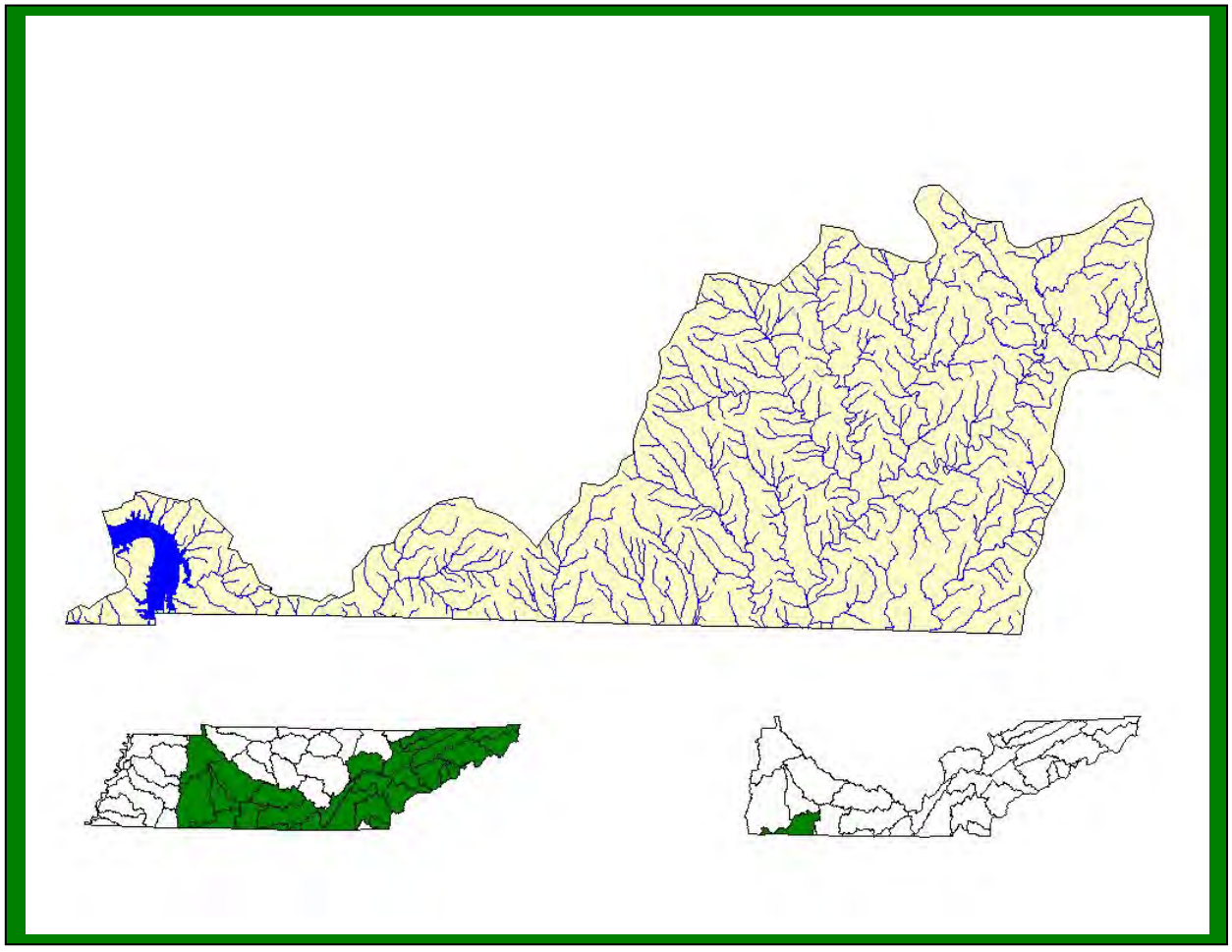
PICKWICK LAKE WATERSHED (06030005) OF THE TENNESSEE RIVER BASIN

WATERSHED WATER QUALITY MANAGEMENT PLAN



2003

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

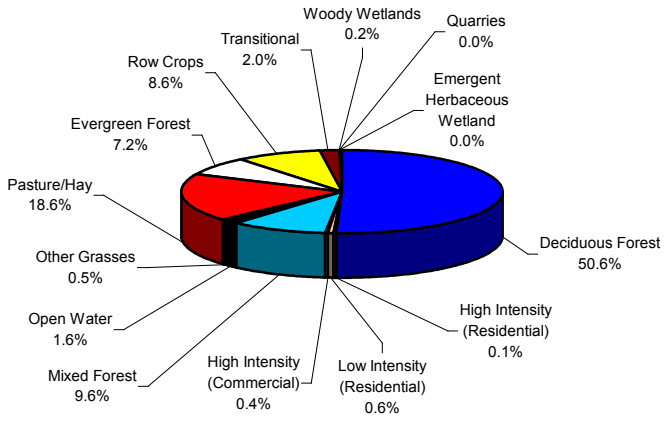
Summary – Pickwick Lake

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 Pickwick 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.

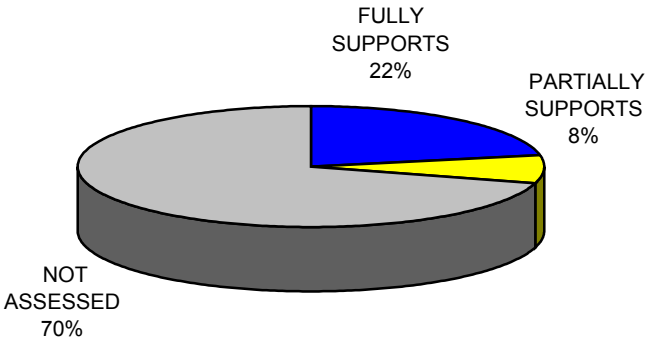
A detailed description of the watershed can be found in Chapter 2. The Tennessee portion of the Pickwick Lake Watershed is approximately 639 square miles and includes parts of three Middle Tennessee counties. A part of the Lower Tennessee River drainage basin, the Tennessee portion of the watershed has 953 stream miles and 5,840 lake acres.



Land Use in the Pickwick Lake Watershed is based on MRLC Satellite Imagery.

One interpretive area and one wildlife management area are located in the watershed. Twenty-five rare plant and animal species have been documented in the Tennessee portion of the watershed, including eight rare fish species, one rare mussel species and two rare snail species.

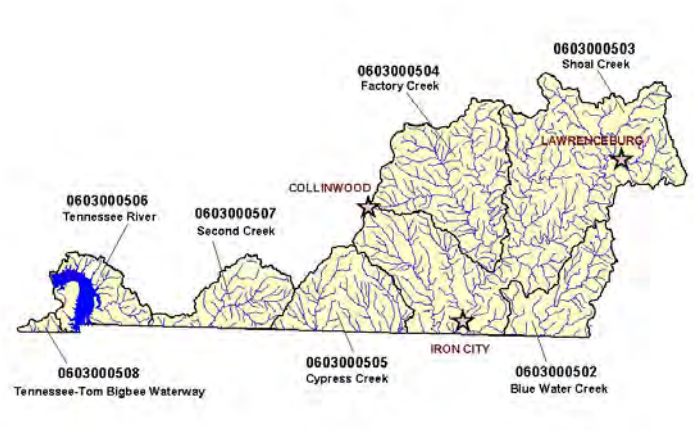
A review of water quality sampling and assessment is presented in Chapter 3. Using the Watershed Approach to Water Quality, 50 sampling sites were utilized in the Tennessee portion of the Pickwick Lake Watershed. These were ambient, ecoregion or watershed monitoring sites. Monitoring results support the conclusion that 22% of total stream miles (based on RF3) fully support designated uses.



Water Quality Assessment in the Pickwick Lake Watershed is Based on the 1998 303(d) List.

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

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 Pickwick Lake Watershed.

Point source contributions to the Tennessee portion of the Pickwick Lake Watershed consist of three individual NPDES-permitted facilities. Other point source permits in the watershed are Aquatic Resource Alteration Permits (32), Tennessee Multi-Sector Permits (14) and Mining 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 Pickwick 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 Tennessee Portion of the Pickwick 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 Pickwick Lake Watershed Water Quality Management Plan can be found at: http://www.state.tn.us/environment/wpc/watershed/wsmplans/.

GLOSSARY

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

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

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

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

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

AFO. Animal Feeding Operation.

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

ARAP. Aquatic Resource Alteration Permit.

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

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

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

Benthic. Bottom dwelling.

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

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

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

CAFO. Concentrated Animal Feeding Operation.

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

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

DO. Dissolved oxygen.

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

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

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

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

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

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

MRLC. Multi-Resolution Land Classification.

MS4. Municipal Separate Storm Sewer System.

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

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

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

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

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

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

SBR. Sequential Batch Reactor.

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

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

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

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

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

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

TMSP. Tennessee Multi-Sector Permit.

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

WAS. Waste Activated Sludge.

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

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

WET. Whole Effluent Toxicity.

WWTP. Waste Water Treatment Plant

CHAPTER 1

WATERSHED APPROACH TO WATER QUALITY

1.1 BACKGROUND. 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.

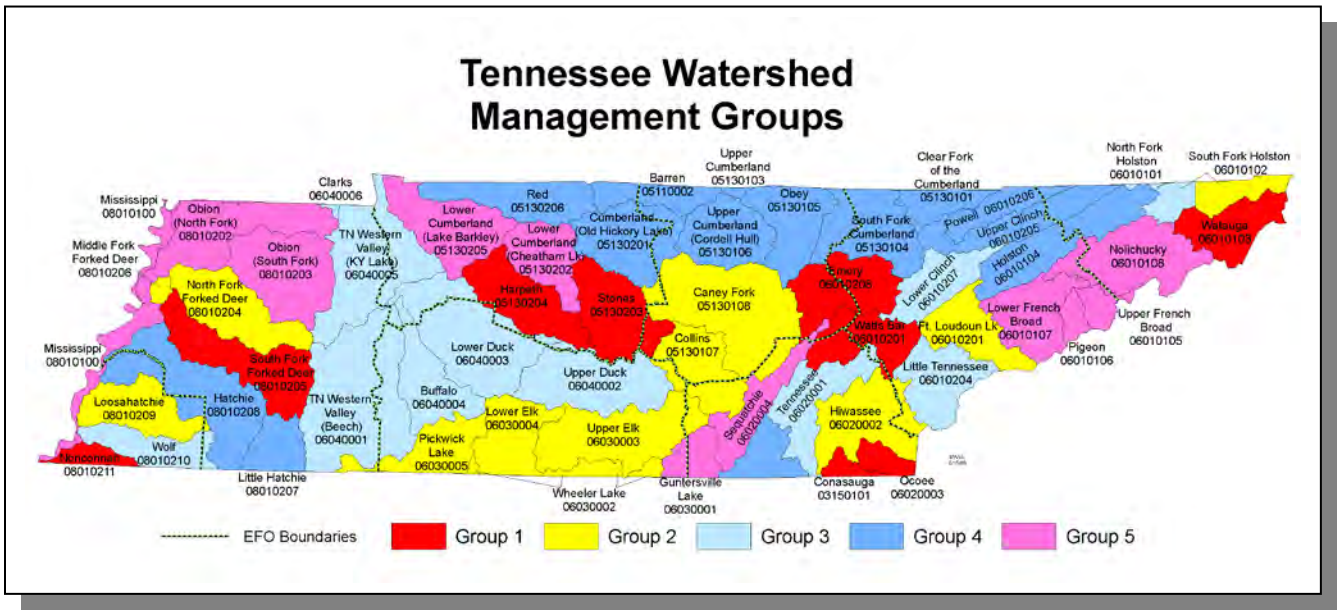


Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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.

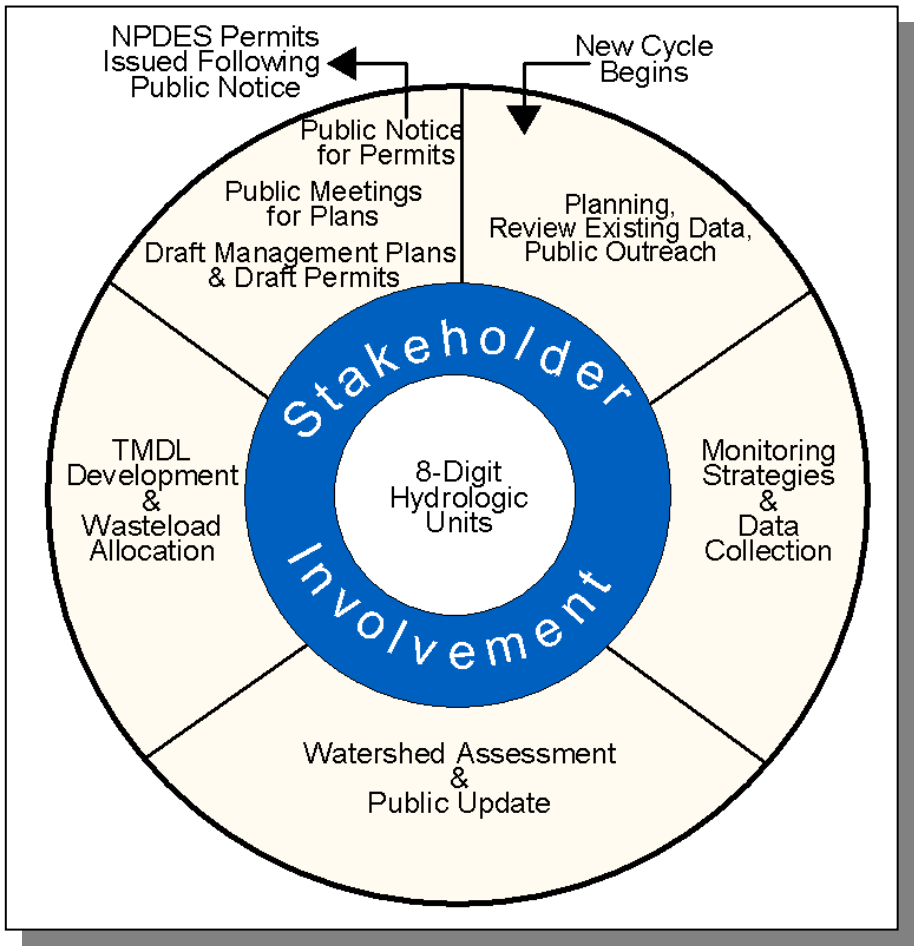


Figure 1-2. The Watershed Approach Cycle.

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 PICKWICK LAKE WATERSHED

2.1. Background. Pickwick Landing was the name of an early settlement in the watershed. Its name was assigned by an early postmaster whose favorite book was The Pickwick Papers by Charles Dickens.

Streams in the Pickwick watershed are characterized by coarse chert gravel and sand substrates with areas of bedrock, moderate gradients, and relatively clear water. Some agriculture occurs in the flatter areas and in the stream and river valley.

This Chapter describes the location and characteristics of the Pickwick Lake Watershed.

2.2. Description of the Watershed.

2.2.A. General Location. Located in Middle Tennessee and Alabama, the Tennessee portion of the Pickwick Lake Watershed includes parts of Hardin, Lawrence, and Wayne Counties.

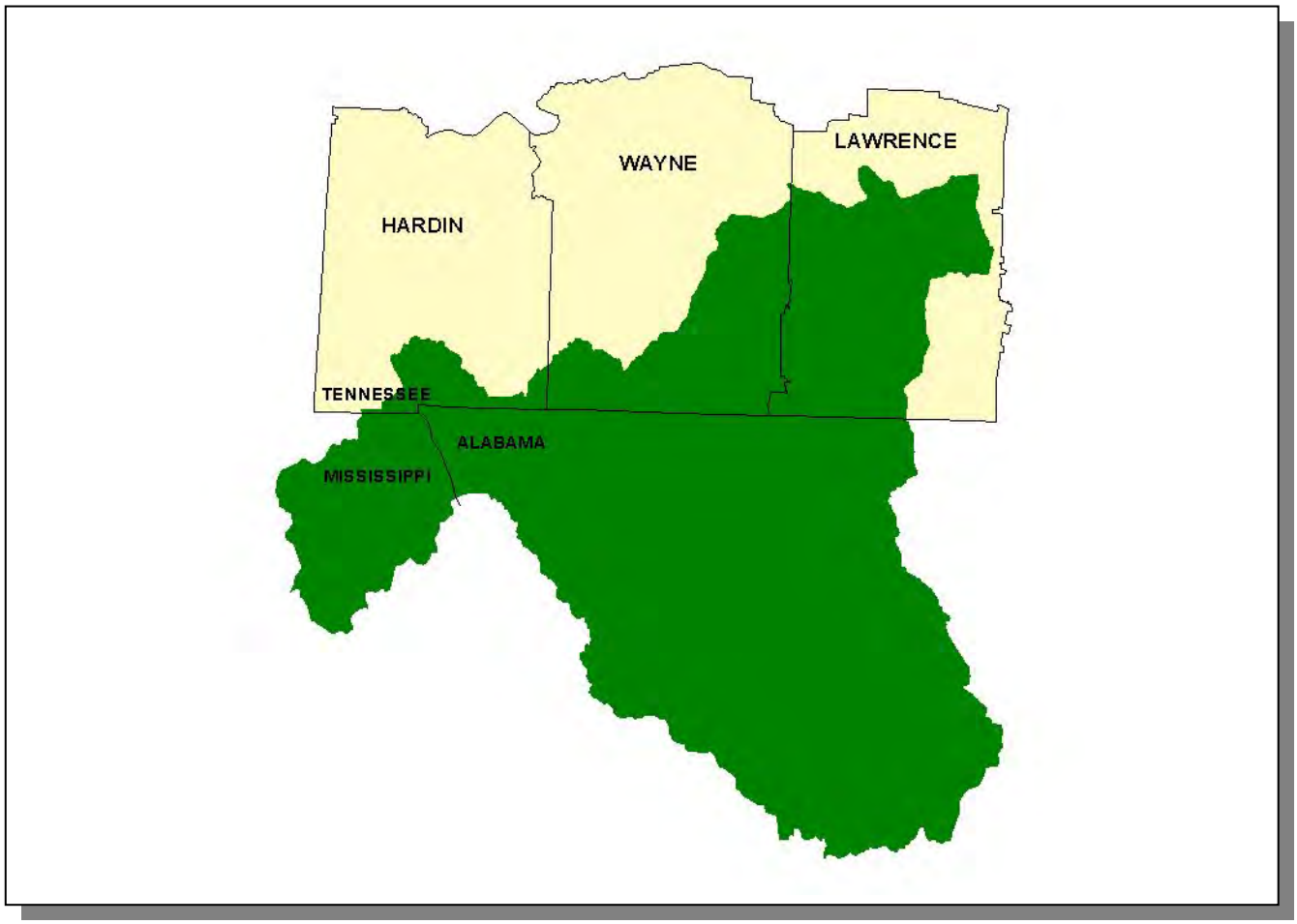


Figure 2-1. General Location of the Pickwick Lake Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Wayne	52.8
Lawrence	38.2
Hardin	9.0

Table 2-1. The Pickwick Lake Watershed Includes Parts of Three Middle Tennessee Counties.

2.2.B. Population Density Centers. Four state highways serve the major communities in the Pickwick Lake Watershed.

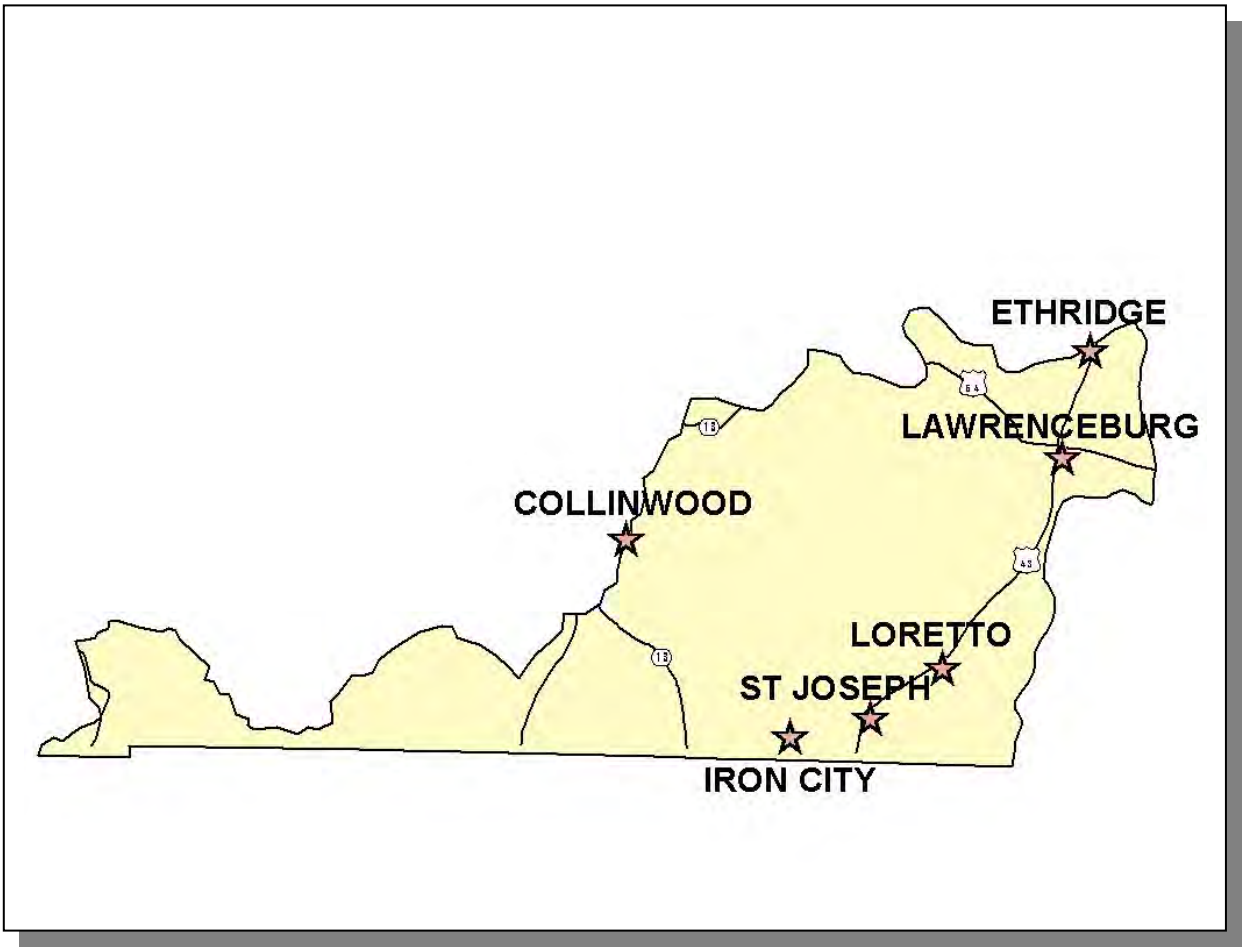


Figure 2-2. Municipalities and Roads in the Tennessee Portion of the Pickwick Lake Watershed.

MUNICIPALITY	POPULATION	COUNTY
Collinwood	1,041	Wayne
Ethridge	625	Lawrence
Iron City	437	Lawrence, Wayne
Lawrenceburg*	11,109	Lawrence
Loretto	1,649	Lawrence
St. Joseph	872	Lawrence

Table 2-2. Municipalities in the Tennessee Portion of the Pickwick Lake Watershed. *Population based on 1996 census (Tennessee Blue Book). Asterisk (*) indicates county seat.*

2.3. General Hydrologic Description.

2.3.A. Hydrology. The Pickwick Lake Watershed, designated 06030005 by the USGS, is approximately 639 square miles and empties to Kentucky Lake (Tennessee River).

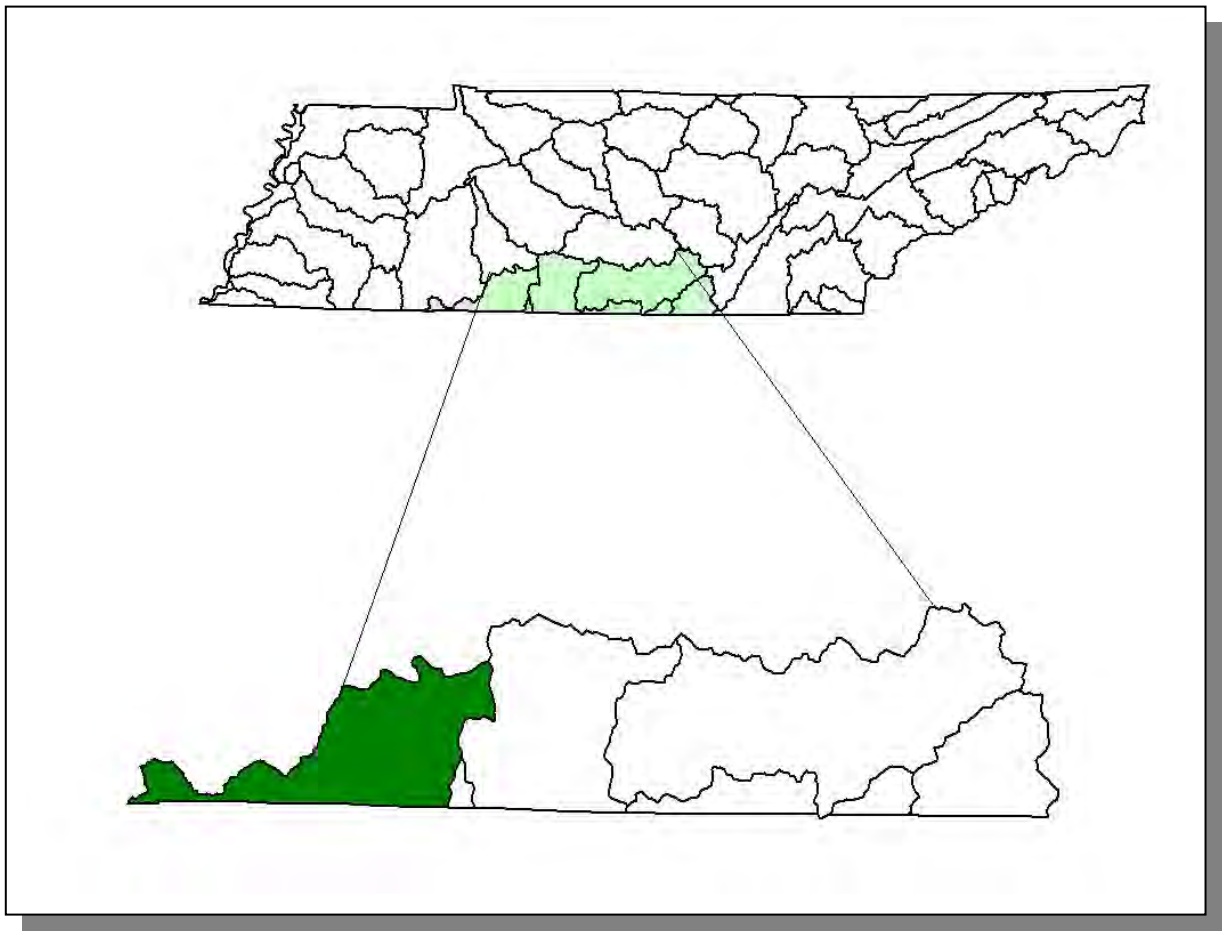


Figure 2-3. The Pickwick Lake Watershed is Part of the Lower Tennessee River Basin.

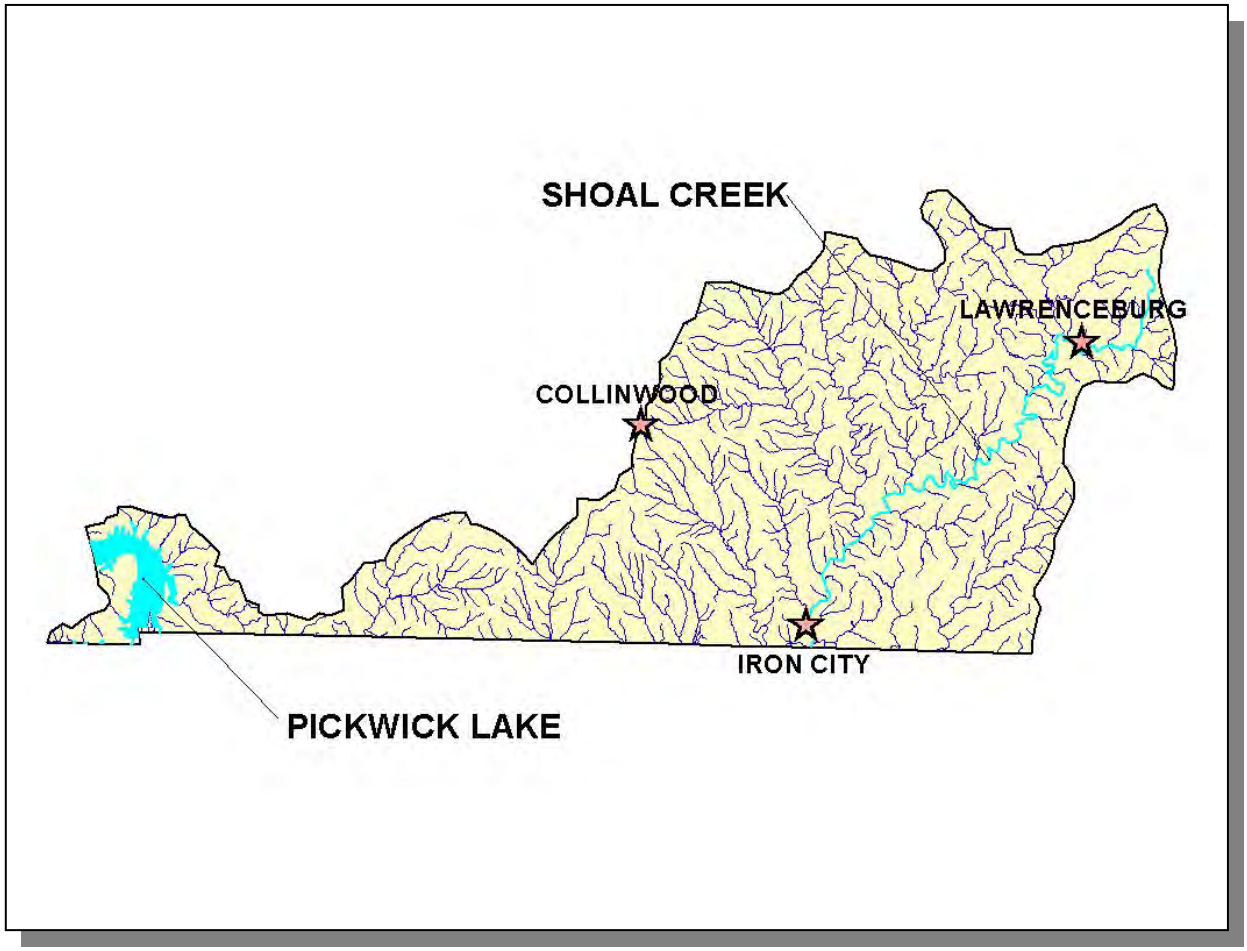


Figure 2-4. Hydrology in the Tennessee Portion of the Pickwick Lake Watershed. *There are 953 stream miles and 5,840 lake acres recorded in River Reach File 3 in the Pickwick Lake Watershed. Location of the Pickwick Lake and the cities of Collinwood, Iron City, and Lawrenceburg are shown for reference.*

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

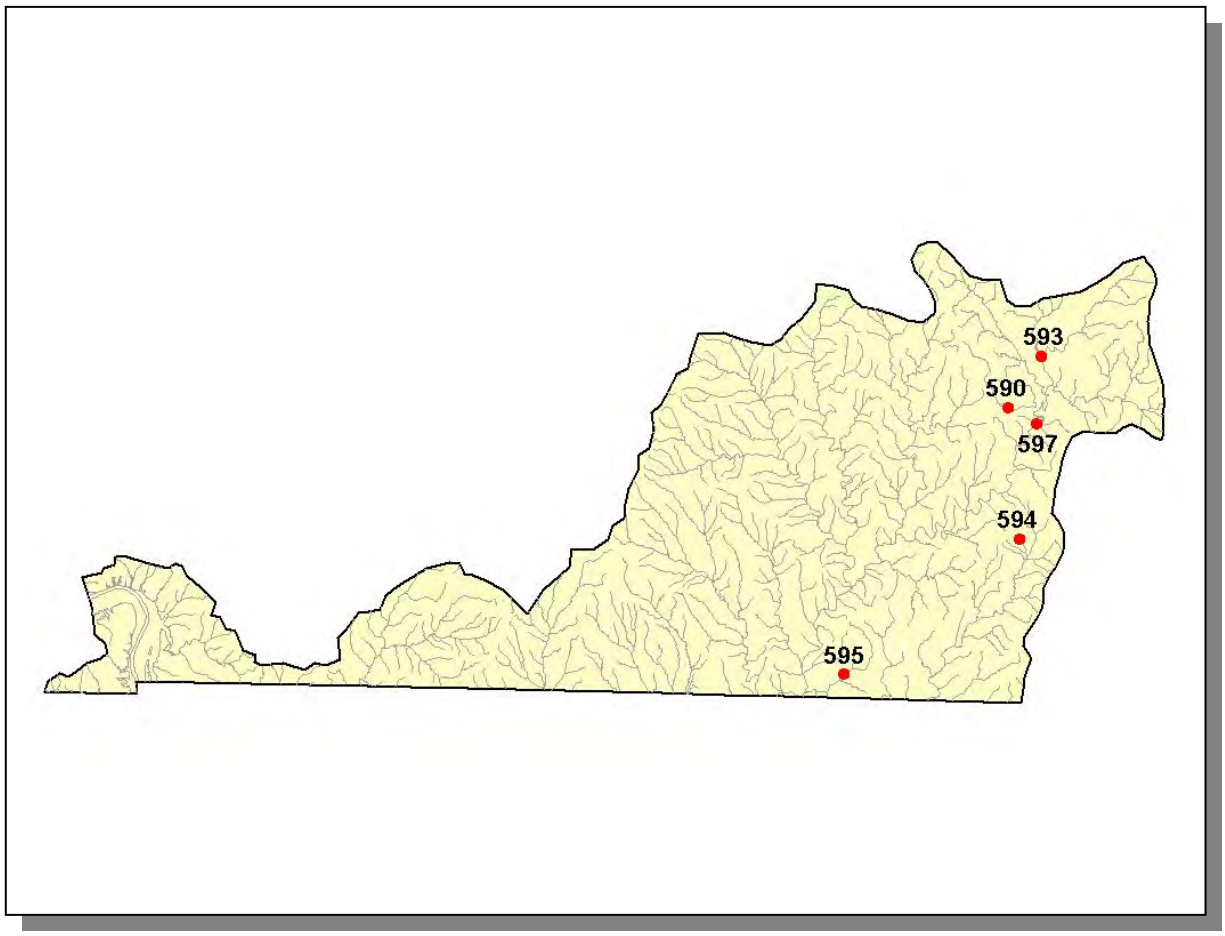


Figure 2-5. Location of Inventoried Dams in the Tennessee Portion of the Pickwick Lake Watershed. *More information is provided in Pickwick-Appendix II and on the TDEC homepage at: http://gwidc.gwi.memphis.edu/website/dams/viewer.htm*

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.

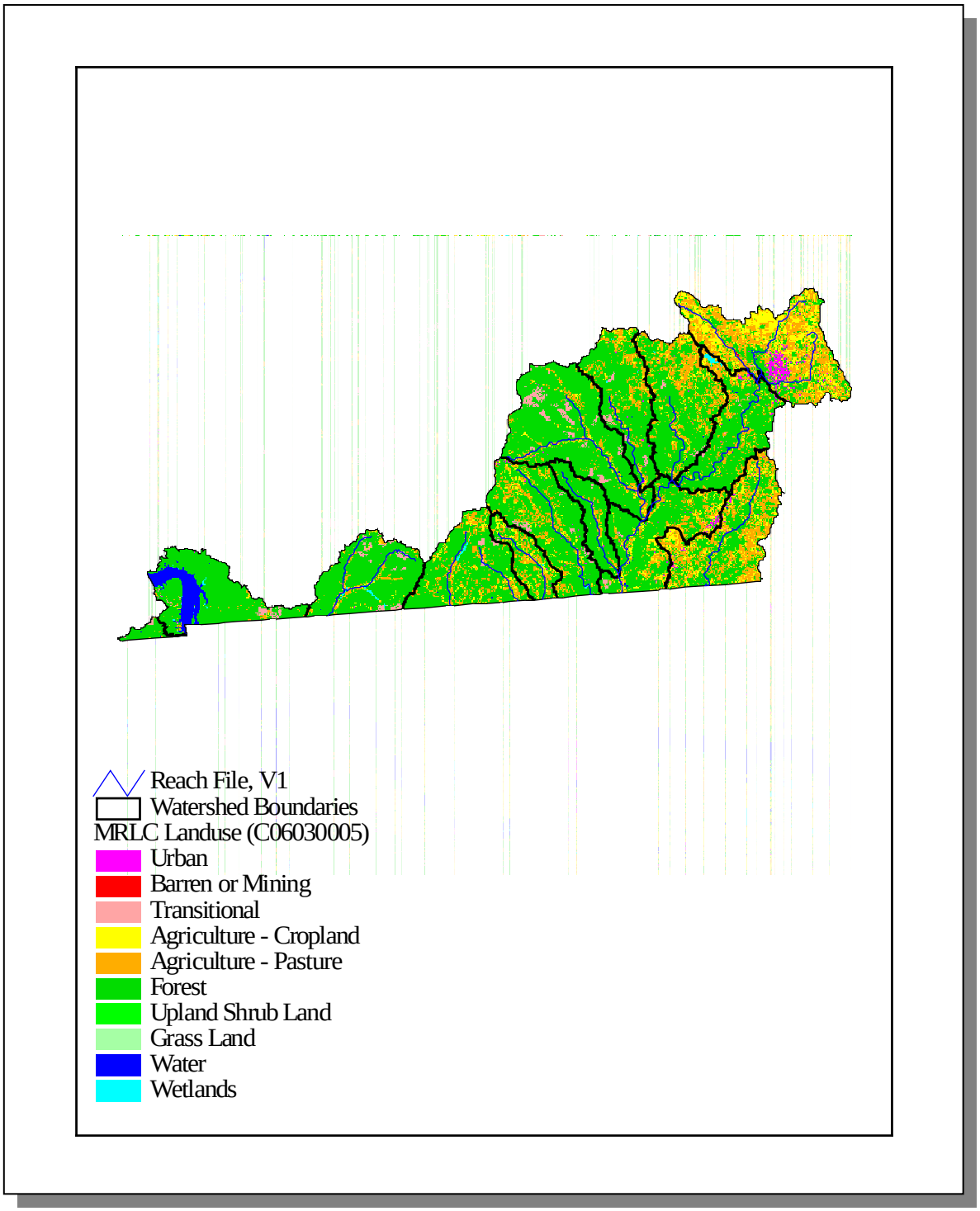


Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.

