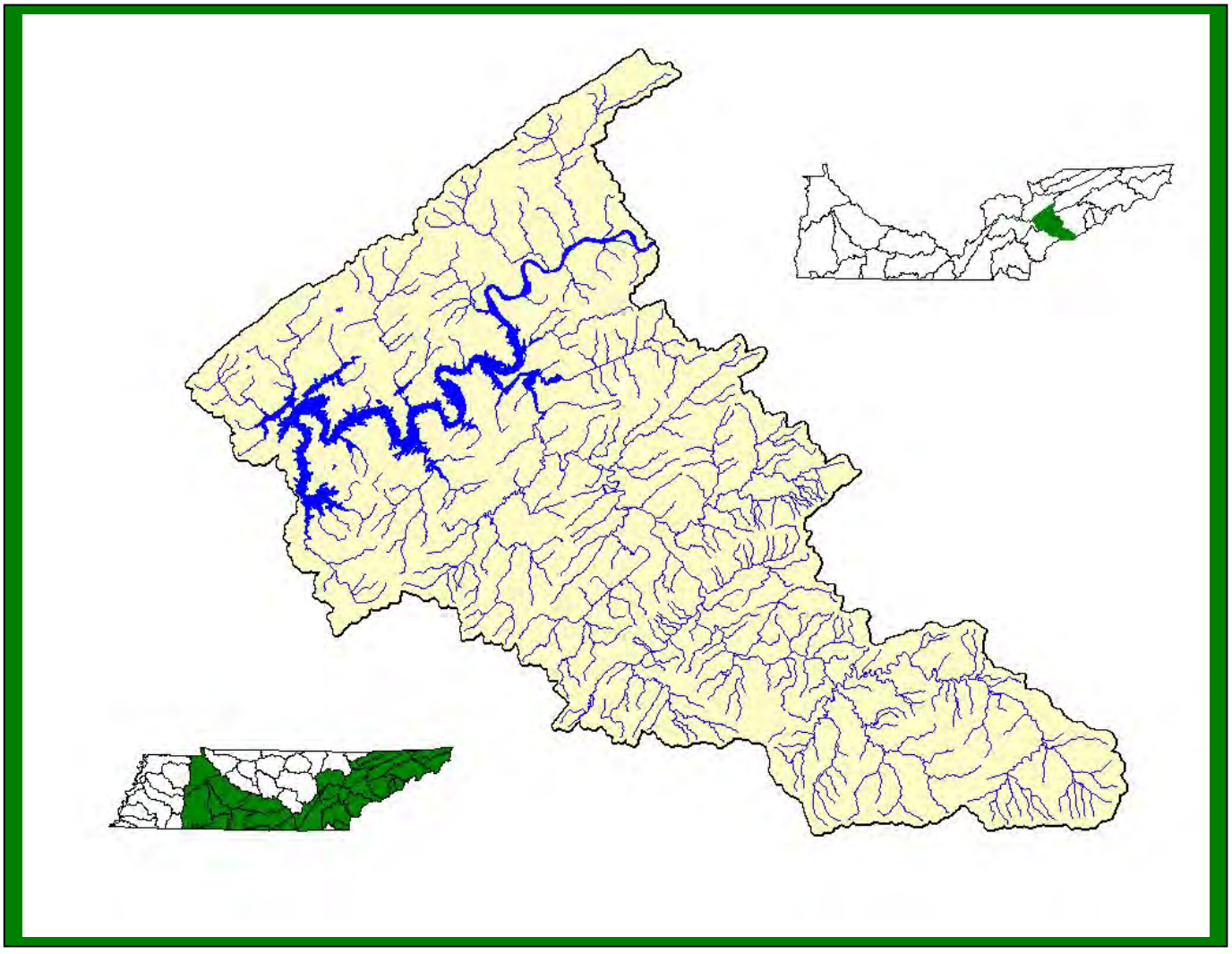
# FORT LOUDOUN LAKE WATERSHED (06010201) OF THE TENNESSEE RIVER BASIN

# WATERSHED WATER QUALITY MANAGEMENT PLAN



**TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION**
**DIVISION OF WATER POLLUTION CONTROL**
**WATERSHED MANAGEMENT SECTION**
**2003**

# GLOSSARY

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

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

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

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

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

**AFO.** Animal Feeding Operation.

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

**ARAP.** Aquatic Resource Alteration Permit.

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

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

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

**Benthic.** Bottom dwelling.

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

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

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

**CAFO.** Concentrated Animal Feeding Operation.

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

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

**DO.** Dissolved oxygen.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**SBR.** Sequential Batch Reactor.

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

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

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

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

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

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

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

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

**WAS.** Waste Activated Sludge.

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

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

**WET.** Whole Effluent Toxicity.

**WWTP.** Waste Water Treatment Plant

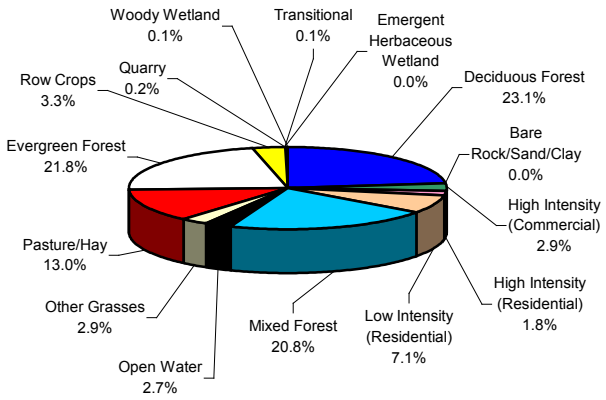
# Summary – Ft. Loudoun Lake

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 Ft. Loudoun 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.

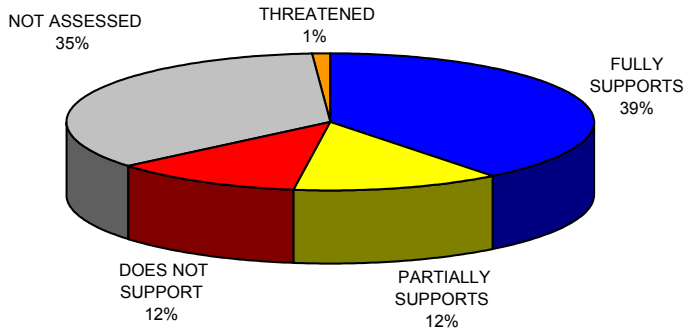
A detailed description of the watershed can be found in Chapter 2. The Tennessee portion of the Ft. Loudoun Lake Watershed is approximately 638 square miles and includes parts of four East Tennessee counties. A part of the Tennessee River drainage basin, the Tennessee portion of the watershed has 911 stream miles and 14,600 lake acres.




*Land Use in the Ft. Loudoun Lake Watershed is based on MRLC Satellite Imagery.*

One Greenway, four interpretive areas and one wildlife management area are located in the watershed. Ninety rare plant and animal species have been documented in the Tennessee portion of the watershed, including ten rare fish species, seven rare mussel species and six rare snail species.

