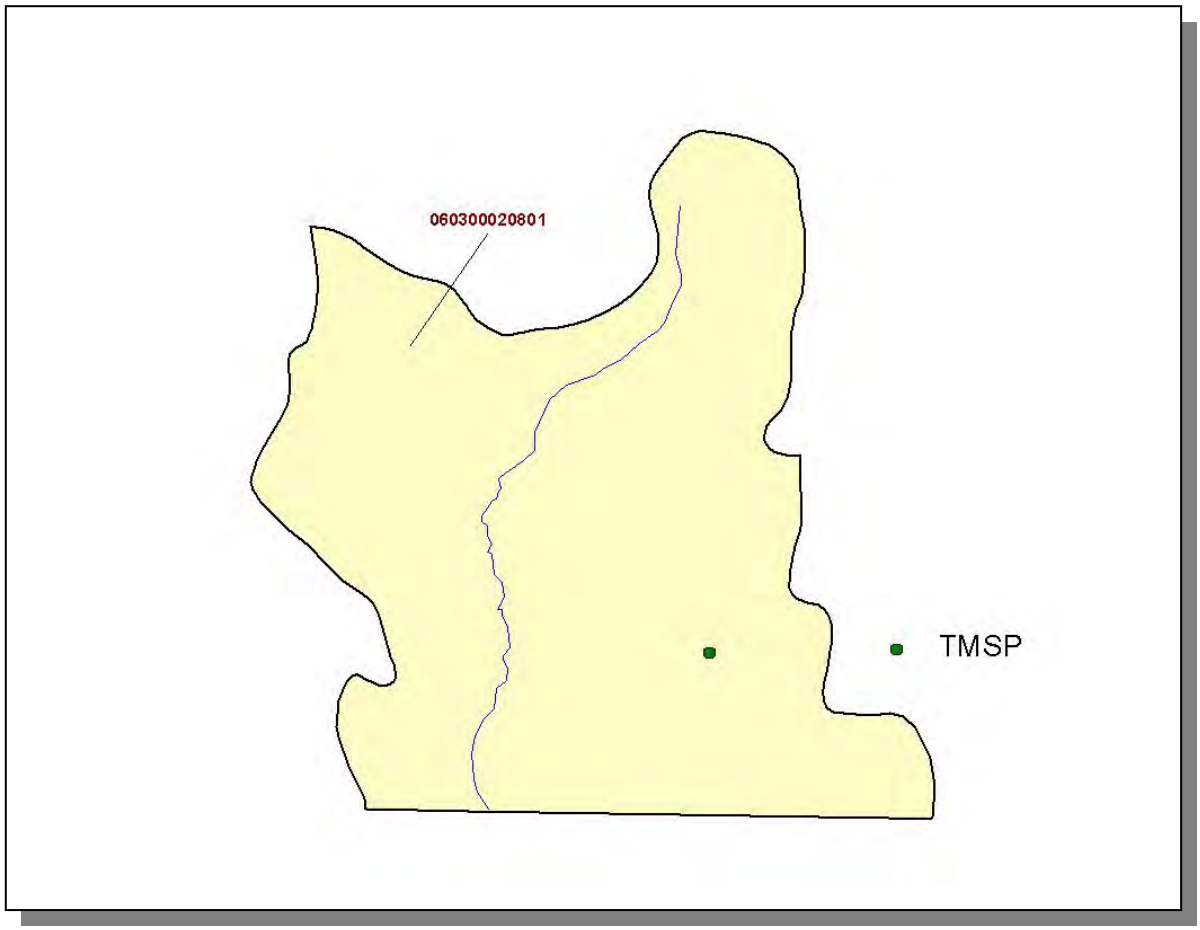

Figure 4-24. Location of Active Point Source Facilities in Tennessee Portion of Subwatershed 08010208. *Subwatershed 060300020801 boundary is shown for reference. More information is provided in the following charts.*

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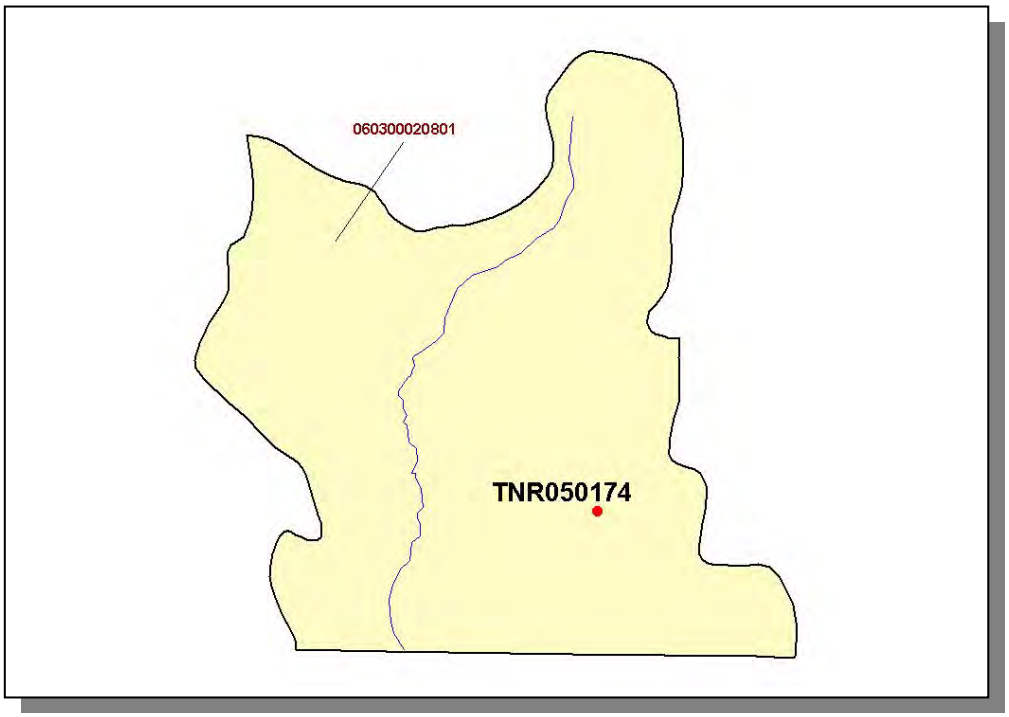

Figure 4-25. Location of TMSP Facilities in Tennessee Portion of Subwatershed 0603000208. *Subwatershed 060300020801 boundary is shown for reference. More information is provided in Wheeler-Appendix IV.*

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4.2.D.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens	Chickens Sold	Hogs	Sheep
109	9	238	0	5,456	30	1

Table 4-21. Summary of Livestock Count Estimates in Tennessee Portion of Subwatershed 0603000208. *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)
Giles	**171.8**	**171.8**	**3.3**	**11.4**

Table 4-22. Forest Acreage and Average Annual Removal Rates (1987-1994) in Tennessee Portion of Subwatershed 0603000208.

CROPS	TONS/ACRE/YEAR
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Corn (Row Crops)	4.21
Soybeans (Row Crops)	3.14
All Other Row Crops	2.70
Wheat (Close Grown Cropland)	1.90
Barley (Close Grown Cropland)	1.08
Summer Fallow (Other Cropland)	0.35
Grass (Hayland)	0.21
Legume/Grass (Hayland)	0.10
Grass (Pastureland)	1.05
Grass, Forbs, Legumes (Mixed Pasture)	0.80
Conservation Reserve Program Land	0.23
Other Vegetable and Truck Crops	4.29
Other Cropland not Planted	0.25
Farmsteads and Ranch Headquarters	0.13

Table 4-23. Annual Soil Loss in Tennessee Portion of Subwatershed 0603000208.

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4.2.E. 0603000209.