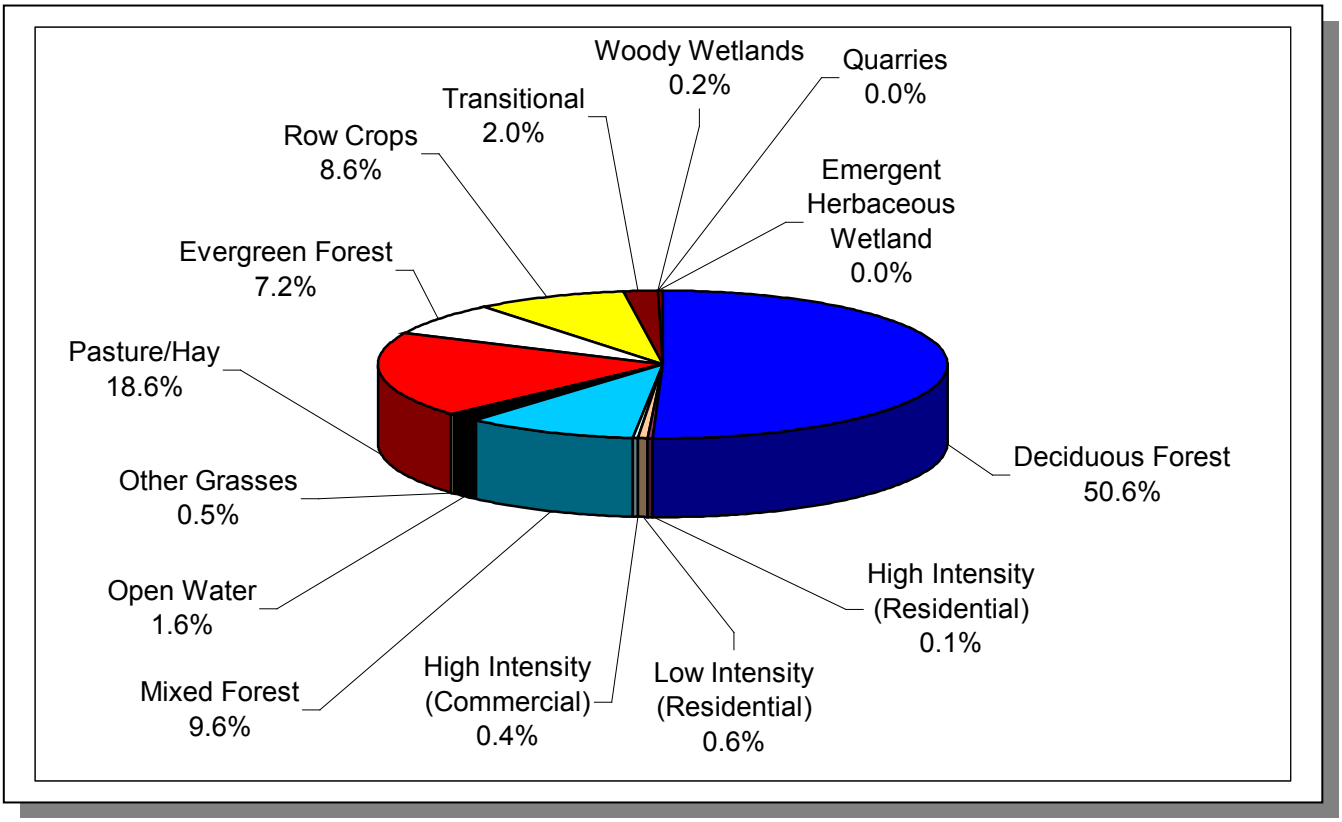


Figure 2-7. Land Use Distribution in the Tennessee Portion of the Pickwick Lake Watershed. *More information is provided in Pickwick-Appendix II.*

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

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Pickwick Lake Watershed lies within 2 Level III ecoregions (Southeastern Plains, Interior Plateau) and contains 4 Level IV subecoregions (Griffen, Omernik, Azavedo):

- The Southeastern Plains and Hills (65e) contain several north-south trending bands of sand and clay formations. Tertiary-age sand, clay, and lignite are to the west, and Cretaceous-age fine sand, fossiliferous micaceous sand, and silty clays are to the east. With elevations reaching over 650 feet, and more rolling topography and ore relief than the Loess Plains (74b) to the west, streams have increased gradient, generally sandy substrates, and distinctive faunal characteristics for west Tennessee. The natural vegetation type is oak-hickory forest, grading into oak-hickory-pine to the south.

- The Fall Line Hills (65i) ecoregion, comprising the Tennessee or Tombigbee Hills in Mississippi and the Fall Line Hills in Alabama, is composed primarily of Cretaceous-age coastal plain sandy sediments. The sand and chert gravel surficial materials are covered by sandy loam topsoils. It is mostly forested terrain of oak-hickory-pine on open hills with 100-200 feet of relief. Elevations in the small Tennessee portion, roughly between Chambers Creek and Pickwick Lake in Hardin County, are 450-685 feet.

- The Transition Hills (65j) have the highest elevation in Ecoregion 65, and contain characteristics of both the Southeastern Plains (65) and the Interior Plateau (71) ecoregions. Many streams of this transition area have cut down into the Mississippian, Devonian, and Silurian-aged rocks and may look similar to those of the Interior Plateau (71). Cretaceous-age coastal plain deposits of silt, sand, clay, and gravel, however, overlie the older limestone, shale, and chert. It is a mostly forested region of oak-hickory-pine, and has had pine plantation activities associated with pulp and paper operations.

- 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, acidic, 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 themed 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 valley: mostly hay, pasture, and cattle, with some cultivation of corn and tobacco.

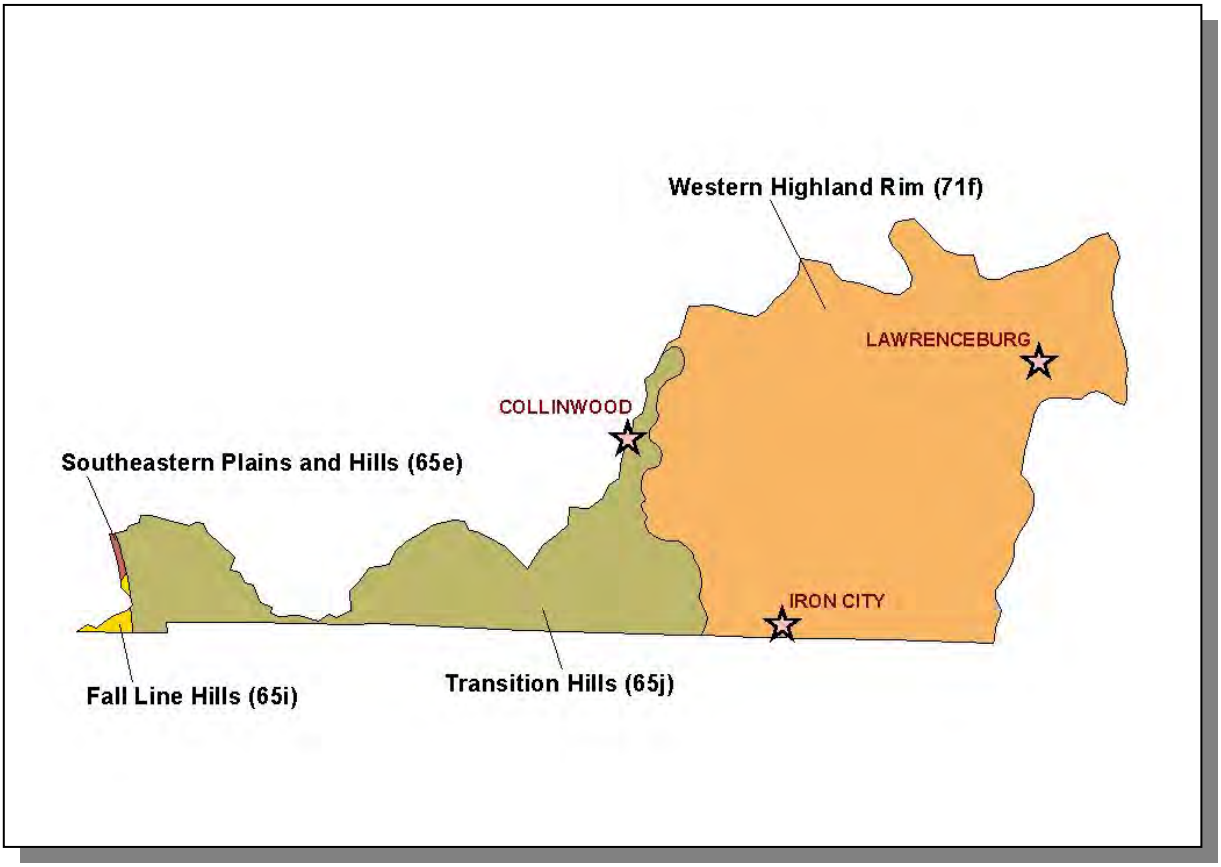


Figure 2-8. Level IV Ecoregions in the Tennessee Portion of the Pickwick Lake Watershed. *Locations of Collinwood, Iron City, and Lawrenceburg are shown for reference.*

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.

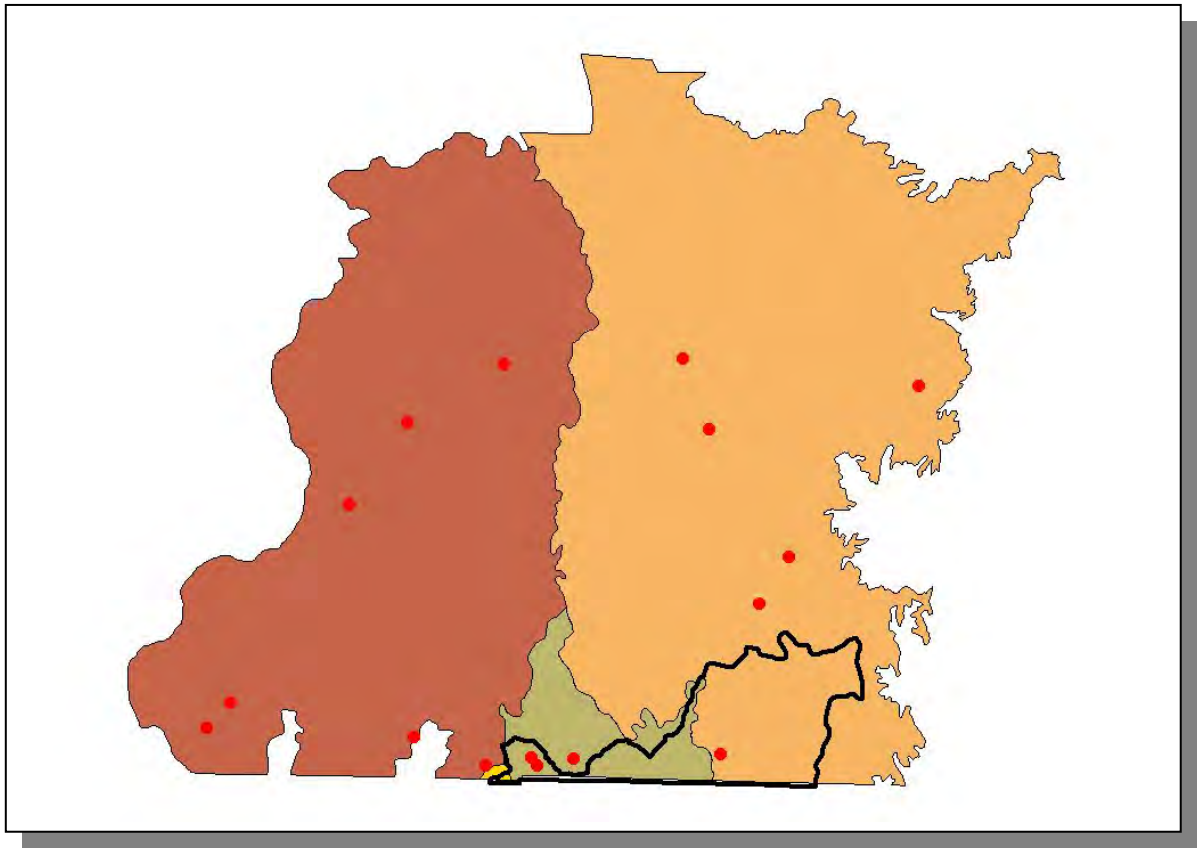


Figure 2-9. Ecoregion Monitoring Sites in Level IV Ecoregions 65e, 65i, 65j, and 71f. *The Tennessee portion of the Pickwick Lake Watershed is shown for reference. More information is provided in Pickwick-Appendix II.*

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	1
Mussels	1
Snails	2
Amphibians	1
Birds	1
Fish	8
Mammals	1
Reptiles	2
Plants	8
Total	**25**

Table 2-3. There are 25 Rare Plant and Animal Species in the Tennessee Portion of the Pickwick Lake Watershed.

In the Pickwick Lake Watershed, there are eight rare fish species, one rare mussel species, two rare snail species, and one rare insect species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Ichthyomyzon gagei	Southern brook lamprey		D
Hemitremia flammea	Flame chub	MC	D
Typhlichthys subterraneus	Southern cavefish	MC	D
Etheostoma boschungi	Slackwater darter	LT	T
Etheostoma neopterum	Lollipop darter		
Etheostoma tuscumba	Tuscumbia darter	MC	D
Etheostoma corona	Crown darter	MC	E
Percina burtoni	Blotchside darter	MC	D
Ophiogomphus acuminatus	Tennessee snaketail		
Pleurobema oviforme	Tennessee clubshell		
Leptoxis praerosa	Onyx rocksnail		
Lithasia verrucosa	Varicose rocksnail		

Table 2-4. Rare Aquatic Species in the Tennessee Portion of the Pickwick 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 the U.S. Fish and Wildlife Service. State Status: E, Listed Endangered by the Tennessee Wildlife Resources Agency; D, Deemed in Need of Management by the Tennessee Wildlife Resources Agency, T, Listed Threatened 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.

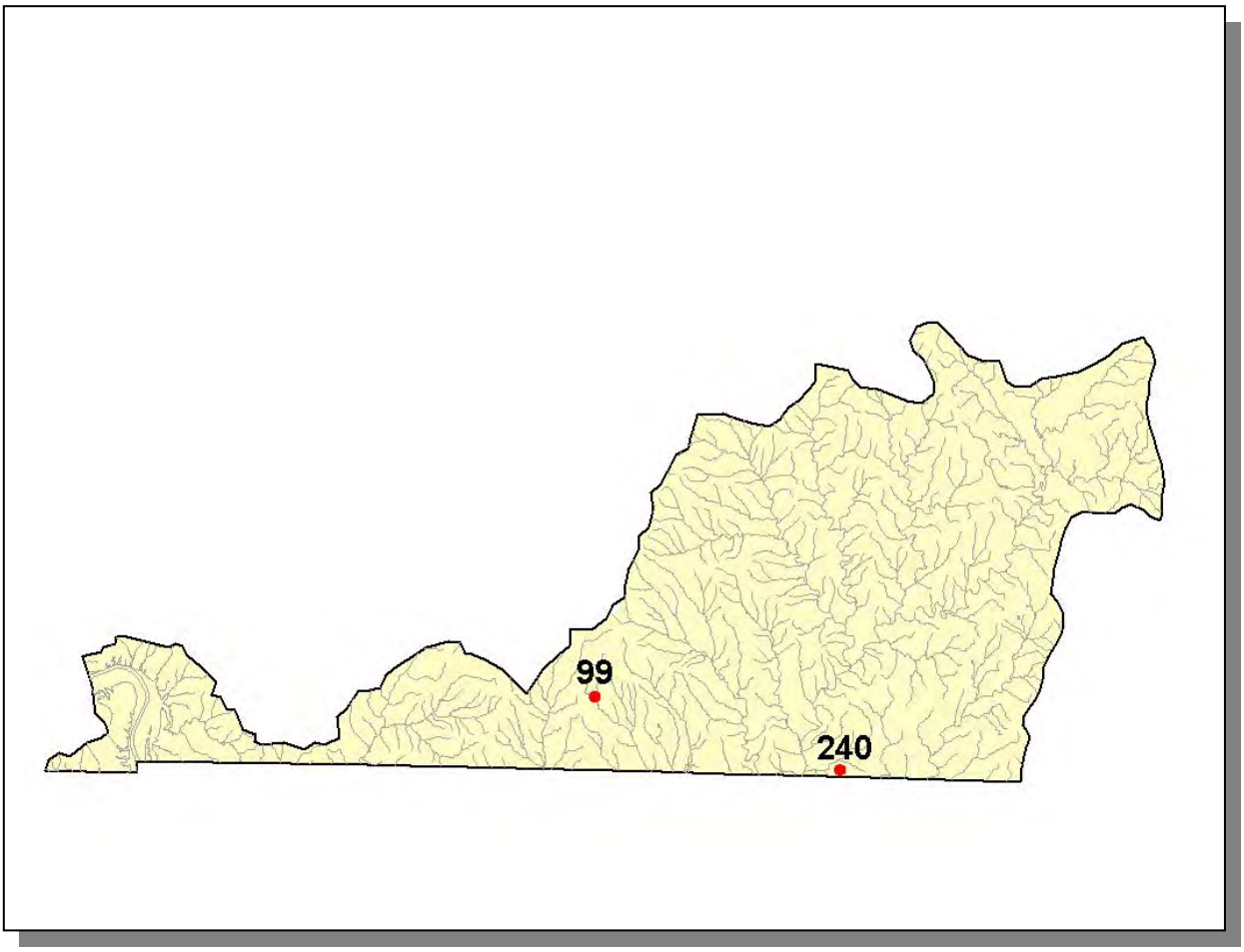


Figure 2-10. Location of Wetland Sites in TDEC Division of Natural Heritage Database in the Tennessee Portion of the Pickwick Lake Watershed. This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands in the watershed*. More information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

2.7. CULTURAL RESOURCES.

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

- Pickwick Landing State Park, site of a riverstop dating to the 1800's, now the location of Pickwick Reservoir.

In addition, many local interpretive areas are common, most notably, the Tennessee River Waterways Museum, which showcases TVA and Tennessee River history.

2.7.B. Wildlife Management Area (WMA). The Tennessee Wildlife Resources Agency manages the Laurel Hill Wildlife Management Agency, which is partly in the Pickwick Lake watershed.

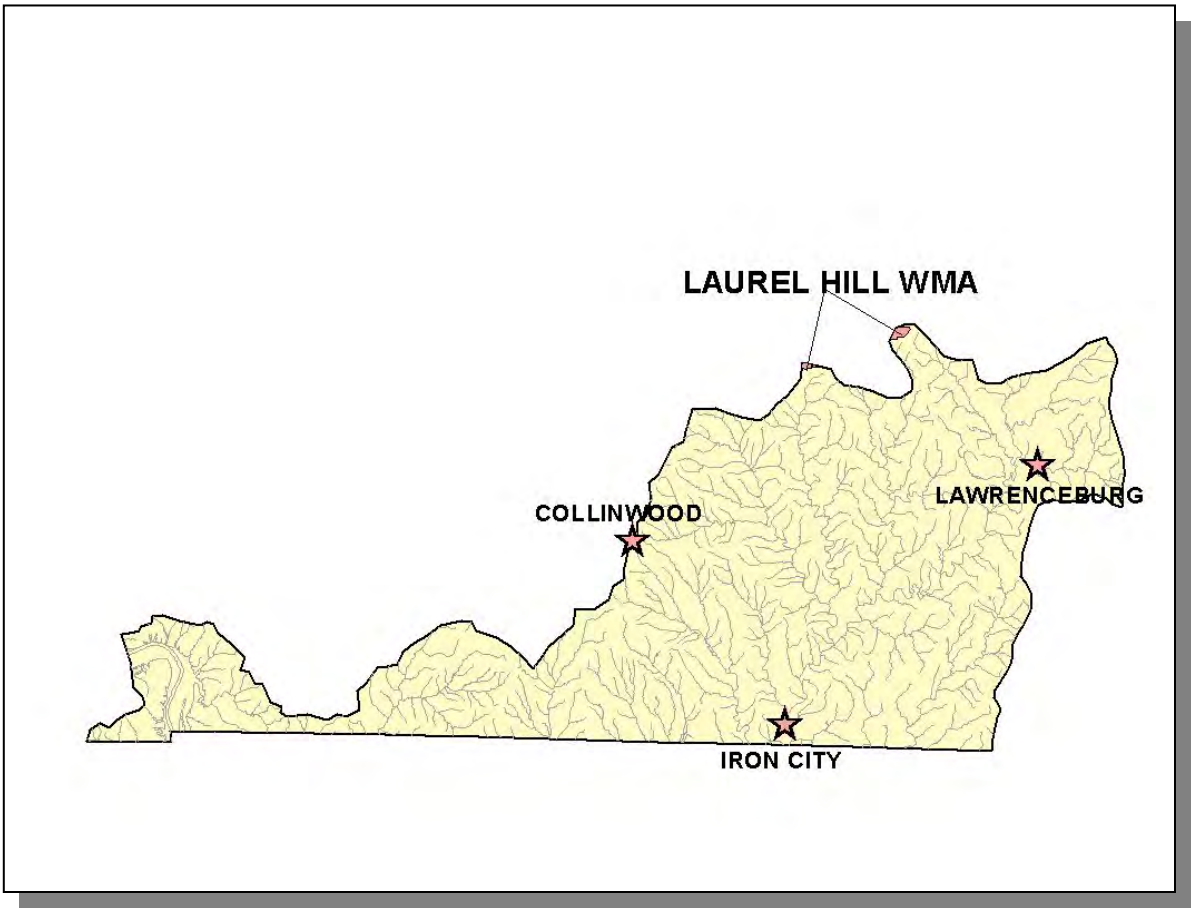


Figure 2-11. TWRA Manages Pea Ridge Wildlife Management Area in the Pickwick Lake Watershed. *Locations of Collinwood, Iron City, and Lawrenceburg are shown for reference.*

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

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

STREAM	NSQ	RB	RF	STREAM	NSQ	RB	RF
Beeler Creek	2			Little Cypress Creek	2		
Bluewater Creek	3		1	Little Shoal Creek	3		
Butler Creek	2			Long Branch Creek	3		
Chisholm Creek	2			Middle Butler Creek	2		
Clack Branch Shoal Creek	2			Middle Cypress Creek	2		
Crowson Creek	2			Piney Branch Knob Creek	2		
Cypress Creek	2			Pond Creek	2		
Dry Creek	1			Scab Branch Factory Creek	2		
Factory Creek	1			Second Creek	2		
Grandaddy Creek	3			Shawnette Creek	2		
Grassy Creek	2			Shoal Creek	1,3	2	
Holly Creek	2			Stults Creek	2		
Hurricane Creek	3			Spring Branch Knob Creek	3		
Knob Creek	2			Swanegan Creek	2		
Last Butler Creek	2			Wolf Creek	3		
Little Bluewater Creek	3						

Table 2-5. 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 PICKWICK 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 Pickwick Lake Watershed, summarizes data collection and assessment results, and describes impaired waters.

3.2. DATA COLLECTION. Comprehensive water quality monitoring in the Pickwick Lake Watershed was conducted in 1997 and 1998. Data were collected from 98 sites and are from one of four types of sites: 1)Ambient sites, 2)Ecoregion sites, 3)Watershed sites or 4)Aquatic Resources Alteration Permit (ARAP) inspection sites.

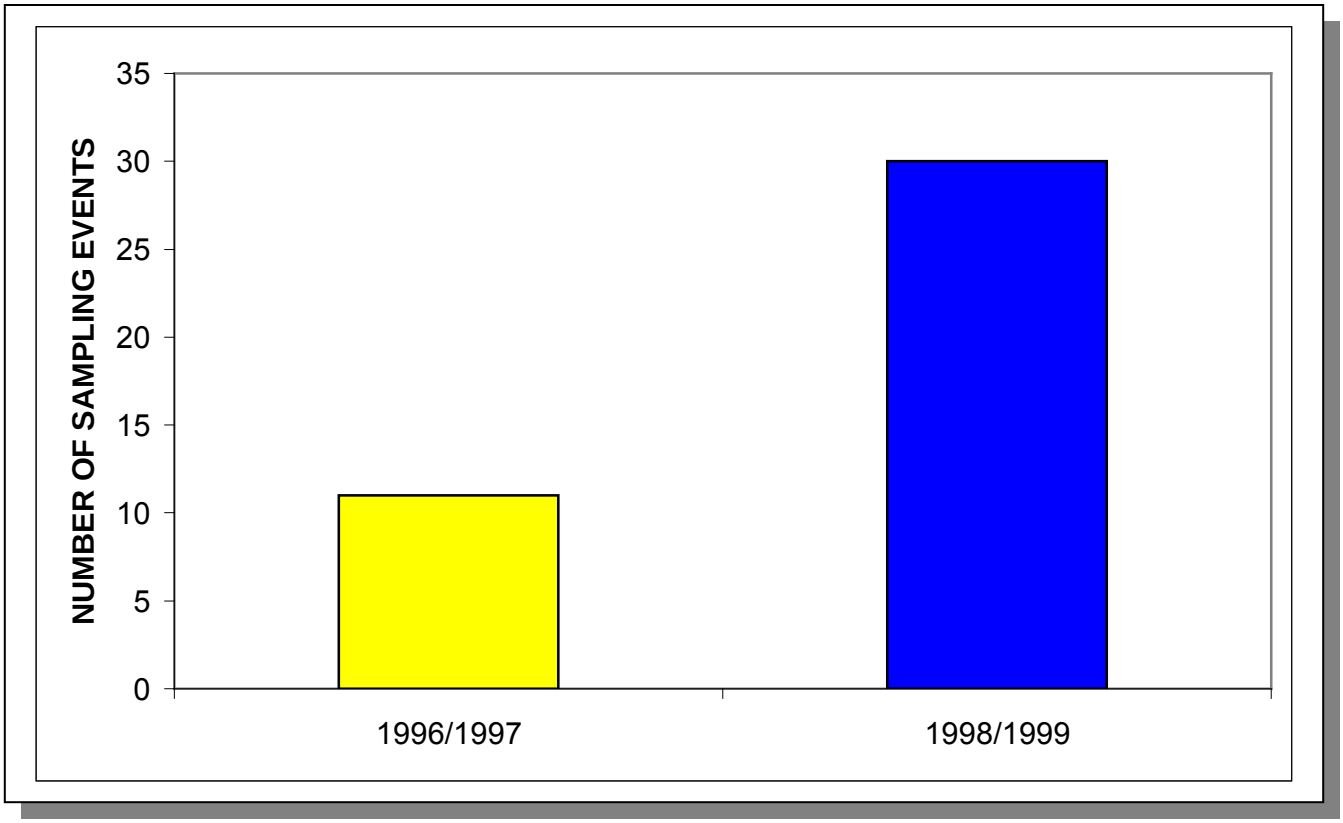


Figure 3-1. Number of Sampling Events Using the Traditional Approach (1996) and Watershed Approach (1998) in the Tennessee Portion of the Pickwick Lake Watershed.

Figure 3-2. Location of Monitoring Sites in the Tennessee Portion of the Pickwick Lake Watershed. *Red, Biological Assessment Sites; Black, Observational Assessment Sites; Green, Chemical Sampling Sites. Locations of Collinwood, Iron City, and Lawrenceburg are shown for reference.*

TYPE	NUMBER	TOTAL NUMBER OF SAMPLING EVENTS		
		CHEMICAL ONLY	BIOLOGICAL ONLY	OBSERVATION
Ambient	21	21	0	0
Ecoregion	9	4	5	0
Watershed	20	3	8	9
Totals	**50**	**28**	**13**	**9**

Table 3-1. Monitoring Sites in the Tennessee Portion of the Pickwick Lake Watershed During the Data Collection Phase of the Watershed Approach.

In addition to the sampling events, 19 citizen complaints were investigated.

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Assistance Center-Nashville 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 Pickwick 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 Pickwick Lake Watershed lies within 1 Level III ecoregion (Interior Plateau) and contains 4 subecoregions (Level IV):

- Southeastern Plains and Hills (65e)
- Fall Line Hills (65i)
- Transition Hills (65j)
- Western Highland Rim (71f)

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

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

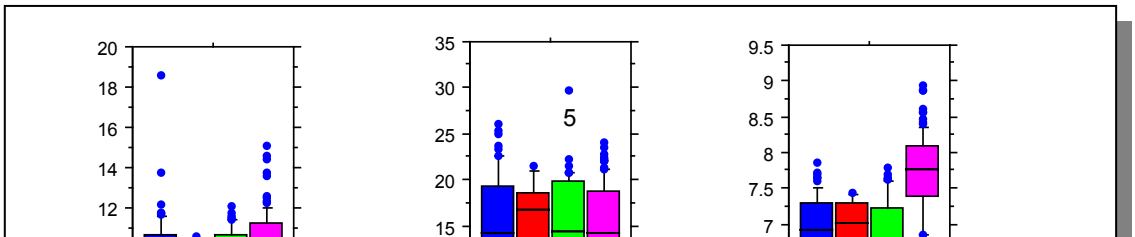


Figure 3-3. Select Chemical Data Collected in the Tennessee Portion of Pickwick Lake Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots.* Fecal, fecal coliform bacteria; TN, Total Nitrogen; TP, Total Phosphorus.

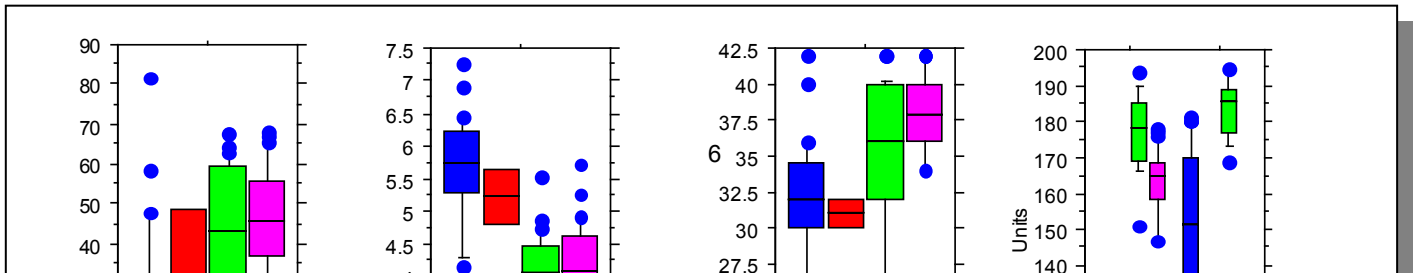


Figure 3-4. Benthic Macroinvertebrate and Habitat Scores for Tennessee Portion of Pickwick Lake Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score, Habitat Riffle/Run,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

3.2.C. Watershed 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.

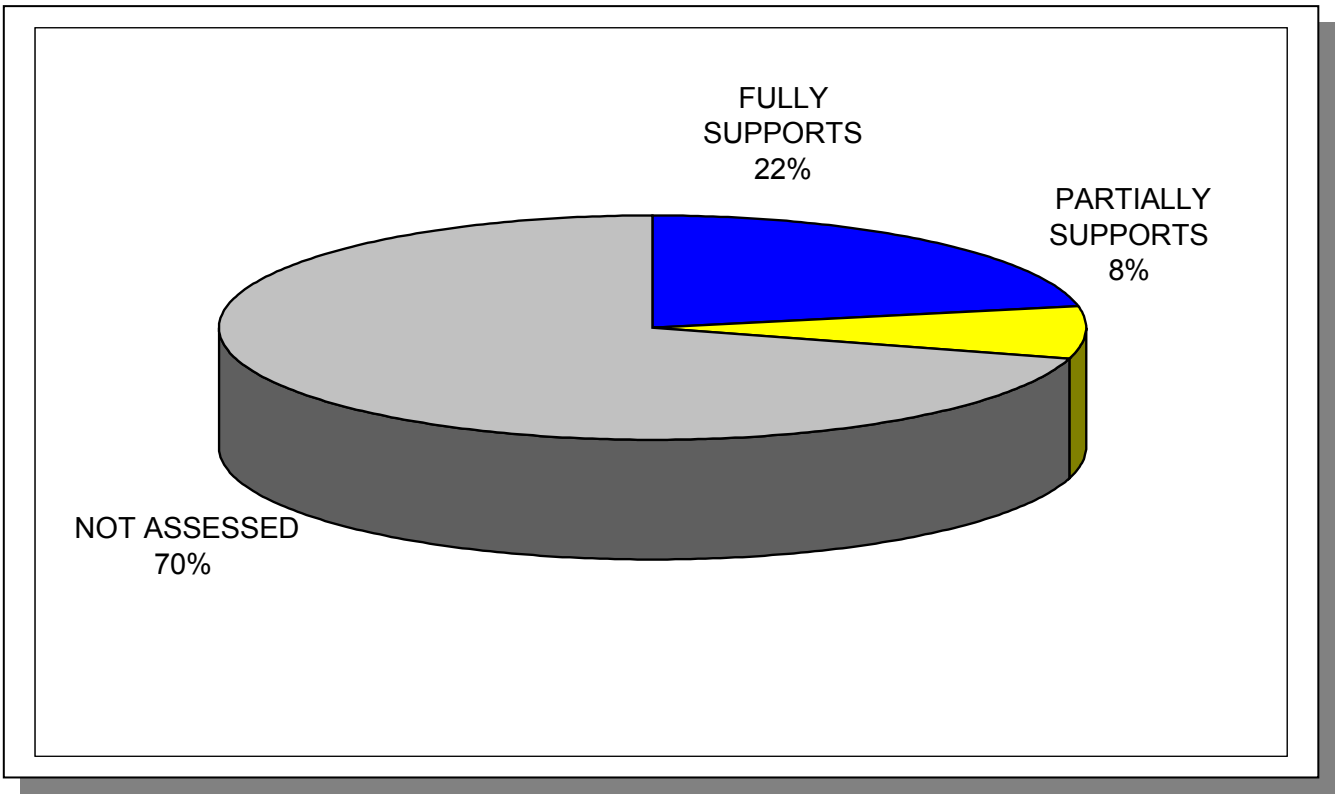


Figure 3-5a. Water Quality Assessment for Streams and Rivers in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. More information is provided in Appendix III.*

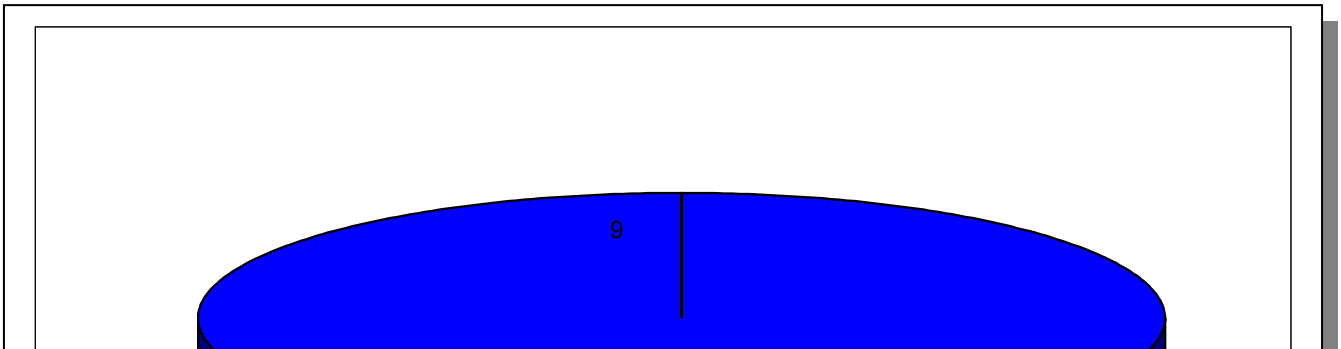


Figure 3-5b. Water Quality Assessment for Lakes in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. More information is provided in Appendix III.*

3.3.A. Assessment Summary.

Figure 3-6a. Overall Use Support Attainment in the Tennessee Portion of the Pickwick 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. Collinwood, Iron City, and Lawrenceburg are shown for reference. More information is provided in Appendix III.*

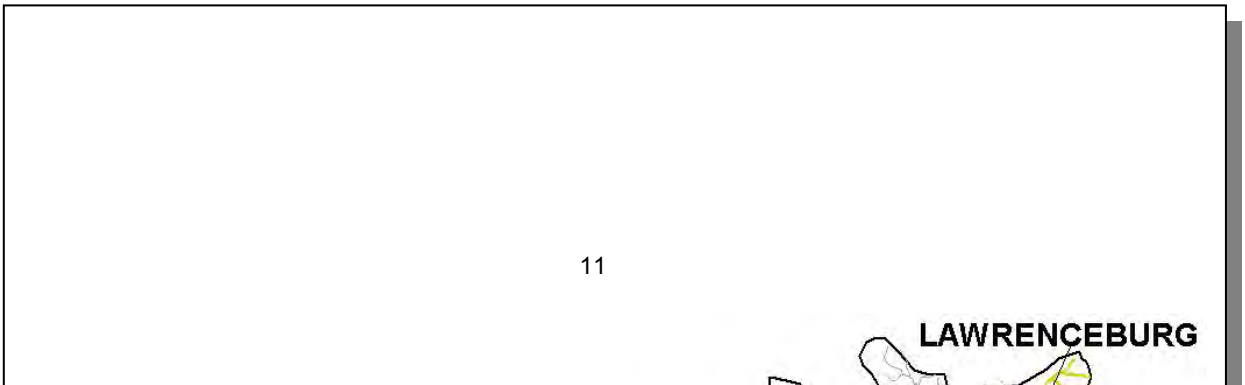


Figure 3-6b. Fish and Aquatic Life Use Support Attainment in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collinwood, Iron City, and Lawrenceburg are shown for reference.*

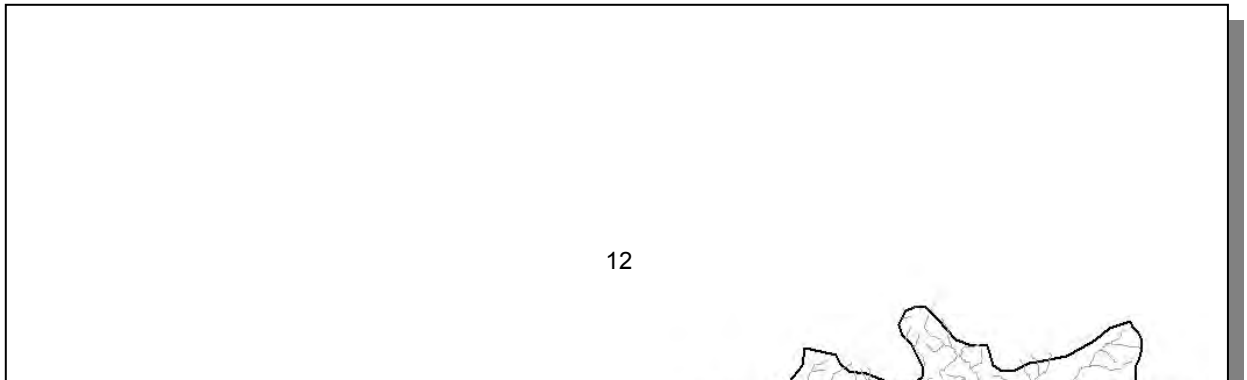


Figure 3-6c. Recreation Use Support Attainment in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collinwood, Iron City, and Lawrenceburg are shown for reference.*

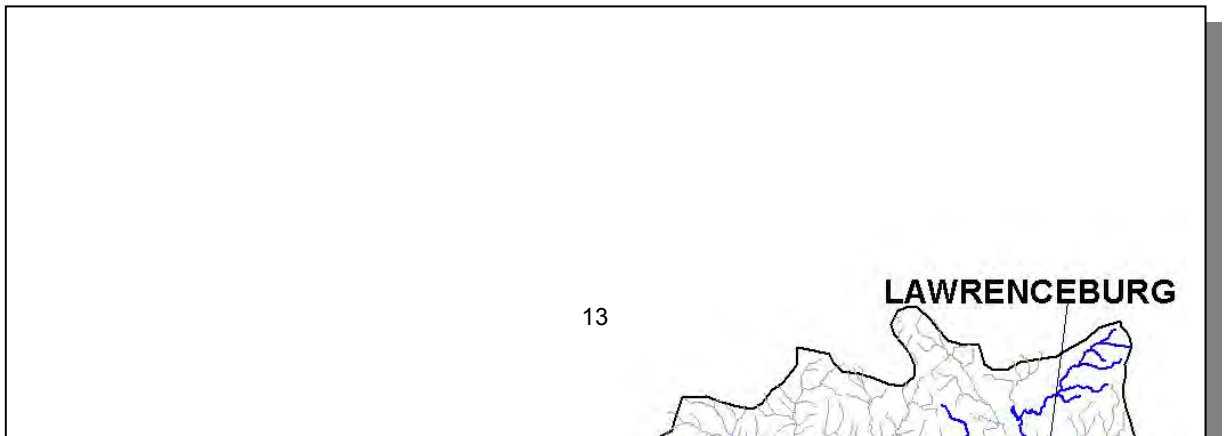


Figure 3-6d. Irrigation Use Support Attainment in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Collinwood, Iron City, and Lawrenceburg are shown for reference.*

Figure 3-6e. Livestock Watering and Wildlife Use Support Attainment in the Tennessee Portion of the Pickwick 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. Collinwood, Iron City, and Lawrenceburg are shown for reference.*

3.3.B. Use Impairment Summary.