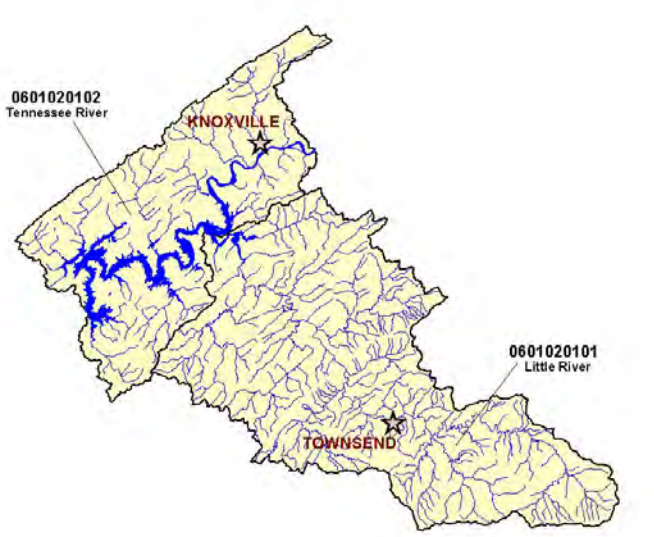
A review of water quality sampling and assessment is presented in Chapter 3. Using the Watershed Approach to Water Quality, 76 sampling sites were utilized in the Tennessee portion of the Ft. Loudoun Lake Watershed. These were ambient, ecoregion, watershed monitoring sites or special survey sites. Monitoring results support the conclusion that 39% of total stream miles (based on RF3) fully support designated uses.




*Water Quality Assessment in the Tennessee portion of the Ft. Loudoun 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 PCBs, Pathogens, Habitat Alteration and siltation.

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




*HUC-10 Subwatersheds in the Ft. Loudoun Lake Watershed.*

Point source contributions to the Tennessee portion of the Ft. Loudoun Lake Watershed consist of 28 individual NPDES-permitted facilities, 13 of which discharge into streams that have been listed on the 1998 303(d) list. Other point source permits in the watershed are Aquatic Resource Alteration Permits (17), Tennessee Multi-Sector Permits (82) and Mining Permits (6). 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 Ft. Loudoun 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, National Park Service), and state agencies (TDEC Division of Community Assistance, TDEC Division of Water Supply, Tennessee Department of Agriculture) are summarized. Local initiatives of active watershed organizations (Tennessee Izaak Walton League, Little River Watershed Association) are also described.

Point and Nonpoint source approaches to water quality problems in the Ft. Loudoun 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 Ft. Loudoun Lake Watershed Water Quality Management Plan can be found at: http://www.state.tn.us/environment/wpc/watershed/wsmplans/.