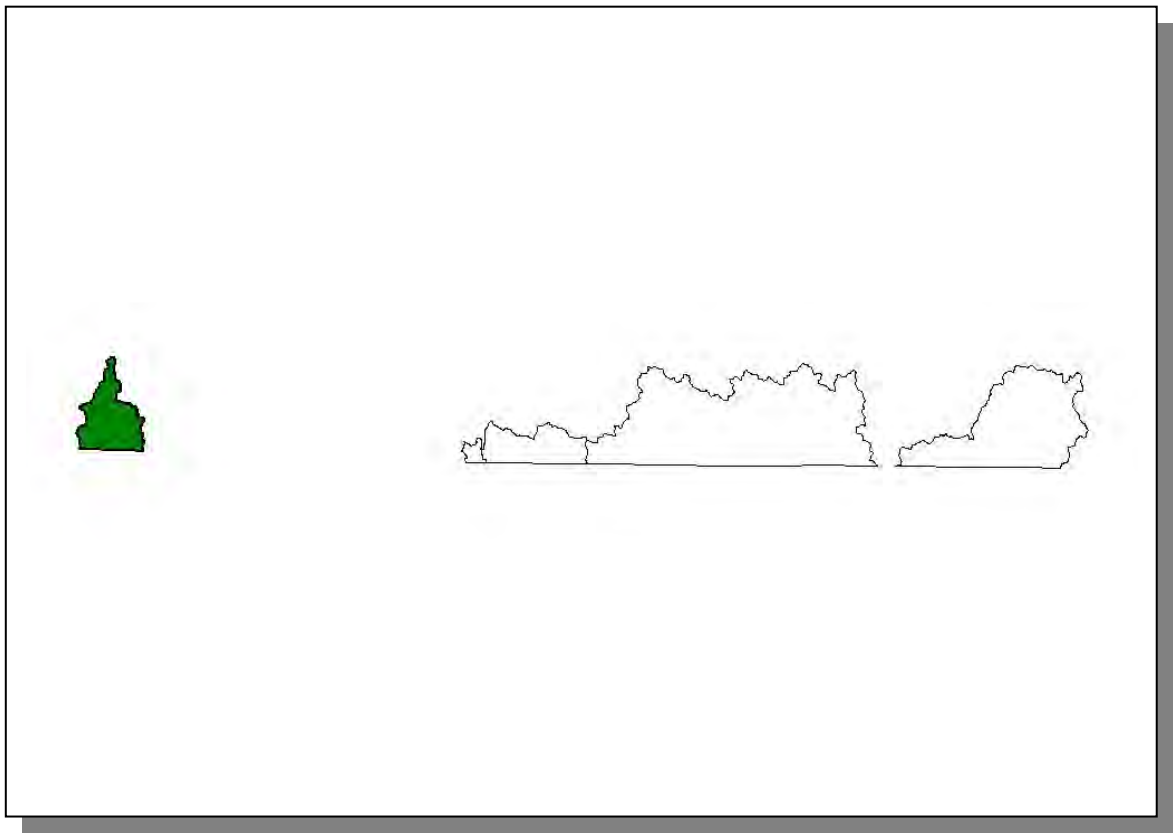

Figure 4-26. Location of Tennessee Portion of Subwatershed 0603000209. *All Wheeler Lake HUC-10 subwatershed boundaries are shown for reference.*

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4.2.E.i. General Description.

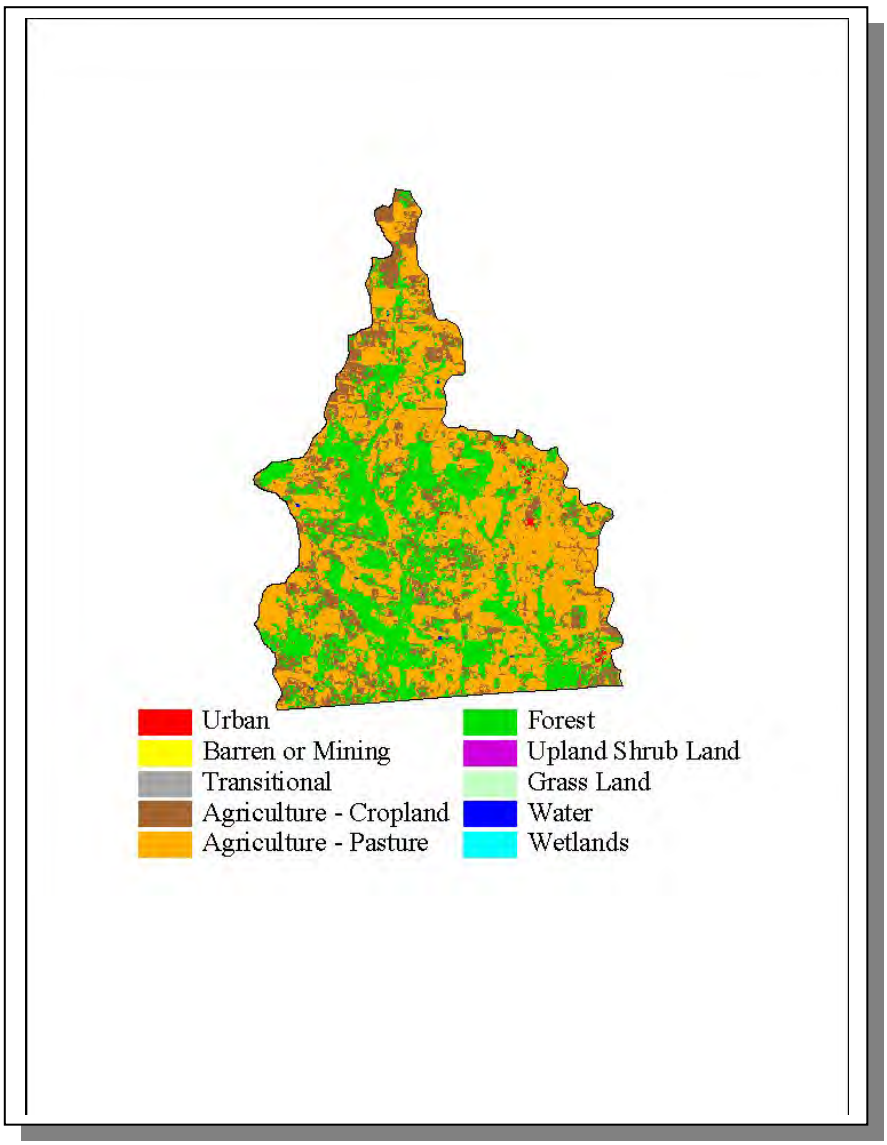

Figure 4-27. Illustration of Land Use Distribution in Subwatershed 0603000209.

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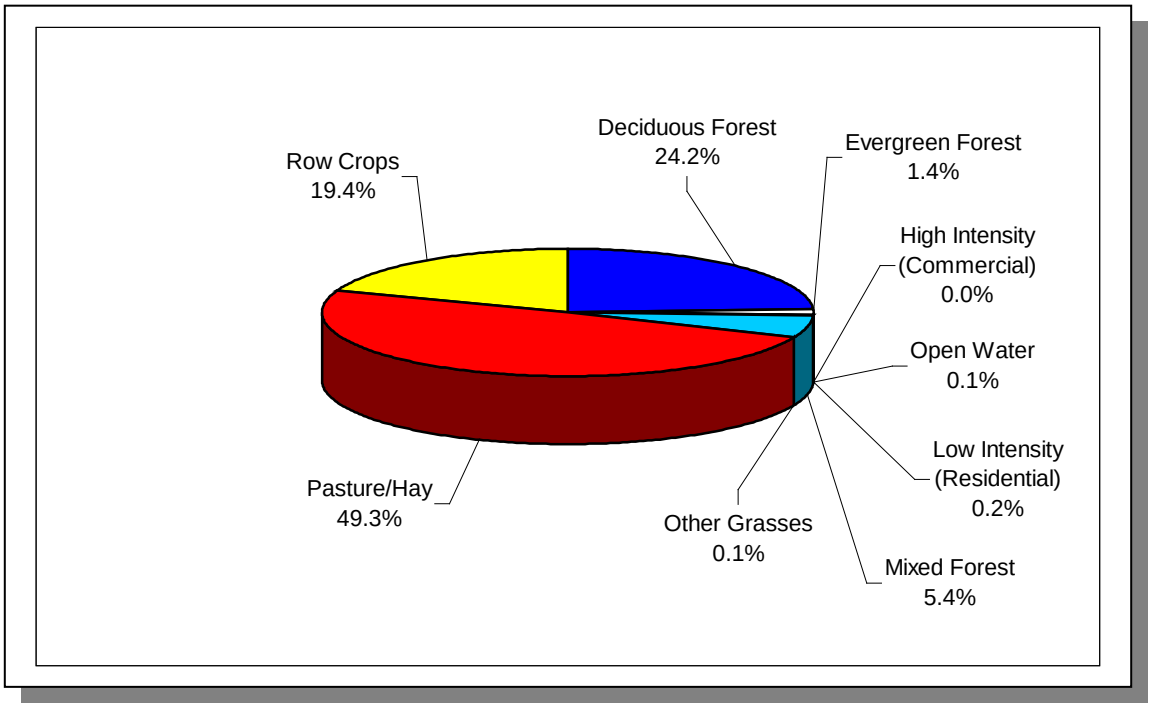

Figure 4-28. Land Use Distribution in Tennessee Portion of Subwatershed 0603000209. *More information is provided in Wheeler-Appendix IV.*