Figure 3-7a. Impaired Streams Due to Habitat Alteration in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment; Yellow, Partially Supports designated Use; Red, Does Not Support Designated Use; Collinwood, Iron City, and Lawrenceburg are shown for reference. More information is provided in Appendix III.*

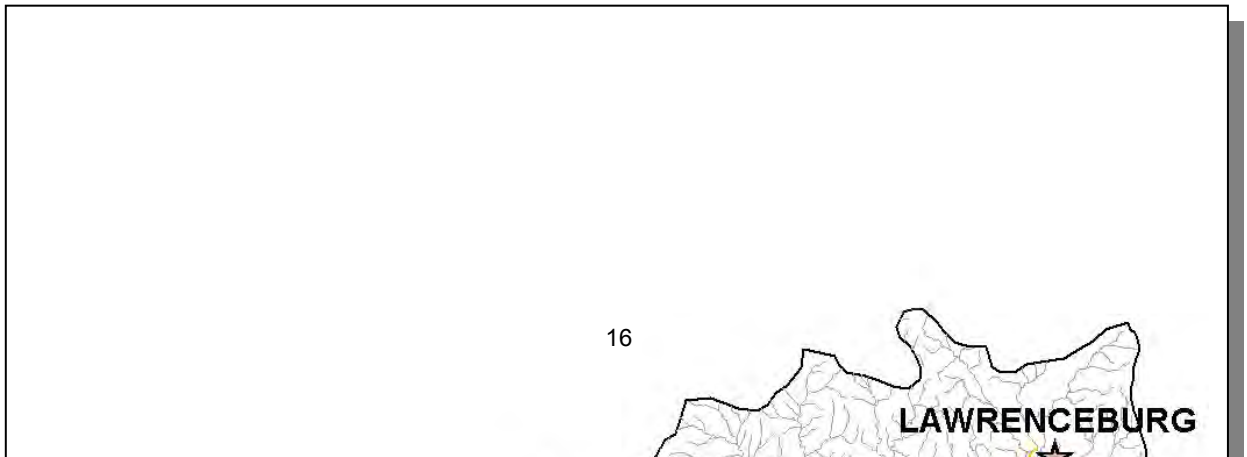


Figure 3-7b. Impaired Streams Due to Organic Enrichment/Low Dissolved Oxygen in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports designated Use; Red, Does Not Support Designated Use; Collinwood, Iron City, and Lawrenceburg are shown for reference. More information is provided in Appendix III.*

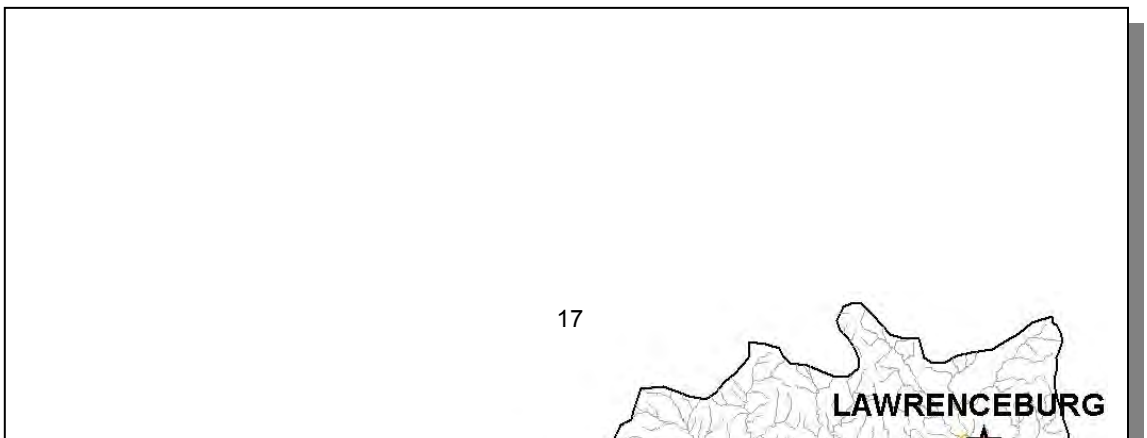


Figure 3-7c. Impaired Streams Due to Pathogens in the Tennessee Portion of the Pickwick Lake Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Collinwood, Iron City, and Lawrenceburg are shown for 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.

CHAPTER 4

POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE PICKWICK 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 Pickwick Lake Watershed (HUC 06030005) has been delineated into seven 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.

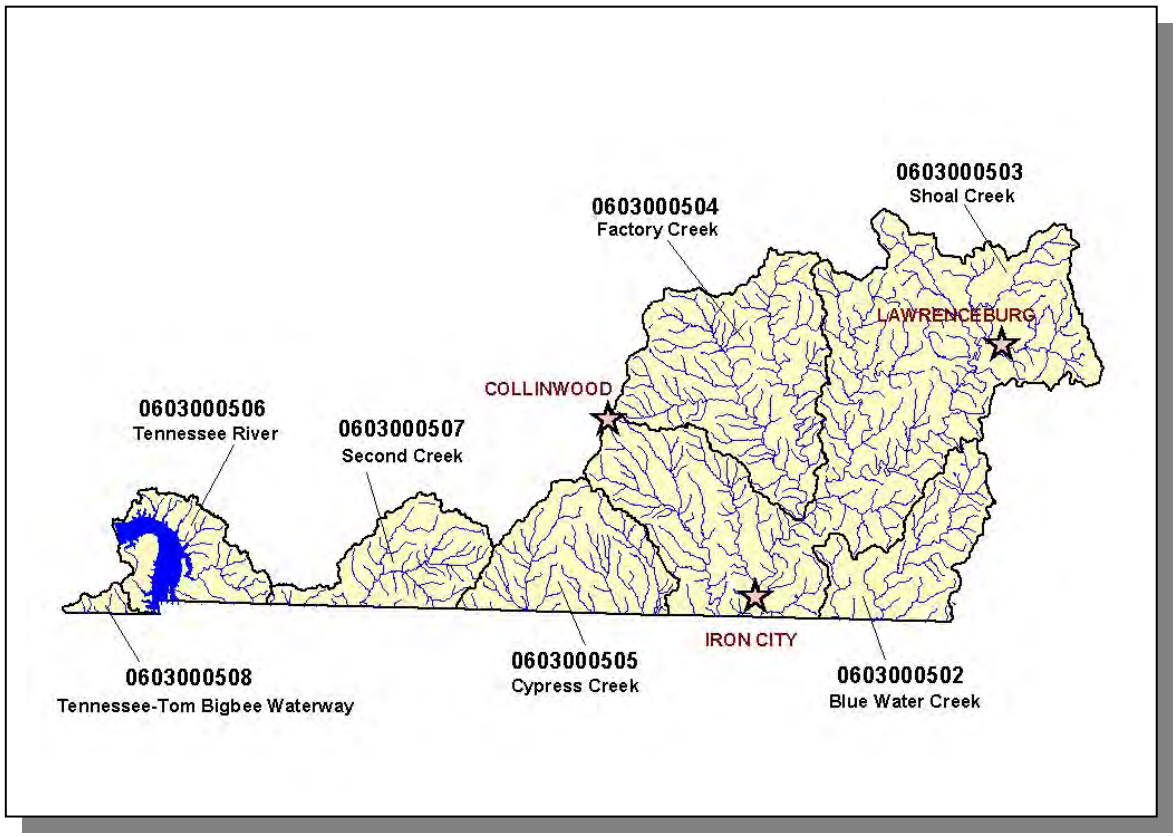


Figure 4-1. The Tennessee Portion of Pickwick Lake Watershed is Composed of Seven USGS-Delineated Subwatersheds (10-Digit Subwatersheds). *Locations of Collinwood, Iron City, and Lawrenceburg are shown for reference.*

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

HUC-10	HUC-12
0603000502	060300050201 (Blue Water Creek)
0603000503	060300050301 (Little Shoal Creek)
	060300050302 (Dryland Creek)
	060300050303 (Upper Shoal Creek)
	060300050304 (Crowson Creek)
	060300050305 (Pond Creek)
	060300050306 (Middle Shoal Creek)
	060300050307 (Knob Creek)
	060300050308 (Holly Creek)
	060300050309 (Butler Creek)
0603000504	060300050401 (Factory Creek)
	060300050402 (Chisholm Creek)
0603000505	060300050501 (Cypress Creek)
	060300050502 (Middle Cypress Creek)
	060300050504 (Little Cypress Creek)
0603000506	060300050605 (Tennessee River Pickwick Dam)
0603000507	060300050701 (Second Creek)
	060300050702 (Bumpass Creek)
0603000508	060300050804 (TennTom)

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

4.2.A. 0603000502.

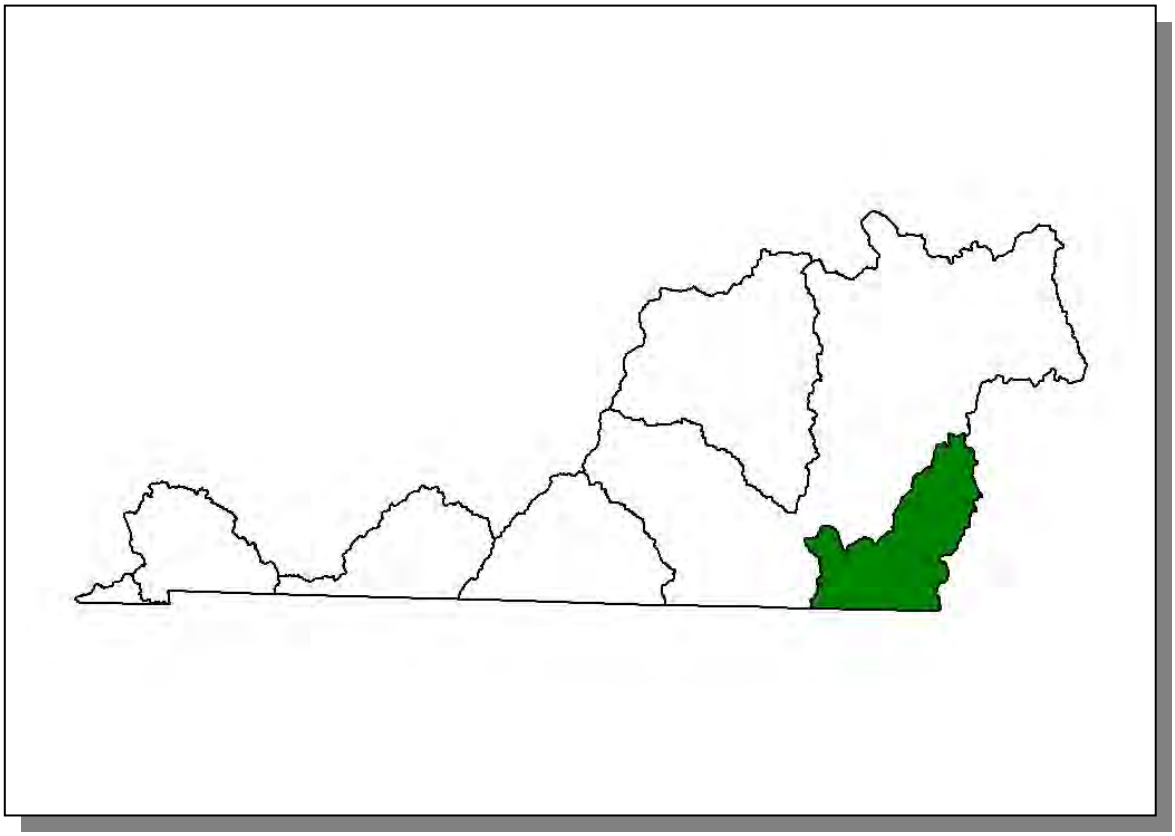


Figure 4-2. Location of Subwatershed 0603000502. *All Pickwick HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.A.i. General Description.

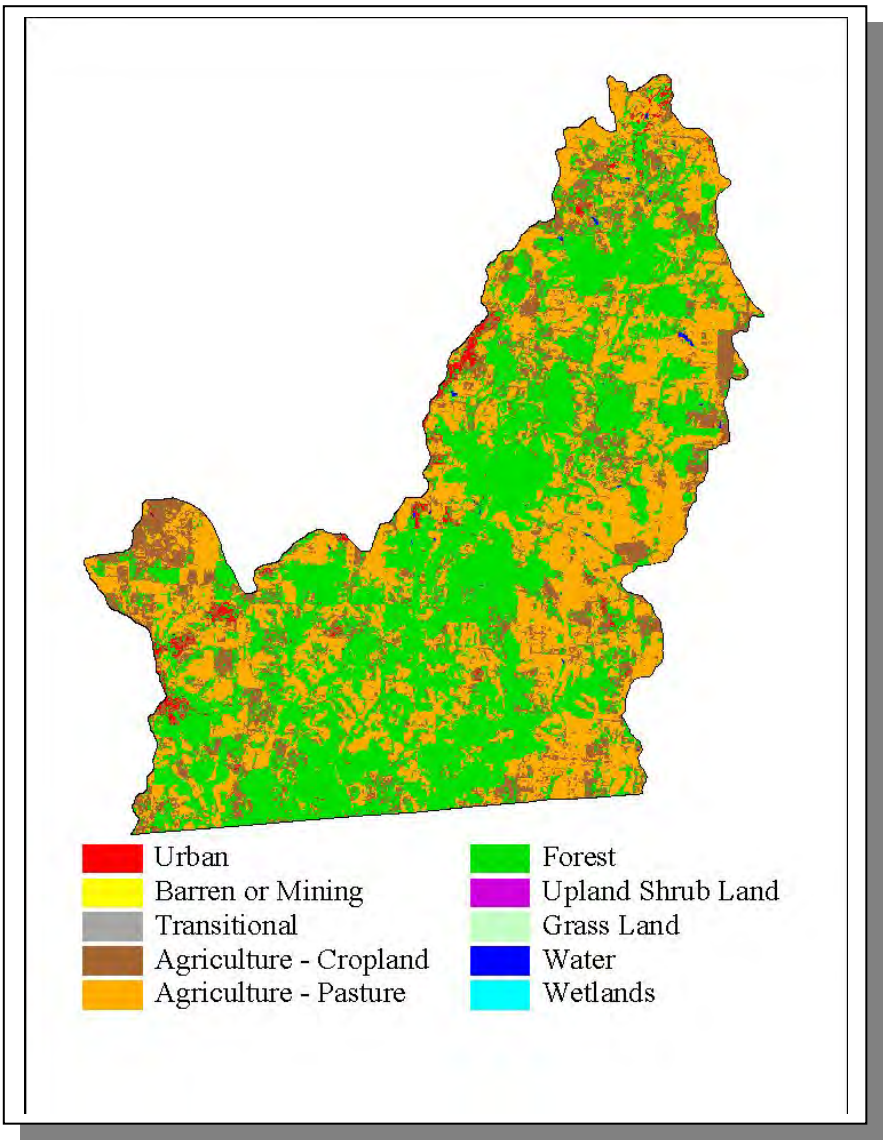


Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0603000502.

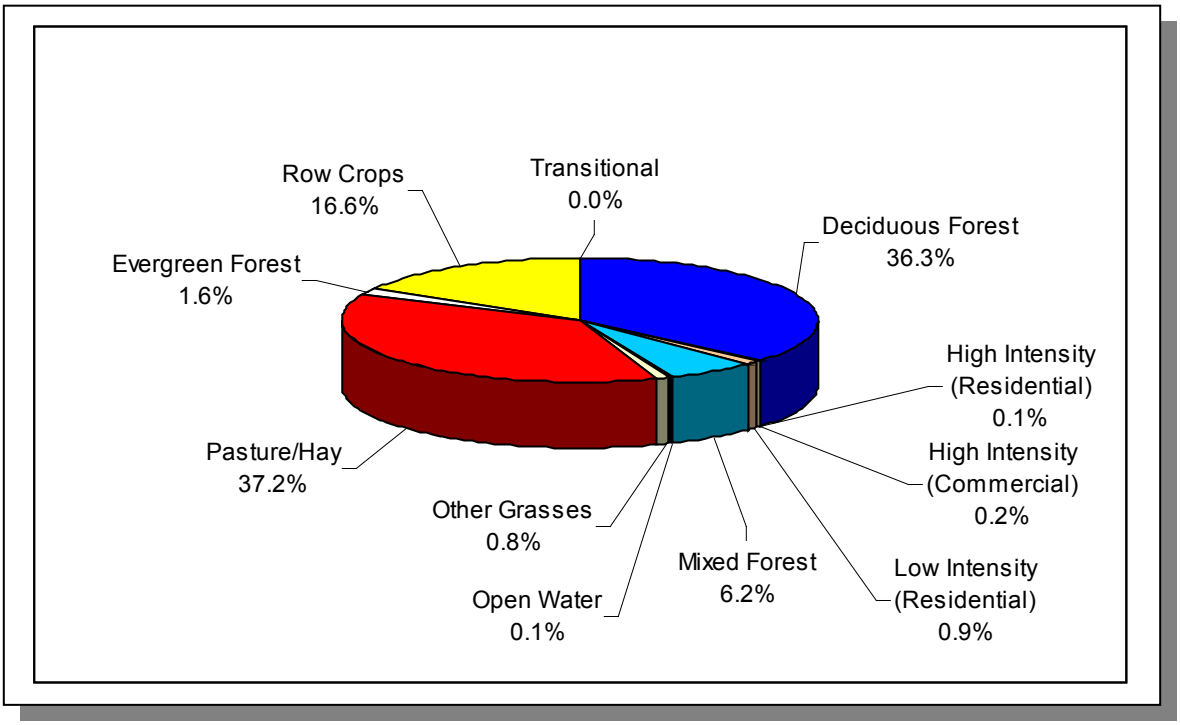


Figure 4-4. Land Use Distribution in Subwatershed 0603000502. *More information is provided in Pickwick-Appendix IV.*

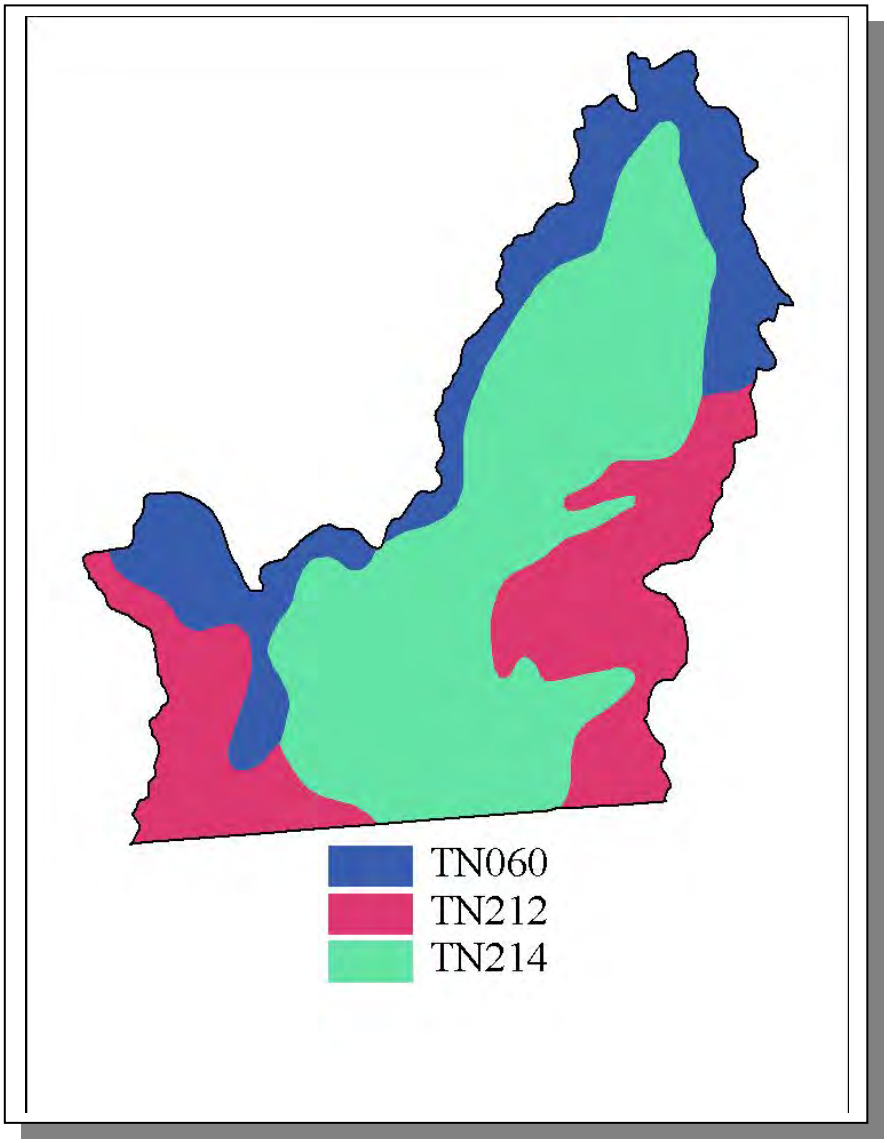


Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000502.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
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 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000502. *More details are provided in Pickwick-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Lawrence	35,303	39,095	8.47	2,989	3,310	10.7

Table 4-3. Population Estimates in Subwatershed 0603000502.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Loretto	Lawrence	1,515	620	20	594	6
St. Joseph	Lawrence	806	336	14	315	7
Total		**2,321**	**956**	**34**	**909**	**13**

Table 4-4. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0603000502.

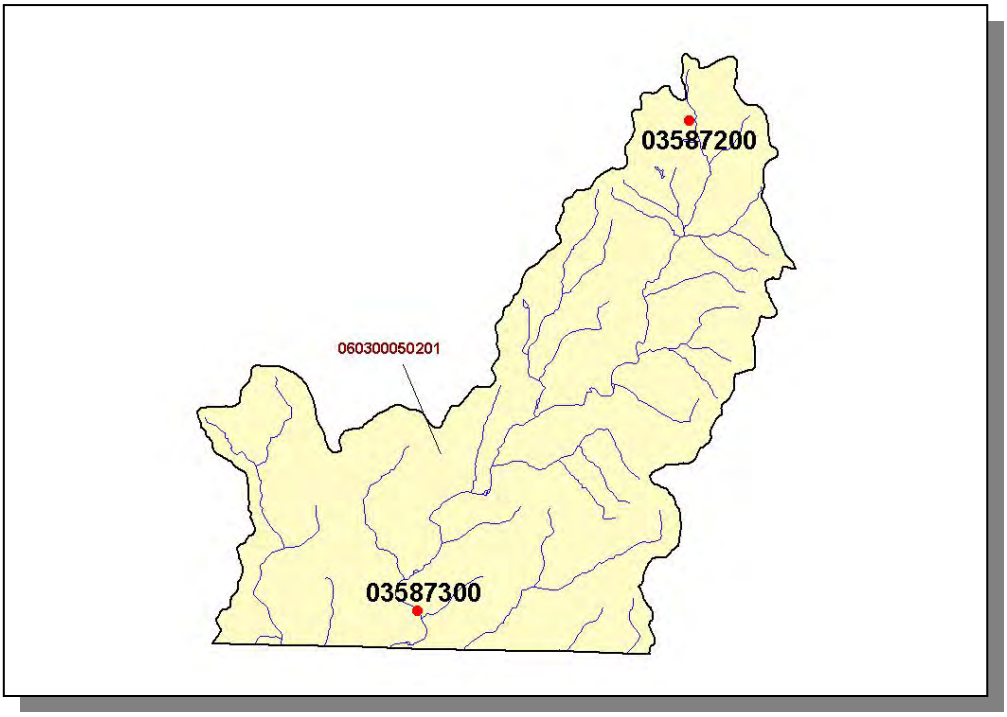


Figure 4-6. Location of Historical Streamflow Data Collection Sites in Subwatershed 0603000502. *More information is provided in Pickwick-Appendix IV.*

4.2.A.ii. Point Source Contributions.

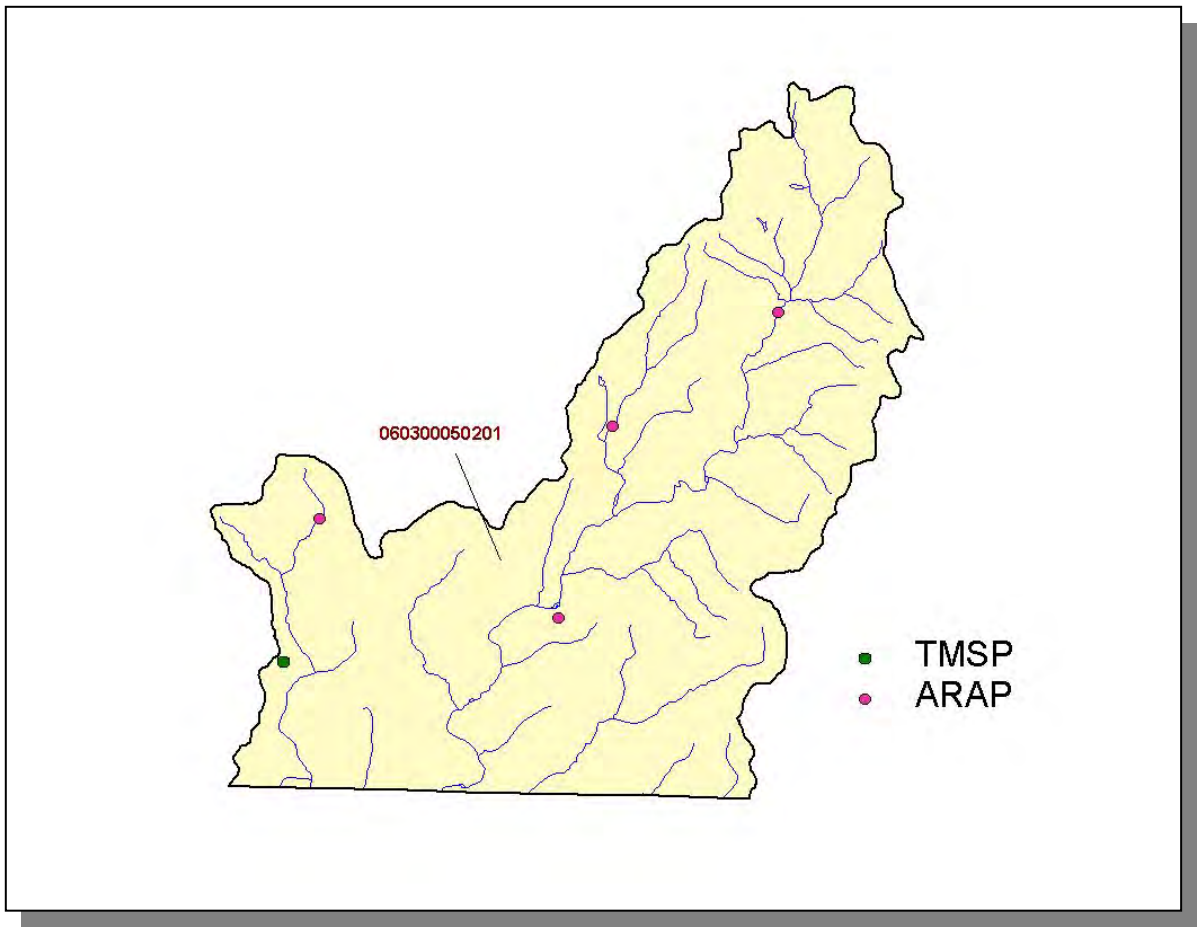


Figure 4-7. Location of Active Point Source Facilities in Subwatershed 0603000502. *More information is provided in the following figures.*

Figure 4-8. Location of TMSP Facilities in Subwatershed 0603000502. *More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

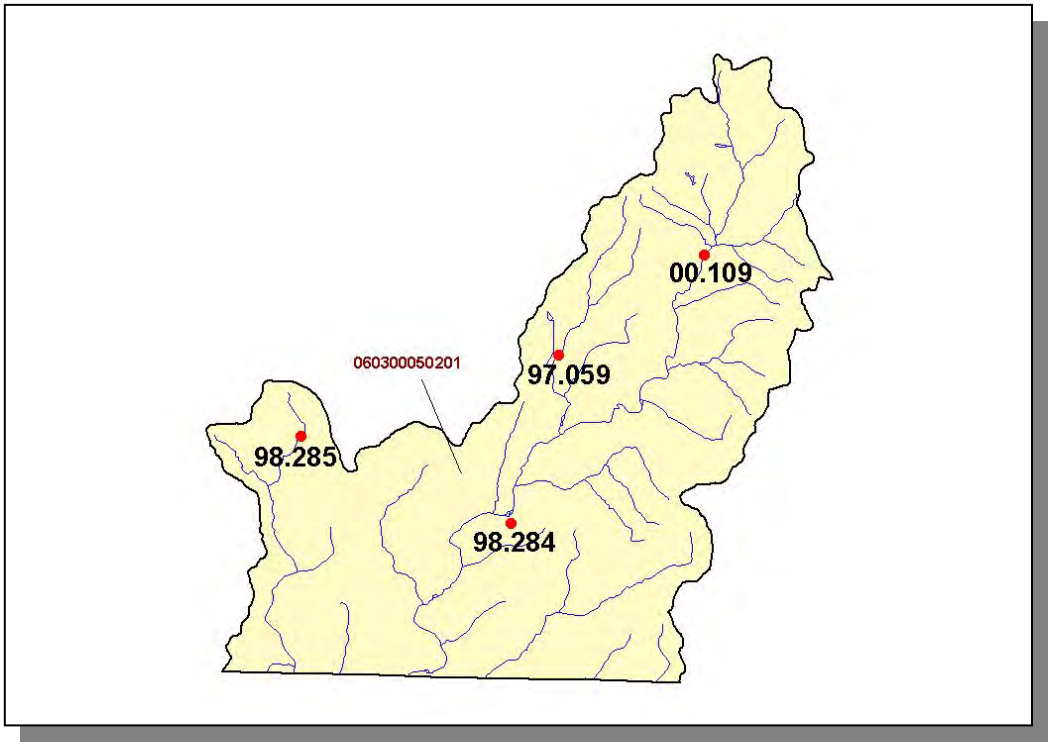


Figure 4-9. Location of ARAP Sites (Individual Permits) in Subwatershed 0603000502. *More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
3,261	6,359	363	10	16,014	976	26

Table 4-5. Summary of Livestock Count Estimates in Subwatershed 0603000502. *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 4-6. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0603000502.

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

Table 4-7. Annual Estimated Total Soil Loss in Subwatershed 0603000502.

4.2.B. 0603000503.

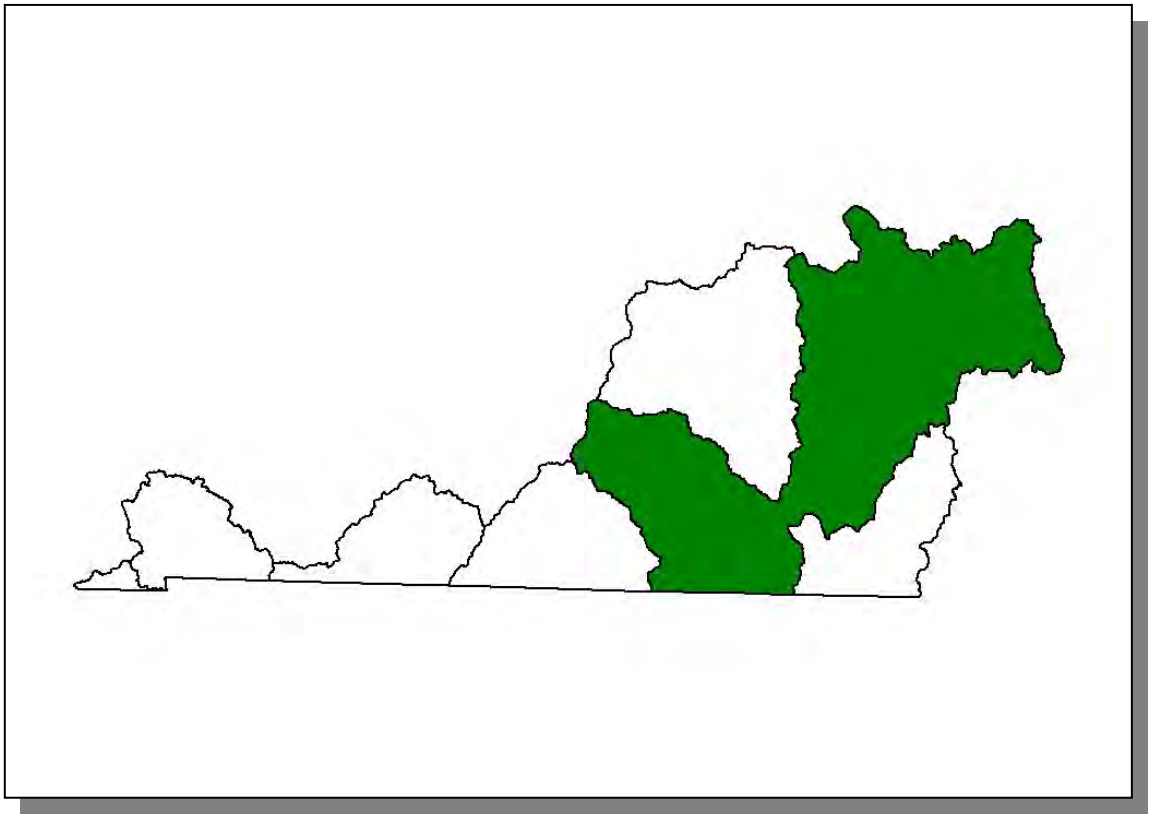


Figure 4-10. Location of Subwatershed 0603000503. *All Pickwick HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.B.i. General Description.

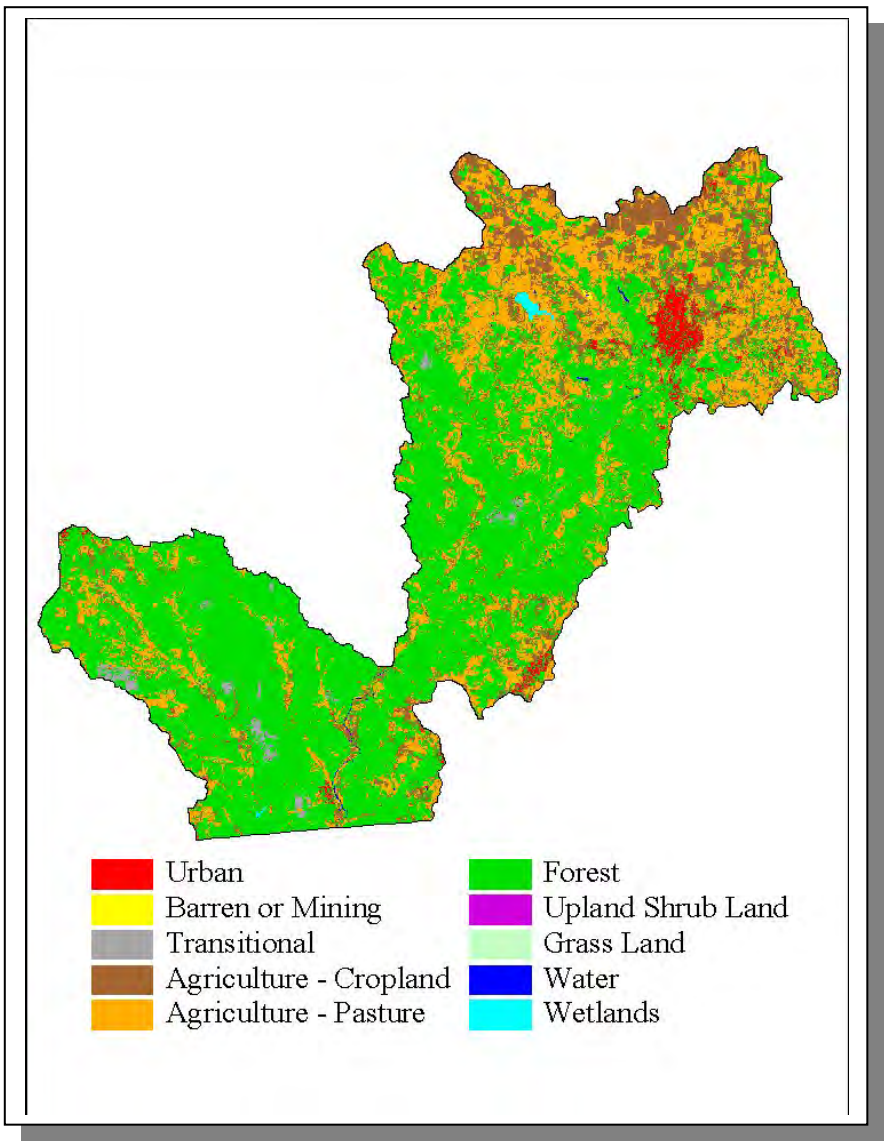


Figure 4-11. Illustration of Land Use Distribution in Subwatershed 0603000503.