# CHAPTER 1

## WATERSHED APPROACH TO WATER QUALITY



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

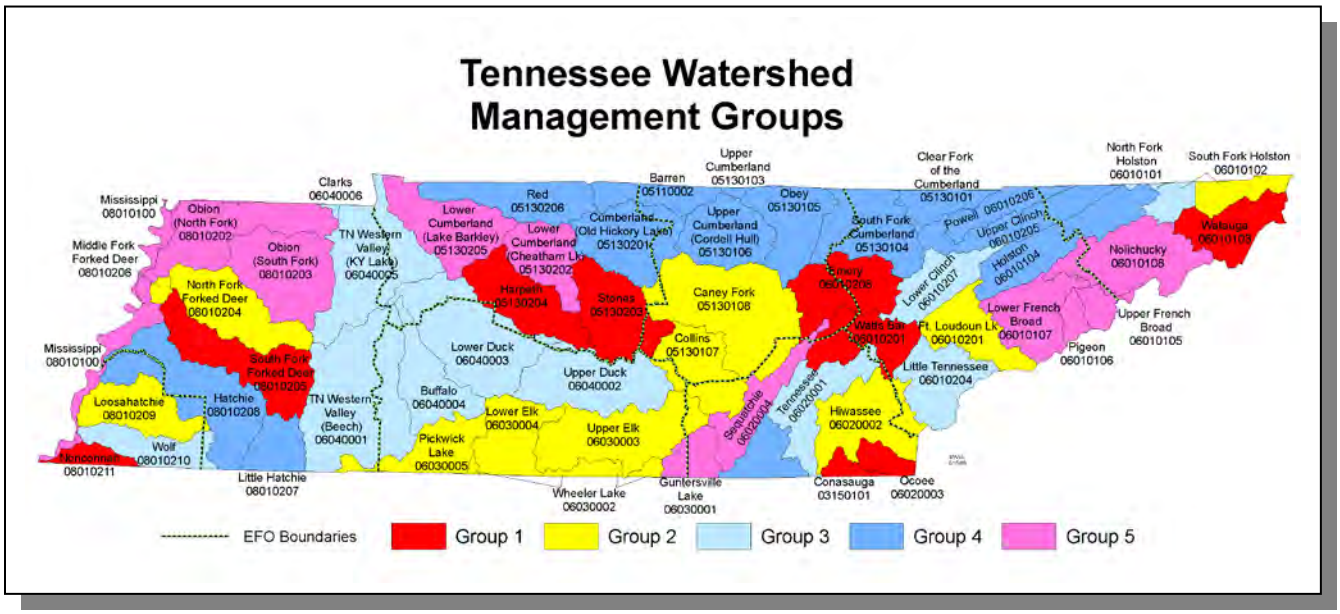



***Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.***

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

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

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

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

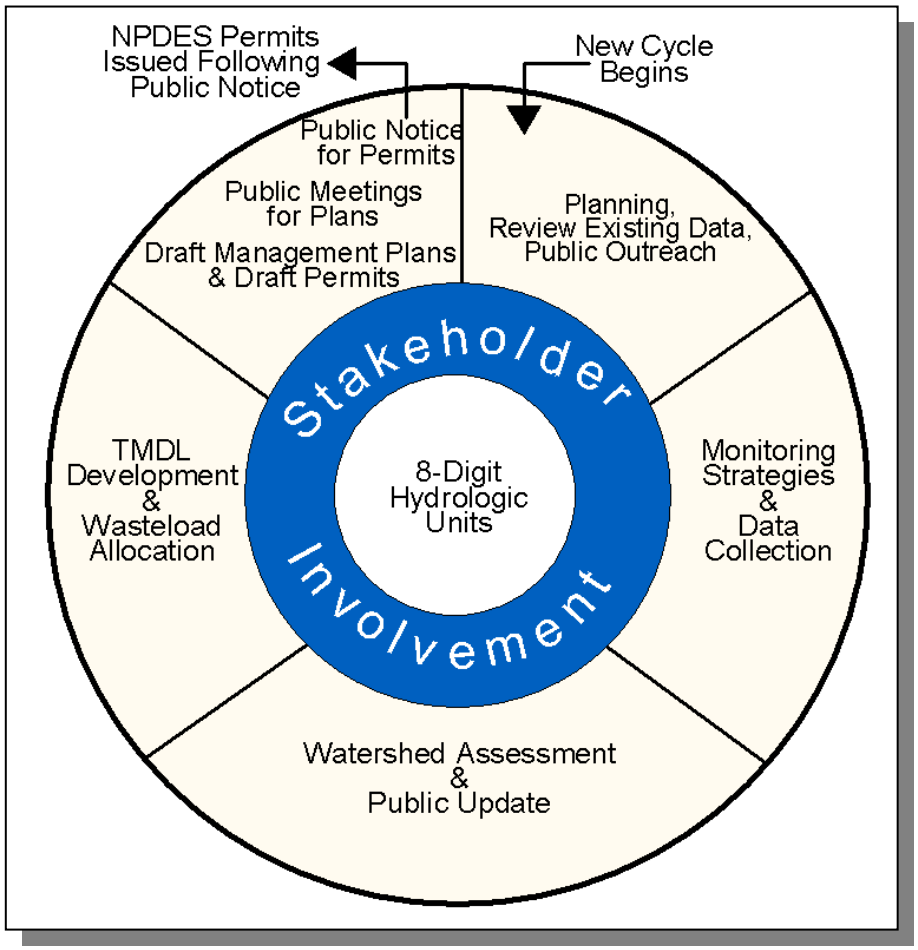



***Figure 1-2. The Watershed Approach Cycle.***

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

# CHAPTER 2

## DESCRIPTION OF THE FORT LOUDOUN LAKE WATERSHED



**2.1. BACKGROUND.** The Fort Loudoun Lake Watershed contains Fort Loudoun Dam, the uppermost dam on the Tennessee River. The dam received its name from a British fort that was built near the present site of the dam during the French and Indian War. The fort was named in honor of John Campbell, 4th Earl of Loudoun, who was the commander-in-chief of the British forces in North America. Fort Loudoun Reservoir was created by the damming of the Tennessee River, and is a popular site for fishing and boating.

The watershed is characterized by forested slopes, high gradient, cool, clear streams, and rugged terrain. Some of the lower stream reaches occur on limestone. The chemistry of the streams flowing down the sandstone ridges can vary greatly depending on the geologic material. Some of the watershed's streams flow through the Blue Ridge Mountains, and have a distinct fauna, some containing brook trout, the only salmonid native to Tennessee.

This Chapter describes the location and characteristics of the Fort Loudoun Lake Watershed.

## 2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. Located in East Tennessee, the Fort Loudoun Lake Watershed includes parts of Blount, Knox, Loudon, and Sevier Counties.

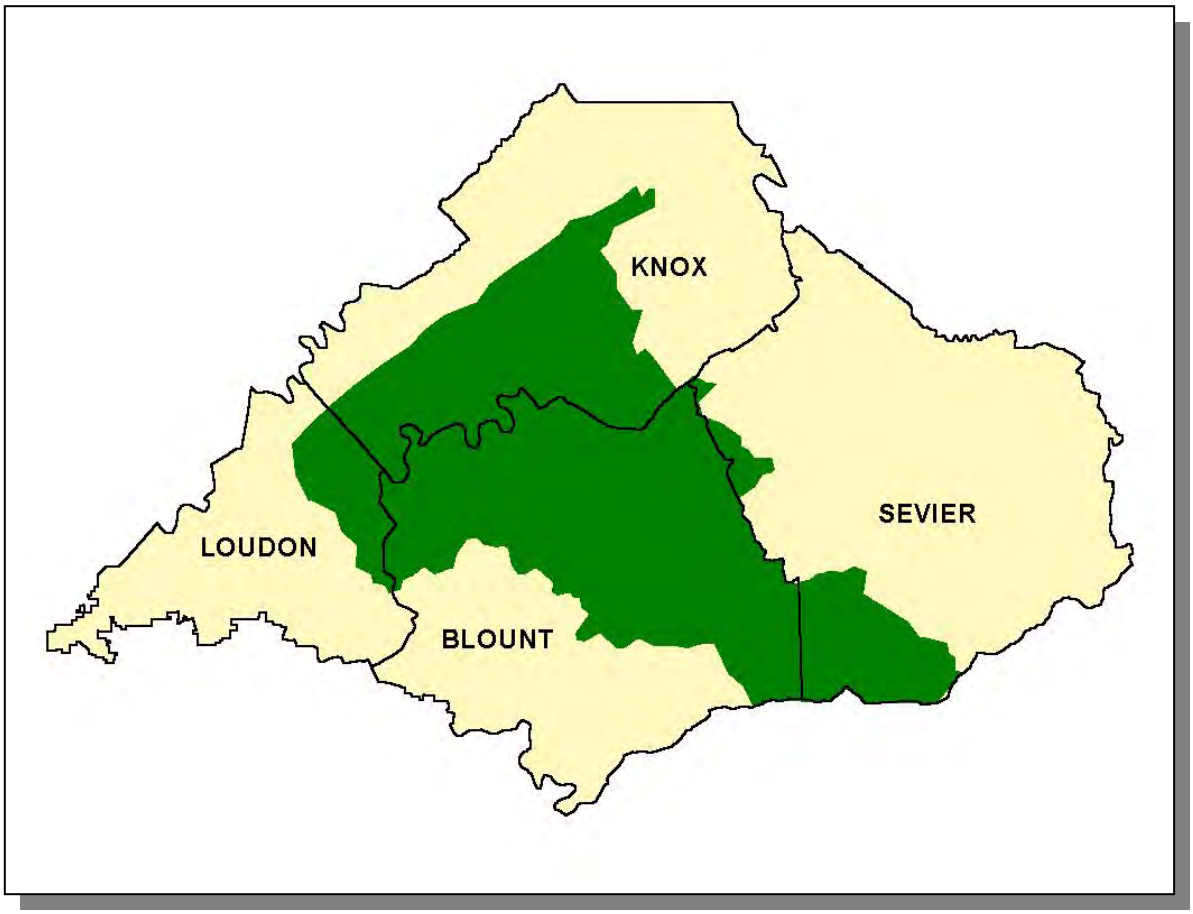



*Figure 2-1. General Location of the Fort Loudoun Lake Watershed.*

| COUNTY | % OF WATERSHED IN EACH COUNTY |
|---|---|
| Blount | 51.5 |
| Knox | 29.7 |
| Sevier | 12.4 |
| Loudon | 6.4 |

*Table 2-1. The Fort. Loudoun Lake Watershed Includes Parts of Four East Tennessee Counties.*

2.2.B. Population Density Centers. One interstate and eight state highways serve the major communities in the Fort Loudoun Lake Watershed.