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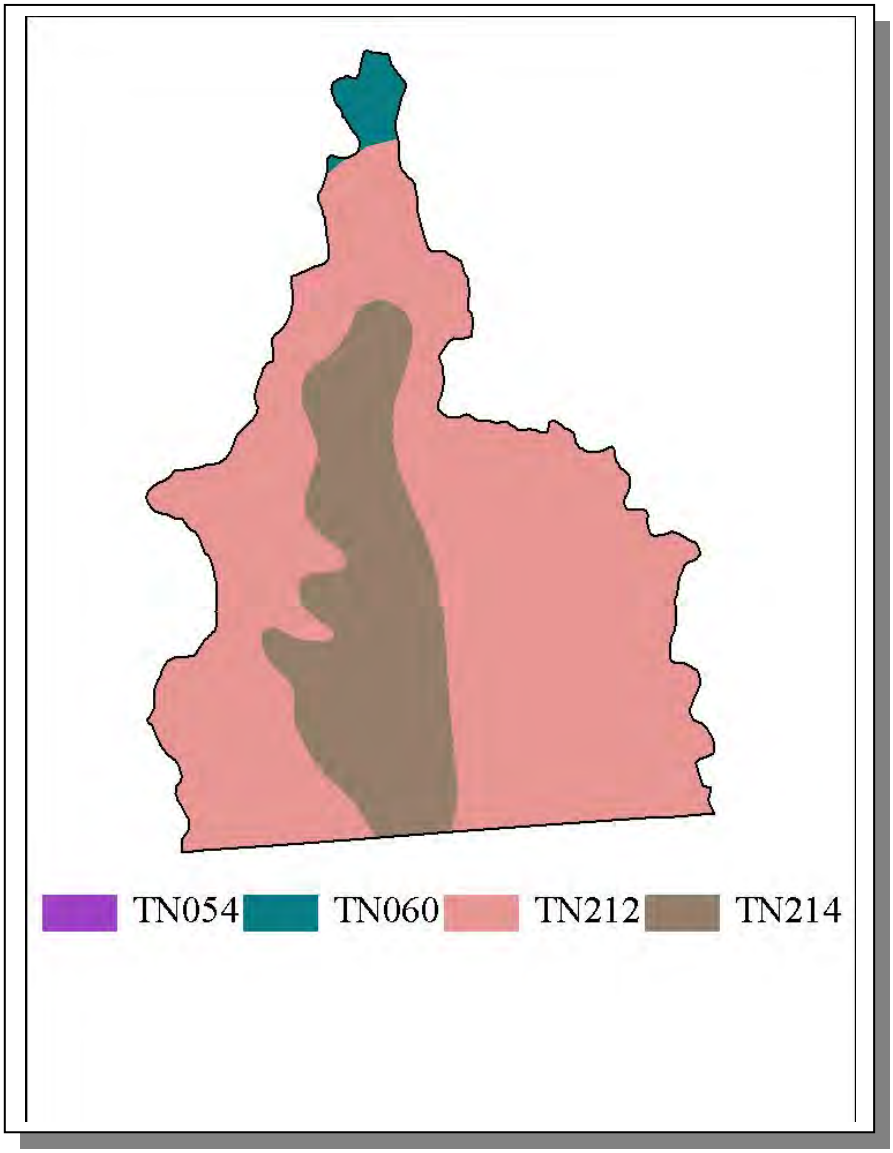

Figure 4-29. STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000209.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN212	4.00	B	1.95	5.04	Silty Loam	0.38
TN214	0.00	B	2.52	4.86	Loam	0.32

Table 4-24. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Tennessee Portion of Subwatershed 0603000209. *More information is provided in Wheeler-Appendix IV.*

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	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Lawrence	35,303	39,095	2.81	992	1,099	10.8

Table 4-25. Population Estimates in Tennessee Portion of Subwatershed 0603000209.

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4.2.E.ii. Point Source Contributions.

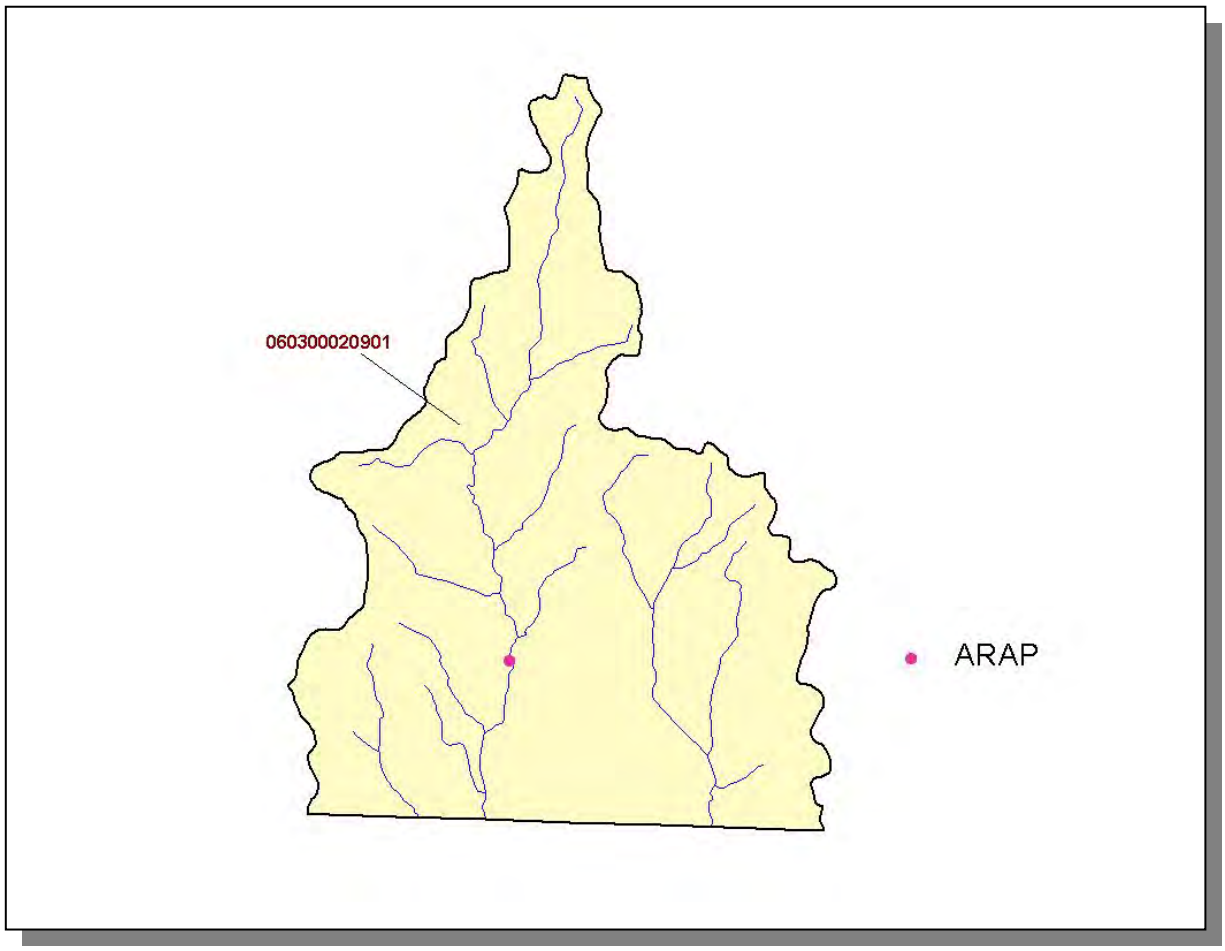

Figure 4-30. Location of Active Point Source Facilities in Tennessee Portion of Subwatershed 0603000209. *Subwatershed 060300020901 boundary is shown for reference. More information is provided in the following charts.*

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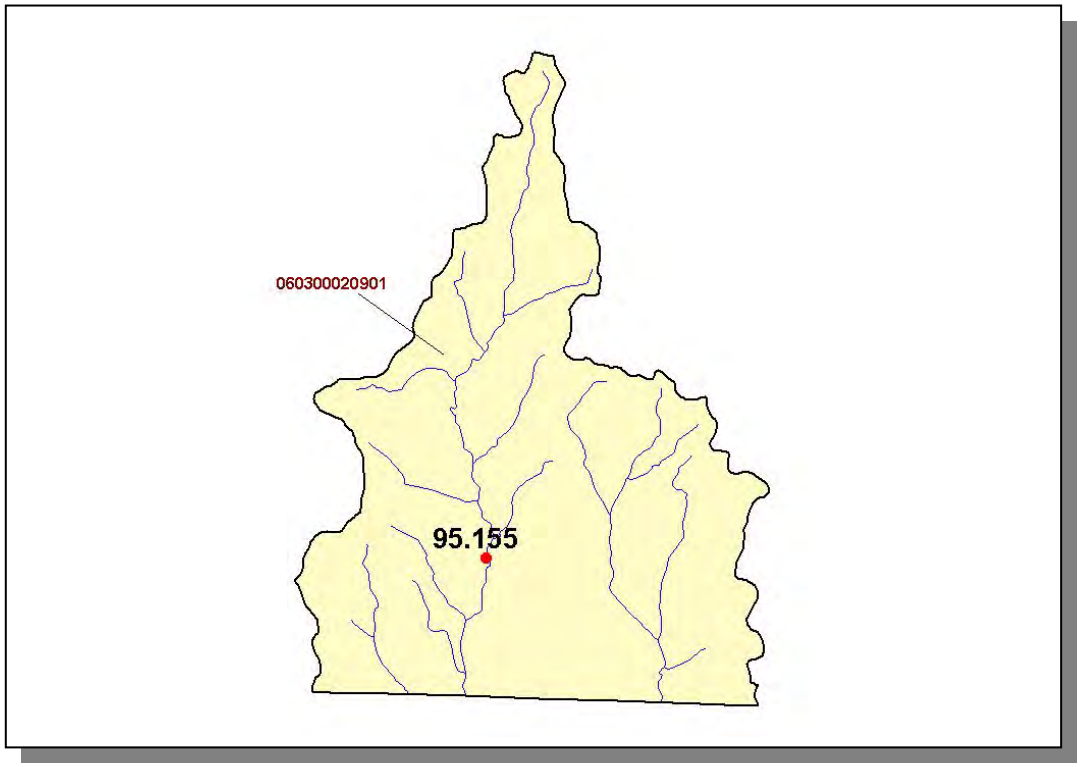