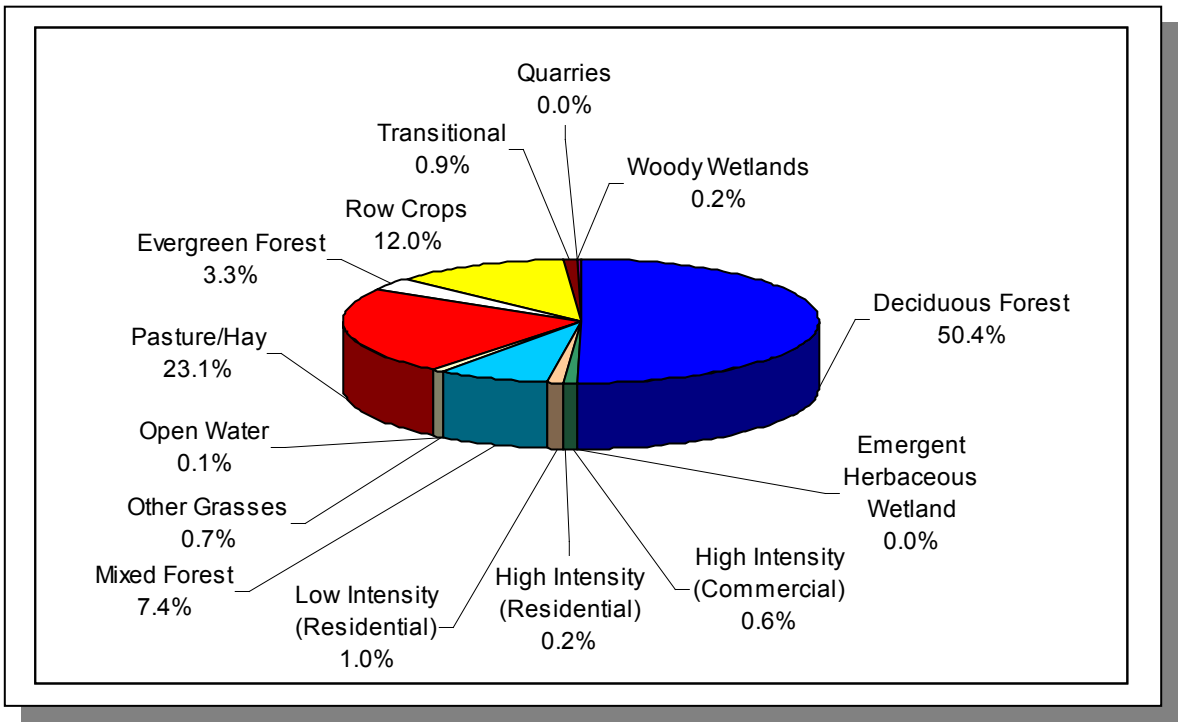


Figure 4-12. Land Use Distribution in Subwatershed 0603000503. *More information is provided in Pickwick-Appendix IV.*

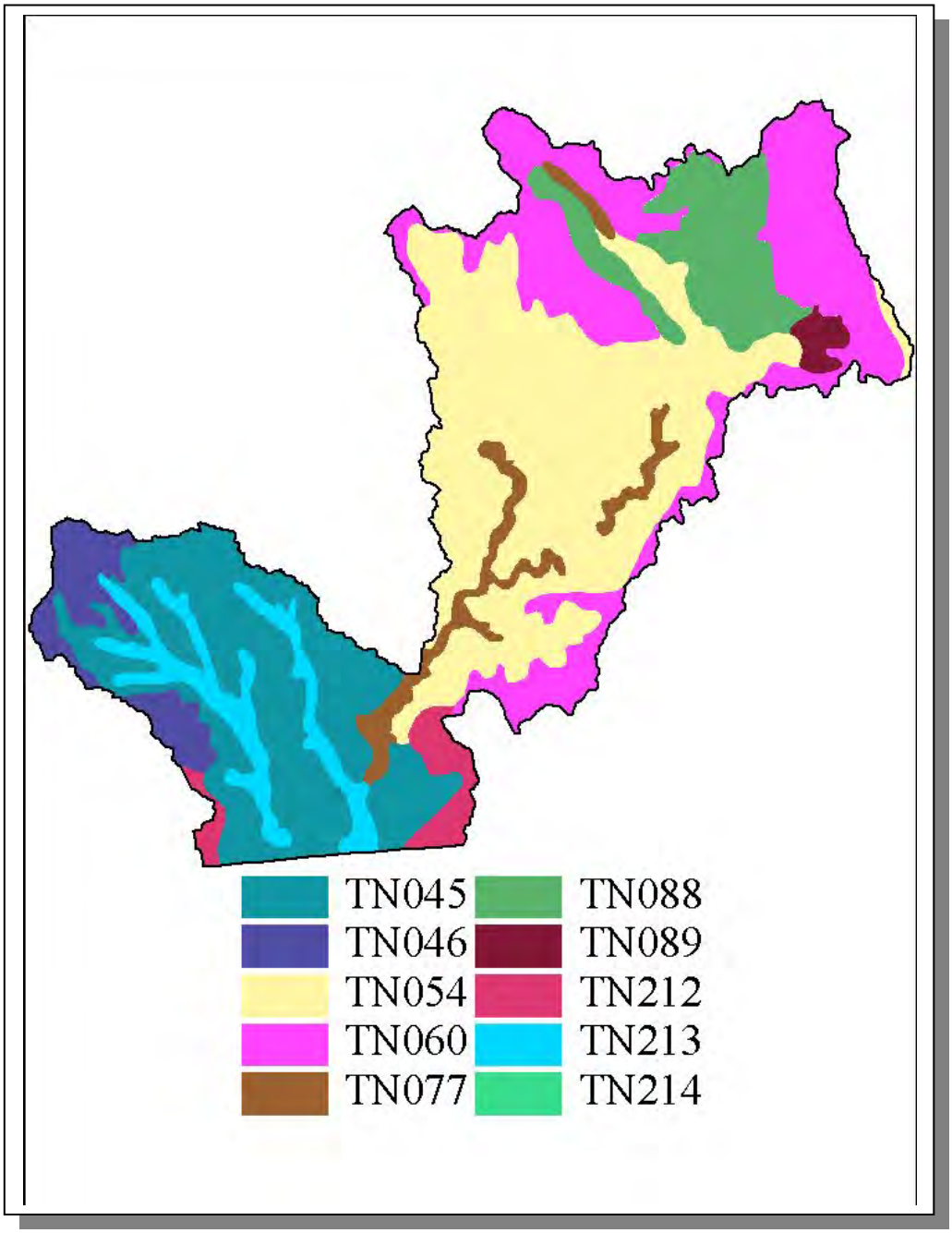


Figure 4-13. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000503.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN045	0.00	B	1.95	5.45	Loam	0.35
TN046	0.00	B	1.98	5.09	Silty Loam	0.38
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN077	4.00	C	2.16	5.03	Loam	0.34
TN088	1.00	B	1.38	5.43	Silty Loam	0.34
TN089	3.00	B	1.46	5.36	Loam	0.35
TN212	4.00	B	1.95	5.04	Silty Loam	0.38
TN213	9.00	C	1.89	5.30	Loam	0.35
TN214	0.00	B	2.52	4.86	Loam	0.32

Table 4-8. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000503. *More information is provided in Pickwick-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Lawrence	35,303	39,095	35.79	12,636	13,994	10.7
Wayne	13.935	16.498	9.27	1,292	1,529	18.3
Total	**49,238**	**55,593**		**13,928**	**15,523**	**11.5**

Table 4-9. Population Estimates in Subwatershed 0603000503.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Collinwood	Wayne	1,014	440	31	407	2
Iron City	Lawrence	385	156	0	156	0
Ethridge	Lawrence	571	250	11	234	5
Lawrenceburg	Lawrence	10,412	4,711	4,134	564	13
Loretto	Lawrence	1,515	620	20	594	6
St. Joseph	Lawrence	806	336	14	315	7
Totals		**14,703**	**6,513**	**4,210**	**2,270**	**33**

Table 4-10. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0603000503.

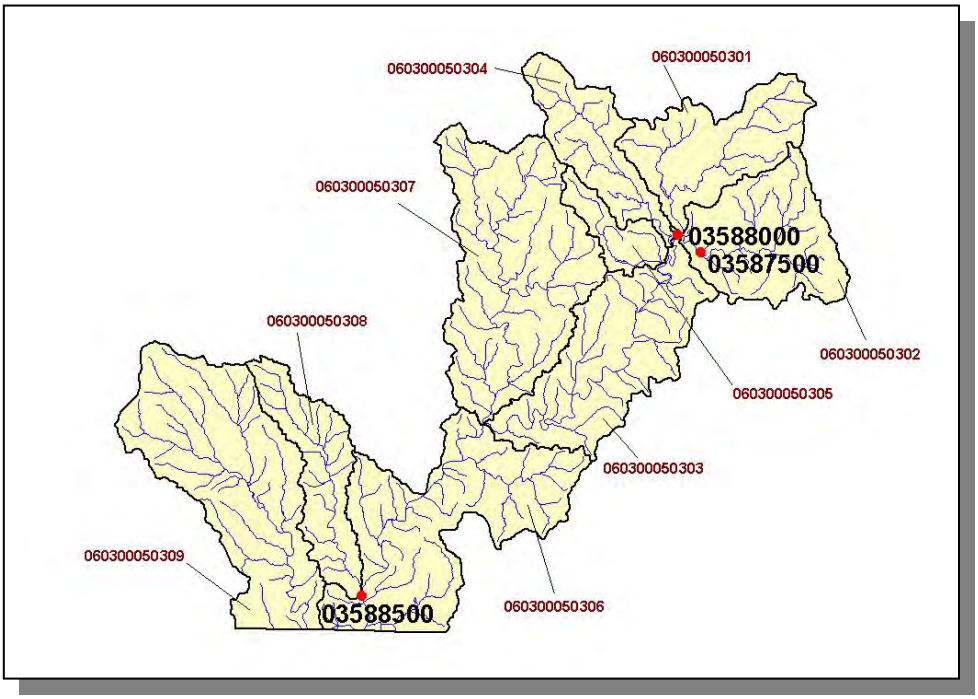


Figure 4-14. Location of Historical Streamflow Data Collection Sites in Subwatershed 0603000503. *Subwatershed 060300050301, 060300050302, 060300050303, 060300050304, 060300050305, 060300050306, 060300050307, 060300050308, and 060300050309 boundaries are shown for reference. More information is provided in Pickwick-Appendix IV.*

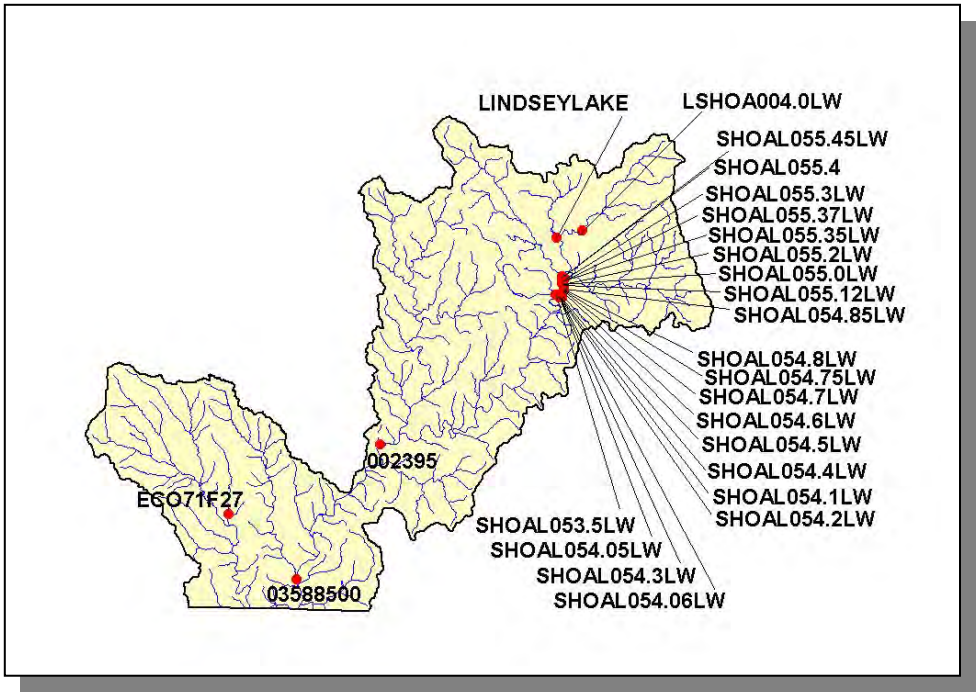


Figure 4-15. Location of STORET Monitoring Sites in Subwatershed 0603000503. *Subwatershed 060300050301, 060300050302, 060300050303, 060300050304, 060300050305, 060300050306, 060300050307, 060300050308, and 060300050309 boundaries are shown for reference. More information is provided in Pickwick-Appendix IV.*

4.2.B.ii. Point Source Contributions.

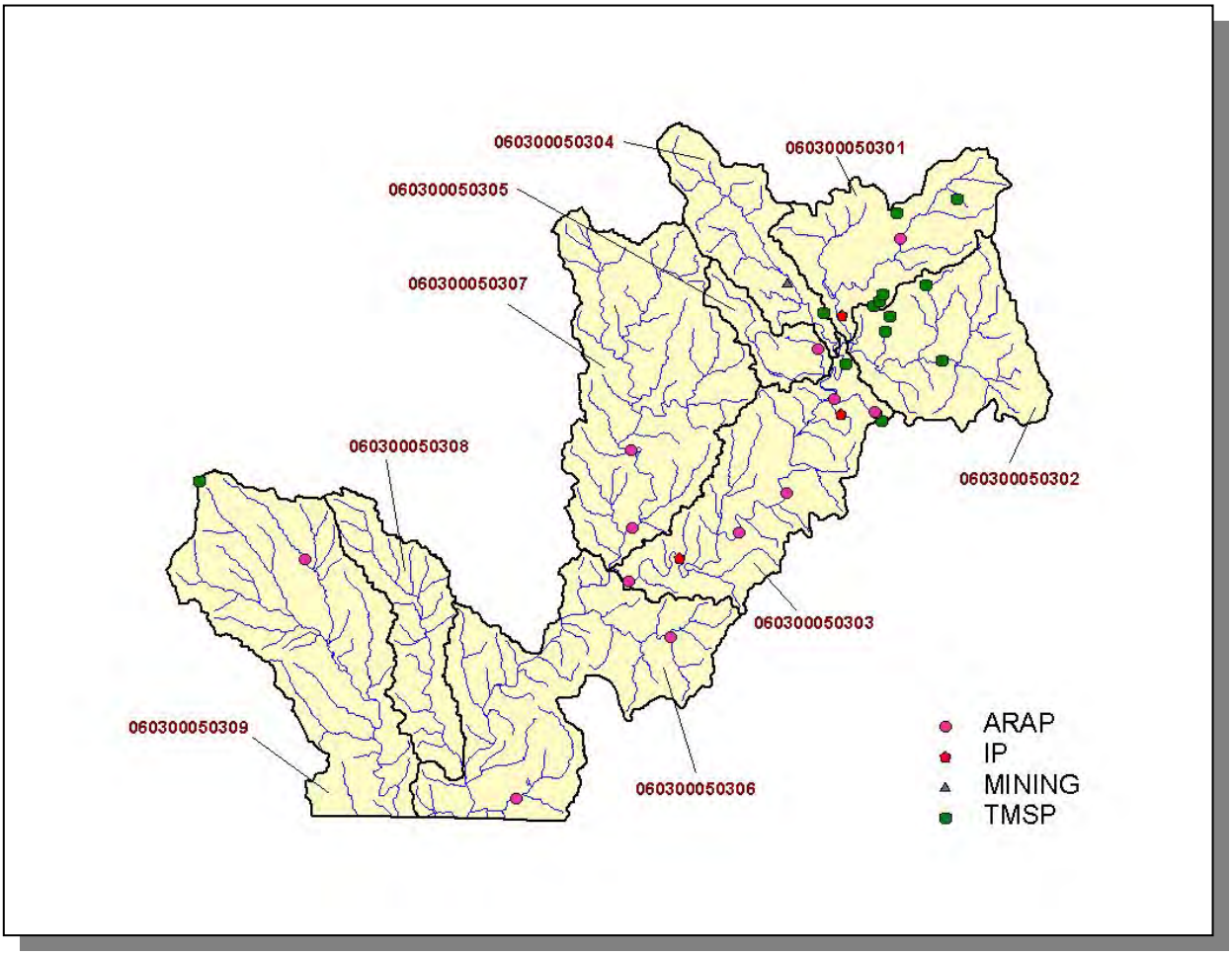


Figure 4-16. Location of Active Point Source Facilities in Subwatershed 0603000503. *Subwatershed 060300050301, 060300050302, 060300050303, 060300050304, 060300050305, 060300050306, 060300050307, 060300050308, and 060300050309 boundaries are shown for reference. More information is provided in the following figures.*

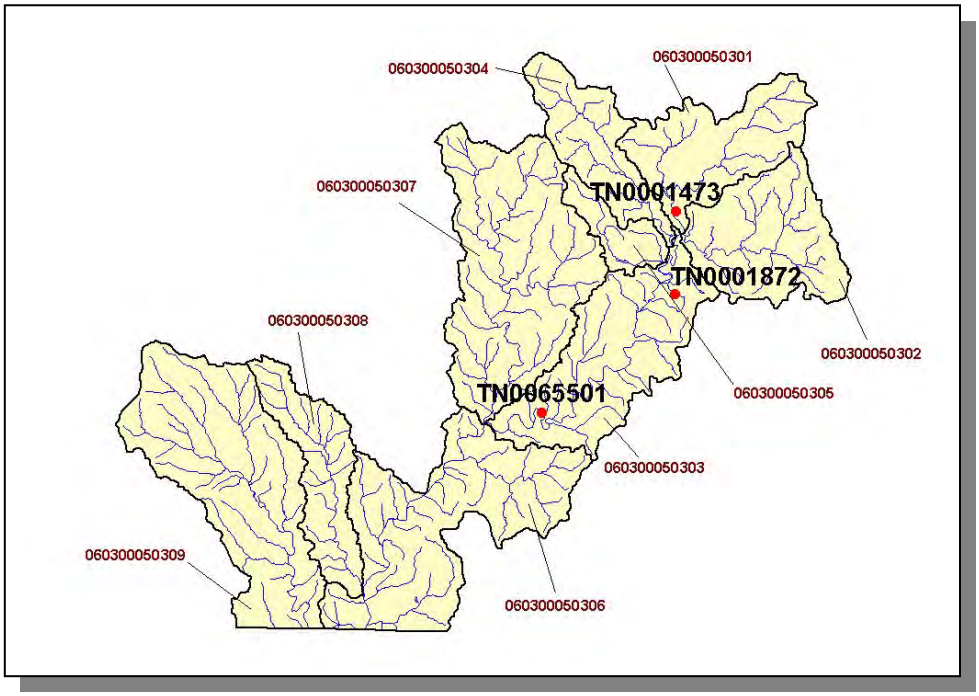


Figure 4-17. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 0603000503. *Subwatershed 060300050301, 060300050302, 060300050303, 060300050304, 060300050305, 060300050306, 060300050307, 060300050308, and 060300050309 boundaries are shown for reference. More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

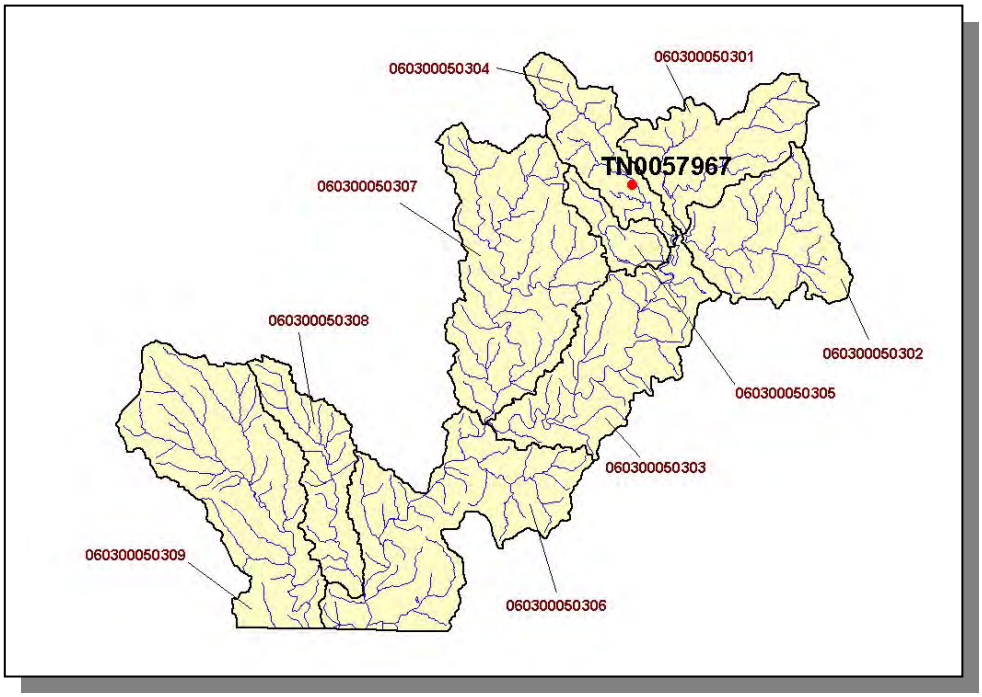


Figure 4-18. Location of Active Mining Sites in Subwatershed 0603000503. *Subwatershed 060300050301, 060300050302, 060300050303, 060300050304, 060300050305, 060300050306, 060300050307, 060300050308, and 060300050309 boundaries are shown for reference. More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

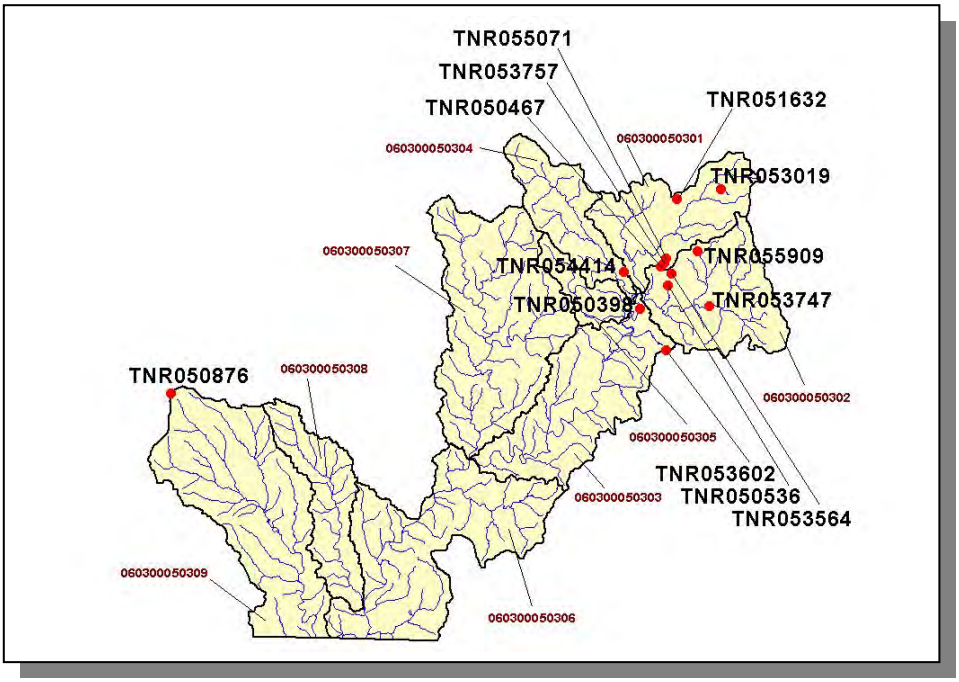


Figure 4-19. Location of TMSP Facilities in Subwatershed 0603000503. *Subwatershed 060300050301, 060300050302, 060300050303, 060300050304, 060300050305, 060300050306, 060300050307, 060300050308, and 060300050309 boundaries are shown for reference. More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

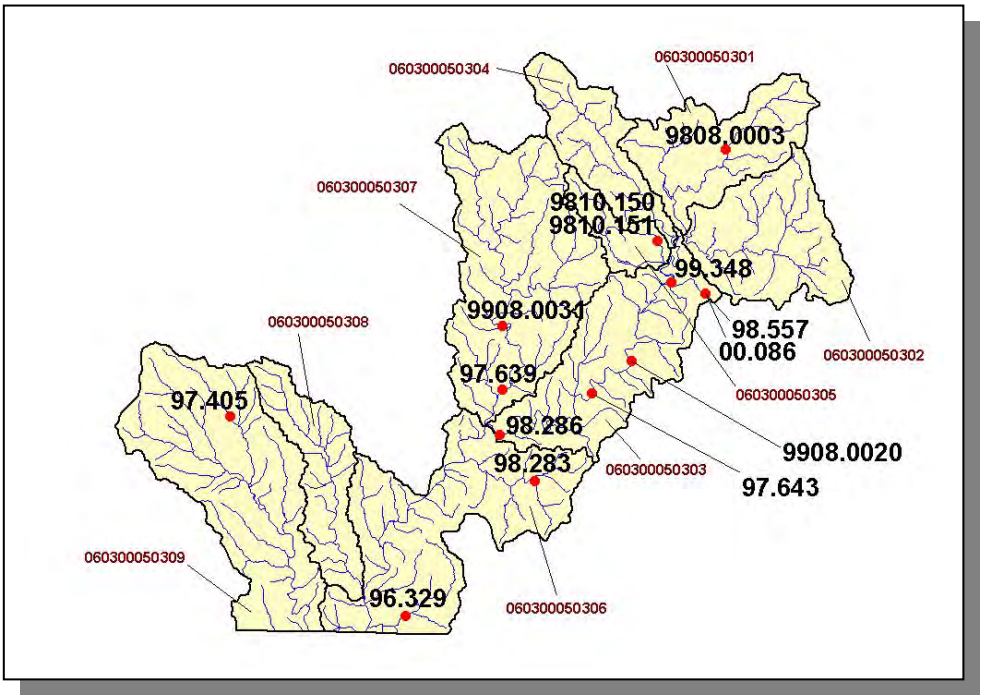


Figure 4-20. Location of ARAP Sites (Individual Permits) in Subwatershed 0603000503. *Subwatershed 060300050301, 060300050302, 060300050303, 060300050304, 060300050305, 060300050306, 060300050307, 060300050308, and 060300050309 boundaries are shown for reference. More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

4.2.B.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
11,836	22,830	1,153	33	5,979	3,407	91

Table 4-11. Summary of Livestock Count Estimates in Subwatershed 0603000503. *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)
Wayne	199.8	199.8	6.6	27.1
Lawrence	372.6	372.6	14.1	41.1
Total	**572.4**	**572.4**	**20.7**	**68.2**

Table 4-12. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0603000503.

CROPS	TONS/ACRE/YEAR
Legume/Grass (Hayland)	0.64
Grass (Hayland)	0.19
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Corn (Row Crops)	6.01
Soybeans (Row Crops)	28.85
Cotton (Row Crops)	8.07
Wheat (Close Grown Cropland)	14.15
All Other Close Grown Cropland	1.80
Grass (Pastureland)	0.23
Grass, Forbs, Legumes (Mixed Pasture)	0.25
Other Vegetable and Truck Crop	
Other (Horticulture)	
Other Cropland not Planted	13.55
Conservation Reserve Program Land	0.90
Non Agricultural Land Use	0.00
Farmsteads and Ranch Headquarters	5.16

Table 4-13. Annual Estimated Total Soil Loss in Subwatershed 0603000503.

4.2.C. 0603000504.

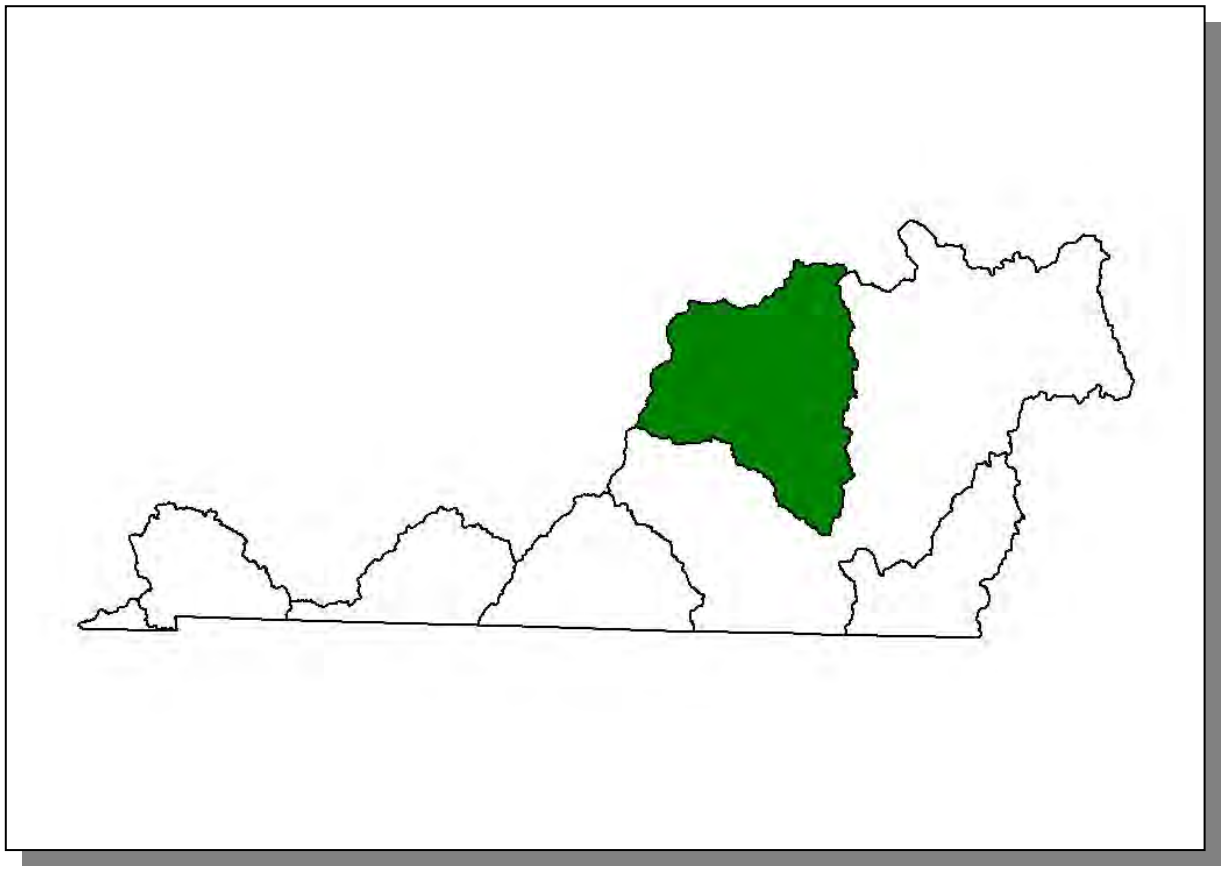


Figure 4-21. Location of Subwatershed 0603000504. *All Pickwick HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.C.i. General Description.

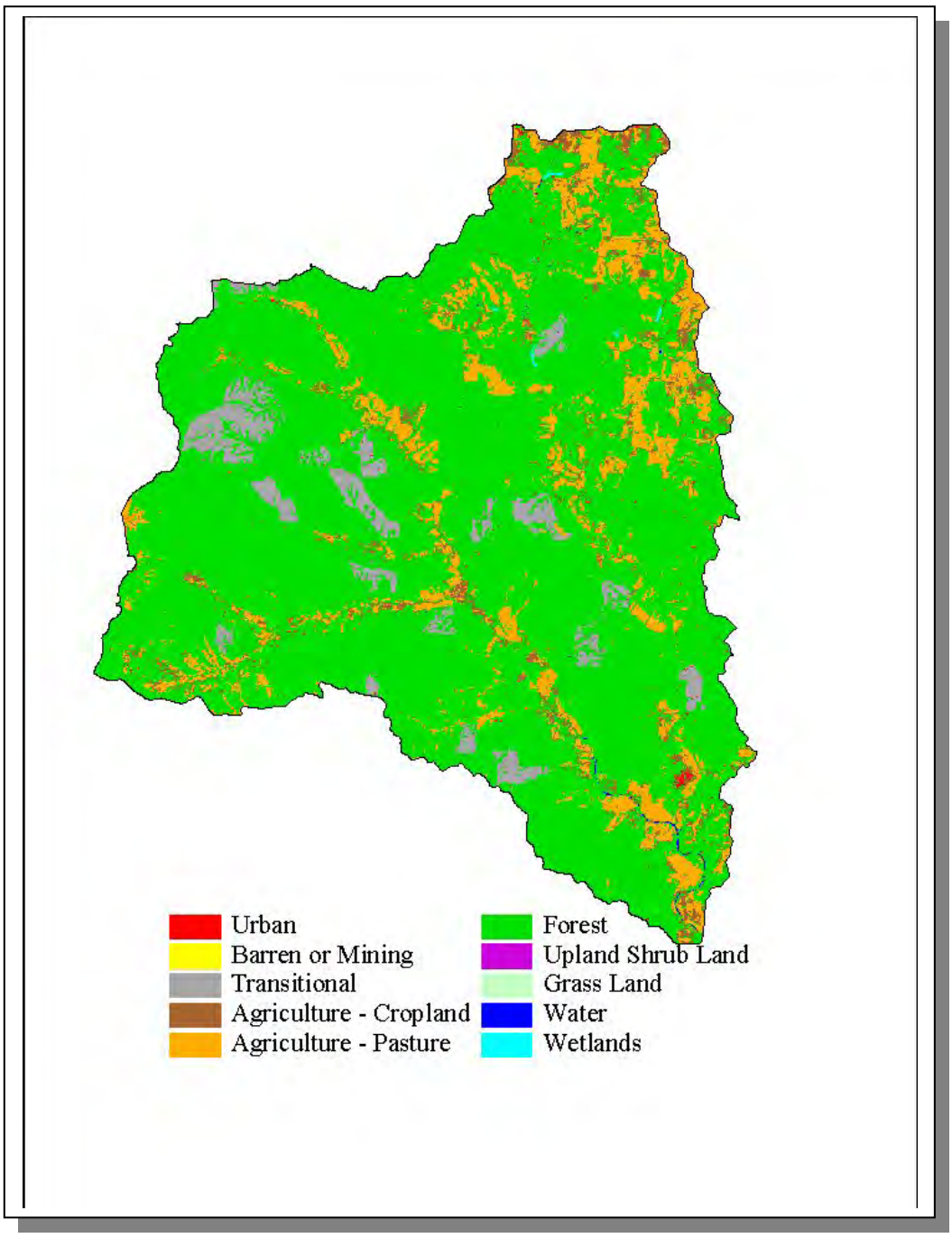


Figure 4-22. Illustration of Land Use Distribution in Subwatershed 0603000504.

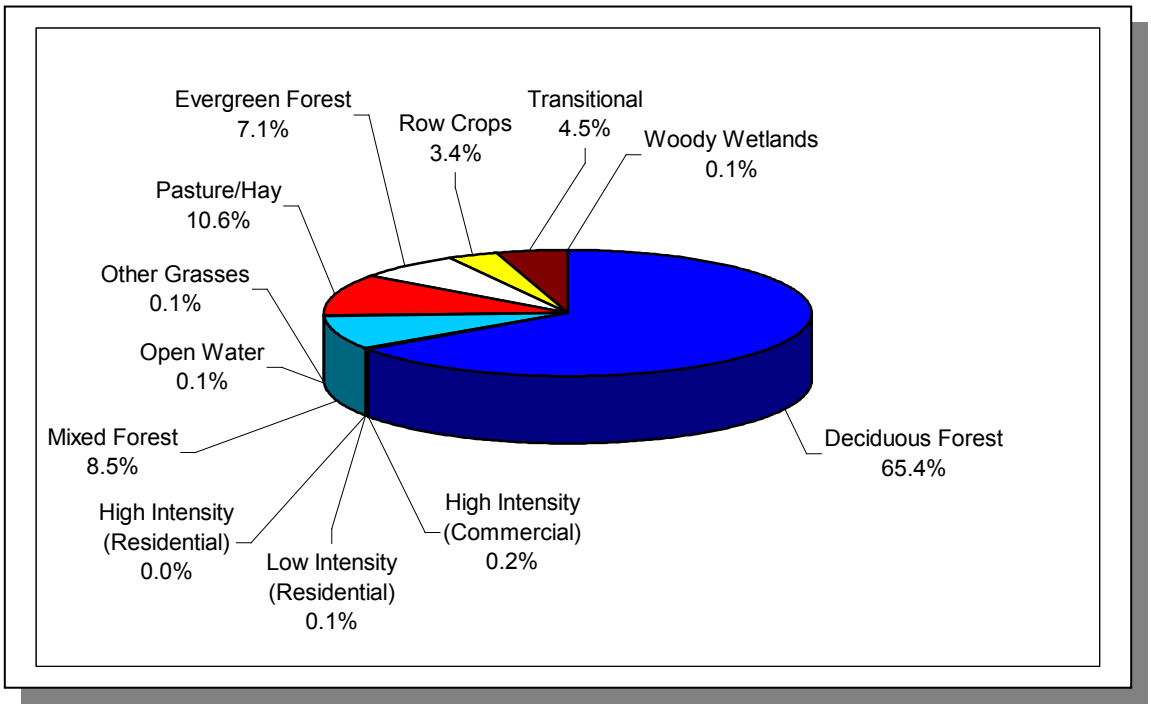


Figure 4-23. Land Use Distribution in Subwatershed 0603000504. *More information is provided in Pickwick-Appendix IV.*

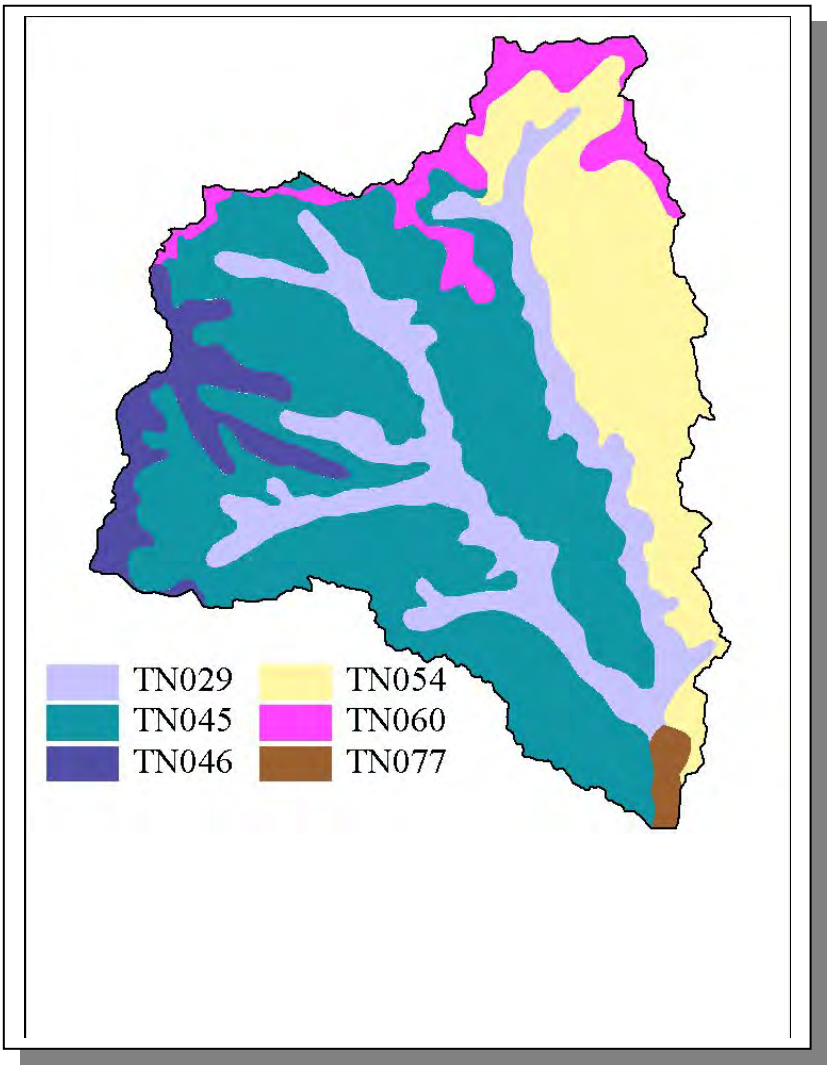


Figure 4-24. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000504.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN029	8.00	C	2.96	5.40	Loam	0.33
TN045	0.00	B	1.95	5.45	Loam	0.35
TN046	0.00	B	1.98	5.09	Silty Loam	0.38
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN077	4.00	C	2.16	5.03	Loam	0.34

Table 4-14. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000504. *More information is provided in Pickwick-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Lawrence	35,303	39,095	8.65	3,052	3,380	10.7
Wayne	13,935	16,498	8.91	1,241	1,469	18.4
Total	**49,238**	**55,593**		**4,293**	**4,849**	**13.0**

Table 4-15. Population Estimates in Subwatershed 0603000504.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Collinwood	Wayne	1,104	440	31	407	2

Table 4-16. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0603000504.