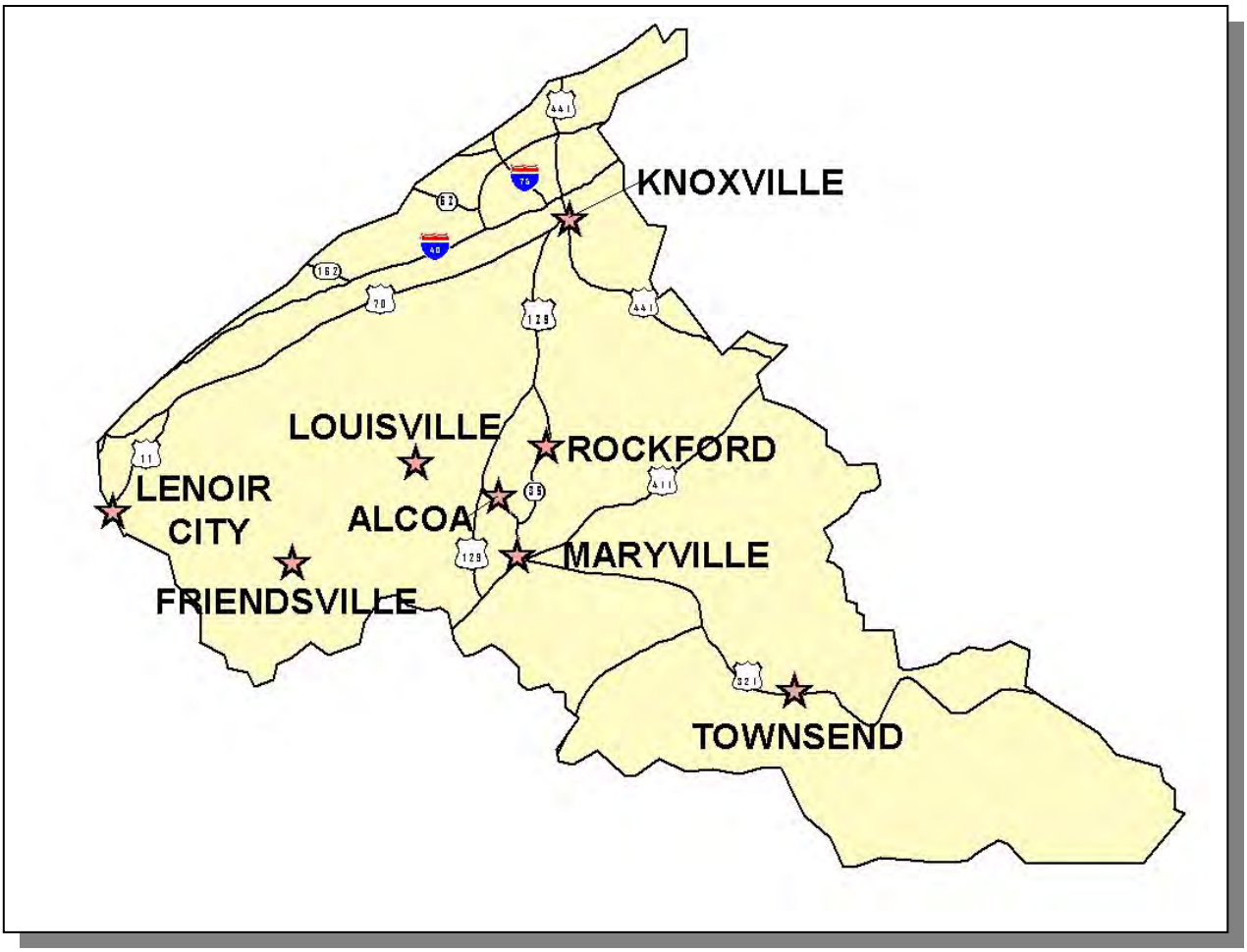



***Figure 2-2. Municipalities and Roads in the Fort. Loudoun Lake Watershed.***

| MUNICIPALITY | POPULATION | COUNTY |
|---|---|---|
| Knoxville* | 167,535 | Knox |
| Maryville* | 23,042 | Blount |
| Lenoir City | 8,890 | Loudon |
| Alcoa | 7,137 | Blount |
| Louisville | 986 | Blount |
| Friendsville | 950 | Blount |
| Rockford | 746 | Blount |
| Townsend | 426 | Blount |

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

## 2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Fort Loudoun Lake Watershed, designated 06010201 by the USGS, is approximately 638 square miles and empties to the Tennessee River.

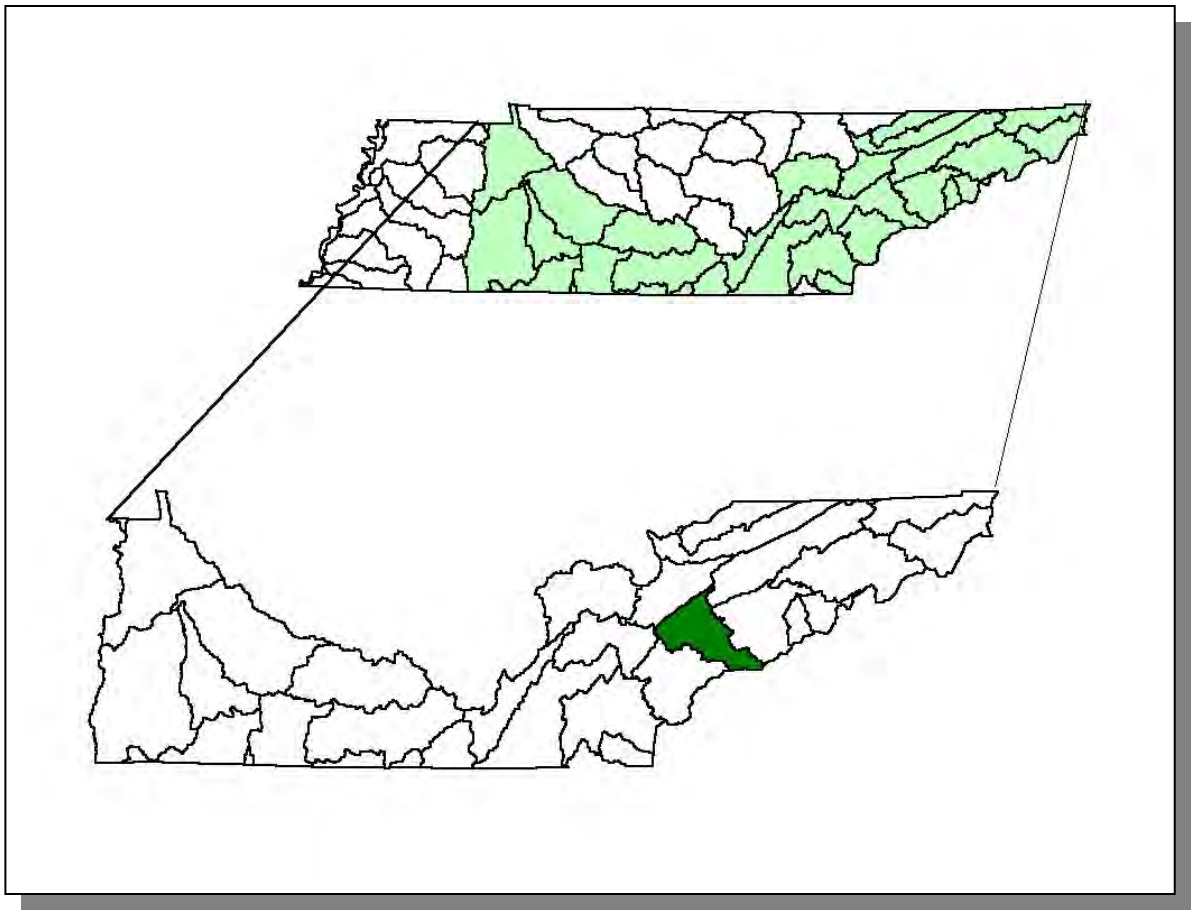


*Figure 2-3. The Fort Loudoun Lake Watershed is Part of the Tennessee River Basin.*