Figure 4-31. Location of ARAP Sites (Individual Permits) in Tennessee Portion of Subwatershed 0603000209. *Subwatershed 060300020901 boundary is shown for reference. More information is provided in Wheeler-Appendix IV.*

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4.2.E.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens	Chickens Sold	Hogs	Sheep
3,430	364	6,671	10	42,546	987	31

Table 4-26. Summary of Livestock Count Estimates in Tennessee Portion of Subwatershed 0603000209. *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)
Lawrence	199.8	199.8	6.6	27.1

Table 4-27. Forest Acreage and Annual Removal Rates (1987-1994) in Tennessee Portion of Subwatershed 0603000209.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.24
Grass, Forbs, Legumes (Mixed Pasture)	0.11
Grass (Hayland)	0.19
Legume/Grass (Hayland)	0.64
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Soybeans (Row Crops)	28.85
Corn (Row Crops)	5.41
Cotton (Row Crops)	8.07
Wheat (Close Grown Cropland)	14.15
All Other Close Grown Cropland	1.80
Conservation Reserve Program Land	0.90
Other Cropland not Planted	13.55
Farmsteads and Ranch Headquarters	6.47
Non Agricultural Land Use	0.00

Table 4-28. Annual Estimated Soil Loss in Tennessee Portion of Subwatershed 0603000209.

CHAPTER 5

WATER QUALITY PARTNERSHIPS IN THE WHEELER LAKE 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 Wheeler Lake Watershed. The information presented is provided by the agencies and organizations described.

5.2. FEDERAL PARTNERSHIPS.

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

Performance & Results Measurement System (PRMS) is a Web-based database application providing USDA Natural Resources Conservation Service, conservation partners, and the public fast and easy access to accomplishments and progress toward strategies and performance. The PRMS may be viewed at http://prms.nrcs.usda.gov/prms. From the opening menu, select "Reports," then select the Conservation Treatment of interest on the page that comes up. Select the desired location and time period from the drop down menus and choose "Refresh." Choose "by HUC" in the "Location" option and choose "Refresh" again.

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
Comprehensive Nutrient Management Plans (Number)	2
Conservation Buffers (Acres)	26
Erosion Reduction (Tons/Year)	3,341
Inventory and Evaluations (Number)	0
Irrigation Management (Acres)	0
Nutrient Management (Acres)	2,272
Pest Management (Acres)	1,085
Prescribed Grazing (Acres)	180
Residue Management (Acres)	2,130
Tree and Shrub Practices (Acres)	0
Waste Management (Number)	0
Wetlands Created, Restored, or Enhanced (Acres)	12
Wildlife Habitat (Acres)	200

Table 5-1. Landowner Conservation Practices in Partnership with NRCS in the Tennessee Portion of Wheeler Lake Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period. More information is provided in Wheeler-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 89 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/).

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. For a complete listing of endangered and threatened species in the Wheeler Lake Watershed, please visit the Service's website at http://www.cookeville.fws.gov.

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 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, 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.

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 Cookeville Ecological Services Field Office at 931/528-6481 or visit their website at http://www.cookeville.fws.gov.

5.2.D. Tennessee Valley Authority (TVA). Tennessee Valley Authority's (TVA) 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 formed 11 multidisciplinary Watershed Teams to help communities across the Tennessee Valley 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 Wilson Reservoir watershed.

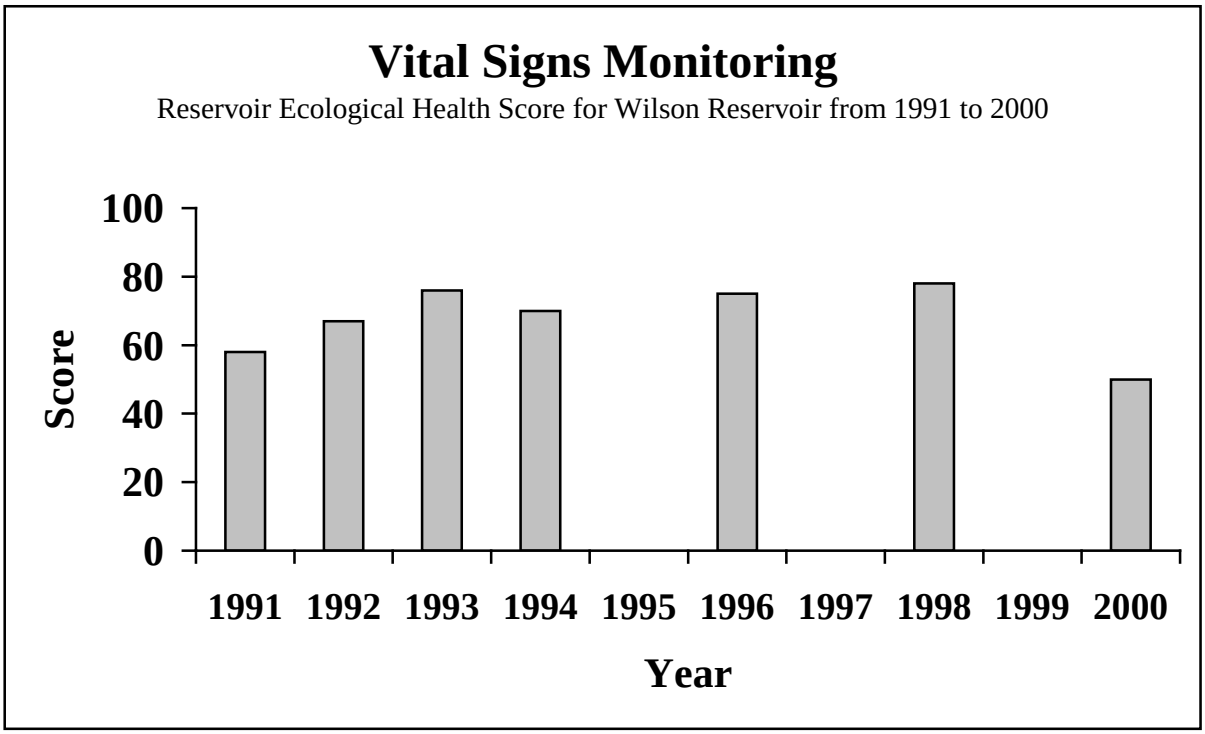
MONITORING

Vital Signs Monitoring

Reservoir Monitoring: TVA has monitored the quality of water resources of Wilson Reservoir regularly as part of its Vital Signs Monitoring effort since 1991. Physical, chemical, and biological indicators (dissolved oxygen, chlorophyll, sediment chemistry, benthos, and fish) provide information from various habitats on the ecological health of the reservoir. All sample sites in this watershed are located in Alabama. These parameters are sampled at the forebay station near Wilson Dam (TRM 260.8) and at the inflow station downstream of Wheeler Dam (TRM 273). Samples were collected annually from 1991 to 1994 and semiannually since. All sample locations are in Alabama.

Numeric ratings are given to all of the indicators sampled at each station. The lowest possible rating for any indicator is 1 (poorest condition) while the highest rating is 5 (best condition). Sediment chemistry is an exception; 0.5 is the lowest rating, 2.5 the highest. This information is used to evaluate conditions at each location as well as to develop an ecological health score for the reservoir. To obtain this score, ratings from all locations are summed and divided by total possible points for the reservoir. The result is then multiplied by 100. The lowest possible score is 20, the highest is 100.

The following chart presents Wilson Reservoir Vital Signs scores for each year for which data are comparable. Overall ecological health rating was fair in most years. Because of its overall small size and deep waters, overall ratings for Wilson Reservoir are very dependant upon weather conditions each year. Low flow rates during dry years produce very low dissolved oxygen levels in the forebay, which contributes to low benthos ratings. Low flows also contribute to higher chlorophyll levels. Typically, Wilson Reservoir typically rates fair to poor.



Bacteriological sampling: There are no bacteriological monitoring stations in this watershed located in Tennessee:

Fish Flesh Toxic Contaminants: TVA does not monitor fish flesh in this watershed within Tennessee.