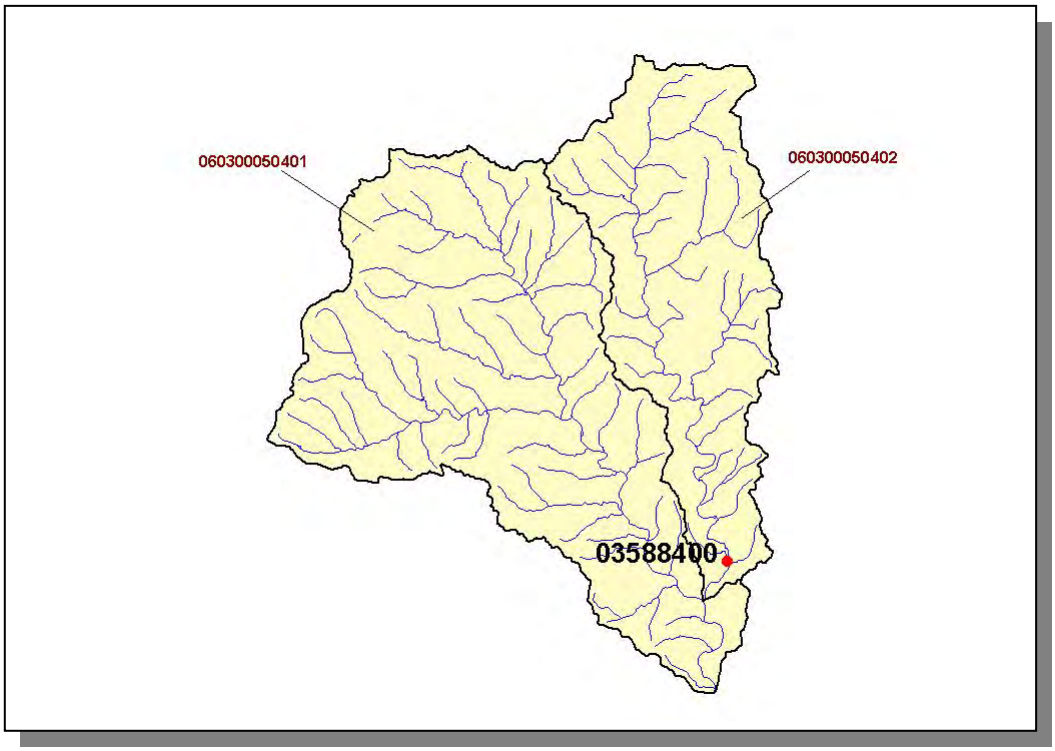


Figure 4-25. Location of Historical Streamflow Data Collection Sites in Subwatershed 0603000504. *Subwatershed 060300050401 and 060300050402 boundaries are shown for reference. More information is provided in Pickwick-Appendix IV.*

4.2.C.ii. Point Source Contributions.

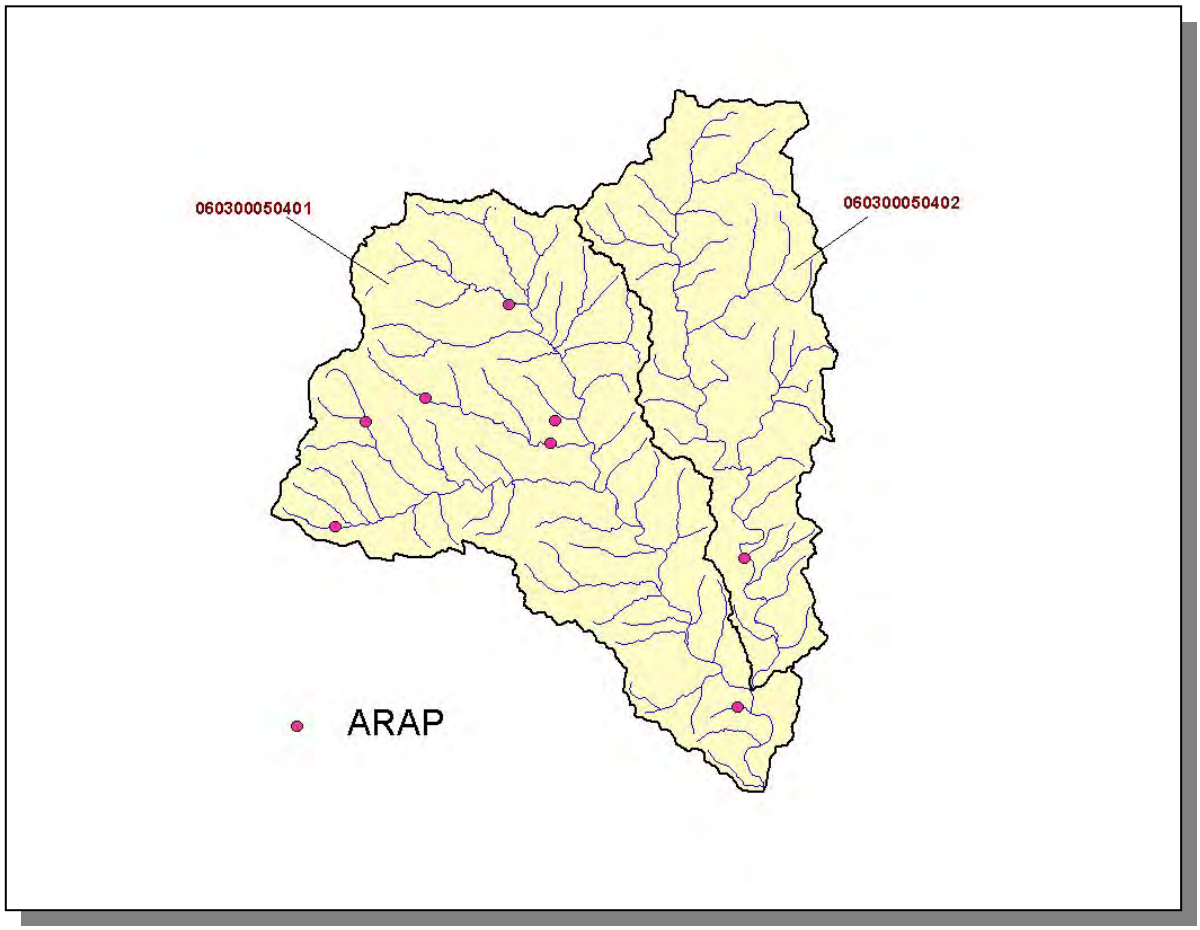


Figure 4-26. Location of Active Point Source Facilities in Subwatershed 0603000504. *Subwatershed 060300050401 and 060300050402 boundaries are shown for reference. More information is provided in the following figures.*

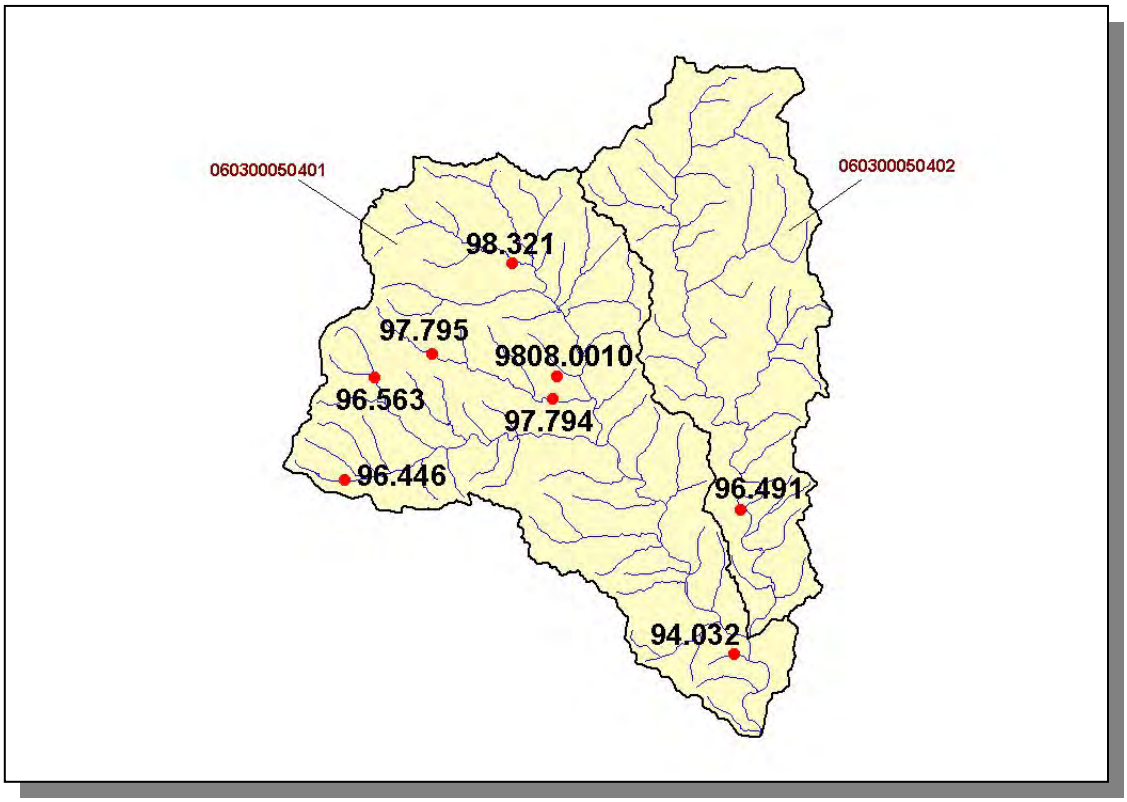


Figure 4-27. Location of ARAP Sites (Individual Permits) in Subwatershed 0603000504. *Subwatershed 060300050401 and 060300050402 boundaries are shown for reference. More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

4.2.C.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
2,082	3,921	137	5	3	529	17

Table 4-17. Summary of Livestock Count Estimates in Subwatershed 0603000504. *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
Wayne	372.6	372.6	14.1	41.1
Totals	**572.4**	**572.4**	**20.7**	**68.2**

Table 4-18. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0603000504.

CROPS	TONS/ACRE/YEAR
Corn (Row Crops)	6.80
Soybeans (Row Crops)	28.85
Cotton (Row Crops)	8.07
Grass (Hayland)	0.19
Legume/Grass (Hayland)	0.64
Grass (Pastureland)	0.23
Grass, Forbs, Legumes (Mixed Pasture)	0.43
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Wheat (Close Grown Cropland)	14.15
All Other Close Grown Cropland	1.80
Conservation Reserve Program Land	0.90
Farmsteads and Ranch Headquarters	3.40
Other Cropland not Planted	13.55
Nonagricultural Land Use	0.00

Table 4-19. Annual Estimated Total Soil Loss in Subwatershed 0603000504.

4.2.D. 0603000505.

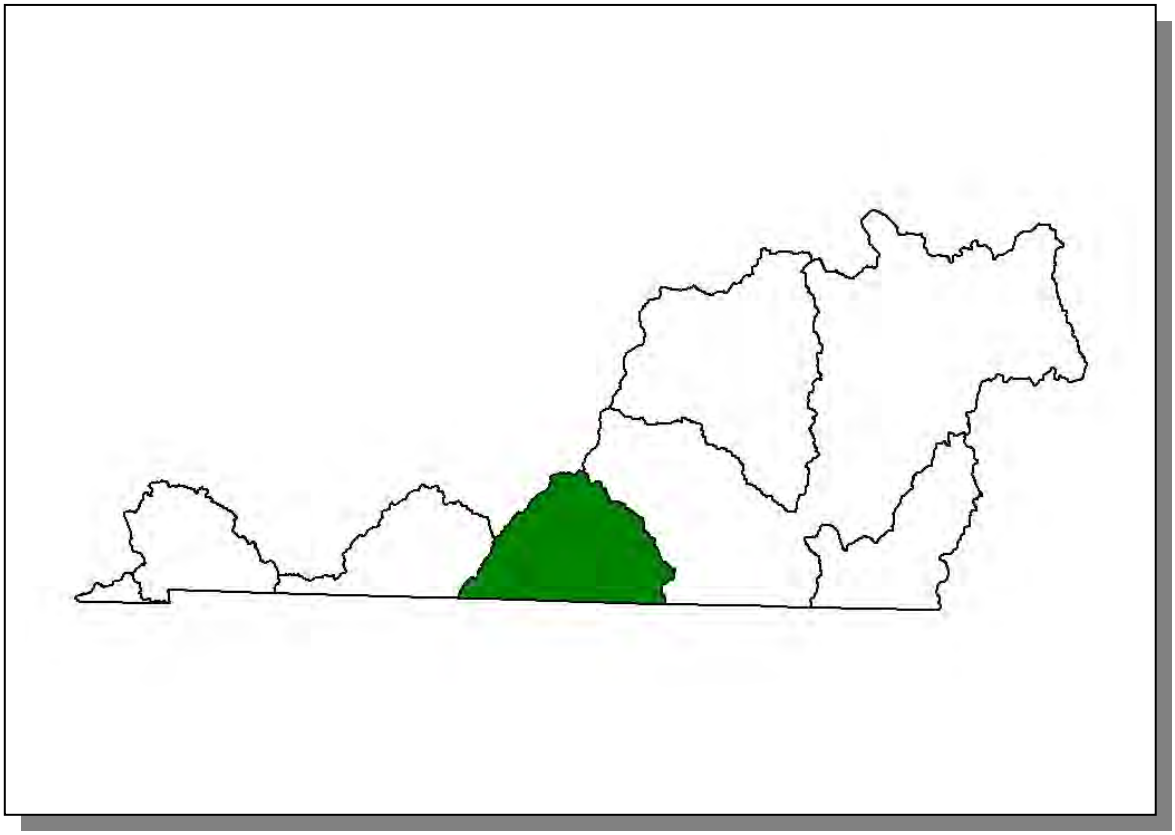


Figure 4-28. Location of Subwatershed 0603000505. *All Pickwick HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.D.i. General Description.

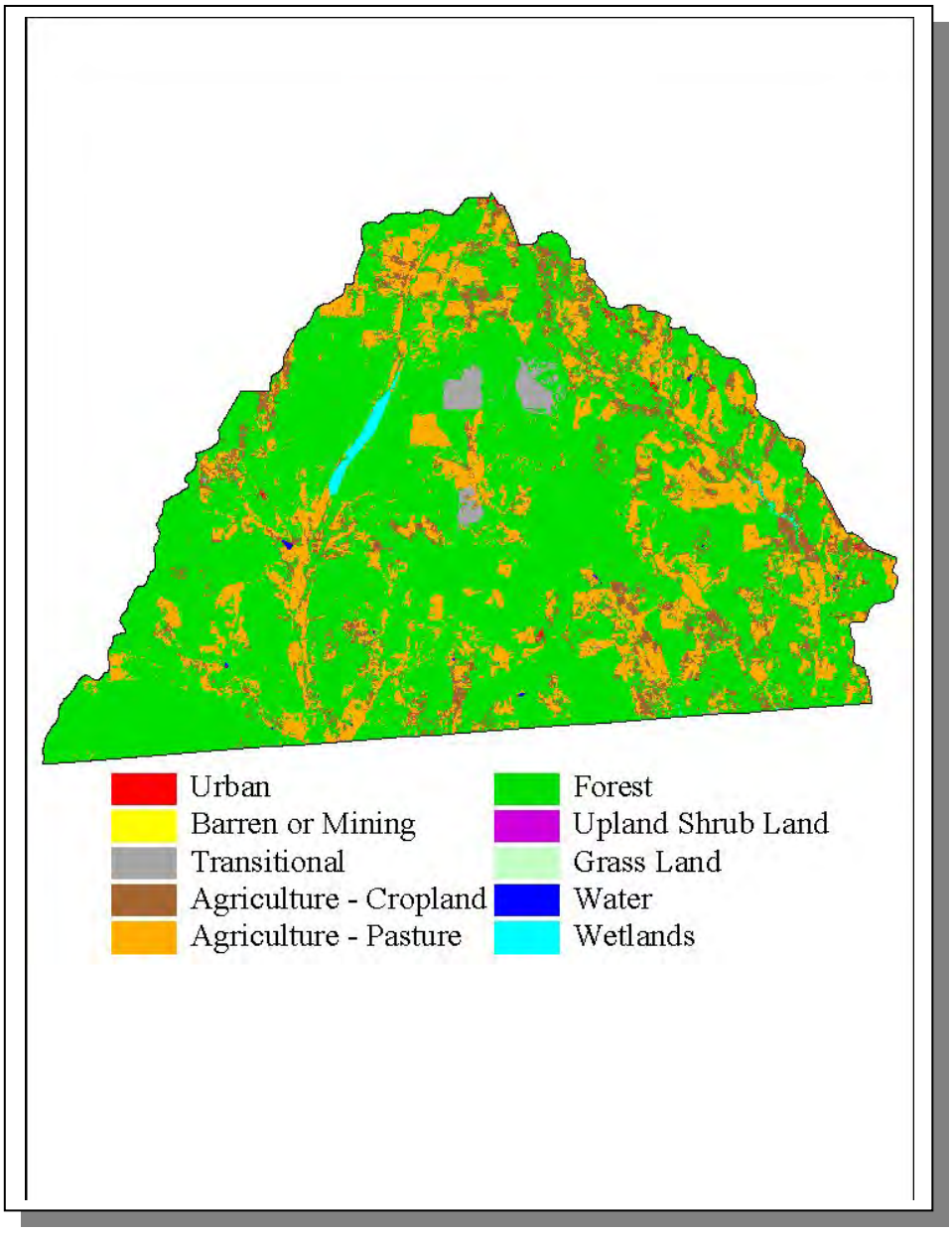


Figure 4-29. Illustration of Land Use Distribution in Subwatershed 0603000505.

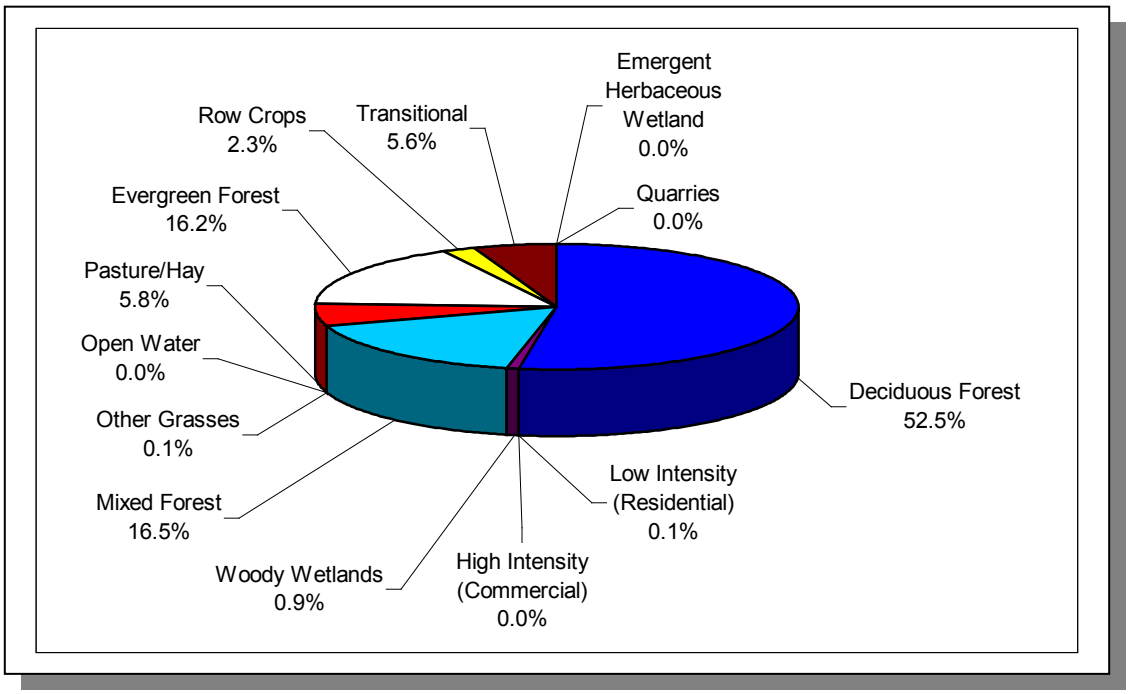


Figure 4-30. Land Use Distribution in Subwatershed 0603000505. *More information is provided in Pickwick-Appendix IV.*

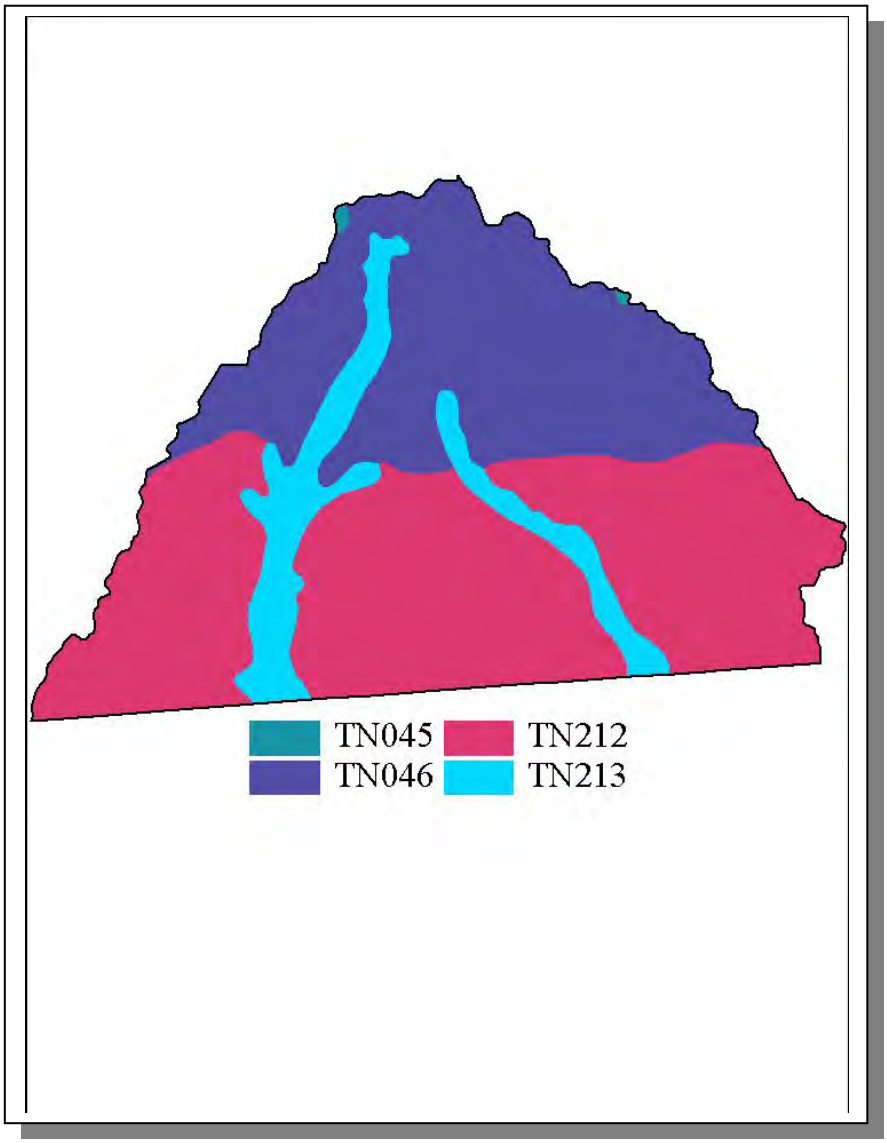


Figure 4-31. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000505.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN045	0.10	B	1.95	5.45	Loam	0.35
TN046	0.10	B	1.98	5.09	Silty Loam	0.38
TN212	12.00	B	1.95	5.04	Silty Loam	0.38
TN213	36.00	C	1.89	5.30	Loam	0.35

Table 4-20. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000505. *More information is provided in Pickwick-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Wayne	13,935	16,498	8.06	1,123	1,329	18.3
Lauderdale	79,661	84,042	0.87	691	729	5.5
Total	**93,596**	**100,540**		**1,814**	**2,058**	**13.5**

Table 4-21. Population Estimates in Subwatershed 0603000505.

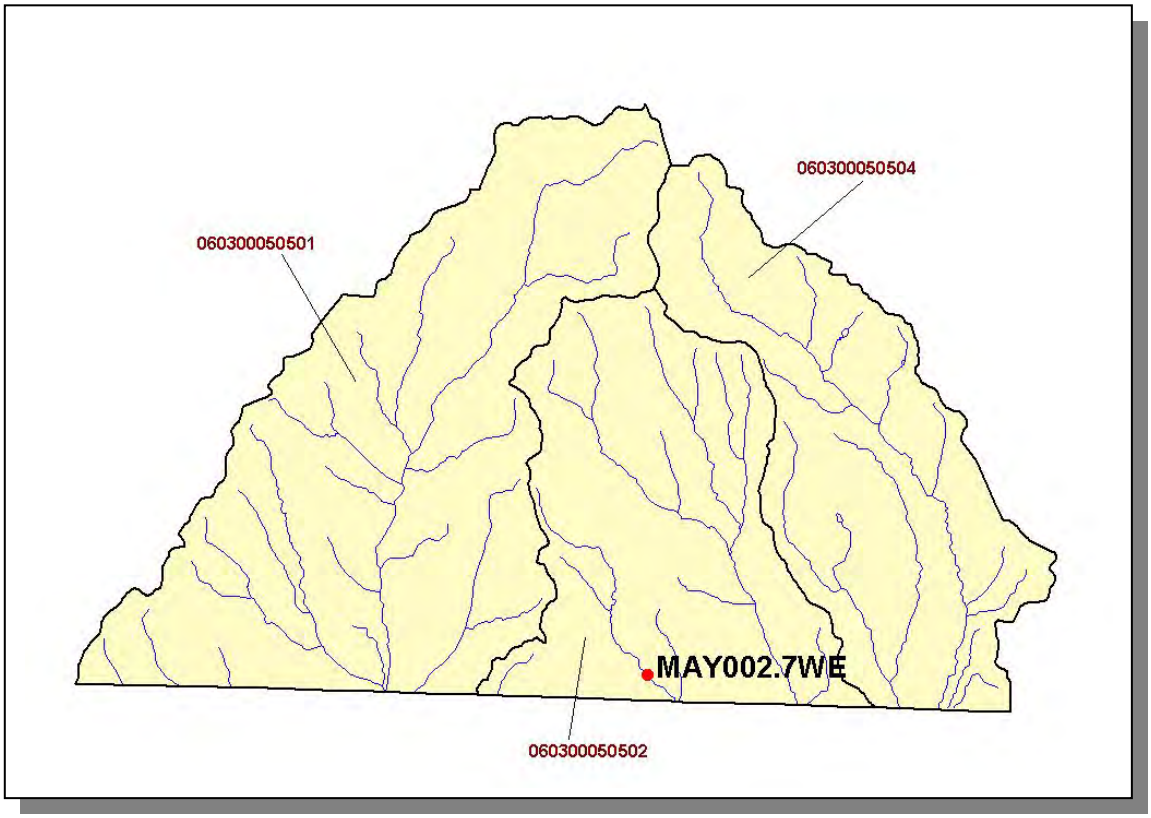


Figure 4-32. Location of STORET Monitoring Sites in Subwatershed 0603000505. *Subwatershed 060300050501 and 060300050504 boundaries are shown for reference. More information is provided in Pickwick-Appendix IV.*

4.2.D.ii. Point Source Contributions.

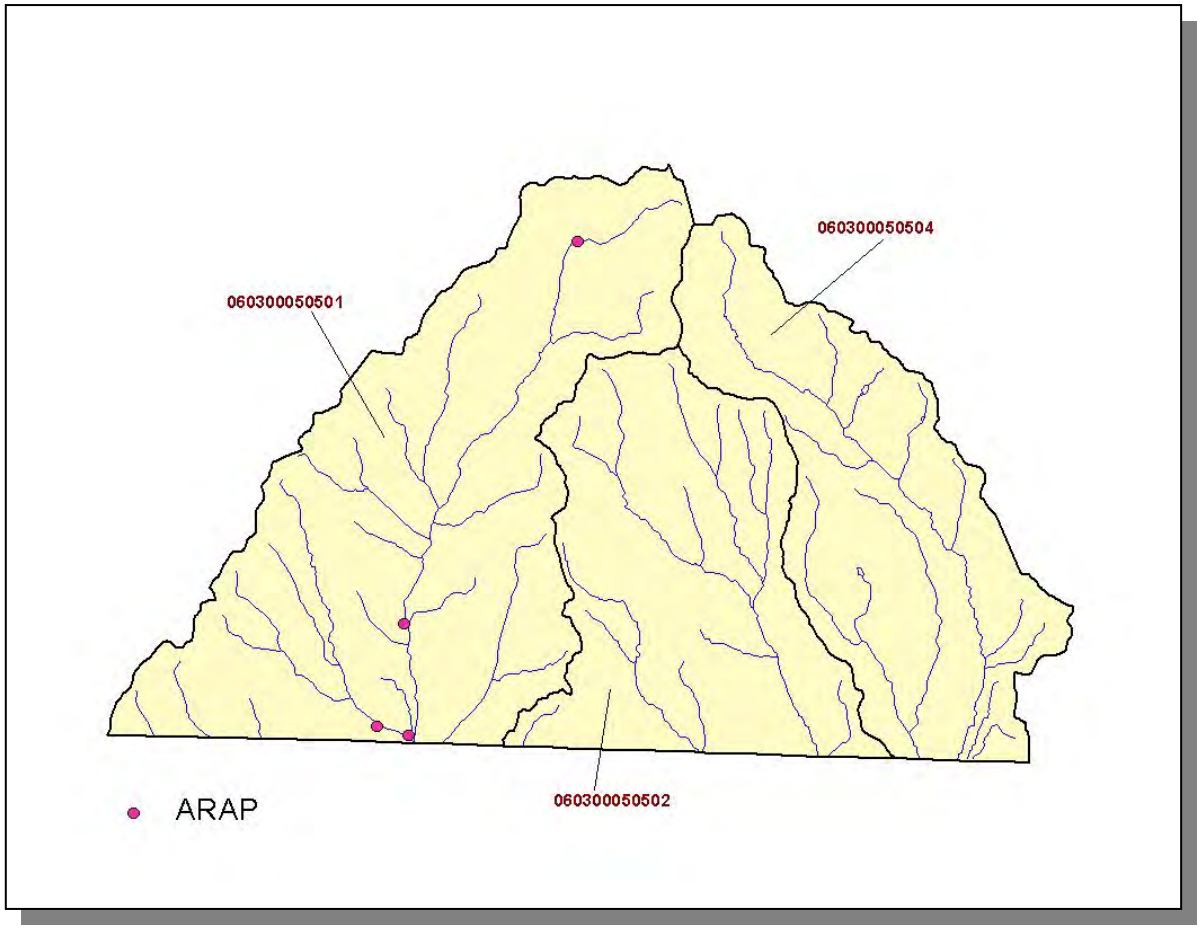


Figure 4-33. Location of Active Point Source Facilities in Subwatershed 0603000505. *Subwatershed 060300050501 and 060300050504 boundaries are shown for reference. More information is provided in the following figures.*

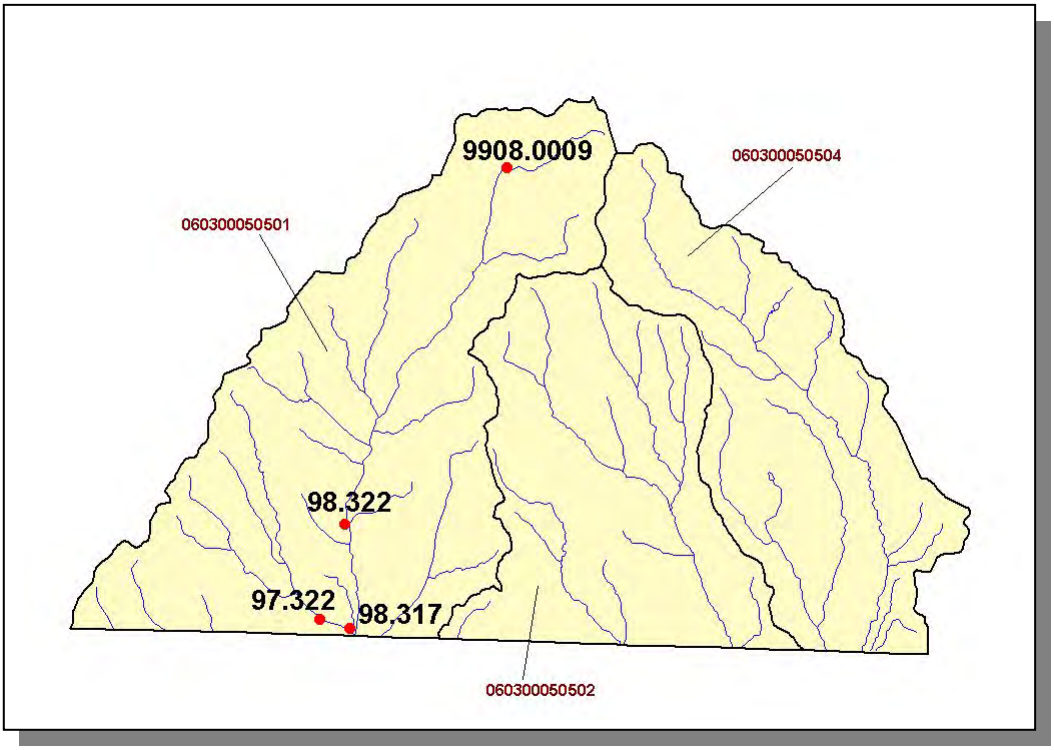


Figure 4-34. Location of ARAP Sites (Individual Permits) in Subwatershed 0603000505. *Subwatershed 060300050501 and 060300050504 boundaries are shown for reference. More information is provided in Pickwick-Appendix IV.*

4.2.D.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens	Chickens Sold	Hogs	Sheep
2,437	<5	4,359	<5	8	449	24

Table 4-22. Summary of Livestock Count Estimates in Subwatershed 0603000505. *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)
Wayne	372.6	372.6	14.1	14.1

Table 4-23. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0603000505.

4.2.E. 0603000506.

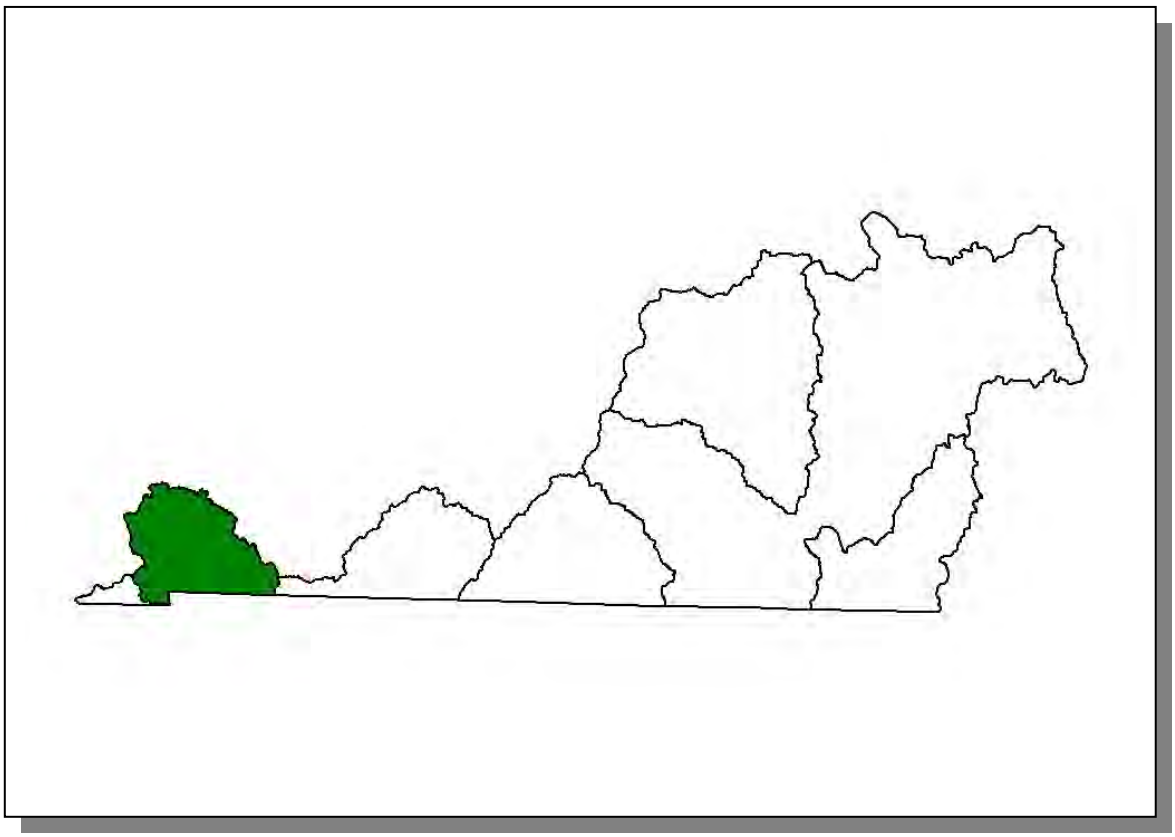


Figure 4-35. Location of Subwatershed 0603000506. *All Pickwick HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.E.i. General Description.

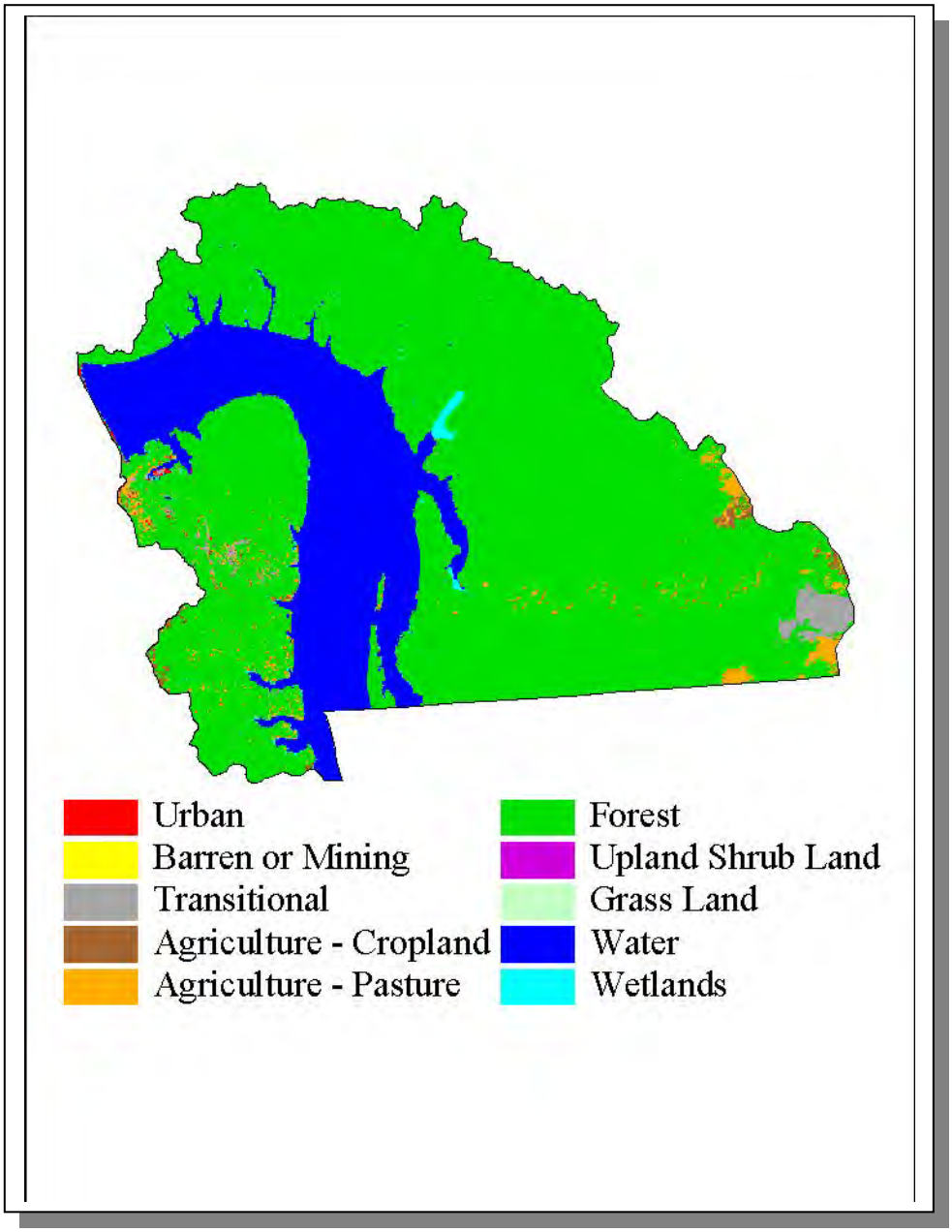


Figure 4-36. Illustration of Land Use Distribution in Subwatershed 0603000506.