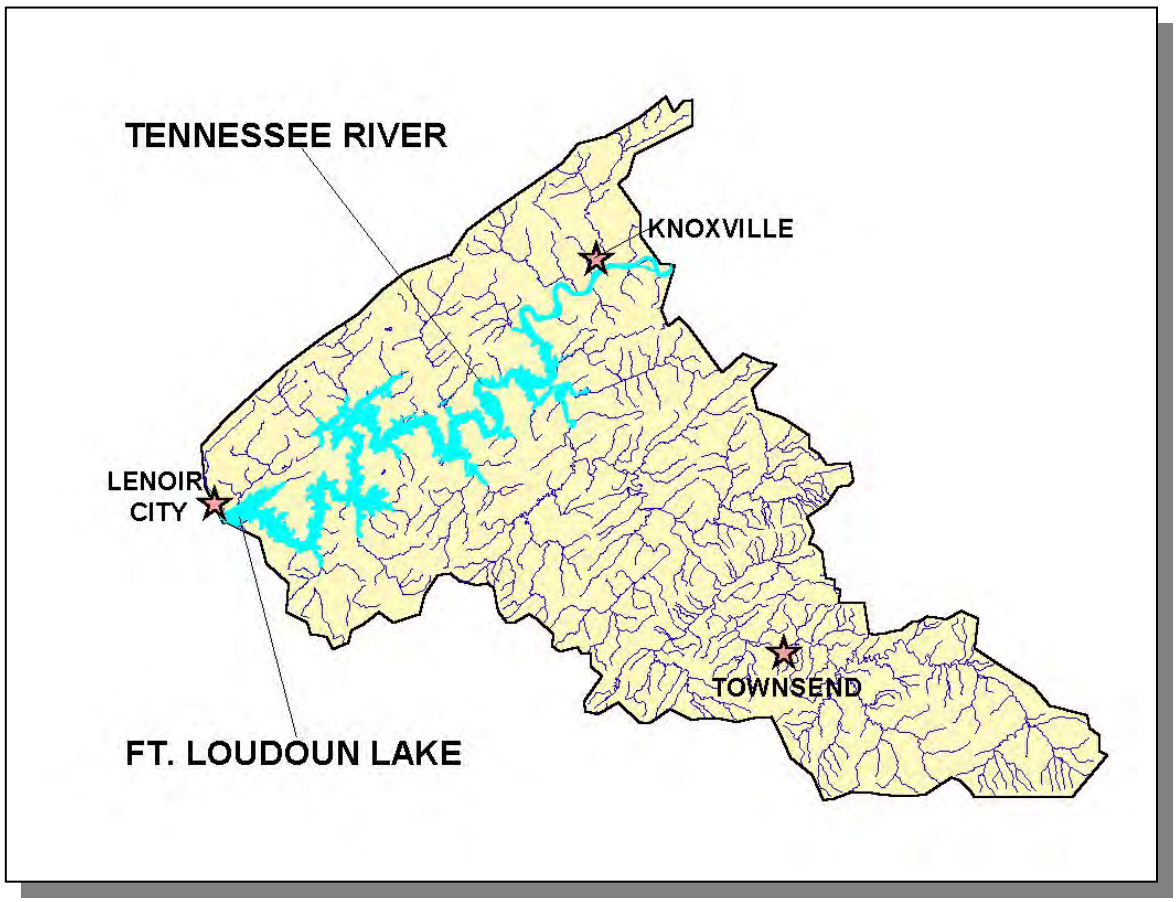



***Figure 2-4. Hydrology in the Fort Loudoun Lake Watershed.*** *There are 911 stream miles and 14,600 lake acres recorded in River Reach File 3 in the Fort Loudoun Lake Watershed. Locations of Tennessee River and Fort Loudoun Lake and the cities of Knoxville, Lenoir City, and Townsend are shown for reference.*

2.3.B. Dams. There are 7 dams inventoried by TDEC Division of Water Supply in the Fort Loudoun Lake Watershed. These dams either retain 30 acre-feet of water or have structures at least 20 feet high.

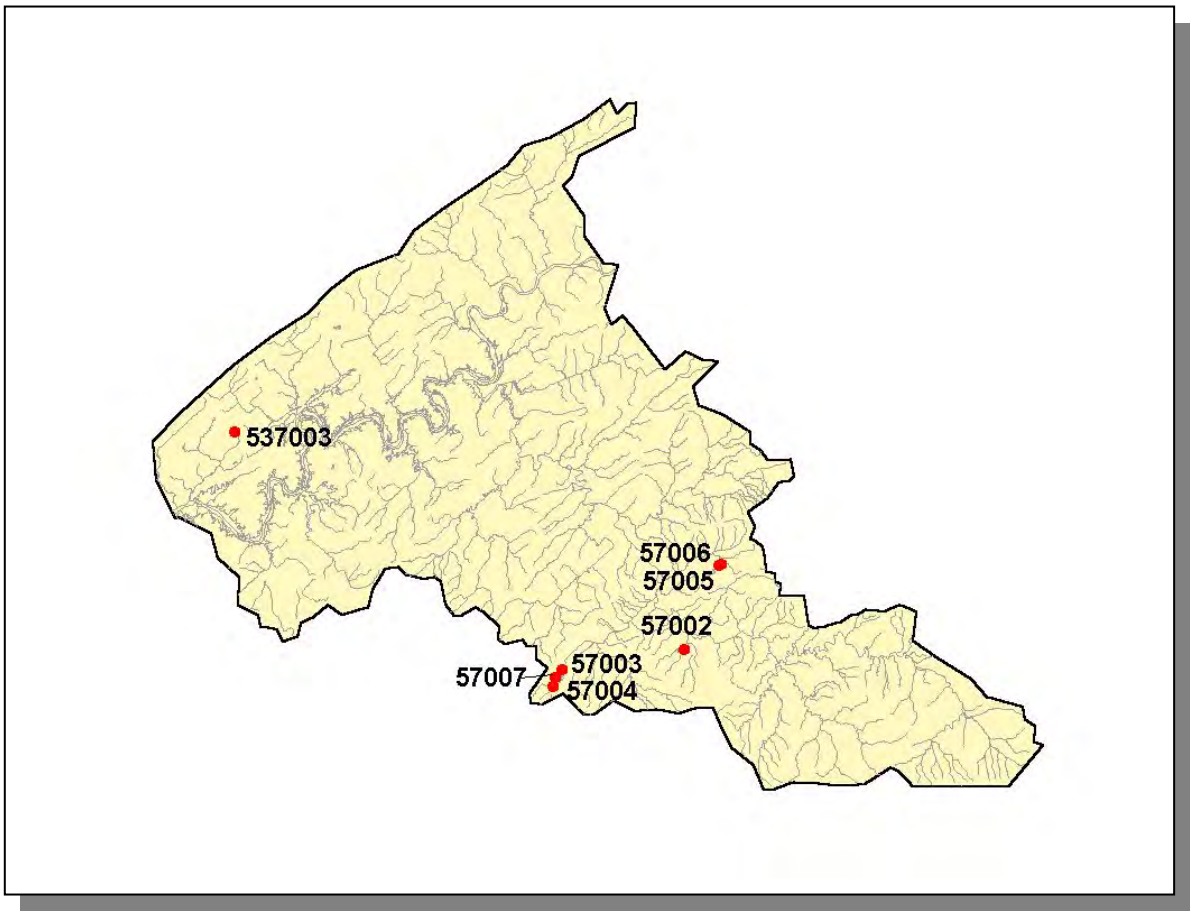



***Figure 2-5. Location of Inventoried Dams in the Fort Loudoun Lake Watershed.*** *More information is provided in Fort Loudoun-Appendix II and on the TDEC homepage at: http://gwidc.gwi.memphis.edu/website/dams/viewer.htm*