Further information on Vital Signs Monitoring can be obtained by writing to Tyler Baker at: Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee, 37402 or calling him at 423-876-6733. Email address: tfbaker@tva.gov

Stream Bioassessment. Condition of water resources in Wilson watershed streams 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.

Attributes	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 regular.	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 sub-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.

TVA routinely samples 12 sites in the Tennessee portion of the Wilson watershed:

Bluewater Creek at Beartown Road
Butler Creek at TN Hwy. 227
Chisolm Creek at Old Railroad Bed Road
Crowson Creek at Old Waynesboro Road
East Fork Shoal Creek above the mouth
Factory Creek (lower) at Bromley Ford
Factory Creek (upper) at Luker Road
Holly Creek at Railroad Bed Road
Knob Creek at TN Hwy. 242
Little Shoal Creek at Davy Crockett State Park campground
Shoal Creek (lower) at Iron City Park
Shoal Creek (middle) at Hollis Hollow (SCM 38)

These sites are typically sampled every five years to keep a current picture of watershed condition. Results of the most recent surveys are summarized below.

	Year	Fish	EPT	Habitat
Bluewater Creek	2001	44-Fair/Good	8-Fair	35
Butler Creek	2002	52-Good	20-Good	34
Chisolm Creek	2000	*	*	*
Crowson Creek	2000	42-Fair	10-Good	29
East Fork Shoal Creek	2000	40-Fair	10-Good	32
Factory Creek (lower)	2000	52-Good	7-Fair	31
Factory Creek (upper)	2000	52-Good	18-Good	29
Holly Creek	2001	46-Fair/Good	12-Good	33
Knob Creek	2001	48-Good	15-Good	35
Little Shoal Creek	2000	*	*	*
Shoal Creek (lower)	2000	50-Good	14-Good	31
Shoal Creek (middle)	2000	*	*	*

*Data not available

Details about stream bioassessment sampling sites and scores can be obtained by writing Charles Saylor at Tennessee Valley Authority, PO Box 920, Ridge Way Road, Norris, TN 37828 or calling him at 865-632-1779. Email address: cfsaylor@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. In 1999, TVA initiated a series of workshops for watershed organizations. Past workshops have covered, state and federal water quality protection programs, grant writing, fund raising, communication/outreach, and strategic planning.

Inter-agency 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. Currently, the Pickwick Watershed Team is working with Davy Crockett State Park to establish a riparian buffer demonstration along Little Shoal Creek, to increase public awareness of the importance of riparian buffers.

Outreach

National Clean Boating Campaign: The National Clean Boating Campaign is a partnership program which 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.

Clean Marina Initiative: The Tennessee Valley Clean Marina Initiative is an effort by TVA to promote environmentally-responsible marina practices. This voluntary program, established in support of the National Clean Boating Campaign, helps marina operators protect the resource that provides them with their livelihood.

Since Wilson Reservoir is solely in Alabama, no marina efforts are being conducted in the Tennessee portion of this watershed.

Protection and restoration activities

Promote Best Management Practices: TVA provides funding and technical expertise to assist with instillation of best management practices (BMPs) that will reduce non-point pollution. TVA also works with partners to promote use of BMPs.

Shoreline stabilization: Although there is no reservoir shoreline in the Tennessee portion of the Wilson Reservoir watershed, the Pickwick Watershed Team provides technical assistance to stakeholders through individual landowner meetings and public workshops for those interested in stabilization on private stream bank areas.

Promote Riparian Buffers: An effective line of water quality protection is maintaining the vegetative plant cover along waterbodies. TVA encourages waterfront property owners to maintain or establish vegetated riparian buffers by providing information and materials to the riparian property owner. In 2002, TVA partnered with Davy Crockett State Park and Columbia State Community College to begin work on a riparian buffer demonstration area. Native riparian plant seedlings were planted along a 100 feet section of Shoal Creek and around a small mill pond within the park. Efforts to establish this demonstration site will continue in 2003. 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 will be available on the TVA internet site (http://www.tva.com/river/landandshore/index.htm) in March, 2002.

Further information on TVA's Watershed Assistance activities in the Wilson Watershed can be obtained by writing the Pickwick Watershed Team at: Tennessee Valley Authority, P.O. Box 1010, SB-1H, Muscle Shoals, AL 35662-1010 or calling them at 256/386-2228.

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 are 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.

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.

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.

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 Wheeler Lake Watershed was funded under an agreement with the Tennessee Department of Agriculture, Nonpoint Source Program, and the U.S. Environmental Protection Agency Assistance Agreements C9994674-99-0, C9994674-00-0, and C9994674-01-0.

- 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 about the joint policy to address Bad Actors in forestry operations is available at http://www.state.tn.us/environment/news/release/jan99/badact.htm

5.3.D. Alabama Division of Environmental Management. Alabama has a long history of water quality partnerships in the Tennessee River Basin. The most recent development affecting the role and depth of such efforts within the Valley include the creation of the Alabama Clean Water Partnership (CWP). The CWP is a coalition of public and private individuals, companies, organizations and governing bodies working together to protect and preserve water resources and aquatic ecosystems. The CWP has a strong presence in the Wheeler Lake Hydrologic Unit through the Tennessee River Basin Clean Water Partnership Steering Committee and sub-basin committees. Like similar committees established throughout the other river basins of the State, the CWP efforts in the Wheeler Hydrologic Unit are focused on the development of new partnerships, support of existing partnerships and the funding to support water quality projects. Recent efforts by the CWP have resulted in several new watershed projects in the Wheeler Lake Hydrologic Unit that are scheduled to receive funding through Alabama's Nonpoint Source Management Program.

The CWP is currently working closely with the Alabama Department of Environmental Management to facilitate stakeholder-led, long-term water quality planning efforts and to develop watershed management plans by river basin and to develop specific restoration plans for impaired waterbodies. These planning efforts will help target waterbodies and watersheds for concentrated efforts in future years.

The majority of local partnerships and water quality projects currently active in the Tennessee River Basin occur in the Wheeler Lake Hydrologic Unit. To date, five watershed projects have developed in the Wheeler sub-basin with combinations of

financial support from Section 319 grants, Tennessee Valley Authority, Soil & Water Conservation Districts, industry, foundations and local government sources. Some of these projects date back to the initial efforts of Alabama's Nonpoint Source Management Program.

Active partnerships and watershed projects in the Wheeler Lake Hydrologic Unit include the Cotaco Creek, Flint Creek, Flint River, Paint Rock River, and Piney Creek projects. While each of these partnerships was organized around a different combination of issues and concerns, due to the long history of agriculture in the area most seek to address agricultural nonpoint source issues.

For more information concerning Clean Water Partnership activities in the Tennessee Valley of Alabama, contact Vicky Mitchell, Basin Facilitator by phone at (256) 353-6146 x2, or by E-mail: sobroke@aol.com.

For information regarding Clean Water Partnership activities elsewhere in Alabama, you may contact the ADEM website http://www.adem.state.al.us, the Clean Water Partnership website http://ww.cleanwaterpartnership.org> or call Allison Newell, Statewide ACWP Coordinator at 1-888-3 Got H2O.

CHAPTER 6

FUTURE DIRECTIONS IN THE WHEELER LAKE 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 stormwater rules (implemented under the NPDES program) are transitioning from Phase 1 to Phase 2. More information on stormwatrer rules may be found at: http://www.state.tn.us/environment/wpc/stormh2o/MS4.htm.

This Chapter addresses point and nonpoint source approaches to water quality problems in the Wheeler Lake Watershed as well as specific NPDES permittee information.

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

6.2.A. Year 1 Public Meeting. The first Wheeler Lake Watershed public meeting was held April 16, 1997 in Pulaski. 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.

6.2.B. Year 3 Public Meeting. The second Wheeler Lake Watershed public meeting was held October 26, 1999 at the Winchester Courthouse. 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.

6.2.C. Year 5 Public Meeting. The third scheduled Wheeler Lake Watershed public meeting was held October 30, 2003 at the Columbia State Community College-Lawrenceburg Campus (this meeting was for the Wheeler Lake and Pickwick Lake Watersheds). 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
- Tennessee Valley Authority display

In addition, citizens had the opportunity to make formal comments on the draft Watershed Water Quality Management Plan and to rate the effectiveness of the meeting.