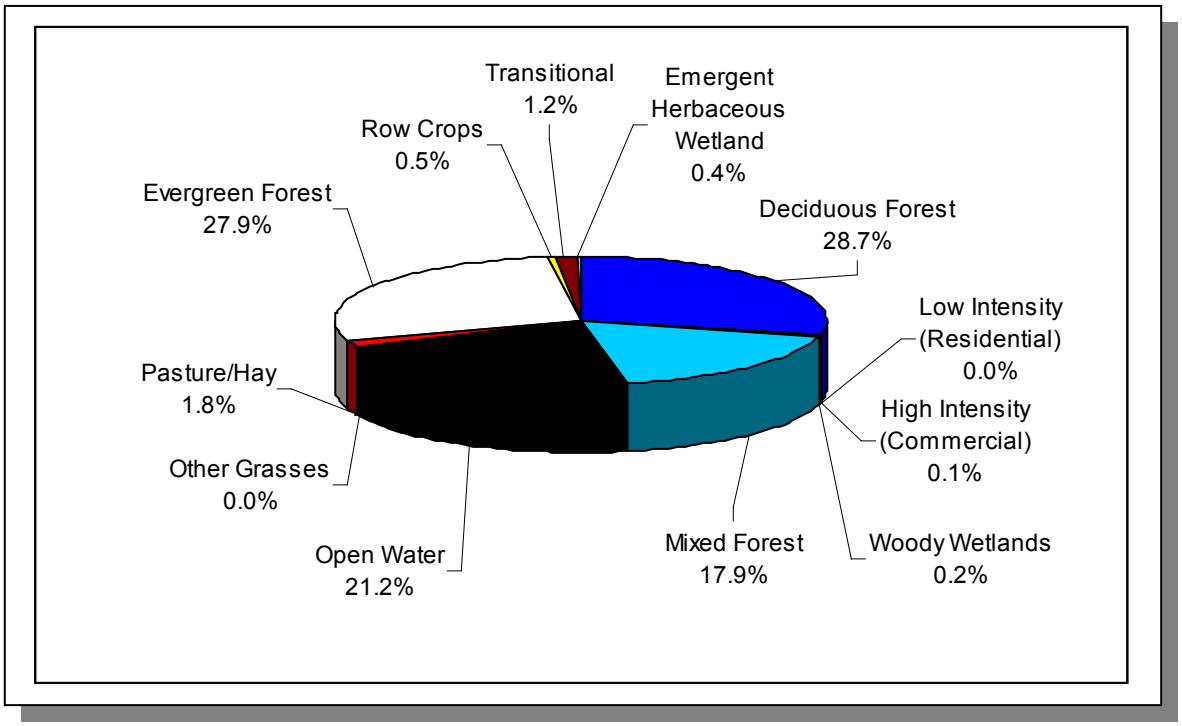


Figure 4-37. Land Use Distribution in Subwatershed 0603000506. *More information is provided in Pickwick-Appendix IV.*

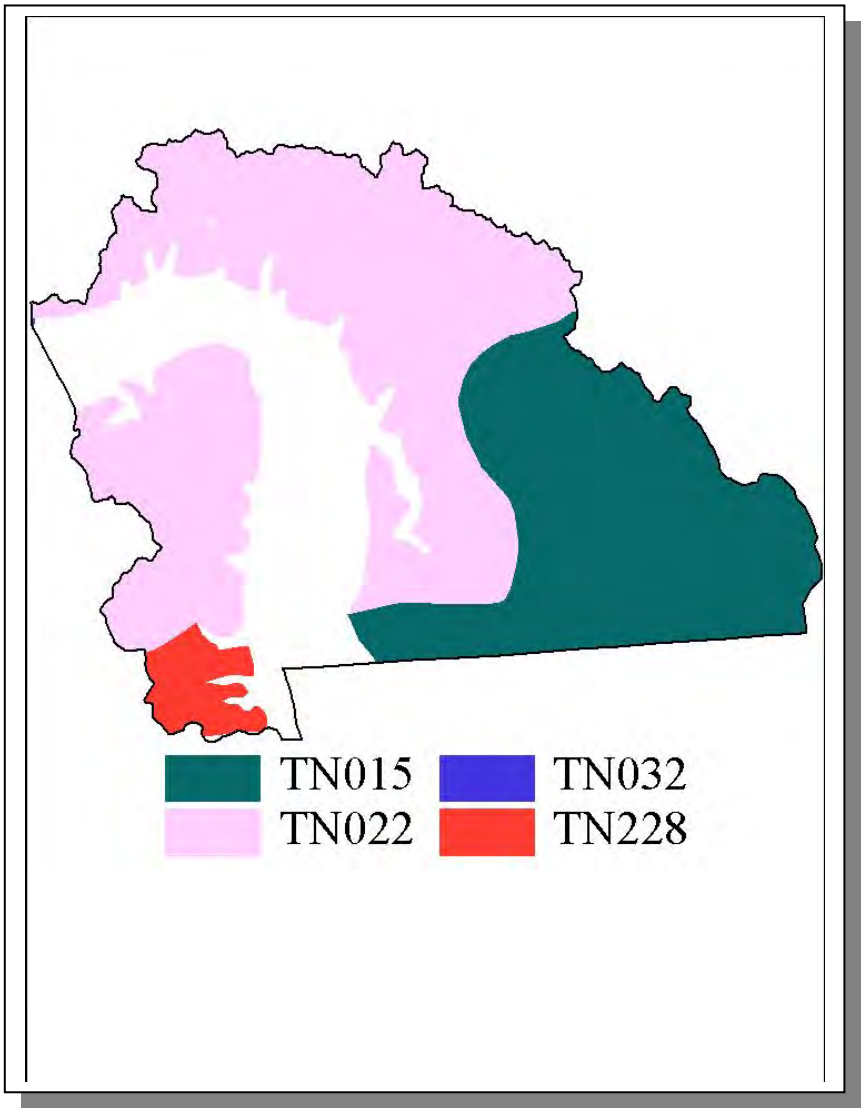


Figure 4-38. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000506.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN015	4.00	C	3.62	4.98	Sandy Loam	0.25
TN022	5.00	C	1.98	5.07	Loam	0.37
TN032	19.00	C	1.21	5.51	Silty Loam	0.37
TN228	1.00	B	3.32	5.09	Sandy Loam	0.28

Table 4-24. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000506. *More information is provided in Pickwick-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Hardin	22,633	24,816	6.73	1,523	1,669	9.6

Table 4-25. Population Estimates in Subwatershed 0603000506.

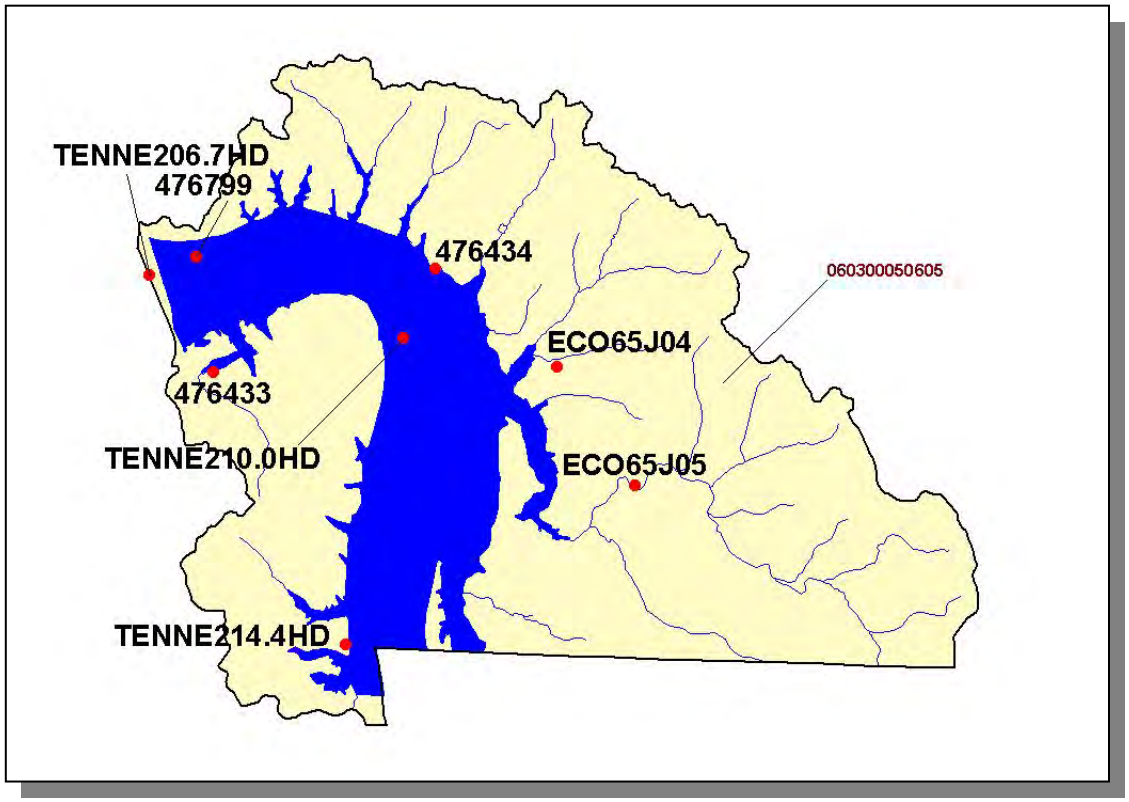


Figure 4-39. Location of STORET Monitoring Sites in Subwatershed 0603000506. *More information is provided in Pickwick-Appendix IV.*

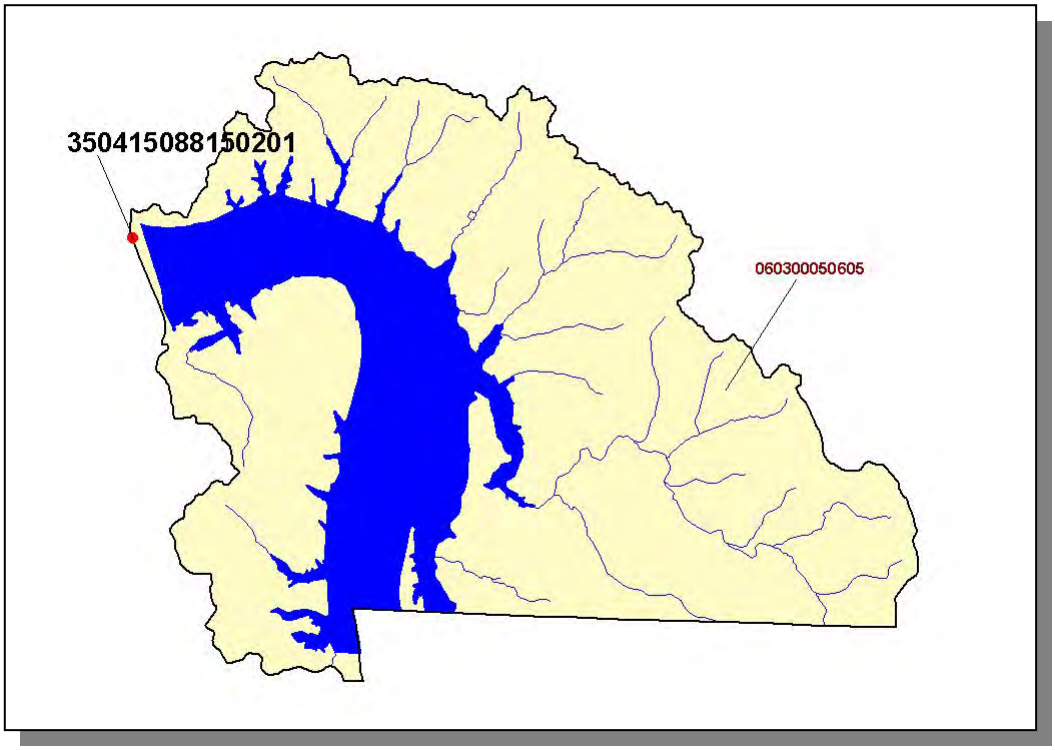


Figure 4-40. Location of Historical Streamflow Data Collection Sites in Subwatershed 0603000506. *Subwatershed 06030005060 boundaries are shown for reference. More information is provided in Pickwick-Appendix IV.*

4.2.E.ii. Point Source Contributions.

There are no point sources in subwatershed 0603000506.

4.2.E.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens	Chickens Sold	Hogs	Sheep
49	0	95	0	1,806	21	1

Table 4-26. Summary of Livestock Count Estimates in Subwatershed 0603000506. *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)
Hardin	219.9	219.9	6.5	27.6

Table 4-27. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0603000506.

CROPS	TONS/ACRE/YEAR
Corn (Row Crops)	3.91
Soybeans (Row Crops)	13.10
Cotton (Row Crops)	2.63
Grass (Pastureland)	0.15
Grass, Forbs, Legumes (Mixed Pasture)	0.42
Grass (Hayland)	0.31
Legume/Grass (Hayland)	0.46
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Wheat (Close Grown Cropland)	3.93
All Other Close Grown Cropland	5.50
Conservation Reserve Program Land	0.35
Other Cropland not Planted	9.54
Non Agricultural Land Use	0.00
Farmsteads and Ranch Headquarters	0.36

Table 4-28. Annual Estimated Soil Loss in Subwatershed 0603000506.

4.2.F. 0603000507

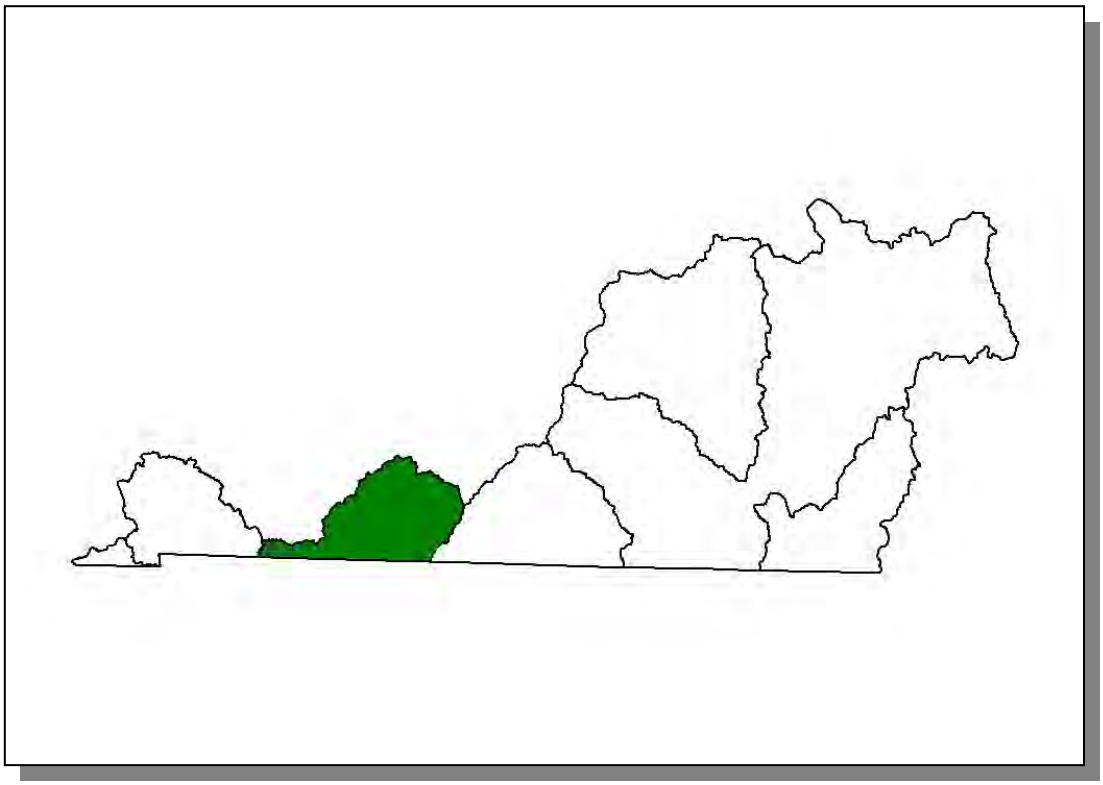


Figure 4-41. Location of Subwatershed 0603000507. *All Pickwick HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.F.i. General Description.

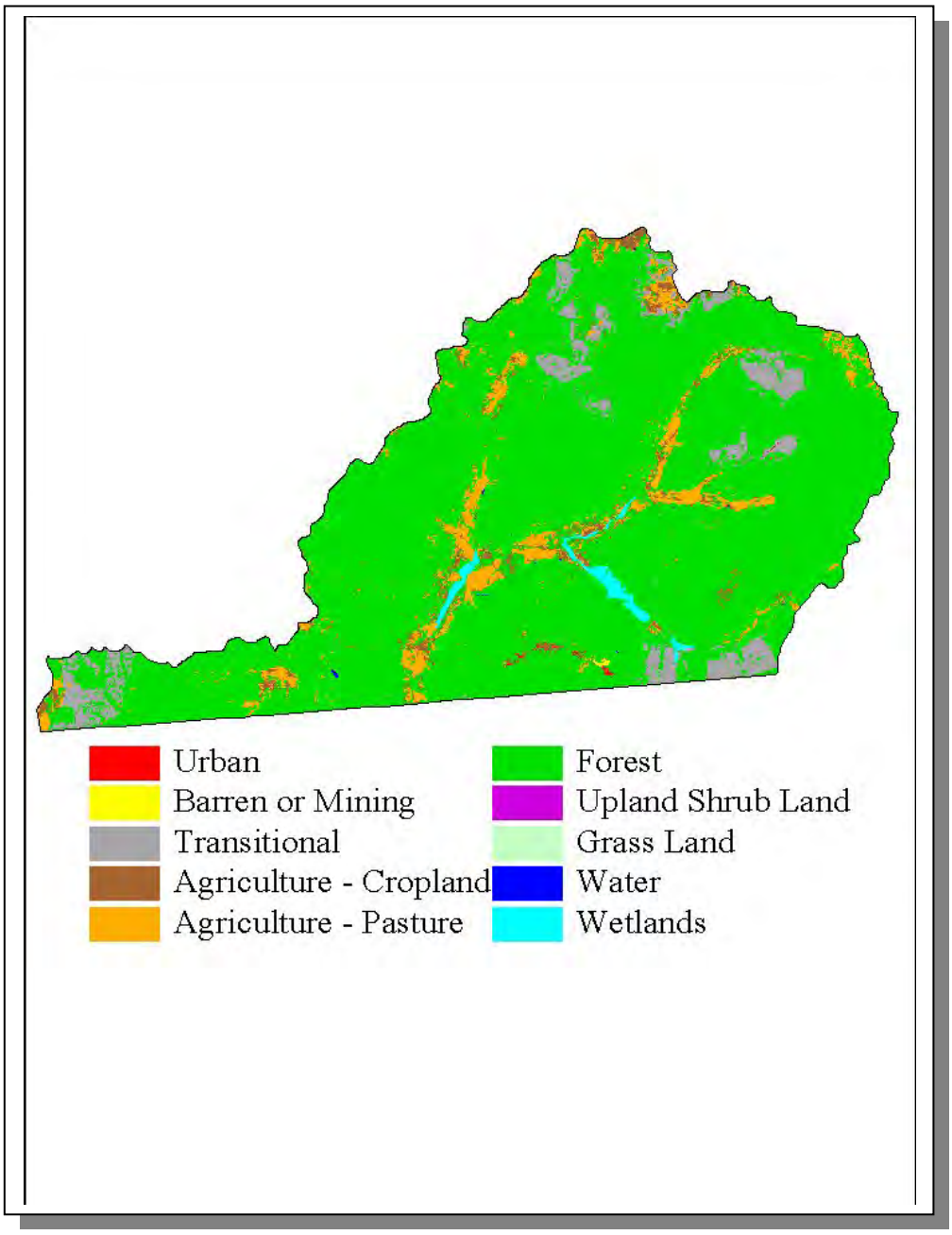


Figure 4-42. Illustration of Land Use Distribution in Subwatershed 0603000507.

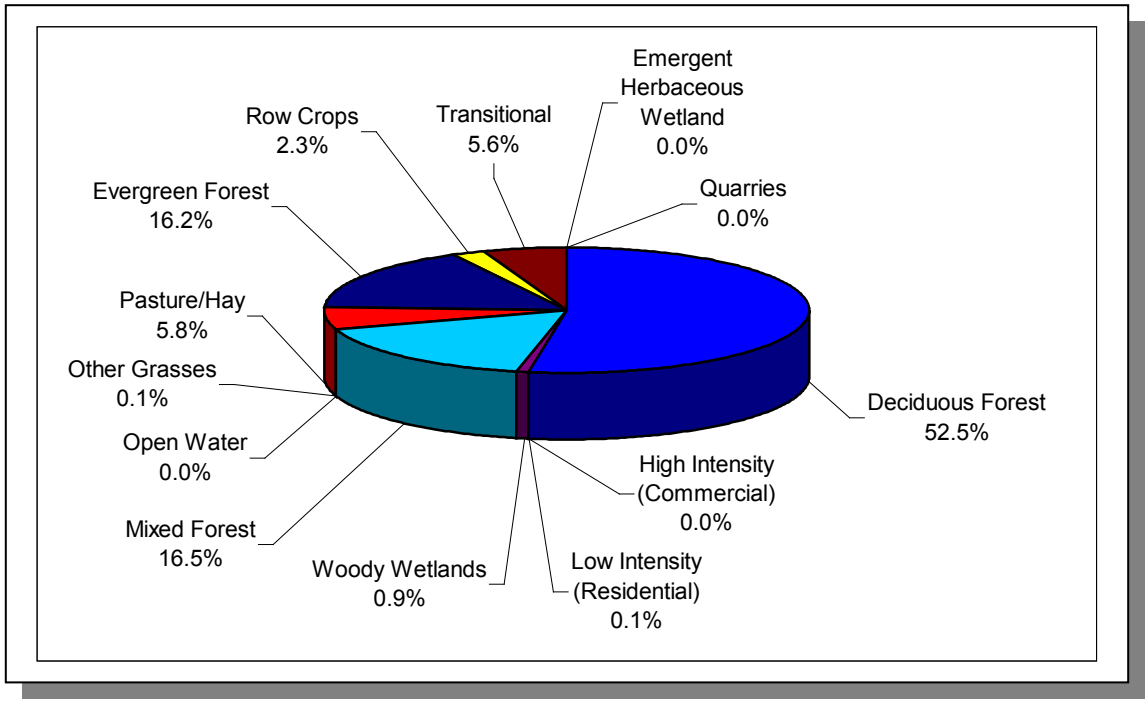


Figure 4-43. Land Use Distribution in Subwatershed 0603000507. *More information is provided in Pickwick-Appendix IV.*

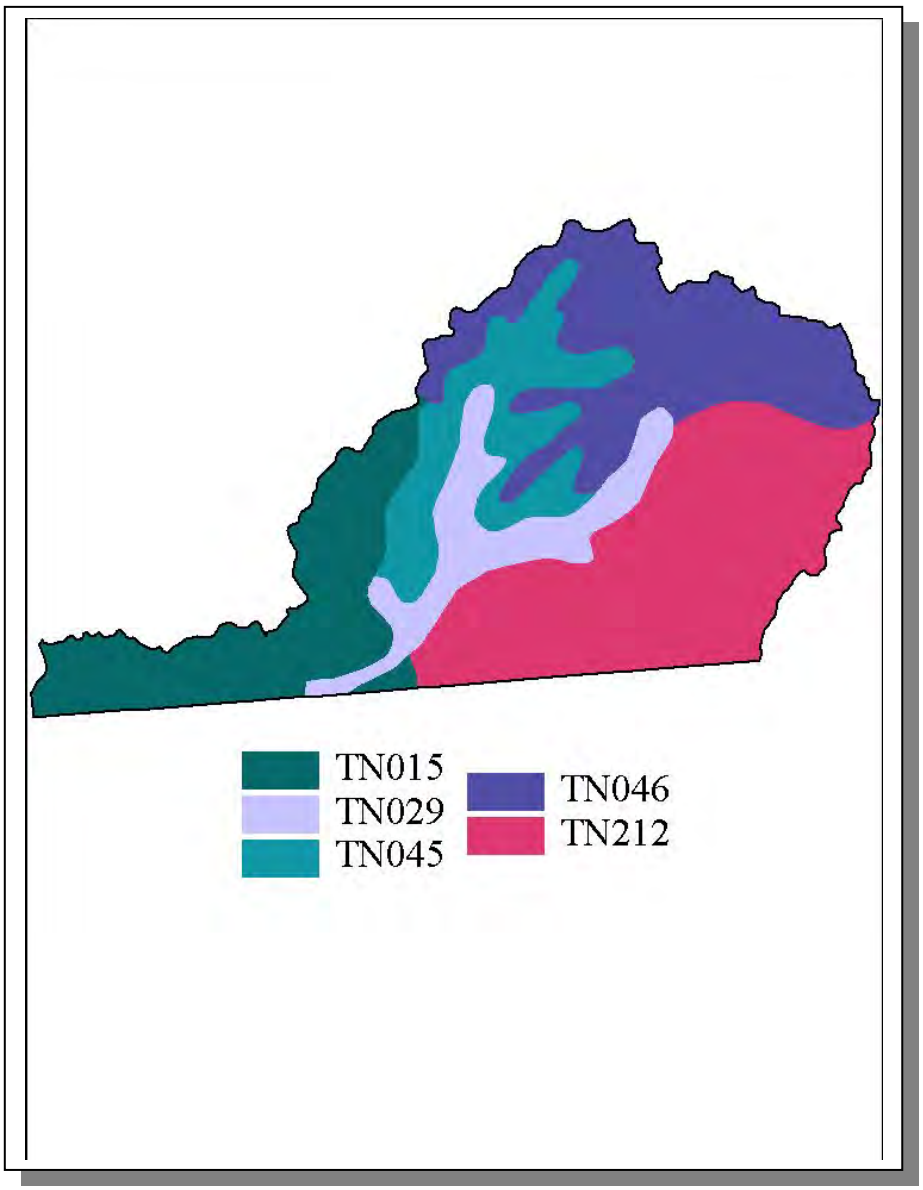


Figure 4-44. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000507.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN015	4.00	C	3.62	4.98	Sandy Loam	0.25
TN029	8.00	C	2.96	5.40	Loam	0.33
TN045	0.00	B	1.95	5.45	Loam	0.35
TN046	0.00	B	1.98	5.09	Silty Loam	0.38
TN212	4.00	B	1.95	5.04	Silty Loam	0.38

Table 4-29. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000507. *More information is provided in Pickwick-Appendix IV.*

	TOTAL COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Hardin	22,633	24,816	1.14	257	282	9.7
Wayne	13,935	16,498	4.76	664	786	18.4
Totals	**36,568**	**41,314**		**921**	**1,068**	**16.0**

Table 4-30. Population Estimates in Subwatershed 0603000507.

4.2.F.ii. Point Source Contributions.

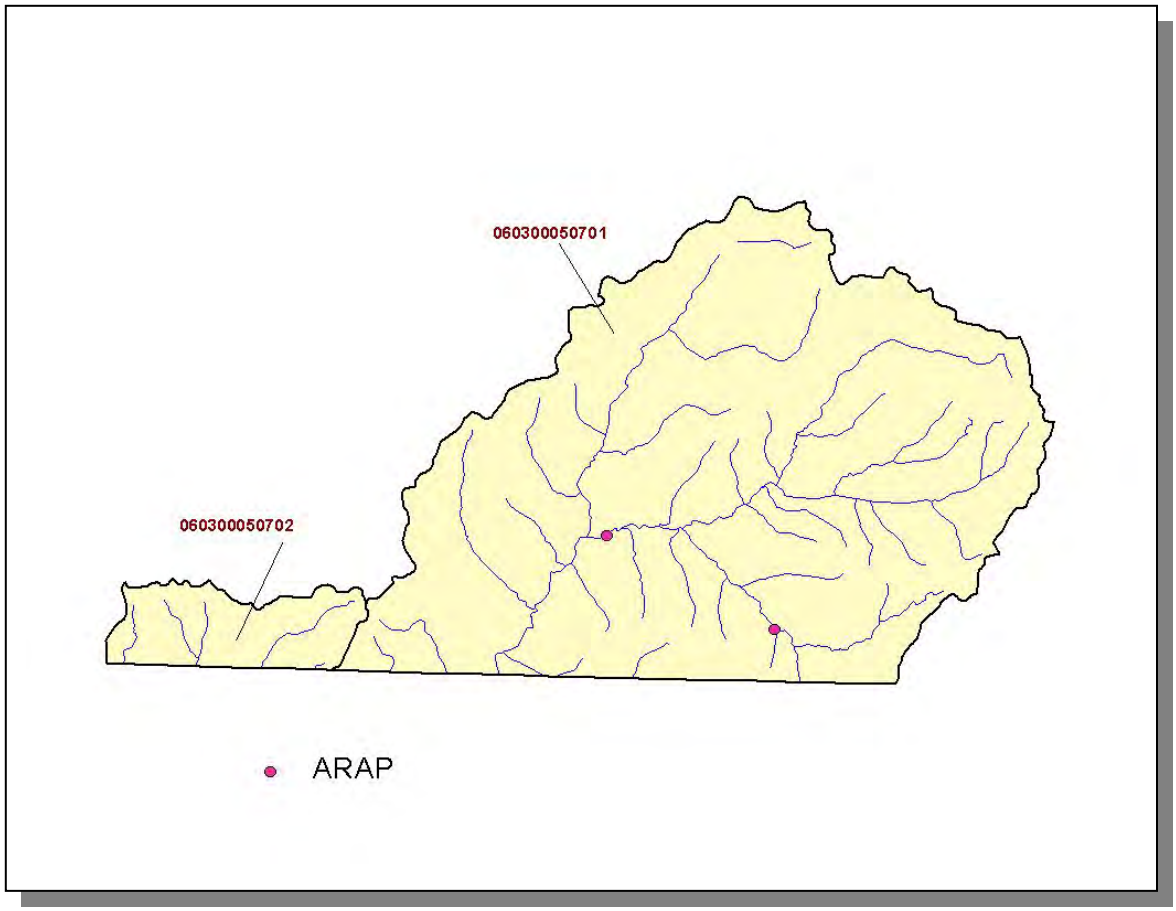


Figure 4-45. Location of Active Point Source Facilities in Subwatershed 0603000507. *Subwatershed 060300050701 and 060300050702 boundaries are shown for reference. More information is provided in the following figures.*

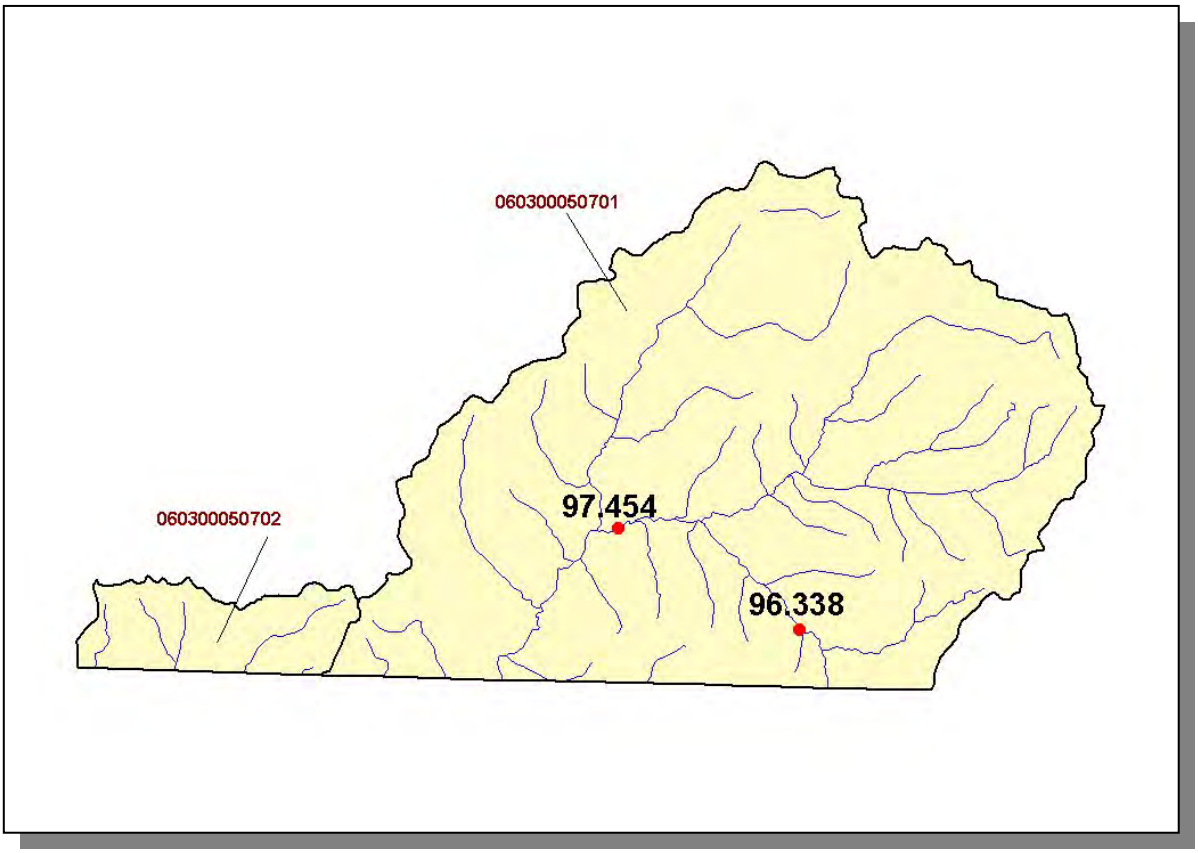


Figure 4-46. Location of ARAP Sites (Individual Permits) in Subwatershed 0603000507. *Subwatershed 060300050701 and 060300050702 boundaries are shown for reference. More information, including the names of facilities, is provided in Pickwick-Appendix IV.*

4.2.F.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens	Chickens Sold	Hogs	Sheep
534	2	959	1	4,198	101	6

Table 4-31. Summary of Livestock Count Estimates in Subwatershed 0603000507. *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)
Hardin	219.9	219.9	6.5	27.6
Wayne	372.6	372.6	14.1	41.1
Total	**592.5**	**592.5**	**20.6**	**68.7**

Table 4-32. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0603000507.

CROPS	TONS/ACRE/YEAR
Grass (Hayland)	0.21
Legume/Grass (Hayland)	0.46
Grass (Pastureland)	0.21
Grass, Forbs, Legumes (Mixed (Pasture)	0.65
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Soybeans (Row Crops)	13.10
Corn (Row Crops)	7.30
Cotton (Row Crops)	2.63
Wheat (Close Grown Cropland)	3.93
All Other Close Grown Cropland	5.50
Conservation Reserve Program Land	0.35
Other Cropland not Planted	9.54
Non Agricultural Land Use	0.00
Farmsteads and Ranch Headquarters	0.79

Table 4-33. Annual Estimated Total Soil Loss in Subwatershed 0603000507.

4.2.G. 0603000508.

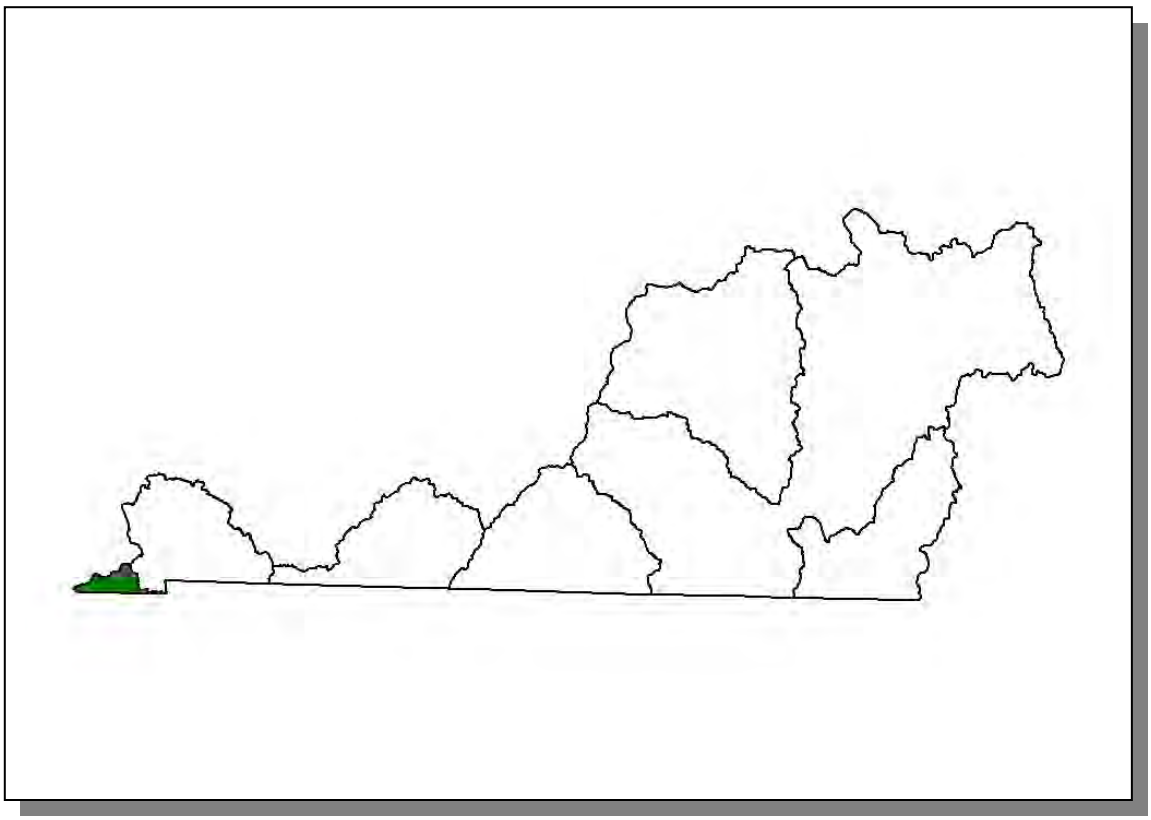


Figure 4-47. Location of Subwatershed 0603000508. *All Pickwick HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.G.i. General Description.

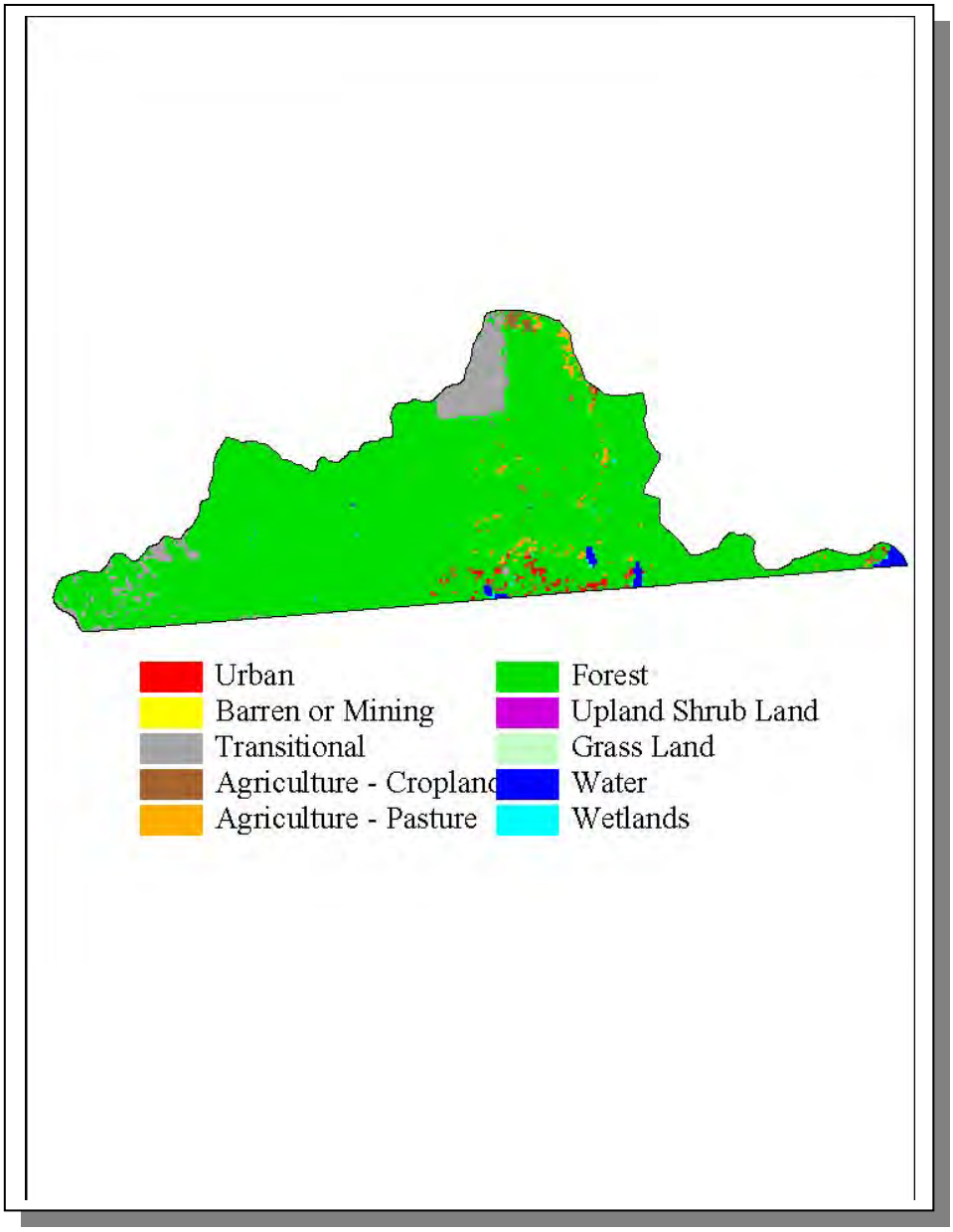


Figure 4-48. Illustration of Land Use Distribution in Subwatershed 0603000508.