**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.

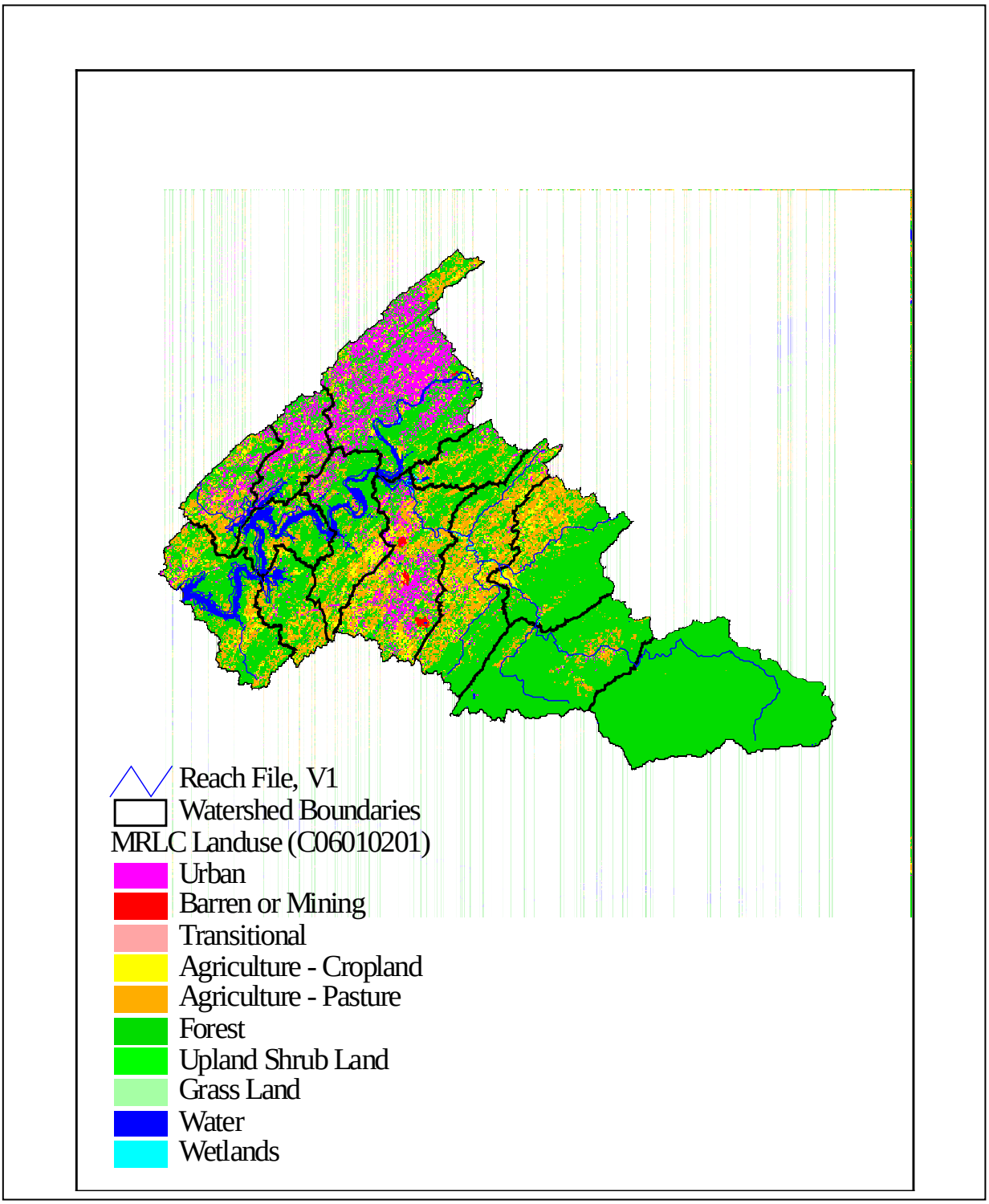



***Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.***

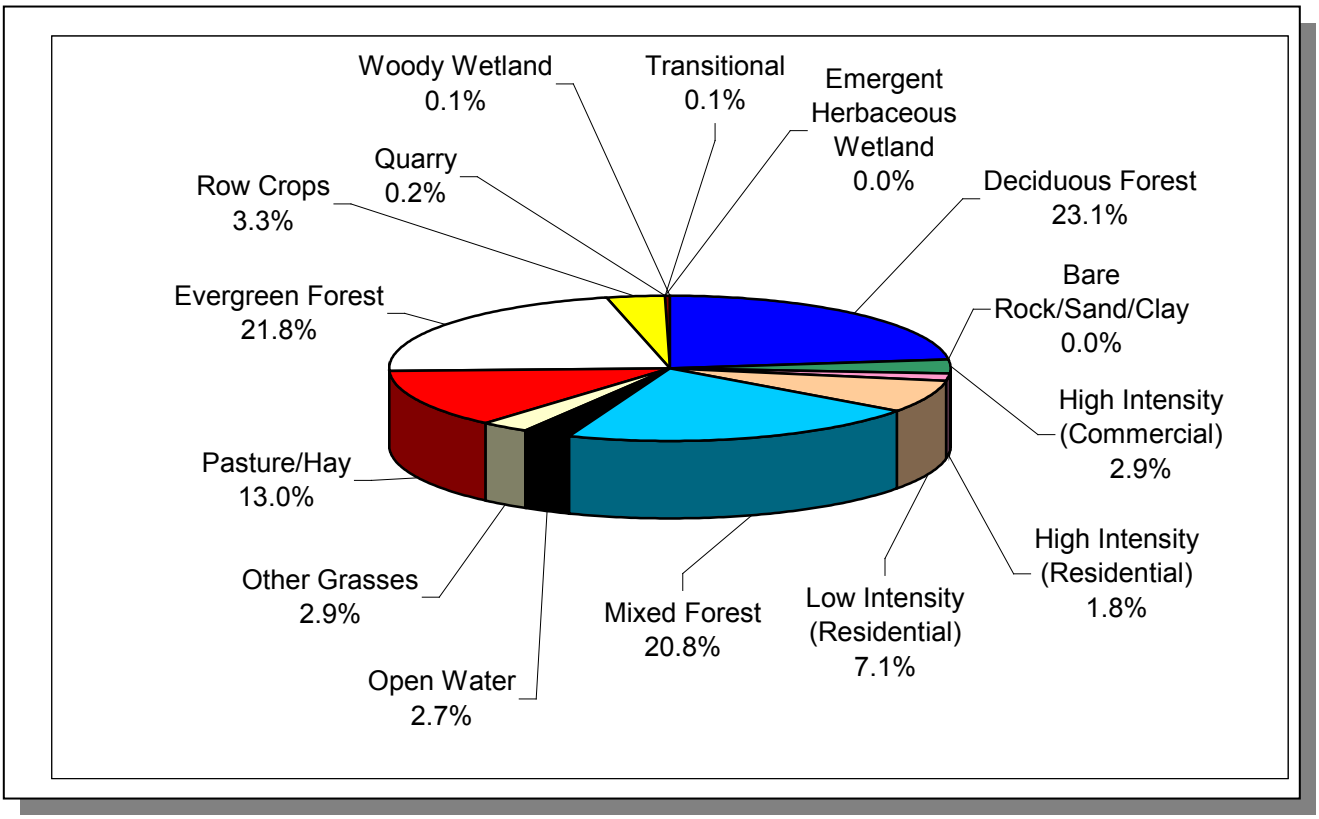



***Figure 2-7. Land Use Distribution in the the Fort Loudoun Lake Watershed.*** *More information is provided in Fort Loudoun-Appendix II.*

**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 Fort Loudoun Lake Watershed lies within 2 Level III ecoregions (Blue Ride Mountains, Ridge and Valley) and contains 7 Level IV subecoregions (Griffen, Omernik, Azavedo):

- The Southern Sedimentary Ridges (66e) in Tennessee include some of the westernmost foothill areas of the Blue Ridges Mountains ecoregion, such as the Bean, Starr, Chilhowee, English, Stone, Bald, and Iron Mountain areas. Slopes are steep, and elevations are generally 1000-4500 feet. The rocks are primarily Cambrian-age sedimentary (shale, sandstone, siltstone, quartzite, conglomerate), although some lower stream reachs occur on limestone. Soils are predominantly friable loams and fine sandy loams with variable amounts of sandstone rock fragments, and support mostly mixed oak and oak-pine forests.

- Limestone Valleys and Coves (66f) are small but distinct lowland areas of the Blue Ridge, with elevations mostly between 1500 and 2500 feet. About 450 million years ago, older Blue Ridge rocks to the east were forced up and over younger rocks to the west. In places, the Precambrian rocks have eroded through to Cambrian or Ordovician-age limestones, as seen especially in isolated, deep cove areas that are surrounded by steep mountains. The main areas of limestone include the Mountain City lowland area and Shady Valley in the north; and Wear Cove, Tuckaleechee Cove, and Cades Cove of the Great Smoky Mountains in the south. Hay and pasture, with some tobacco patches on small farms, are typical land uses.