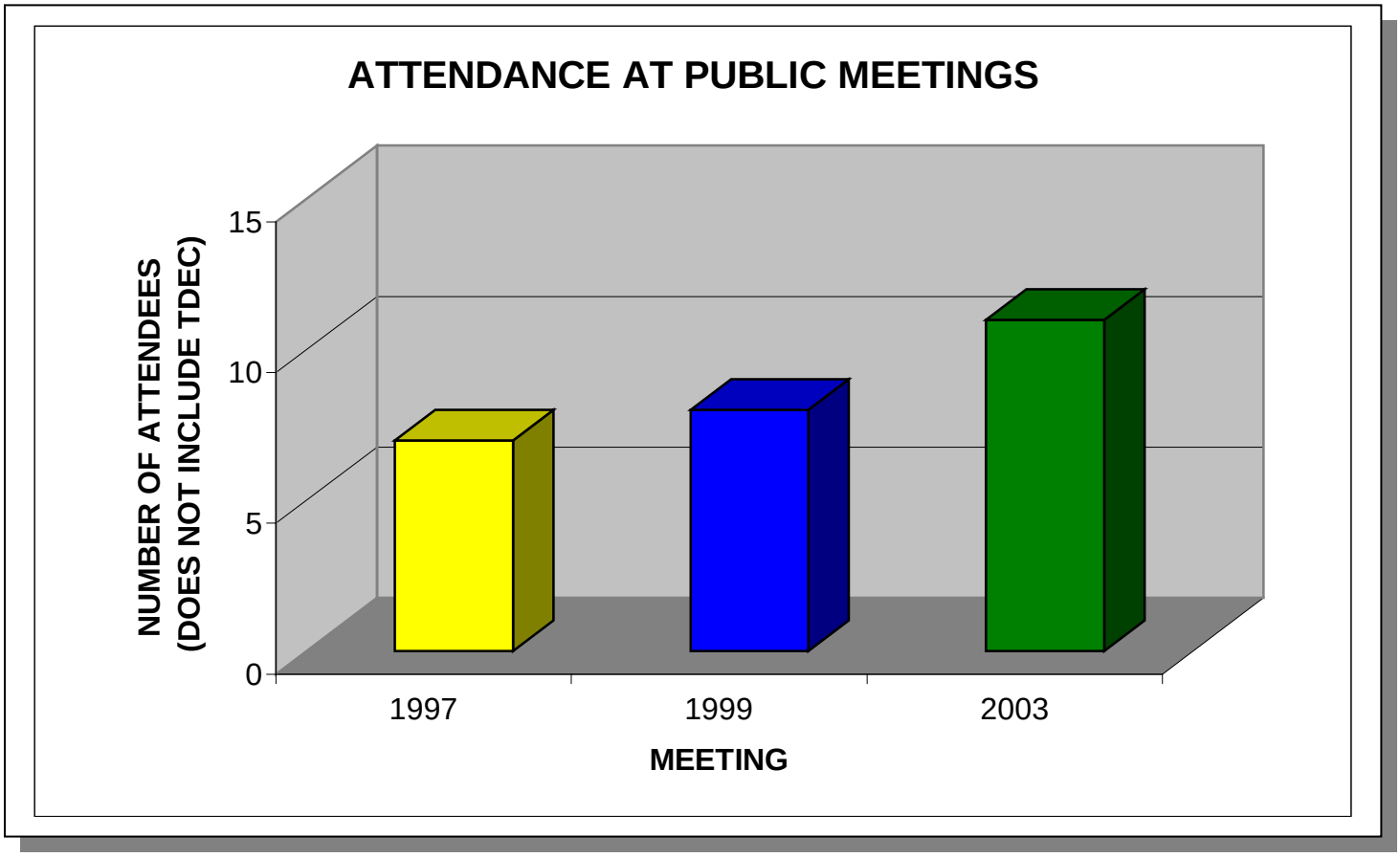


Figure 6-1. Attendance at Public Meetings in the Wheeler Lake Watershed. *The 1997 and 1999 watershed meeting numbers represent Wheeler Lake, Pickwick Lake, Upper Elk River, and Lower Elk River, Watershed joint meetings.*

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.php

TMDLs are prioritized for development based on many factors.

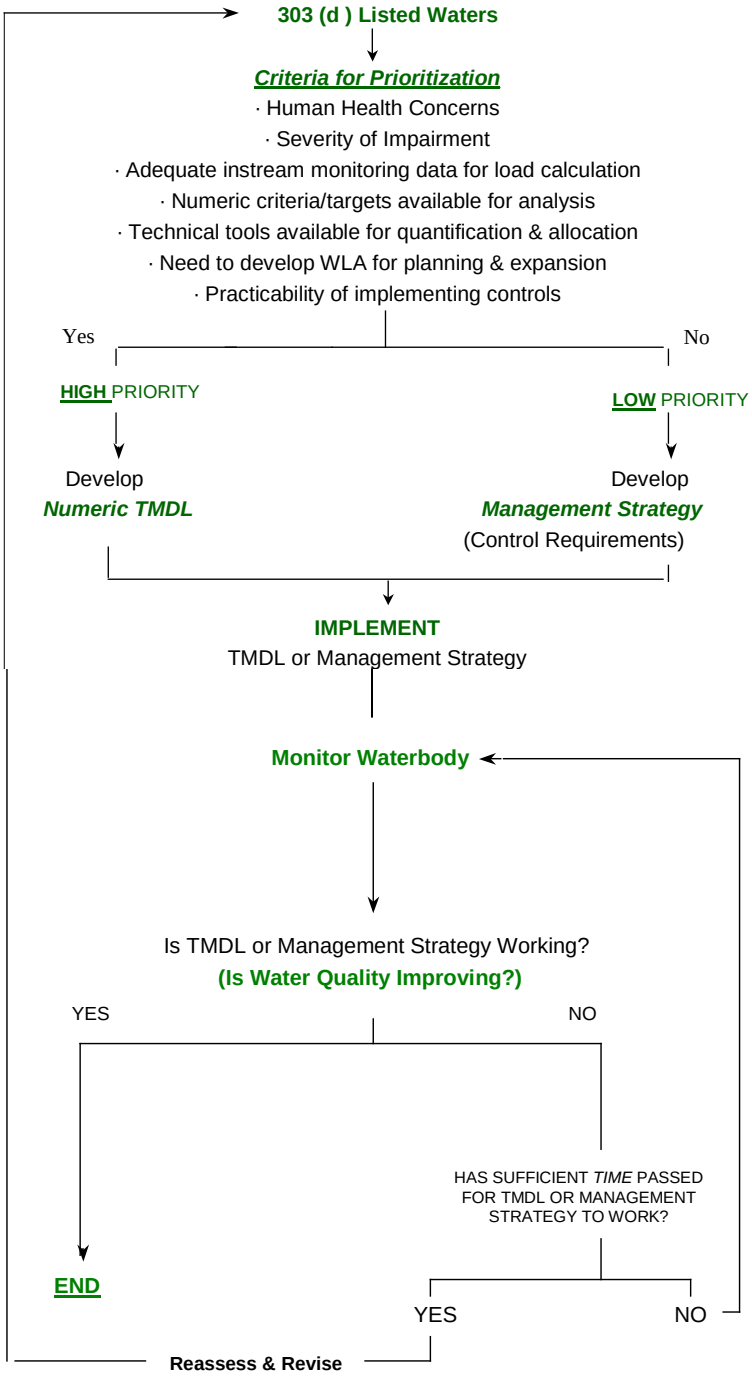


Figure 6.2. Prioritization scheme for TMDL Development.

6.3.B. Nonpoint Sources

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

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

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

6.3.B.i. Sedimentation.

6.3.B.i.a. From Construction Sites. Construction activities have historically been considered “nonpoint sources.” In the late 1980’s, EPA designated them as being subject to NPDES regulation if more than 5 acres are disturbed. In the spring of 2003, that threshold became 1 acre. The general permit issued for such construction sites sets out conditions for maintenance of the sites to minimize pollution from stormwater 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 already impaired due to sedimentation. Regardless of the size, no construction site is allowed to cause a condition of pollution.

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. An Example of this type of stream is the Flint River.

6.3.B.i.b. From Channel and/or Bank Erosion. Methods or controls that might be necessary to address common problems are:

Voluntary activities

- Re-establishment of bank vegetation (example: Flint River).
- Limit cattle access to streams and bank vegetation (example: Flint River).

Additional strategies

- Community planning for the impacts of development on small streams.
- Restrictions requiring post construction run-off rates to be no greater than pre-construction rates in order to avoid in-channel erosion.
- Additional restrictions on logging in streamside management zones.
- Prohibition on clearing of stream and ditch banks. *Note: Permits may be required for any work along streams.*
- Additional restriction to road and utilities crossings of streams.
- Restrictions on the use of off-highway vehicles on stream banks and in stream channels.

6.3.B.i.c. From Agriculture and Silviculture. Even though there is an exemption in the Water Quality Control Act stating that normal agricultural and silvicultural practices that do not result in a point source discharge do not have to obtain a permit, efforts are being made to address impacts due to these practices.

The Master Logger Program has been in place for several years to train loggers how to plan their logging activities and to install Best management Practices that lessen the impact of logging activities. Recently, laws and regulations were enacted which established the expected BMPs to be used and allows the Commissioners of the Departments of Environment and Conservation and of Agriculture to stop a logging operation that has failed to install these BMPs and so are impacting 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. The Flint River could benefit from agricultural BMPs.

6.3.B.ii. Pathogen Contamination.