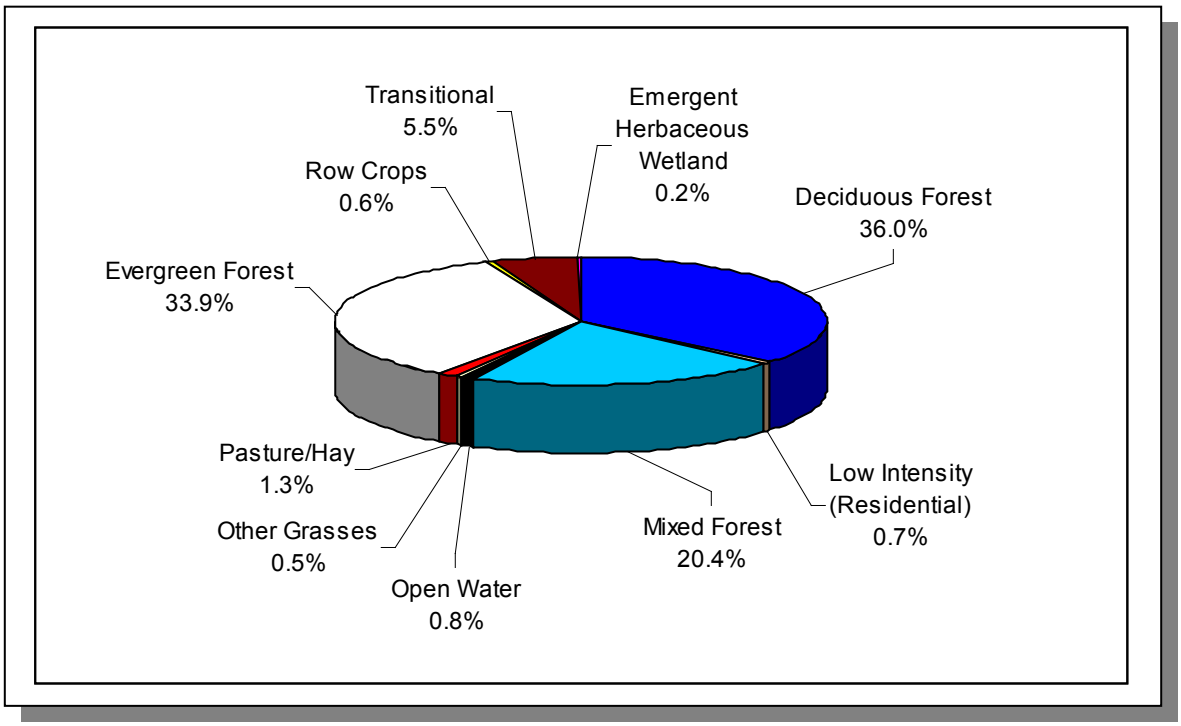


Figure 4-49. Land Use Distribution in Subwatershed 0603000508. *More information is provided in Pickwick-Appendix IV.*

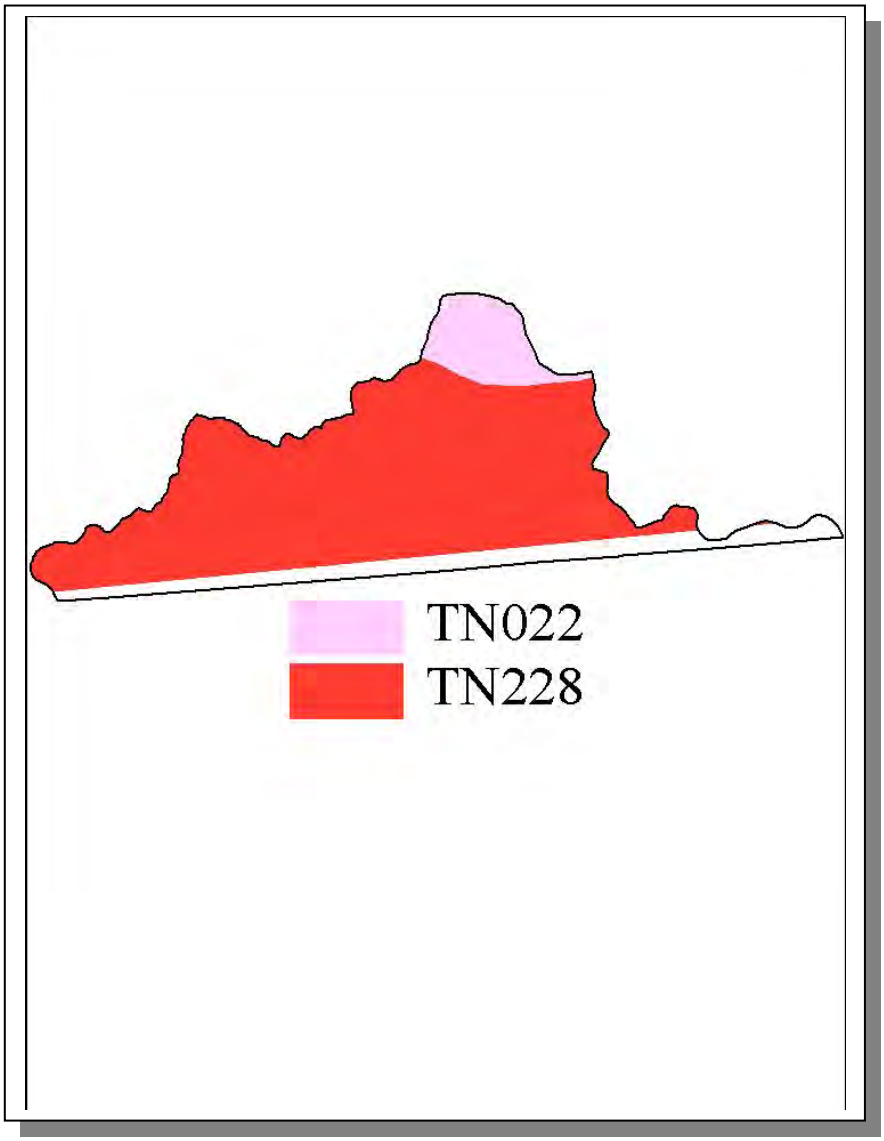


Figure 4-50. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000508.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN022	5.00	C	1.98	5.07	Loam	0.37
TN228	1.00	B	3.32	5.09	Sandy Loam	0.28

Table 4-34. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0603000508. *More information is provided in Pickwick-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Hardin	22,633	24,816	0.34	77	84	9.1

Table 4-35. Population Estimates in Subwatershed 0603000508.

4.2.G.ii. Point Source Contributions.

There are no point sources in subwatershed 0603000508.

4.2.G.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
<5	7	0	0	0	<5	0

Table 4-36. Summary of Livestock Count Estimates in Subwatershed 0603000508. *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)
Hardin	219.9	219.9	6.5	27.6

Table 4-37. Forest Acreage and Average Removal Rates (1987-1994) in Subwatershed 0603000508.

CROPS	TONS/ACRE/YEAR
Grass (Hayland)	0.31
Legume/Grass (Hayland)	0.46
Grass (Pastureland)	0.15
Grass, Forbs, Legumes (Mixed Pasture)	0.42
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Corn (Row Crops)	3.91
Soybeans (Row Crops)	13.10
Cotton (Row Crops)	2.63
Wheat (Close Grown Cropland)	3.93
All Other Close Grown Cropland	5.50
Conservation Reserve Program Land	0.35
Farmsteads and Ranch Headquarters	0.36
Other Cropland not Planted	9.54
Nonagricultural Land Use	0.00

Table 4-38. Annual Estimated Total Soil Loss in Subwatershed 0603000508.

CHAPTER 5

WATER QUALITY PARTNERSHIPS IN THE PICKWICK 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 Pickwick 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)	0
Conservation Buffers (Acres)	205
Erosion Reduction (Tons/Year)	19,080
Inventory and Evaluations (Number)	4
Irrigation Management (Acres)	0
Nutrient Management (Acres)	2,137
Pest Management (Acres)	1,968
Prescribed Grazing (Acres)	152
Residue Management (Acres)	0
Tree and Shrub Practices (Acres)	505
Waste Management (Number)	1
Wetlands Created, Restored, or Enhanced (Acres)	0
Wildlife Habitat (Acres)	655

Table 5-1. Landowner Conservation Practices in Partnership with NRCS in the Tennessee Portion of Pickwick Lake Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period. More information is provided in Pickwick-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. The Service has designated Critical Habitat (50 CFR 17.95, page 422) for the Federally endangered slackwater darter (*Etheostoma boschungi*) in all permanent and intermittent tributaries, with flowing water from December to June, of Cypress and Middle Cypress Creek in Wayne County.

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

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

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

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

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 Pickwick watershed.

MONITORING

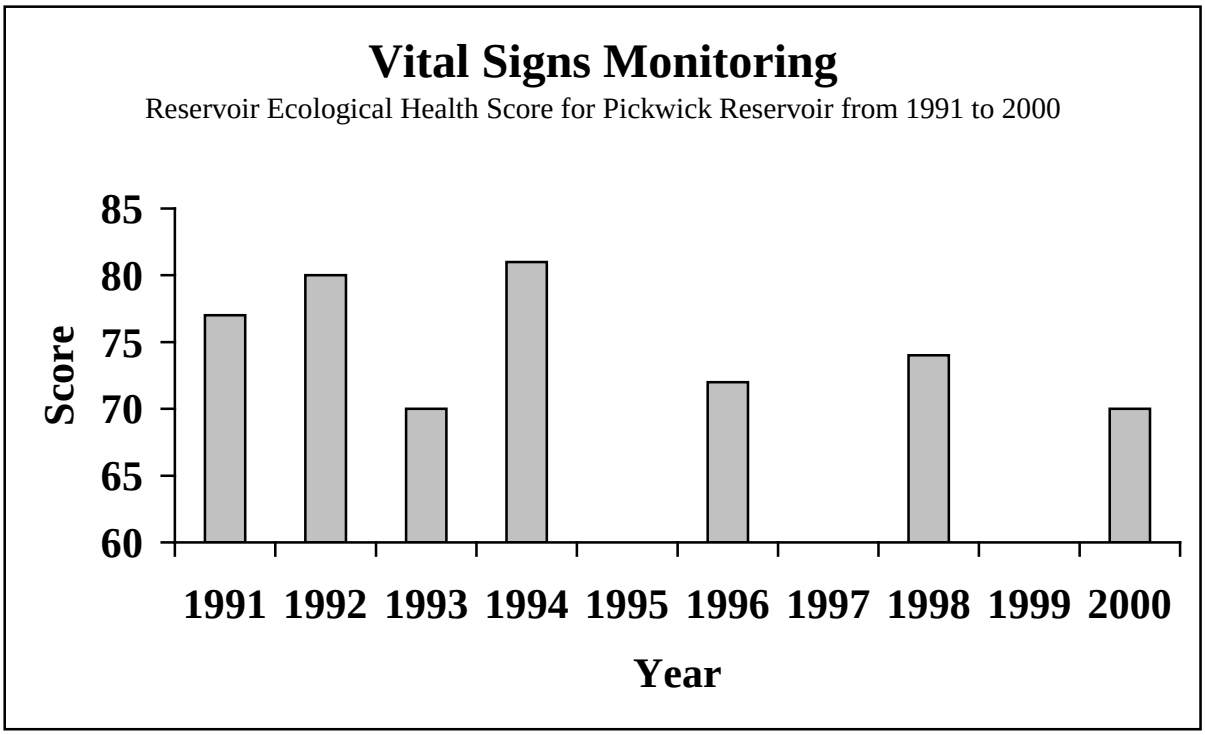
Vital Signs Monitoring

Reservoir Monitoring: TVA has monitored the quality of water resources of Pickwick 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. These parameters are sampled at the forebay station near Pickwick Dam (TRM 207.3), at mid-reservoir (TRM 230.0), and at the inflow station downstream of Wilson Dam (TRM 253). TVA has also monitored conditions in the Bear Creek embayment (AL and MS) since 1993 at BCM 8.4. Samples were collected annually from 1991 to 1994 and semiannually since. Only the forebay station is located in Tennessee.

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 Pickwick Reservoir Vital Signs scores for each year for which data are comparable. Overall ecological health rating was fair in most years. High chlorophyll concentration and lower ratings in the Bear Creek embayment contributed to lower ratings. Dissolved oxygen, fish and benthos at the forebay station typically rates good each year. Sediment analysis has indicated no elevated levels of chemicals of concern. Reservoir Vital Signs samples were collected in again in 2002, however results are not yet available.



Bacteriological sampling: Two sites on Pickwick Reservoir in Tennessee were sampled ten times each for fecal coliform bacteria in 2002. Both sites met Tennessee's bacteriological criteria for water contact recreation. Tennessee's criteria for water contact recreation requires the collection of at least 10 fecal coliform samples within a 30 day period, with a geometric mean less than 200 fecal coliform colonies per 100 milliliters of water. Samples were collected at the following locations:

Site Name	Location	Type of Site
Pickwick Landing State Park beach	TRM 209 L	swim
Bruton Branch State Rec. Area beach	TRM 208 R	swim

Swimming beaches are sampled every year. Data from this sampling effort is shared in a timely manner with TDEC's Division of Water Pollution Control.

Fish Flesh Toxic Contaminants: The State of Tennessee has issued no advisories against eating fish from Pickwick Reservoir.

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 Pickwick 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.

Only 4 sites are routinely sampled in the Tennessee portion of the Pickwick watershed: Second Creek at TN Hwy. 69, Dry Creek above the mouth, Little Cypress Creek at Whitten School Road and North Fork Cypress Creek along Natchez Trace Parkway. 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
Dry Creek	2001	38-Fair/Poor	14-Good	28
Second Creek	2001	48-Good	14-Good	33
Little Cypress Creek	2002	48-Good	14-Good	29
N. Fork Cypress Creek	2002	44-Fair	14-Good	30

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.

Although the Pickwick Watershed team actively works with these type organizations in the Alabama portion of the Pickwick Reservoir watershed, there is currently no group active in the Tennessee portion of the watershed.

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.

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: In September 2000, the Pickwick Watershed Team partnered with Pickwick Landing State Park to successfully stabilized approximately 500 feet of critically eroding reservoir shoreline in the Bruton Branch Recreational Area. In addition, the team provides technical assistance to stakeholders through individual landowner meetings and public workshops for those interested in stabilization on private shoreline 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 the Bruton Branch Homeowners Association to sponsor a riparian buffer workshop. Packages of native riparian plant seedlings were distributed to riparian property owners in the Bruton/Pompeys Branch watershed. 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 Pickwick 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.

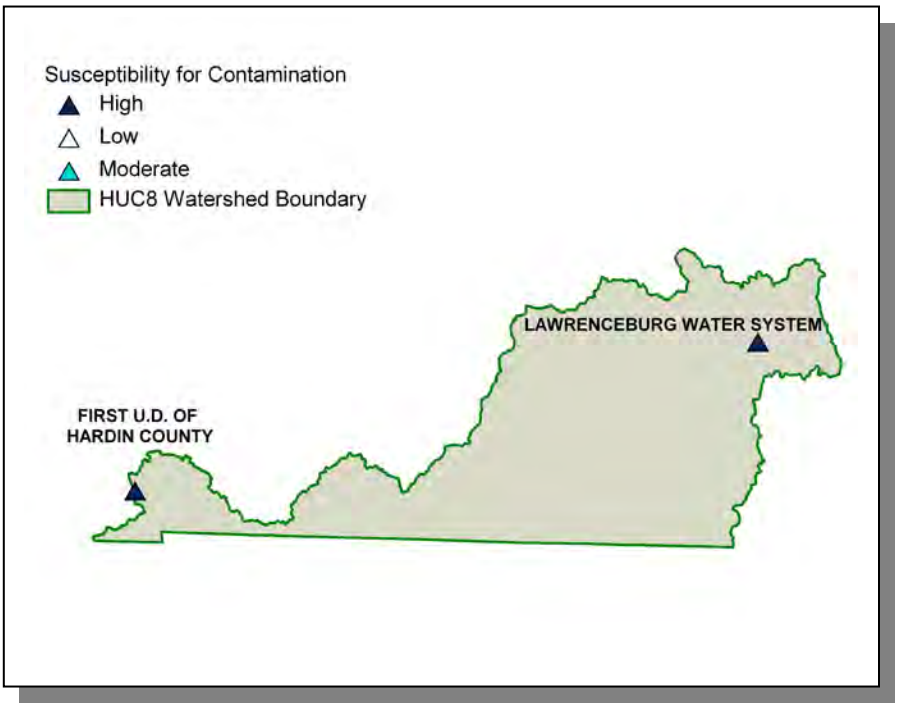


Figure 5-1. Susceptibility for Contamination in the Pickwick Lake Watershed.

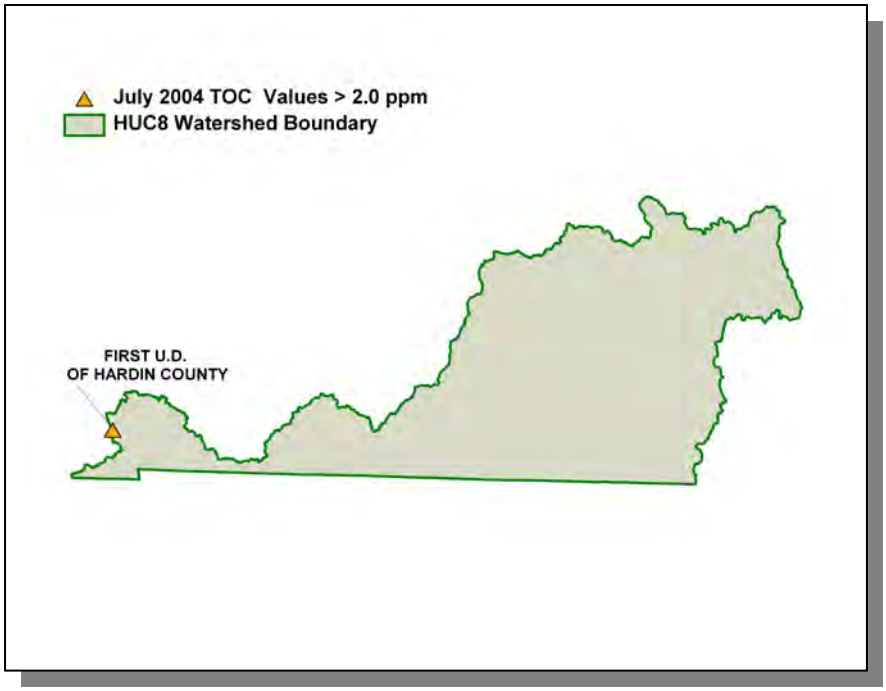


Figure 5-2. July 2004 Raw Water Total Organic Carbon (TOC) Analysis in the Pickwick Lake Watershed.

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

5.3.B. State Revolving Fund. TDEC administers the state's Clean Water State Revolving Fund Program. Amendment of the Federal Clean Water Act in 1987 created the Clean Water State Revolving Fund (SRF) Program to provide low-interest loans to cities, counties, and utility districts for the planning, design, and construction of wastewater facilities. The U.S. Environmental Protection Agency awards annual capitalization grants to fund the program and the State of Tennessee provides a twenty-percent funding match. TDEC has awarded loans totaling approximately $550 million since the creation of the SRF Program. SRF loan repayments are returned to the program and used to fund future SRF loans.

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

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

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

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

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

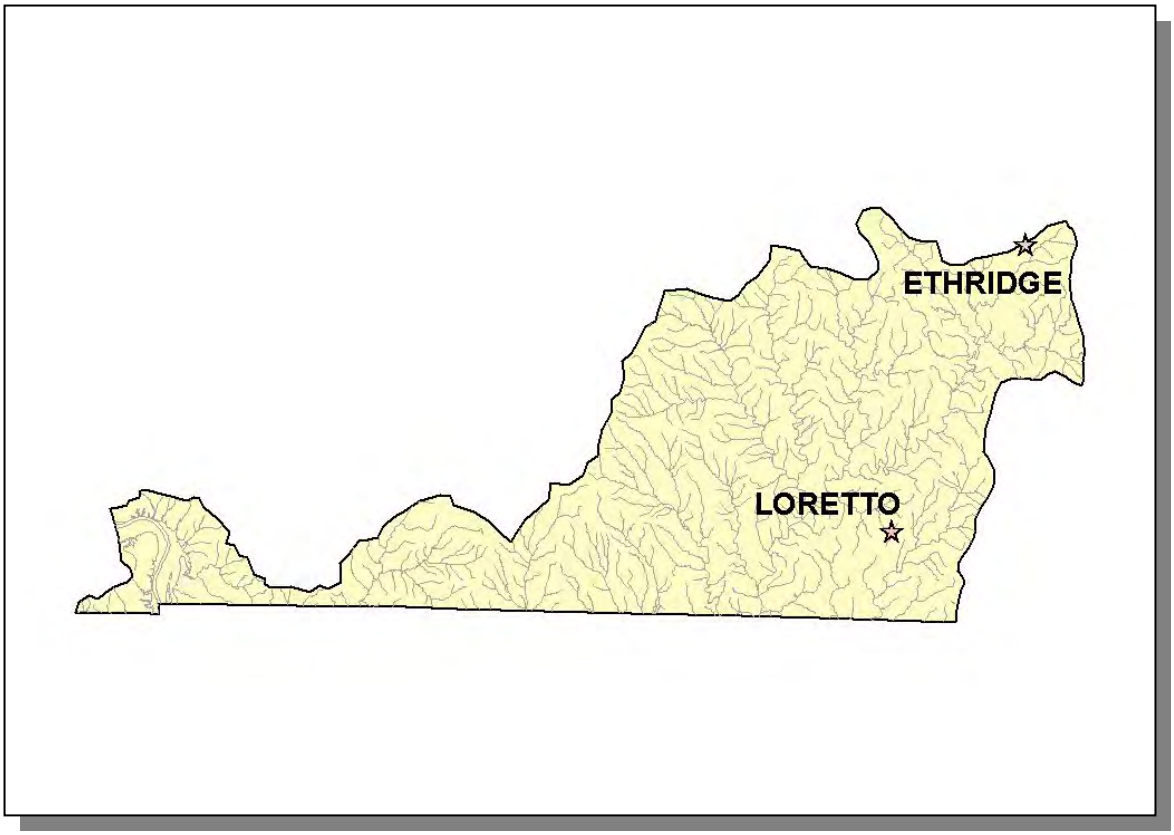


Figure 5-3. Location of Communities Receiving SRF Loans or Grants in the Tennessee Portion of the Pickwick Lake Watershed. *More information is provided in Pickwick-Appendix V.*

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

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

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

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

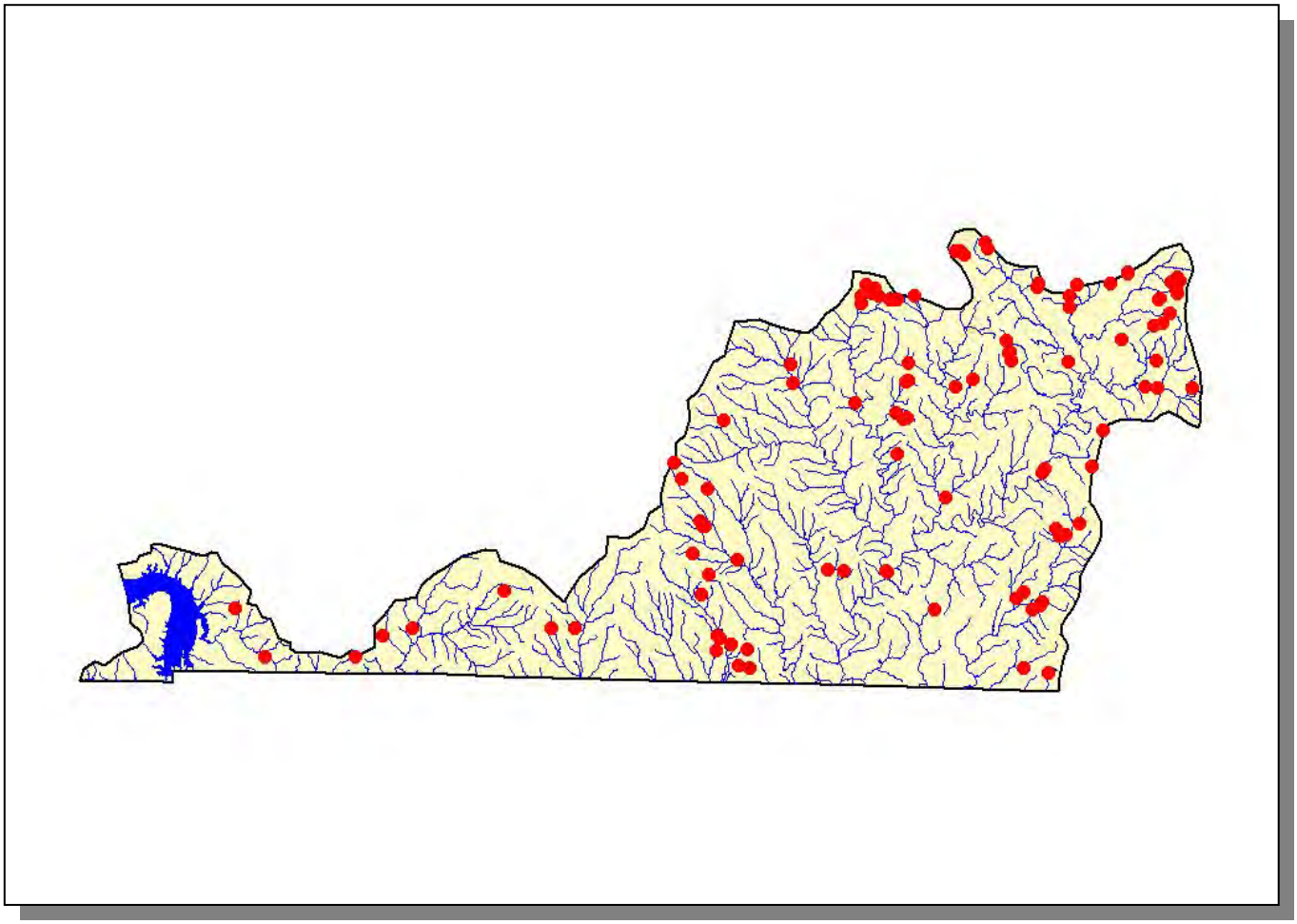


Figure 5-4. Location of BMPs installed from 1999 through 2002 in the Tennessee Portion of the Pickwick Lake Watershed with Financial Assistance from the Tennessee Department of Agriculture's Nonpoint Source and Agricultural Resources Conservation Fund Grant Programs.

5.4.D. Alabama Department 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 Pickwick 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 Pickwick Lake 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 Pickwick 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.

A number of local partnerships and water quality projects currently active in the Tennessee River Basin occur in the Pickwick Lake Hydrologic Unit. To date, 3 long-term watershed projects have developed in the Pickwick sub-basin with combinations of financial support from Section 319 grants, Tennessee Valley Authority, Soil & Water Conservation Districts, industry, foundations and local government sources.

Partnerships and watershed projects exist in the Big Nance Creek and Cypress Creek watersheds. While the Big Nance Creek projects addresses agricultural runoff, the Cypress Creek project is focused on the protection of source water from increasing urban and agricultural pressure. A newly funded project on Second Creek will address agricultural issues when implemented.

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://www.cleanwaterpartnership.org or call Allison Newell, Statewide ACWP Coordinator at 1-888-3 Got H2O.

CHAPTER 6

FUTURE DIRECTIONS IN THE PICKWICK LAKE RIVER WATERSHED

6.1. BACKGROUND.

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

In addition to the NPDES program, some state and federal regulations, such as the TMDL and ARAP programs, address point and nonpoint issues. Construction and MS4 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 Pickwick 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 Pickwick 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.

Major Concerns/Comments

- Effects of the Watershed Approach (cycle) on permit holders
- Nonpoint sources of pollution
- Water quality modeling not available to permitees
- The effect of naturally high phosphate in local streams on permit limits
- Sediment getting into streams

6.2.B. Year 3 Public Meeting. The second Pickwick Lake Watershed public meeting was held October 26, 1999 at the courthouse in Winchester. 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 Pickwick Lake Watershed public meeting was held October 30, 2003 at the Columbia State Community College-Lawrenceburg Campus (the meeting was for the Pickwick Lake and Wheeler 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.

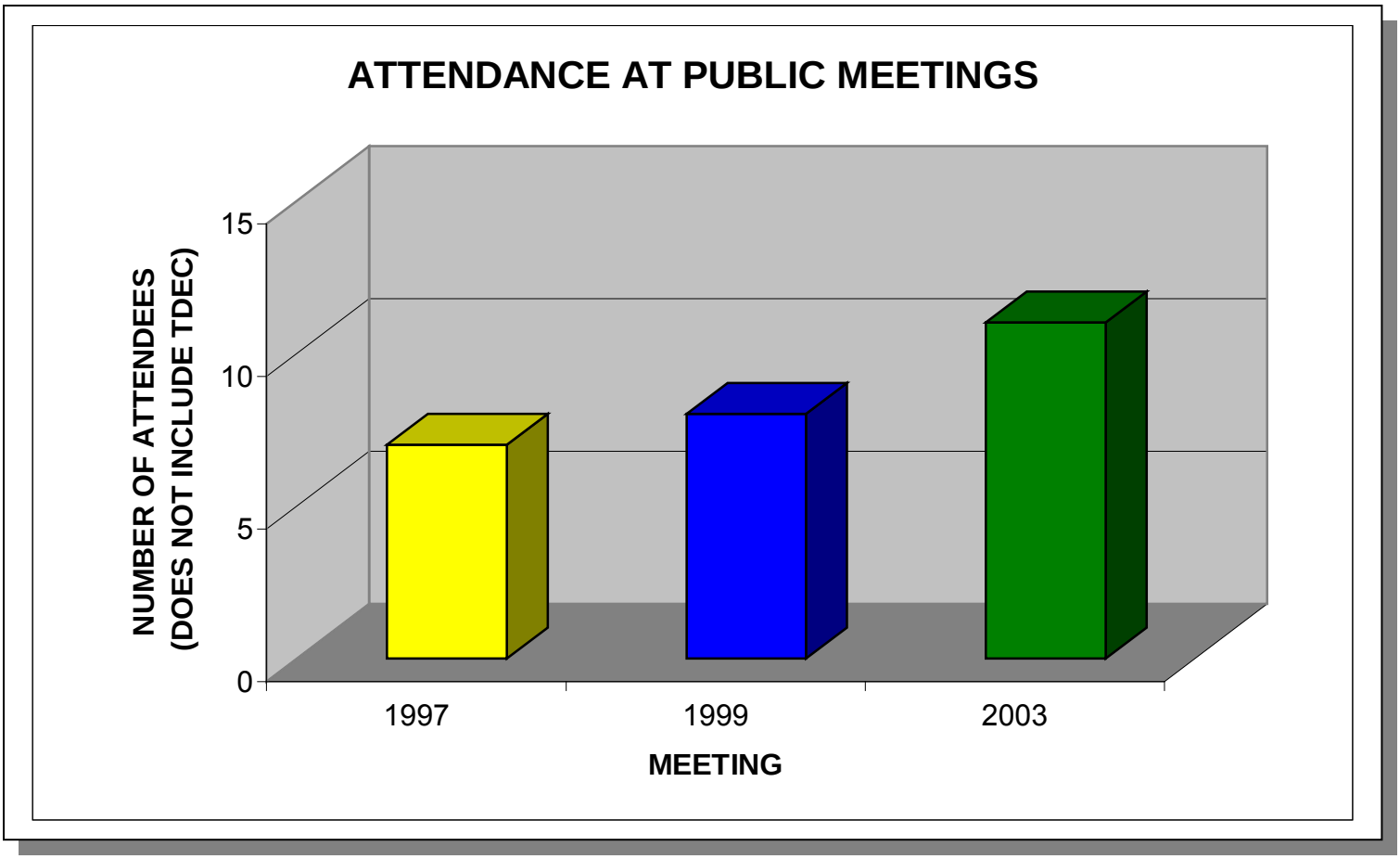


Figure 6-1. Attendance at Public Meetings in the Pickwick Lake Watershed. *The 1997 and 1999 watershed meeting numbers represent Pickwick Lake, Wheeler Lake, Lower Elk River, and Upper Elk River Watershed joint meetings.*

Figure 6-2. Watershed meetings begin with an educational slide program about the watershed and a review of the draft Watershed Water Quality Management Plan.

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.

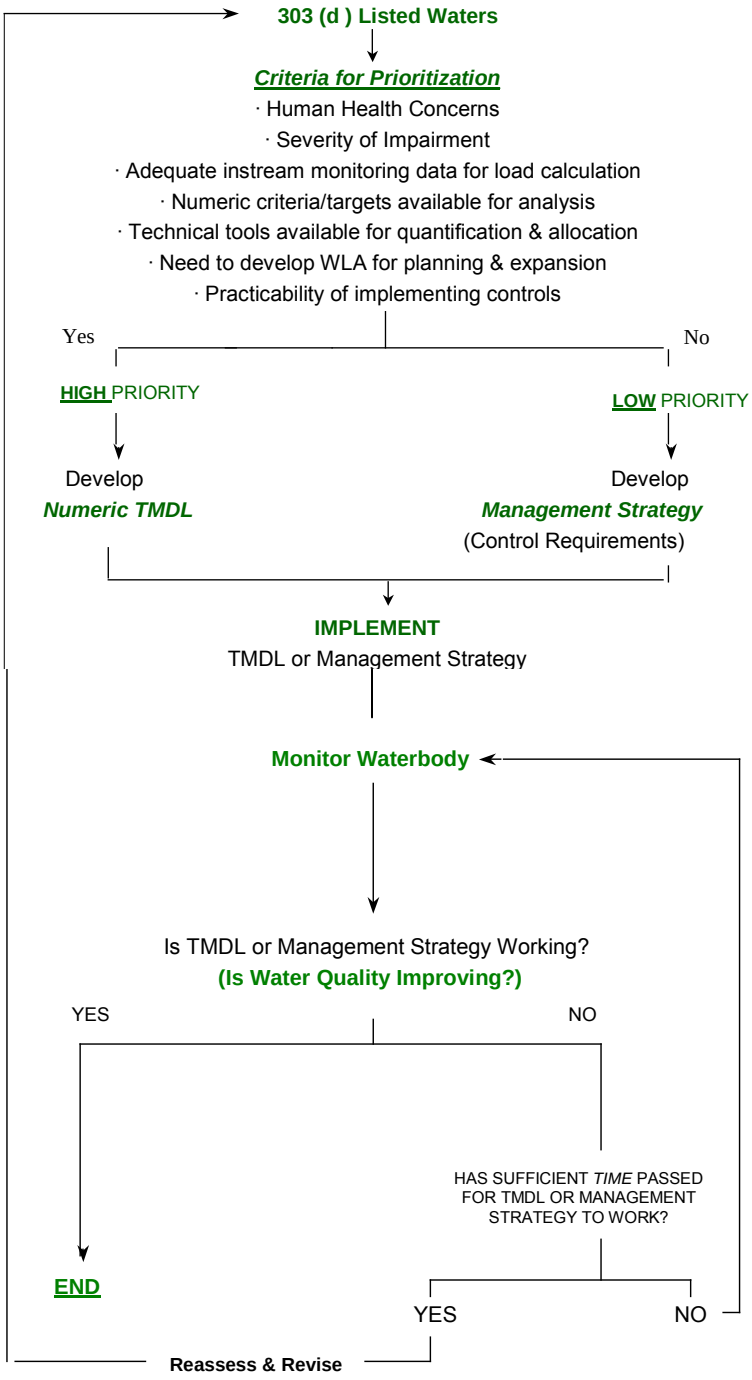


Figure 6-3. Prioritization scheme for TMDL Development.

6.3.B. Nonpoint Sources

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

There are several state and federal regulations that address some of the contaminants impacting waters in the Pickwick 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. Examples of these streams are Shoal Creek and Little Shoal Creek.

The same requirements apply to sites in the drainage of high quality waters. Cypress Creek and Bluewater Creek are examples of high quality streams in the Pickwick Lake watershed.

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 (examples: Little Shoal Creek and Grassy Creek).
- Establish off channel watering areas for cattle by moving watering troughs and feeders back from stream banks.
- Limit cattle access to streams and bank vegetation.

Additional strategies

- Increase efforts in the Master Logger program to recognize impaired streams and require more effective management practices.
- 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. Shoal Creek, Little Shoal Creek, and Grassy Creek could all 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 (example: Shoal Creek).
- Limiting livestock access to streams.
- Proper management of animal waste from feeding operations.

Enforcement strategies

- Greater enforcement of regulations governing on-site wastewater treatment (example: Shoal Creek).
- 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.

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

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

Other sources of nutrients can be addressed by:

Voluntary activities

- Encourage no-till farming.

- Encourage cattle exclusion and riparian restoration practices (example: Shoal Creek).
- Encourage farmers to use the proper rate of fertilizer for the soil and crop.
- Educate homeowners and lawn care companies in the proper application of fertilizers.
- Encourage landowners, developers, and builders to leave stream buffer zones. Streamside vegetation can filter out many nutrients and other pollutants before they reach the stream. These riparian buffers are also vital along livestock pastures.
- Use grassed drainage ways that can remove fertilizer before it enters streams.
- Use native plants for landscaping since they don't require as much fertilizer and water.

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

- Maintain shade over a stream. Cooler water can hold more oxygen and retard the growth of algae.
- Discourage impoundments. Ponds and lakes do not aerate water. *Note: Permits may be required for any work on a stream, including impoundments.*

6.3.B.iv. Toxins and Other Materials.

Many materials enter our streams due to apathy, or lack of civility or knowledge by the public. Litter in roadside ditches, garbage bags tossed over bridge railings, paint brushes washed off over storm drains, and oil drained into ditches are all 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 (examples: Shoal Creek and Grassy Creek).
- 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.
- Increase frequency of ARAP inspections (examples: Shoal Creek and Grassy Creek).

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 Pickwick 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 Pickwick Lake Watershed*.