- The Southern Metasedimentary Mountains (66g) are steep, dissected, biologically-diverse mountains that include Clingmans Dome (6643 feet), the highest point in Tennessee. The Precambrian-age metamorphic and sedimentary geologic materials are generally older and more metamorphosed than the Southern Sedimentary Ridges (66e) to the west and north. The Appalachian oak forests and, at higher elevations, the northern hardwoods forests include a variety of oaks and pines, as well as silverbell, hemlock, yellow poplar, basswood, buckeye, yellow birch, and beech. Spruce-fir forests, found generally above 5500 feet, have been affected greatly over the past twenty-five years by the balsam woolly aphid. The Copper Basin, in the southeast corner of Tennessee, was the site of copper mining and smelting from the 1850's to 1987, and once left more than fifty square miles of eroded earth.

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

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

- The Southern Sandstone Ridges (67h) ecoregion encompasses the major sandstone ridges, but these ridges also have areas of shale and siltstone. The steep, forested chemistry of streams flowing down the ridges can vary greatly depending on the geologic material. The higher elevation ridges are in the north, including Wallen Ridge, Powell Mountain, Clinch Mountain, and Bays Mountain. White Oak Mountain in the south has some sandstone on the west side, but abundant shale and limestone as well. Grindstone Mountain, capped by the Gizzard Group sandstone, is the only remnant of Pennsylvanian-age strata in the Ridge and Valley of Tennessee.

- The Southern Dissected Ridges and Knobs (67i) contain more crenulated, broken, or hummocky ridges, compared to smoother, more sharply pointed sandstone ridges. Although shale is common, there is a mixture and interbedding of geologic materials. The ridges on the east side of Tennessee's Ridge and Valley tend to be associated with the Ordovician-age Sevier shale, Athens shale, and Holston and Lenoir limestones. These can include calcareous shale, limestone, siltstone, sandstone, and conglomerate. In the central and western part of the ecoregion, the shale ridges are associated with the Cambrian-age Rome Formation: shale and siltstone with beds of sandstone. Chestnut oak forests and pine forests are typical for the higher elevations of the ridges, with areas of white oak, mixed mesophytic forest, and tulip poplar on the lower slopes, knobs, and draws.