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

surface disposal of wastewater. The Division of Water Pollution Control regulates surface disposal.

Other measures that may be necessary to control pathogens are:

Voluntary activities

- Off-channel watering of livestock.
- Limiting livestock access to streams.
- Proper management of animal waste from feeding operations.

Enforcement strategies

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

Additional strategies

- Restrict development in areas where sewer is not available and treatment by subsurface disposal is not an option due to poor soils, floodplains, or high water tables.
- Develop and enforce leash laws and controls on pet fecal material.
- Greater efforts by sewer utilities to identify leaking lines or overflowing manholes.
- Cattle exclusion projects (example: unnamed tributary to Hester Creek).

6.3.B.iii. Toxins and Other Materials.

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

Voluntary activities

- Providing public education.
- Painting warnings on storm drains that connect to a stream.
- Sponsoring community clean-up days.
- Landscaping of public areas.
- Encouraging public surveillance of their streams and reporting of dumping activities to their local authorities.

Needing regulation

- Prohibition of illicit discharges to storm drains.
- Litter laws and strong enforcement at the local level.

6.3.B.v. Habitat Alteration.

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

Measures that can help address this problem are:

Voluntary activities

- Sponsoring litter pickup days to remove litter that might enter streams.
- Organizing stream cleanups removing trash, limbs and debris before they cause blockage.
- Avoiding use of heavy equipment to "clean out" streams.
- Planting vegetation along streams to stabilize banks and provide habitat (example: Flint River).
- Encouraging developers to avoid extensive culverts in streams.

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.
- More frequent construction stormwater inspections (example: Flint River).

Additional Enforcement

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

6.4. PERMIT REISSUANCE PLANNING

Under the *Tennessee Water Quality Control Act*, municipal, industrial and other dischargers of wastewater must obtain a permit from the Division. Approximately 1,700 permits have been issued in Tennessee under the federally delegated National Pollutant Discharge Elimination System (NPDES). These permits establish pollution control and monitoring requirements based on protection of designated uses through implementation of water quality standards and other applicable state and federal rules.

The following three sections provide specific information on municipal, industrial, and water treatment plant active permit holders in the Wheeler Lake watershed. Compliance information was obtained from EPA's Permit Compliance System (PCS). All data was queried for a five-year period between January 1, 2001 and December 31, 2006. PCS can be accessed publicly through EPA's Envirofacts website. This website provides access to several EPA databases to provide the public with information about environmental activities that may affect air, water, and land anywhere in the United States:

http://www.epa.gov/enviro/html/ef_overview.html

Stream Segment information, including designated uses and impairments, are described in detail in Chapter 3, *Water Quality Assessment of the Wheeler Lake Watershed*.

6.4.A. Municipal Permits

TN0058939 Highland Rim School

Discharger rating: Major
City: Fayetteville
County: Lincoln
EFO Name: Columbia
Issuance Date: 6/29/02
Expiration Date: 6/30/07
Receiving Stream(s): Harper Branch at mile 1.3
HUC-12: 060300020201
Effluent Summary: Treated domestic wastewater from Outfall 001
Treatment system: Extended aeration

Segment	TN060300021216_0210
Name	Washburn Branch
Size	17.3
Unit	Miles
First Year on 303(d) List	2004
Designated Uses	Recreation (Not Assessed), Irrigation (Supporting), Fish and Aquatic Life (Non-Supporting), Livestock Watering and Wildlife (Supporting)
Causes	Alteration in stream-side or littoral vegetative covers, Sedimentation/Siltation
Sources	Non-irrigated Crop Production

Table 6-1. Stream Segment Information for Highland Rim School.

PARAMETER	*SEASON*	*LIMIT*	*UNITS*	*SAMPLE DESIGNATOR*	*MONITORING FREQUENCY*	*SAMPLE TYPE*	*MONITORING LOCATION*
Ammonia as N (Total)	All Year	10	mg/L	DMax Conc	2/Month	Grab	Effluent
Ammonia as N (Total)	All Year	5	mg/L	MAvg Conc	2/Month	Grab	Effluent
CBOD5	All Year	40	mg/L	DMax Conc	2/Month	Grab	Effluent
CBOD5	All Year	25	mg/L	MAvg Conc	2/Month	Grab	Effluent
D.O.	All Year	5	mg/L	DMin Conc	Weekdays	Grab	Effluent
Fecal Coliform	All Year	1000	#/100mL	DMax Conc	2/Month	Grab	Effluent
Fecal Coliform	All Year	200	#/100mL	MAvg Geo Mean	2/Month	Grab	Effluent
Settleable Solids	All Year	1	mL/L	DMax Conc	2/Week	Grab	Effluent
TRC	All Year	0.5	mg/L	DMax Conc	Weekdays	Grab	Effluent
TSS	All Year	45	mg/L	DMax Conc	2/Month	Grab	Effluent
TSS	All Year	30	mg/L	MAvg Conc	2/Month	Grab	Effluent
pH	All Year	8.5	SU	DMax Conc	2/Week	Grab	Effluent
pH	All Year	6.5	SU	DMin Conc	2/Week	Grab	Effluent

Table 6-2. Permit Limits for Highland Rim School.

Comments:
None.

APPENDIX II

ID	NAME	HAZARD
267007	Lakeview #1	3
267008	Lakeview #2	3
527004	Childress Lake	S
527006	Rebecca Lake	2
527008	Steelman Lake	S

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

LAND COVER/LAND USE	ACRES	% OF WATERSHED
Open Water	254	0.2
Other Grasses	741	0.5
Pasture/Hay	38,138	26.2
Row Crops	35,869	24.7
Woody Wetlands	4,451	3.1
Emergent Herbaceous Wetlands	84	0.1
Deciduous Forest	54,941	37.8
Mixed Forest	6,795	4.7
Evergreen Forest	1,433	1.0
High Intensity: Commercial/Industrial	598	0.4
High Intensity: Residential	126	0.1
Low Intensity: Residential	1,289	0.9
Transitional	600	0.4
Total	**145,319**	**100.1**

Table A2-2. Land Use Distribution in the Tennessee Portion of the Wheeler Lake 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
Cumberland Plateau (68a)	Rock Creek Laurel Fork Clear Creek Piney Creek Mullens Creek Daddys Creek Island Creek Rock Creek	South Fork Cumberland South Fork Cumberland Emory River Watts Bar/Fort Loudoun Lake Tennessee River Emory River Emory River Emory River	05130104 05130104 06010208 06010201 06020001 06010208 06010208 06010208
Plateau Escarpment (68c)	Ellis Gap Branch Mud Creek Crow Creek Crow Creek	Tennessee River Upper Elk River Guntersville Lake Guntersville Lake	06020001 06030003 06030001 06030001
Western Highland Rim (71f)	Brush Creek Little Swan Creek South Harpeth Creek Hurricane Creek Swanegan Branch Wolf Creek	Buffalo River Lower Duck River Harpeth River Lower Duck River Pickwick Lake Lower Duck River	06040004 06040003 05130204 06040003 06030005 06040003
Eastern Highland Rim (71g)	Flat Creek Spring Creek Hurricane Creek	Cordell Hull Lake Cordell Hull lake Upper Elk River	05130106 05130106 06030003
Outer Nashville Basin (71h)	Carson Fork Clear Creek Flynn Creek	Stones River Caney Fork River Cordell Hull lake	05130203 05130108 05130106

Table A2-3. Ecoregion Monitoring Sites in Ecoregions 68a, 68c, 71f, 71g, and 71h.

.

CODE	NAME	AGENCY	AGENCY ID
124	TDEC/DNH FLINT RIVERBOTTOM STATE NATURAL AREA SITE	TDEC/DNH	S.USTNHP 149
926	TDEC/DNH RON JONES REPORT: CARTER MOUNTAIN SITE 7A	TDEC/DNH	SOURCECODE F88JON01TNUS
927	TDEC/DNH RON JONES REPORT: CARTER MOUNTAIN SITE 7B	TDEC/DNH	SOURCECODE F88JON01TNUS
928	TDEC/DNH RON JONES REPORT: FRANKLIN COUNTY SITE 8	TDEC/DNH	SOURCECODE F88JON01TNUS
963	TDEC/DNH RON JONES REPORT: FRANKLIN CO SITE 55	TDEC/DNH	SOURCECODE F88JON01TNUS