6.4.A. Municipal Permits

TN0022551 Lawrenceburg STP

Discharger rating: Major
City: Lawrenceburg
County: Lawrence
EFO Name: Columbia
Issuance Date: 2/27/04
Expiration Date: 10/31/07
Receiving Stream(s): Shoal Creek mile 55.4
HUC-12: 060300050303
Effluent Summary: Treated municipal wastewater from Outfall 001
Treatment system: Biologically-treated municipal wastewater

Segment	TN06030005082_1000
Name	Shoal Creek
Size	2.3
Unit	Miles
First Year on 303(d) List	2004
Designated Uses	Fish and Aquatic Life (Non-Supporting), Recreation (Non-Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting)
Causes	Nitrates, Sedimentation/Siltation, Escherichia coli
Sources	Industrial Point Source Discharge, Municipal Point Source Discharges, Non-irrigated Crop Production, Grazing in Riparian or Shoreline Zones, Site Clearance (Land Development or Redevelopment), Sanitary Sewer Overflows (Collection System Failures)

Table 6-1. Stream Segment Information for Lawrenceburg STP

PARAMETER	*SEASON*	*LIMIT*	*UNITS*	*SAMPLE DESIGNATOR*	*MONITORING FREQUENCY*	*SAMPLE TYPE*	*MONITORING LOCATION*
Ag (T)	All Year	0.005	mg/L	MAvg Conc	Monthly	Composite	Effluent
Ag (T)	All Year	0.1	lb/day	MAvg Load	Monthly	Composite	Effluent
Ammonia as N (Total)	All Year	4	mg/L	DMax Conc	3/Week	Composite	Effluent
Ammonia as N (Total)	All Year	10	mg/L	DMax Conc	3/Week	Composite	
Ammonia as N (Total)	All Year	63	lb/day	DMax Load	3/Week	Composite	Effluent
Ammonia as N (Total)	All Year	5	mg/L	WAvg Conc	3/Week	Composite	
Ammonia as N (Total)	All Year	2	mg/L	WAvg Conc	3/Week	Composite	Effluent
Ammonia as N (Total)	All Year	156	lb/day	DMax Load	3/Week	Composite	
Ammonia as N (Total)	All Year	3	mg/L	MAvg Conc	3/Week	Composite	Effluent

Table 6-2a.

PARAMETER	SEASON	LIMIT	UNITS	SAMPLE DESIGNATOR	MONITORING FREQUENCY	SAMPLE TYPE	MONITORING LOCATION
Ammonia as N (Total)	All Year	42	lb/day	MAvg Load	3/Week	Composite	Effluent
Ammonia as N (Total)	All Year	104	lb/day	MAvg Load	3/Week	Composite	
Ammonia as N (Total)	All Year	7.5	mg/L	MAvg Conc	3/Week	Composite	
Bypass of Treatment (occurrences)	All Year		Occurences/Month	MAvg Load	Continuous	Visual	Wet Weather
CBOD % Removal	All Year	40	Percent	DMin % Removal	3/Week	Calculated	% Removal
CBOD % Removal	All Year	85	Percent	MAvg % Removal	3/Week	Calculated	% Removal
CBOD5	All Year	20	mg/L	DMax Conc	3/Week	Composite	Effluent
CBOD5	All Year	10	mg/L	DMin Conc	3/Week	Composite	Effluent
CBOD5	All Year	15	mg/L	MAvg Conc	3/Week	Composite	Effluent
CBOD5	All Year	313	lb/day	DMax Load	3/Week	Composite	Effluent
CBOD5	All Year		mg/L	DMax Conc	3/Week	Composite	Influent (Raw Sewage)
CBOD5	All Year		mg/L	MAvg Conc	3/Week	Composite	Influent (Raw Sewage)
CBOD5	All Year	209	lb/day	MAvg Load	3/Week	Composite	Effluent
Cu (T)	All Year	0.031	mg/L	MAvg Conc	Monthly	Composite	Effluent
Cu (T)	All Year	0.65	lb/day	MAvg Load	Monthly	Composite	Effluent
D.O.	All Year	6	mg/L	DMin Conc	Weekdays	Grab	Effluent
E. coli	All Year	126	#/100mL	MAvg Geo Mean	3/Week	Grab	Effluent
Fecal Coliform	All Year	1000	#/100mL	DMax Conc	3/Week	Grab	Effluent
Fecal Coliform	All Year	200	#/100mL	MAvg Geo Mean	3/Week	Grab	Effluent
Flow	All Year		MGD	DMax Load	Daily	Continuous	Effluent
Flow	All Year		MGD	MAvg Load	Daily	Continuous	Influent (Raw Sewage)
Flow	All Year		MGD	MAvg Load	Daily	Continuous	Effluent
Flow	All Year		MGD	DMax Load	Daily	Continuous	Influent (Raw Sewage)
IC25 7day Ceriodaphnia Dubia	All Year	18	Percent	DMin Conc	Monthly	Composite	Effluent
IC25 7day Fathead Minnows	All Year	18	Percent	DMin Conc	Monthly	Composite	Effluent
NOEL 7day Ceriodaphnia Dubia	All Year	22	Percent	DMin Conc	Quarterly	Composite	Effluent
NOEL 7day Fathead Minnows	All Year	22	Percent	DMin Conc	Quarterly	Composite	Effluent
Nitrogen Total (as N)	All Year		mg/L	DMax Conc	Weekly	Composite	Effluent
Nitrogen Total (as N)	All Year		mg/L	MAvg Conc	Weekly	Composite	Effluent
Overflow Use Occurences	All Year		Occurences/Month	MAvg Load	Continuous	Visual	Non Wet Weather
Overflow Use Occurences	All Year		Occurences/Month	MAvg Load	Continuous	Visual	Wet Weather
Phosphorus, Total	All Year		mg/L	DMax Conc	Weekly	Composite	Effluent
Phosphorus, Total	All Year		mg/L	MAvg Conc	Weekly	Composite	Effluent
Settleable Solids	All Year	1	mL/L	DMax Conc	3/Week	Composite	Effluent
TRC	All Year	0.11	mg/L	DMax Conc	Weekdays	Grab	Effluent
TSS	All Year	45	mg/L	DMax Conc	3/Week	Composite	Effluent
TSS	All Year		mg/L	DMax Conc	3/Week	Composite	Influent (Raw Sewage)
TSS	All Year	834	lb/day	DMax Load	3/Week	Composite	Effluent
TSS	All Year	40	mg/L	MAvg Conc	3/Week	Composite	Effluent

Table 6-2b.

PARAMETER	SEASON	LIMIT	UNITS	SAMPLE DESIGNATOR	MONITORING FREQUENCY	SAMPLE TYPE	MONITORING LOCATION
TSS	All Year	626	lb/day	MAvg Load	3/Week	Composite	Effluent
TSS	All Year		mg/L	MAvg Conc	3/Week	Composite	Influent (Raw Sewage)
TSS	All Year	30	mg/L	WAvg Conc	3/Week	Composite	Effluent
TSS % Removal	All Year	40	Percent	DMin % Removal	3/Week	Calculated	% Removal
TSS % Removal	All Year	85	Percent	MAvg % Removal	3/Week	Calculated	% Removal
pH	All Year	9	SU	DMax Conc	Weekdays	Grab	Effluent
pH	All Year	6	SU	DMin Conc	Weekdays	Grab	Effluent

Table 6-2c.

Tables 6-2a-c. Permit Limits for Lawrenceburg STP.

Compliance History:
The following numbers of exceedences were noted in PCS:

- 9 TSS
- 5 Settleable Solids
- 6 Ammonia
- 37 CBOD
- 6 Fecal Coliform
- 9 Suspended Solids % Removal
- 5 Chlorine
- 2 Silver
- 1 COD
- 70 Overflows
- 84 bypasses

Enforcement:
Commissioner's Order #03-0556
Database Notes: Significant Non Compliance (SNC) status for nine consecutive quarters on the Quality Non Compliance Report (QNCR) for CBOD violations. Order also includes effluent violations for TSS, Ammonia, Settleable Solids, Fecal, and WET failures during March 2001-March 2003. 55 bypass or overflow events were also reported but were not assessed penalties because they were complying with a previous order on the collection system.
11/6/03 Consent Order signed.
10/17/06 Spoke with Lisa Porter at the STP and she told me that the new plant came online September 6, 2006. They are also sending written notice of the start-up.
10/19/06 Letter rec. from Lawrenceburg requesting that the order be lifted since they have met all their requirements.
11/8/06 Letter sent to Lawrenceburg re: Their request to lift order. Request denied due to on-going effluent violation. They have until December to meet permit limits.

EFO Comments:
None.

TN0065501 Loretto STP

Discharger rating: Minor
City: Loretto
County: Lawrence
EFO Name: Columbia
Issuance Date: 12/31/02
Expiration Date: 4/30/07
Receiving Stream(s): Shoal Creek at mile 38
HUC-12: 060300050303
Effluent Summary: Treatment of municipal sewage. Permitting reuse of treated effluent for golf course irrigation.
Treatment system: Lagoon

Segment	TN06030005081_1000
Name	Shoal Creek
Size	21.3
Unit	Miles
First Year on 303(d) List	2004
Designated Uses	Fish and Aquatic Life (Non-Supporting), Livestock Watering and Wildlife (Supporting), Recreation (Not Assessed), Industrial Water Supply (Supporting), Domestic Water Supply (Supporting), Irrigation (Supporting)
Causes	Nitrates, Sedimentation/Siltation
Sources	Industrial Point Source Discharge, Municipal Point Source Discharges, Site Clearance (Land Development or Redevelopment)

Table 6-3. 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		mg/L	DMax Conc	Weekly	Grab	Effluent
Ammonia as N (Total)	All Year		lb/day	DMax Load	Weekly	Grab	Effluent
Ammonia as N (Total)	All Year		mg/L	MAvg Conc	Weekly	Grab	Effluent
Ammonia as N (Total)	All Year	28	mg/L	WAvg Conc	Weekly	Grab	Effluent
Ammonia as N (Total)	All Year	28	lb/day	MAvg Load	Weekly	Grab	Effluent
CBOD % Removal	All Year	65	Percent	MAvg % Removal	Weekly	Calculated	% Removal
CBOD5	All Year	60	mg/L	DMax Conc	Weekly	Grab	Effluent
CBOD5	All Year	113	lb/day	DMax Load	Weekly	Grab	Effluent
CBOD5	All Year	94	lb/day	DMax Load	Weekly	Grab	Effluent
CBOD5	All Year	50	mg/L	MAvg Conc	Weekly	Grab	Effluent
CBOD5	All Year	75	lb/day	MAvg Load	Weekly	Grab	Effluent
CBOD5	All Year	40	mg/L	DMin Conc	Weekly	Grab	Effluent
D.O.	All Year	1	mg/L	DMin Conc	Weekdays	Grab	Effluent
E. coli	All Year	126	#/100mL	MAvg Geo Mean	Weekly	Grab	Effluent
Fecal Coliform	All Year	1000	#/100mL	DMax Conc	Weekly	Grab	Effluent
Fecal Coliform	All Year	200	#/100mL	MAvg Geo Mean	Weekly	Grab	Effluent
Settleable Solids	All Year	1	mL/L	DMax Conc	2/Week	Grab	Effluent
TRC	All Year	1.5	mg/L	DMax Conc	Weekdays	Grab	Effluent
TSS	All Year	120	mg/L	DMax Conc	Weekly	Grab	Effluent

Table 6-4a.

PARAMETER	SEASON	LIMIT	UNITS	SAMPLE DESIGNATOR	MONITORING FREQUENCY	SAMPLE TYPE	MONITORING LOCATION
TSS	All Year	225	lb/day	DMax Load	Weekly	Grab	Effluent
TSS	All Year	206	lb/day	DMax Load	Weekly	Grab	Effluent
TSS	All Year	110	mg/L	MAvg Conc	Weekly	Grab	Effluent
TSS	All Year	188	lb/day	MAvg Load	Weekly	Grab	Effluent
TSS	All Year	100	mg/L	WAvg Conc	Weekly	Grab	Effluent
pH	All Year	9	SU	DMax Conc	2/Week	Grab	Effluent
pH	All Year	6.5	SU	DMin Conc	2/Week	Grab	Effluent

Table 6-4b.

Tables 6-4a and b. Permit Limits for Loretto STP.

Compliance History:
The following numbers of exceedences were noted in PCS:

- 3 CBOD
- 2 overflows

EFO Comments:
None.

6.4.B. Industrial Permits

TN0001872 UCAR Carbon Company Inc.

Discharger rating: Minor
City: Lawrenceburg
County: Lawrence
EFO Name: Columbia
Issuance Date: 1/02/02
Expiration Date: 1/01/07
Receiving Stream(s): Unnamed tributary at mile 0.62 to Shoal Creek at mile 51.9 for Outfall 001 and Redding Branch for Outfall SW1
HUC-12: 060300050303
Effluent Summary: Contact and noncontact cooling water, storm water runoff and treated domestic wastewater through Outfall 001 and storm water runoff through Outfall SW1
Treatment system: -

Segment	TN06030005081_0999
Name	Misc Tribs to Shoal Creek
Size	26.8
Unit	Miles
First Year on 303(d) List	-
Designated Uses	Fish and Aquatic Life (Not Assessed), Recreation (Not Assessed), Irrigation (Not Assessed), Livestock Watering and Wildlife (Not Assessed)
Causes	N/A
Sources	N/A

Table 6-5. Stream Segment Information UCAR Carbon Company Inc.

PARAMETER	*SEASON*	*LIMIT*	*UNITS*	*SAMPLE DESIGNATOR*	*MONITORING FREQUENCY*	*SAMPLE TYPE*	*MONITORING LOCATION*
Ammonia as N (Total)	All Year		mg/L	DMax Conc	Semi-annually	Grab	Effluent
Fecal Coliform	All Year	1000	#/100mL	DMax Conc	Semi-annually	Grab	Effluent
Flow	All Year		MGD	MAvg Load	Weekly	Instantaneous	Effluent
Flow	All Year		MGD	DMax Load	Weekly	Instantaneous	Effluent
Oil and Grease (Freon EM)	All Year	28	mg/L	DMax Conc	Monthly	Grab	Effluent
Oil and Grease (Freon EM)	All Year	14	mg/L	MAvg Conc	Monthly	Grab	Effluent
TSS	All Year	49	mg/L	DMax Conc	Monthly	Grab	Effluent
TSS	All Year	40	mg/L	MAvg Conc	Monthly	Grab	Effluent
pH	All Year	9	SU	DMax Conc	Weekly	Grab	Effluent
pH	All Year	6	SU	DMin Conc	Weekly	Grab	Effluent

Table 6-6. Permit Limits for UCAR Carbon Company Inc.

Compliance History:
None Reported.

EFO Comments:
Manufacture of Carbon Brick primarily for the steel industry and Metal Ceramics Refractories for high temperature applications.

6.4.B. Water Treatment Plant Permits

TN0078794 Saint Joseph Water Treatment Plant

Discharger rating: Minor
City: St. Joseph
County: Lawrence
EFO Name: Columbia
Issuance Date: 10/05/05
Expiration Date: 9/29/09
Receiving Stream(s): Little Bluewater Creek
HUC-12: 060300050201
Effluent Summary: Filter backwash and/or sedimentation basin washdown from Outfall 001
Treatment system: Lime, chlorine, aqua mag, and fluorosilicic acid

Segment	TN06030005074_0100
Name	Little Bluewater Creek
Size	8.5
Unit	Miles
First Year on 303(d) List	-
Designated Uses	Livestock Watering and Wildlife (Supporting), Irrigation (Supporting), Recreation (Not Assessed), Fish and Aquatic Life (Supporting)
Causes	N/A
Sources	N/A

Table 6-7. Stream Segment Information for Saint Joseph Water Treatment Plant.

PARAMETER	*SEASON*	*LIMIT*	*UNITS*	*SAMPLE DESIGNATOR*	*MONITORING FREQUENCY*	*SAMPLE TYPE*	*MONITORING LOCATION*
Al (T)	All Year	0.75	mg/L	DMax Conc	Monthly	Grab	Effluent
Flow	All Year		MGD	MAvg Load	Monthly	Instantaneous	Effluent
Settleable Solids	All Year	0.5	mL/L	DMax Conc	Monthly	Grab	Effluent
TRC	All Year	0.019	mg/L	DMax Conc	Monthly	Grab	Effluent
TSS	All Year	40	Percent	DMin % Removal	3/Week	Composite	Effluent
pH	All Year	6.5	SU	DMin Conc	Monthly	Grab	Effluent
pH	All Year	9	SU	DMax Conc	Monthly	Grab	Effluent

Table 6-8. Permit Limits for Saint Joseph Water Treatment Plant.

EFO Comments:
Turbidity removal WTP

APPENDIX II

ID	NAME	HAZARD
507002	Bennett Lake	3
507005	David Crockett	1
507006	Shack Lake	2
507007	Mckinney	L
507009	New Shoal Creek	2

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

LAND COVER/LAND USE	ACRES	% OF WATERSHED
Open Water	6,380	1.6
Other Grasses	1,862	0.5
Pasture/Hay	74,846	18.6
Row Crops	34,615	8.6
Woody Wetlands	890	0.2
Emergent Herbaceous Wetlands	131	0.0
Deciduous Forest	204,424	50.7
Mixed Forest	38,522	9.6
Evergreen Forest	29,144	7.2
High Intensity: Commercial/Industrial	1,465	0.4
High Intensity: Residential	375	0.1
Low Intensity: Residential	2,452	0.6
Quarries/Strip Mines/Gravel Pits	50	0.0
Transitional	7,943	2.0
Total	**403,099**	**100.1**

Table A2-2. Land Use Distribution in Pickwick 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
Southeastern Plains and Hills (65e)	Blunt Creek Griffin Creek Harris Creek Marshall Creek West Fork Spring Creek	TN Western Valley (KY Lake) North Fork Forked Deer South Fork Forked Deer Hatchie River Hatchie River	06040005 08010204 08010205 08010208 08010208
Fall Line Hills (65i)	Battles Branch	TN Western Valley (Beech)	06040001
Transition Hills (67j)	Pompeys Branch Dry Creek Right Fork Whites Creek Unnamed Trib to Right Fork Whites Creek	TN Western Valley (KY Lake) TN Western Valley (KY Lake) TN Western Valley (Beech) TN Western Valley (Beech)	06030005 06030005 06040001 06040001
Western Highland Rim (71f)	South Harpeth Creek Wolf Creek Brush Creek Swanegan Creek Little Swan Creek Hurricane Creek	Harpeth River Lower Duck River Lower Elk River Pickwick Lake Lower Duck River Lower Duck River	05130204 06040003 06040004 06030005 06040003 06040003

Table A2-3. Ecoregion Monitoring Sites in Ecoregions 65e, 65i, 67j, and 71f.

.

CODE	NAME	AGENCY	AGENCY ID
99	TDEC/DNH MIDDLE CYPRESS CREEK SITE	TDEC/DNH	S.USTNHP 228
240	USACOE-NASHVILLE CLIENT SITE	USACOE-NASHVILLE	

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

APPENDIX III

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Butler Creek	TN06030005093_1000	12.1
Dry Branch	TN06030005566_1000	20.0
Factory Creek	TN06030005089_1000	13.6
Holly Creek	TN06030005092_1000	33.1
Knob Creek	TN06030005086_1000	12.5
Last Butler Creek	TN06030005093_0600	14.5
Middle Cypress Creek	TN06030005098_1000	8.4
Pompeys Branch	TN06030005560_1000	4.5
Pond Creek	TN06030005309_1000	11.4
Second Creek	TN06030005106_1000	28.6
Shawnette Creek	TN06030005089_0100	33.3
Swanagan Branch	TN06030005093_0700	6.4
Talley Branch	TN06030005106_0300	10.3

Table A3-1a. Streams Fully Supporting Designated Uses in Pickwick Lake Watershed. *Data are based on Year 2000 Water Quality Assessment*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Grassy Creek	TN06030005106_0100	14.9
Little Shoal Creek	TN06030005084_1000	20.7
Shoal Creek	TN06030005078_1000	13.2
Shoal Creek	TN06030005081_1000	21.3
Shoal Creek	TN06030005082_1000	2.3

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Aaron Branch	TN06030005087_0300	9.5
Beeler Fork	TN06030005082_0200	10.4
Big Dry Branch	TN06030005082_0100	7.4
Bluewater Creek	TN06030005074_1000	16.2
Brewer Branch	TN06030005078_0100	5.1
Brushy Creek	TN06030005086_0400	4.5
Chisholm Creek	TN06030005087_1000	27.2
Clack Branch	TN06030005078_0200	22.5
Cooper Branch	TN06030005099_0100	10.3
Crawfish Creek	TN06030005084_0100	9.0
Crews Branch	TN06030005086_0600	5.6
Crowson Creek	TN06030005085_1000	23.2
Cypress Creek	TN06030005099_1000	21.6
Dixon Branch	TN06030005074_0200	9.8
Double Branch	TN06030005089_0200	9.7
Dry Branch	TN06030005095_0100	10.4
Dry Land Creek	TN06030005082_0300	9.6
Dulin Creek	TN06030005099_0300	5.1
Fantail Branch	TN06030005093_0300	4.4
First Butler Creek	TN06030005093_0400	11.2
Goslin Branch	TN06030005086_0100	9.0
Granddaddy Creek	TN06030005086_0300	14.3
Hayes Branch	TN06030005099_0200	5.2
Hurricane Creek	TN06030005074_0300	6.6
Kilburn Creek	TN06030005089_0300	5.8
Little Bluewater Creek	TN06030005074_0100	8.5
Little Cypress Creek	TN06030005095_1000	9.8
Long Branch	TN06030005081_0100	11.1
May Branch	TN06030005098_0100	10.0
Middle Butler Creek	TN06030005093_0500	9.1
Mill Branch	TN06030005093_0200	4.0
Misc. tribs to Bluewater Creek	TN06030005074_0999	34.5
Misc. Tribs to Butler Creek	TN06030005093_0999	12.0
Misc. Tribs to Chisholm Creek	TN06030005087_0999	29.2
Misc. Tribs to Factory Creek	TN06030005089_0999	49.5
Misc. Tribs to Knob Creek	TN06030005086_0999	12.7
Misc. Tribs to Little Cypress Creek	TN06030005095_0999	10.9
Misc. Tribs to Pickwick Reservoir	TN06030005001T_0100	5.7
Misc. Tribs to Pickwick Reservoir	TN06030005001T_0999	15.0
Misc. Tribs to Shoal Creek	TN06030005078_0999	21.9
Misc. tribs to Shoal Creek	TN06030005081_0999	26.8
Misc. Tribs to Shoal Creek	TN06030005082_0999	9.5
Piney Branch	TN06030005086_0200	13.3
Pinhook Branch	TN06030005078_0300	5.5
Poplar Creek	TN06030005081_0200	5.4
Reed Patch Creek	TN06030005087_0200	9.7
Scab Branch	TN06030005089_0500	4.8
Shoal Creek	TN06030005082_2000	6.2

Sowell Branch	TN06030005085_0100	5.8
Spain Branch	TN06030005098_0200	9.0
Spring Creek	TN06030005086_0500	16.6
Staggs Branch	TN06030005087_0100	4.6
Stults Creek	TN06030005093_0100	6.2
Sweetwater Branch	TN06030005089_0400	8.5
Wolf Creek	TN06030005078_0400	10.1

Table A3-1c. Streams Not Assessed in Pickwick Lake Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (ACRES)
David Crockett Lake	TN06030005dcrockettl_1000	40
Pickwick Reservoir	TN06030005001_1000	5800

Table A3-1d. Lakes Fully Supporting Designated Uses in Pickwick Lake Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Grassy Creek	TN06030005106_0100	14.9	Partial
Shoal Creek	TN06030005078_1000	13.2	Partial

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Shoal Creek	TN06030005082_1000	2.3	Partial

Table A3-2b. Stream Impairment Due to Organic Enrichment/ Low Dissolved Oxygen Levels in Pickwick Lake Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Shoal Creek	TN06030005082_1000	2.3	Partial

Table A3-2c. Stream Impairment Due to Pathogens in Pickwick Lake Watershed. *Data are based on Year 2000 Water Quality Assessment*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Grassy Creek	TN06030005106_0100	14.9	Partial
Little Shoal Creek	TN06030005084_1000	20.7	Partial

Table A3-2d. Stream Impairment Due to Siltation in Pickwick Lake Watershed. *Data are based on Year 2000 Water Quality Assessment*

APPENDIX IV

LAND USE/LAND COVER	AREAS IN HUC-10 SUBWATERSHEDS (ACRES)						
	02	03	04	05	06	07	08
Deciduous Forest	13,181	95,521	50,174	16,294	7,992	16,294	1,029
Emergent Herbaceous Wetlands		18		7	101	7	6
Evergreen Forest	592	6,323	5,438	5,035	7,790	5,035	969
High Intensity: Commercial/Industrial/Transportation	64	1,154	158	10	36	10	1
High Intensity: Residential	24	357	1				
Low Intensity: Residential	319	1,954	51	18	1	18	19
Mixed Forest	2,250	14,084	6,529	5,140	4,985	5,140	583
Open Water	42	250	59	10	5,919	10	24
Other Grasses: Urban/Recreational	276	1,331	59	20	2	20	14
Pasture/Hay	13,508	43,855	8,105	1,805	513	1,805	36
Row Crops	6,005	22,866	2,610	714	145	714	17
Transitional	3	1,793	3,429	1,735	340	1,735	158
Woody Wetlands		329	46	267	57	267	
Quarries/Strip Mines		51		10		10	
Total	**36,265**	**189,886**	**76,659**	**31,065**	**27,881**	**31,065**	**1,856**

Table A4-1. Land Use Distribution in the Tennessee Portion of Pickwick 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
03587200	0603000502	USGS	Trib to Bluewater Creek				
03587300	0603000502	USGS	Bluewater Creek	38.8	3.3	3.8	3.1
03588000	0603000503	USGS	Shoal Creek	55.4	16.6	17.8	15.9
03587500	0603000503	USGS	Shoal Creek	27.0	5.5	6.1	5.2
03588500	0603000503	USGS	Shoal Creek				
03588400	0603000504	USGS	Chisholm Creek	43.0	9.93	10.5	8.98
350415088150201	0603000506	TVA	Tennessee River				

Table A4-3. Historical Streamflow Data Summary Based on Mean Daily Flows in Pickwick Lake Watershed*. USGS, United States Geological Survey; TVA, Tennessee Valley Authority.*

PARAMETER	SUBWATERSHED		
	03	05	06
E. coli	A, B, Y, Z		
Enterococcus	A, B, Y, Z	$	
Fecal Coliform	A , Y, Z, #	$	γ, δ
Fecal Streptococcus	#		
Alkalinity (Total)	Y, #	$	γ, δ
Color (Apparent)	Y		
Color (True)	Y		
Conductivity (Field)	A, B, Y, Z, #	$	γ, δ
BOD_5	#		
COD (Low)	Z		
DO	B, Y, Z, #		γ, δ
Flow	A, B, Y, Z		
Hardness (Total)	Y, Z, #	$	γ, δ
pH (Field)	A ,B, Y, Z, #		γ, δ
pH (Lab)		$	
Residue (Dissolved)	Y, Z	$	γ, δ
Residue (Settleable)	#		
Residue (Suspended)	Y, Z, #	$	γ, δ
Temperature	A, B, Y, Z, #		γ, δ
Turbidity	Y	$	γ, δ
Biorecon	A, B, Y, Z		γ, δ
RBP III	Y		γ, δ
Ag	Y, #		
Al	A, B		
Ammonia N	A, B, Y, Z, #	$	γ, δ
As	A, B, Y, Z, #	$	γ, δ
Cd	A, B, Y, Z, #	$	δ
Cl^-	Y	$	γ, δ
CN^-	Y	$	γ, δ
Cr (Total)	A, B, Y, Z, #	$	γ, δ
Cu	A, B, Y, Z, #	$	γ, δ
Fe	A, Y	$	γ, δ
Hg	Y, Z, #	$	γ, δ
Mn	A, B, Y, Z, #	$	γ, δ
N (Total Kjeldahl)	Y, Z	$	γ, δ
Ni	A, B, Y, Z, #	$	γ, δ
NO_2+NO_3	A, B, Y, Z, #	$	γ, δ
P (Total)	A, B, Y, Z, #	$	γ, δ
Pb	A, B, Y, Z, #	$	γ, δ
Se	A, B		
SO_4	Y		
TOC	Y	$	γ, δ
Zn	A, B, Y, Z, #	$	γ, δ

Table A4-4a. Water Quality Parameters Monitored in the Tennessee Portion of Pickwick Lake Watershed. *Codes are explained in Table A4-4b.*

CODE	STATION	ALIAS	AGENCY	LOCATION
A	LSHOA004.0LW		TDEC	Little Shoal Creek @ RM 4.0
B	**SHOAL053.5LW**		**TDEC**	**Shoal Creek @ RM 53.5**
C	SHOAL048.5LW		TDEC	Shoal Creek @ RM 58.5
D	SHOAL055.45LW		TDEC	Shoal Creek @ RM 55.45
E	LINDSEYLAKE		TDEC	Lindsey Lake
F	SHOAL054.05LW	SHOALCRIS20	TDEC	Shoal Creek @ RM 54.05
G	SHOAL054.06LW	SHOALCRIS19	TDEC	Shoal Creek @ RM 54.06
H	SHOAL054.1LW	SHOALCRIS18	TDEC	Shoal Creek @ RM 54.1
I	SHOAL054.2LW	SHOALCRIS17	TDEC	Shoal Creek @ RM 54.2
J	SHOAL054.3LW	SHOALCRIS16	TDEC	Shoal Creek @ RM 54.3
K	SHOAL054.4LW	SHOALCRIS15	TDEC	Shoal Creek @ RM 54.4
L	SHOAL054.5LW	SHOALCRIS14	TDEC	Shoal Creek @ RM 54.5
M	SHOAL054.6LW	SHOALCRIS13	TDEC	Shoal Creek @ RM 54.6
N	SHOAL054.75LW	SHOALCRIS11	TDEC	Shoal Creek @ RM 54.75
O	SHOAL054.7LW	SHOALCRIS12	TDEC	Shoal Creek @ RM 54.7
P	SHOAL054.85LW	SHOALCRIS09	TDEC	Shoal Creek @ RM 54.85
Q	SHOAL054.8LW	SHOALCRIS10	TDEC	Shoal Creek @ RM 54.8
R	SHOAL055.0LW	SHOALCRIS08	TDEC	Shoal Creek @ RM 54.0
S	SHOAL055.12LW	SHOALCRIS07	TDEC	Shoal Creek @ RM 54.12
T	SHOAL055.2LW	SHOALCRIS06	TDEC	Shoal Creek @ RM 55.2
U	SHOAL055.35LW	SHOALCRIS04	TDEC	Shoal Creek @ RM 55.35
V	SHOAL055.37LW	SHOALCRIS02	TDEC	Shoal Creek @ RM 55.37
W	SHOAL055.3LW	SHOALCRIS05	TDEC	Shoal Creek @ RM 55.3
X	03588500		USGS	Shoal Creek @ Iron City
Y	ECO71f27		TDEC	Swanegan Branch @ RM 0.48
Z	SHOAL032.2LW	002395	TDEC	Shoal Creek @ RM 32.2
#	SHOAL055.4		TDEC	Shoal Creek @ RM 55.4
$	MAY002.7WE	ECO65JO7	TDEC	May Branch @ RM 2.7
^	TENNE206.7	003360	TDEC	Tennessee River @ RM 206.7
Φ	TENNE210.0HD	TISSUE42	TDEC	Tennessee River @ RM 210.0
Ψ	TENNE214.4HD	003355	TDEC	Tennessee River @ RM 214.4
Ω	476433		TVA	Pickwick Reservoir @ State Park
α	476434		TVA	Pickwick Reservoir @ Bruton Bridge Rec Area
β	476799		TVA	Pickwick Forebay
γ	ECO65J04		TDEC	Pompeys Bridge @ RM 0.85
δ	ECO65JO5		TDEC	Dry Creek @ RM 3.19

Table A4-4b. Water Quality Monitoring Stations in the Tennessee Portion of Pickwick Lake Watershed*. TDEC, Tennessee Department of Environment and Conservation; USGS, United States Geologic Survey; TVA, Tennessee Valley Authority; NPS, National Park Service.*

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	MADI	WATERBODY	HUC-10
TN0001473	Murray Incorporated	3524	Lawn and Garden Equipment	Major	Industrial Sewer to Shoal Creek @ RM 55.4, WWC to Unnamed Trib to Shoal Creek @ RM 56.2, WWC to Shoal Creek, WWC to Little Shoal Creek	0603000503
TN0001872	UCAR Carbon Co.	3624	Carbon and Graphite Products	Minor	Unnamed Trib to Shoal Creek @ RM 51.9, Redding Branch	0603000503
TN0065501	Loretto STP	4952	Sewerage System	Minor	Shoal Creek @ RM 38.0	0603000503

Table A4-5. Active Permitted Point Source Facilities in the Tennessee Portion of Pickwick Lake Watershed. *SIC, Standard Industrial Classification; MADI, Major Discharge Indicator; WWC, Wet Weather Conveyance.*

FACILITY NUMBER	PERMITEE	SIC	SIC NAME	WATERBODY	HUC-10
TN0057967	Rogers Group	1422	Crushed and Broken Limestone	Crowson Ck	0603000503

Table A4-6. Active Permitted Mining Sites in the Tennessee Portion of Pickwick Lake Watershed. *SIC, Standard Industrial Classification.*

FACILITY NUMBER	FACILITY NAME	SECTOR	RECEIVING STREAM	AREA (ACRES)	HUC-10
TNR054464	Hale Products, Incorporated	AB	Little Bluewater Creek	4.1	0603000502
TNR050398	Dura Automotive Systems	AB, Y	Little Shoal Creek	7.0	0603000503
TNR050467	Graphic Packaging Corp.	B, X	Little Shoal Creek	10.0	0603000503
TNR050536	Modine Manufacturing Co.	AB	Shoal Creek	24.6	0603000503
TNR050876	Hughes Hardwood	A, P	Butler Creek Roanoake Fork	7.4	0603000503
TNR051632	Edwards Oil Company	P	Little Shoal Creek	4.5	0603000503
TNR053019	Sharp Transport	P	None	3.3	0603000503
TNR053564	United Parcel Service	P	Unnamed Trib to Shoal Creek	0.8	0603000503
TNR053602	Lawrence County Airport	S	Dry Land Creek	0.5	0603000503
TNR053747	Lawrenceburg Vault Company	E	Beeler Fork	2.7	0603000503
TNR053757	Hughes Parker Industries	AB, AA	Unnamed Trib to Little Shoal Creek	12.5	0603000503
TNR054414	Lindsey Manufacturing Co.	W	Shoal Creek	1.5	0603000503
TNR055071	Dyna-Pak Corporation	B	Little Shoal Creek	7.0	0603000503
TNR055909	All-Star Auto Salvage	M	Big Dry Creek	32.0	0603000503

Table A4-7. Active Permitted TMSP Facilities in the Tennessee Portion of Pickwick 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 A4-8. TMSP Sectors and Descriptions.

LOG NUMBER	COUNTY	DESCRIPTION	WATERBODY	HUC-10
97.052	Lawrence	Gravel Dredging	Dixon Branch	0603000502
98.284	Wayne	Bridge Replacement	Little Cypress Creek	0603000502
98.285	Wayne	Bridge Replacement	Rich Branch	0603000502
00.109	Lawrence	Gravel Dredging	Blue Water Creek	0603000502
96.329	Lawrence	Bridge Replacement Minor Road Crossing	Wolf Creek	0603000503
97.405	Wayne	Road Crossing	Last Buffer Creek	0603000503
97.639	Lawrence	Stream Rebuilding Revegetation	Knob Creek	0603000503
97.643	Lawrence	Stream Relocation	Shoal Creek	0603000503
98.283	Wayne	Bridge Replacement	Roanoake Creek	0603000503
98.286	Wayne	Bridge Replacement	Waterfall Creek	0603000503
98.557	Lawrence	Impound. Const. Repair	West Fork Sugar Creek	0603000503
9808.0003	Lawrence	Water Line Replacement	Little Shoal Creek	0603000503
9810.150	Lawrence	Debris removal	Hardy Branch	0603000503
9810.151	Lawrence	Bank Stabilization	Hardy Branch	0603000503
99.348	Lawrence	Channel Cleanout Gravel Dredging	Coon Creek	0603000503
9908.0020	Lawrence	Minor Road Crossing	Shoal Creek	0603000503
9908.0031	Lawrence	Gravel Dredging	Knob Creek	0603000503
00.086	Lawrence	Bridge Replacement	Unnamed Trib to Shoal Creek,Unnamed Trib to Coon Creek	0603000503
94.032	Lawrence	Gravel Dredging	Factory Creek	0603000504
96.446	Wayne	Pipeline Repair	Shawnette Creek Middle Butler Creek Silvermine Hollow Creek	0603000504
96.491	Lawrence	Road Crossing	Chisholm Creek	0603000504
96.563	Wayne	Stream Relocation	Haggarty Branch	0603000504
97.794	Wayne	Bridge Replacement	Double Branch	0603000504
97.795	Wayne	Bridge replacement	Double Branch	0603000504
98.321	Wayne	Bridge replacement	Sweetwater Branch	0603000504
9808.0010	Wayne	Bank Stabilization	Factory Creek	0603000504
97.322	Wayne	Box Bridge Construction	Cooper Branch	0603000505
98.317	Wayne	Bridge Replacement	Cooper Branch	0603000505
98.322	Wayne	Bridge Replacement	Cypress creek	0603000505
9908.0009	Wayne	Minor Road Crossing	Cypress Creek	0603000505
96.338	Wayne	Road Crossing	Tally Branch	0603000507
97.454	Wayne	Bridge Replacement	Second Creek	0603000507

Table A4-9. Individual ARAP Permits Issued January 1994 Through June 2000 in the Tennessee Portion of Pickwick 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	48,200
Filter Strips	Acres	0
Grassed Waterways	Acres	0
Riparian Forest Buffers	Acres	178
Streambank and Shoreline Protection	Feet	0
Windbreaks and Shelterbelts	Feet	0
Hedgerow Plantings	Feet	0
Herbaceous Wind Barriers	Feet	0
Total Conservation Buffers	Acres	205

Table A5-1a. Conservation Buffers Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Pickwick 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)	1,721
Highly Erodible Land With Erosion Control Practices (Acres)	1,606
Estimated Annual Soil Saved By Erosion Control Measures (Tons/Year)	19,080
Total Estimated Soil Saved (Tons/Year)	19,080

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

PARAMETER	TOTAL
Acres of AFO Nutrient Management Applied	74
Acres of Non-AFO Nutrient Management Applied	2,063
Total Acres Applied	2,137

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

PARAMETER	TOTAL
Acres of Pest Management Systems Applied	1,968

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

CONSERVATION PRACTICE	ACRES
Acres Prepared for Revegetation of Forestland	162
Acres Improved Through Forest Stand Improvement	343
Acres of Tree and Shrub Establishment	505

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

CONSERVATION PRACTICE	ACRES
Acres of Upland Habitat Management	655
Acres of Wetland Habitat Management	0
Total Acres Wildlife Habitat Management	655

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

COMMUNITY	PROJECT DESCRIPTION	AWARD DATE	AWARD AMOUNT
Ethridge	Wastewater Collection System	08/09/01	$479,000
Loretto	Wastewater Treatment Plant and Collection System	06/15/92	$3,825,000

Table A5-2. Communities in the Tennessee Portion of Pickwick Lake Watershed Receiving SRF Grants or Loans.

NRCS CODE	PRACTICE	NUMBER OF BMPs
342	Critical Use Treatment	1
378	Pond	15
378a	Pond for Rotational Grazing System	1
412	Grassed Waterway	2
512	Pasture and Hayland Planting	68
512a	Cropland Conversion	4
516	Pipeline	1
561	Heavy Use Area	2
574	Spring development	1
580	Streambank Stabilization	2
614	Trough/Tank	1

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