Table A2-4. Wetland Sites in Wheeler Lake Watershed in TDEC Database. *TDEC/DNH, Tennessee Department of Environment and Conservation/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 (MILES)
Big Huckleberry Creek	TN060300021149_0600	12.2
Bimgham Cove Branch	TN06030002056_0321	9.6
Briar Fork	TN06030002073_1000	6.4
Burks Creek	TN06030002056_0210	4.2
Campers Branch	TN060300021216_0220	4.8
Cottrell Spring Branch	TN060300021149_0100	8.7
Cotts Creek	TN06030002103_0200	10.5
Crossroads Branch	TN06030002103_0100	2.5
Donneby Branch	TN060300021149_0800	5.8
Dry Creek	TN06030002056_0220	7.0
Estill Fork	TN06030002056_0200	7.5
Fowler Creek	TN060300021216_0100	8.8
Grays Cove Creek	TN06030002056_0320	9.7
Harbin Branch	TN060300021149_0200	12.3
Hester Creek	TN060300021124_1000	22.7
Hurricane Creek	TN06030002056_0300	1.7
Jenny River	TN060300021124_0100	2.4
Johnson Branch	TN06030002090_0100	6.8
Keller Creek	TN06030002056_0230	7.4
Larkin Fork	TN06030002056_0100	8.4
Limestone Creek	TN06030002089_1000	14.9
Little Huckleberry Creek	TN060300021149_0610	7.5
Little Limestone Creek	TN06030002090_1000	2.2
Mason Branch	TN060300021149_0110	6.1
Merrill Branch	TN060300021149_0700	2.4
Mill Creek	TN06030002056_0330	3.2
Misc. tribs to Little Limestone Creek	TN06030002090_0999	1.2
Mulepen Creek	TN060300021149_0500	4.6
Piney Creek	Tn0603000209232_1000	2.1
Second Creek	TN06030002103_1000	19.1
Smith Branch	TN06030002090_0200	5.6
Stiles Creek	TN060300021149_0400	5.7
Trotters Branch	TN060300021149_0300	16.4
Turkey Creek	TN06030002056_0310	6.4
Walker Creek	TN060300021216_0200	17.0
Washburn Branch	TN060300021216_0210	17.3

Table A3-1a. Streams Not Assessed in the Tennessee Portion of the Wheeler Lake Watershed. *Data are based on Year 2000 Water Quality Assessment*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Flint River	TN060300021149_1000	22.0

Table A3-1b. Streams Partially Supporting Designated Uses in the Tennessee Portion of the Wheeler Lake Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Flint River	TN060300021149_1000	22.0	Partial

Table A3-2a. Stream Impairment Due to Habitat Alterations in the Tennessee Portion of the Wheeler Lake Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Flint River	TN060300021149_1000	22.0	Partial

Table A3-2b. Stream Impairment Due to Siltation in the Tennessee Portion of the Wheeler Lake Watershed. *Data are based on Year 2000 Water Quality Assessment*

APPENDIX IV

LAND USE/LAND COVER	AREAS IN HUC-10 SUBWATERSHEDS (ACRES)				
	01	02	06	08	09
Deciduous Forest	37,091	12,305	2,103	370	3,072
Emergent Herbaceous Wetlands		64	20		
Evergreen Forest	345	723	148	42	175
High Intensity: Commercial/Industrial/Transportation	98	434	35	25	6
High Intensity: Residential		93	7	26	
Low Intensity: Residential	18	1,071	96	76	28
Mixed Forest	1,391	4,143	459	121	681
Open Water	0	230	17		7
Other Grasses: Urban/Recreational	2	670	1	52	16
Pasture/Hay	623	26,282	4,652	317	6,264
Row Crops	428	28,605	4,046	324	2,466
Transitional	515	85			
Woody Wetlands		3,858	593		
Total	**40511**	**78,563**	**12,176**	**1,354**	**12,715**

Table A4-1. Land Use Distribution in the Tennessee Portion of Wheeler Lake 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	NAME	AREA (SQ MILES)	LOW FLOW (CFS)		
					1Q10	7Q10	3Q20
03574700	0603000302	USGS	Big Huckleberry Creek				

Table A4-3. Historical Streamflow Data Summary Based on Mean Daily Flows in Wheeler Lake Watershed*. USGS, United States Geological Survey.*

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	MADI	WATERBODY	HUC-10
TN0058939	Highland Rim School STP	4952	Sewerage System	Minor	Harper Branch @ RM 1.3	0603000202

Table A4-4. Active Permitted Point Source Facilities in the Tennessee Portion of Wheeler Lake Watershed. *SIC, Standard Industrial Classification; MADI, Major Discharge Indicator.*

FACILITY NUMBER	FACILITY NAME	SECTOR	RECEIVING STREAM	AREA*	HUC-10
TNR053263	Fayetteville Municipal Airport	S	Walker Creek	0.7	0603000202
TNR054240	Davie R. Ashley Sawmill	A, P	Hester Creek	6.0	0603000202
TNR050174	Wolverine Tube, Incorporated	F, AA	Piney Creek	3.1	0603000208

Table A4-5. Active Permitted TMSP Facilities in the Tennessee Portion of Wheeler Lake Watershed. *Area, acres of property associated with industrial activity. Sector details may be found in Table A4-8.*

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 A4-6. TMSP Sectors and Descriptions.

FACILITY NUMBER	PERMITEE	COUNTY	LIVESTOCK	WATERBODY	HUC-10
TNA000030	David Underwood	Lincoln	Poultry	Flint River	0603000202
TNA000106	Gary Phillips	Lincoln	Poultry	Crystal Springs Branch	0603000202
TNA000090	Scivally Farms	Lincoln	Poultry	Mulepen Creek	0603000202

Table A4-7. CAFO Sites in the Tennessee Portion of Wheeler Lake Watershed.

LOG NUMBER	COUNTY	DESCRIPTION	WATERBODY	HUC-10
94.008A	Lincoln	Gravel Dredging	Cottrell Springs Creek	0603000202
94.008B	Lincoln	Gravel Dredging	Cottrell Springs Creek	0603000202
96.167	Lincoln	Gravel Dredging	Walker Creek	0603000202
97.419	Lincoln	Gas Line Crossing	Harbin Creek	0603000202
97.594	Lincoln	Gravel Dredging	Harbin Creek	0603000202
9810.014	Lincoln	Gravel Dredging	Stiles Creek	0603000202
9810.157	Lincoln	Road Crossing	Trotters Branch	0603000202
95.155	Lawrence	Gravel Dredging	Second Creek	0603000209

Table A4-8. Individual ARAP Permits Issued January 1994 Through June 2000 in the Tennessee Portion of Wheeler Lake Watershed.

APPENDIX V

CONSERVATION PRACTICE	UNITS	AMOUNT
Alley Cropping	Acres	0
Contour Buffer Strips	Acres	0
Crosswind Trap Strips	Acres	0
Field Borders	Feet	0
Filter Strips	Acres	15
Grassed Waterways	Acres	1
Riparian Forest Buffers	Acres	11
Streambank and Shoreline Protection	Feet	0
Windbreaks and Shelterbelts	Feet	0
Hedgerow Plantings	Feet	0
Herbaceous Wind Barriers	Feet	0
Total Conservation Buffers	Acres	26

Table A5-1a. Conservation Buffers Conservation Practices in Partnership with NRCS in the Tennessee Portion of Wheeler Lake Watershed. *Data are from Performance & Results Measurement System (PRMS) for October 1, 2001 through September 30, 2002 reporting period.*

PARAMETER	TOTAL
Erosion Reduction Applied (Acres)	792
Highly Erodible Land With Erosion Control Practices (Acres)	792
Estimated Annual Soil Saved By Erosion Control Measures (Tons/Year)	3,341
Total Estimated Soil Saved (Tons/Year)	3,341

Table A5-1b. Erosion Control Conservation Practices in Partnership with NRCS in the Tennessee Portion of Wheeler Lake Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

PARAMETER	TOTAL
Acres of AFO Nutrient Management Applied	292
Acres of Non-AFO Nutrient Management Applied	1,980
Total Acres Applied	2,272

Table A5-1c. Nutrient Management Conservation Practices in Partnership with NRCS in the Tennessee Portion of Wheeler Lake Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

PARAMETER	TOTAL
Acres of Pest Management Systems Applied	1,085

Table A5-1d. Pest Management Conservation Practices in Partnership with NRCS in the Tennessee Portion of Wheeler Lake Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

CONSERVATION PRACTICE	ACRES
Acres of Wetlands Created or Restored	0
Acres of Wetlands Enhanced	12
Total Acres Created, Restored, or Enhanced	12

Table A5-1e. Wetland Conservation Practices in Partnership with NRCS in the Tennessee Portion of Wheeler Lake Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

CONSERVATION PRACTICE	ACRES
Acres of Upland Habitat Management	188
Acres of Wetland Habitat Management	12
Total Acres Wildlife Habitat Management	200

Table A5-1f. Wildlife Habitat Management Conservation Practices in Partnership with NRCS in the Tennessee Portion of Wheeler Lake Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

NRCS CODE	PRACTICE	NUMBER OF BMPs
317	Composting facility	1
342	Critical Area Treatment	2
378	Pond	3
378a	Pond for Rotational Grazing System	1
382	Fencing	8
512	Pasture and Hayland Planting	19
512a	Cropland Conversion	4
561	Heavy Use Area	2
600	Terraces	1

Table A5-2. Best Management Practices Installed by Tennessee Department of Agriculture and Partners in the Tennessee portion of the Wheeler Lake Watershed.