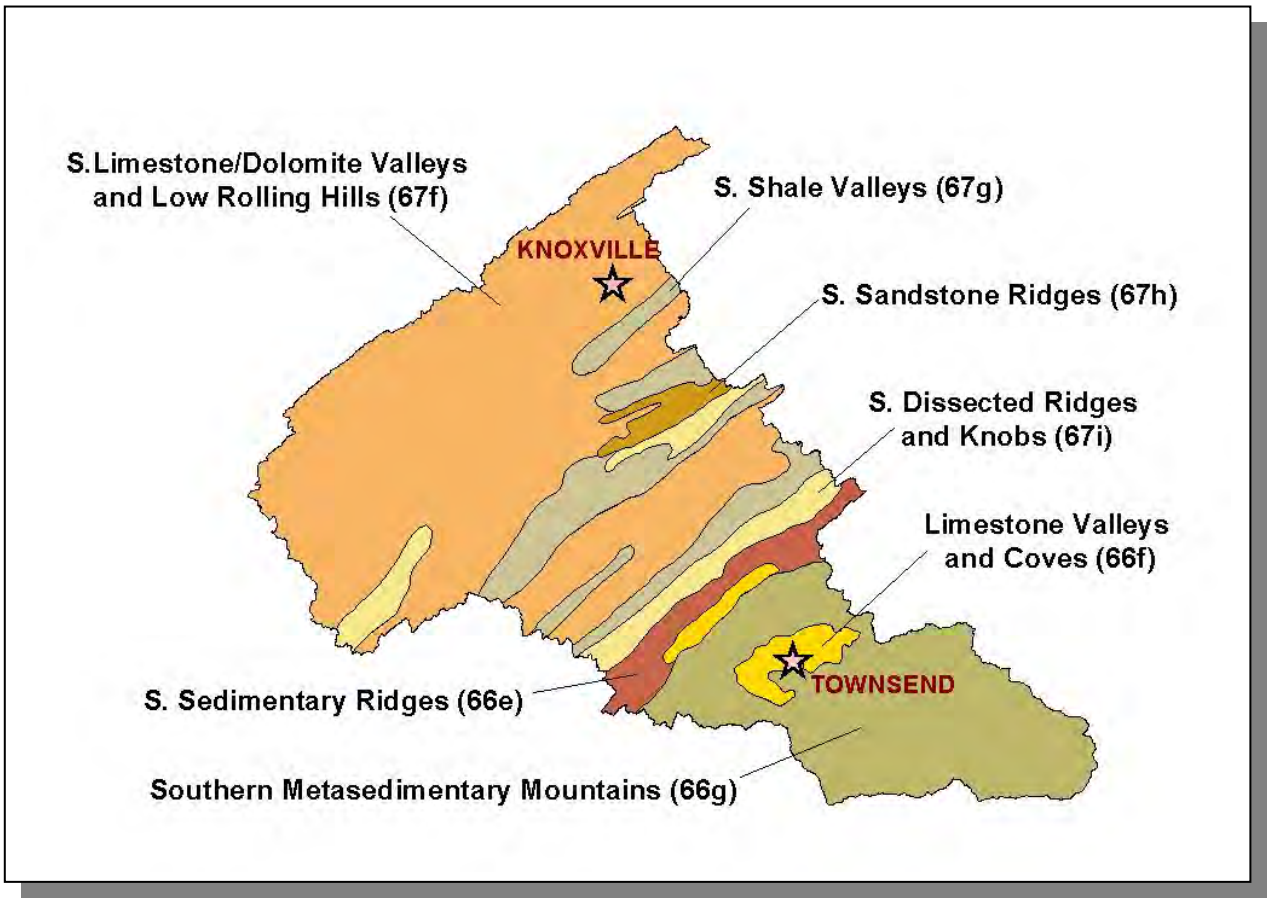



***Figure 2-8. Level IV Ecoregions in the Fort Loudoun Lake Watershed.*** *Locations of Knoxville, Lenoir City, and Townsend are shown for reference.*

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.

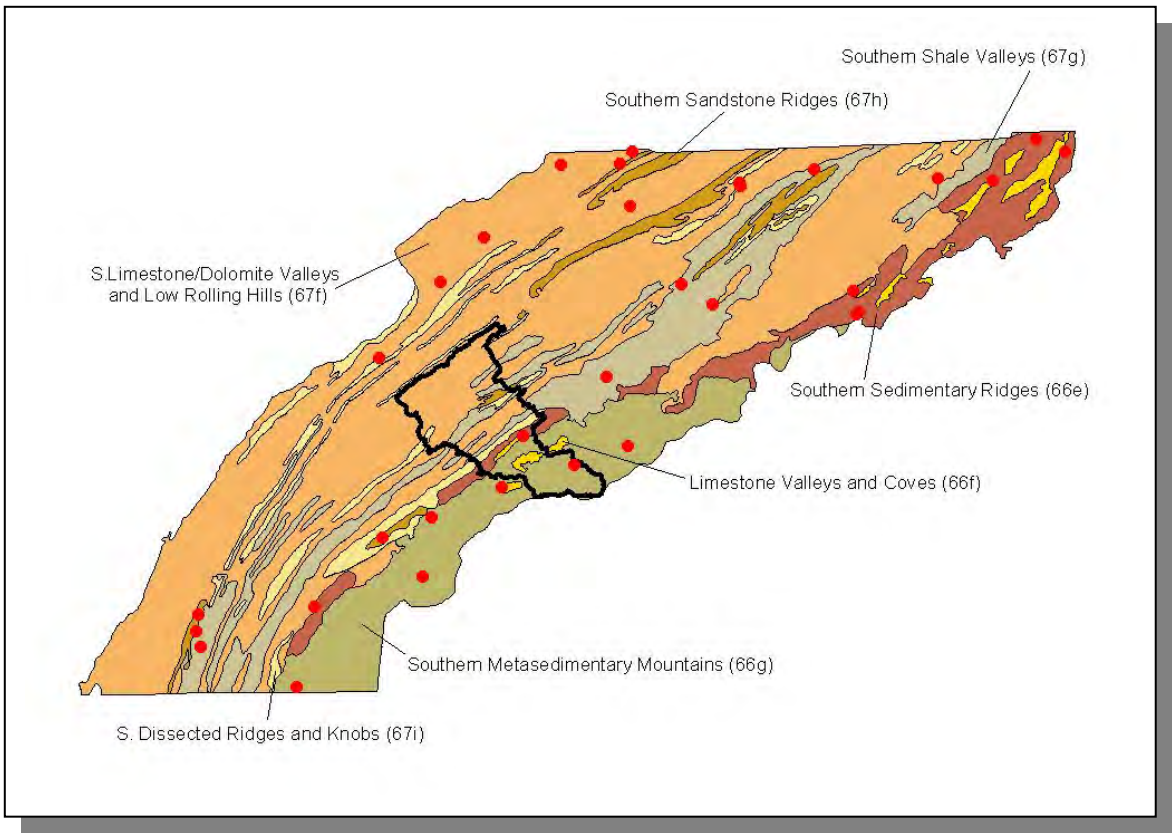



***Figure 2-9. Tennessee Ecoregion Monitoring Sites in Level IV Ecoregions 66e, 66f, 66g, 67f, 67g, 67h, and 67i.*** *The Fort Loudoun Lake Watershed is shown for reference. More information is provided in Fort Loudoun-Appendix II.*

## 2.6. NATURAL RESOURCES.

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

| GROUPING | NUMBER OF RARE SPECIES |
|---|---|
| Crustaceans | 0 |
| Insects | 0 |
| Mussels | 7 |
| Snails | 6 |
| | |
| Amphibians | 2 |
| Birds | 8 |
| Fish | 10 |
| Mammals | 6 |
| Reptiles | 0 |
| | |
| Plants | 51 |
| | |
| **Total** | **90** |

***Table 2-3. There are 90 Rare Plant and Animal Species in the Fort Loudoun Lake Watershed.***

In the Fort Loudoun Lake Watershed, there are ten rare fish species, seven rare mussel species, and six rare snail species.

| SCIENTIFIC NAME | COMMON NAME | FEDERAL STATUS | STATE STATUS |
|---|---|---|---|
| *Acipenser fulvescens* | Lake sturgeon | MC | E |
| *Cyprinella monacha* | Spotfin chub | LT | T |
| *Phoxinus sp 1* | Laurel dace | | E |
| *Cycleptus elongatus* | Blue sucker | MC | T |
| *Noturus flavipinis* | Yellowfin madtom | LT | E |
| *Etheostoma cinereurn* | Ashy darter | MC | T |
| *Etheostoma percnurum* | Duskytail darter | LE | E |
| *Percina burtoni* | Blotchside darter | MC | D |
| *Percina macrocephala* | Longhead darter | | T |
| *Percina tanasi* | Snail darter | LT | T |
| | | | |
| *Cyprogenia irrorata* | Eastern fanshell pearlymussel | LE | E |
| *Dromus dromas* | Dromedary pearlymussel | LE | E |
| *Fusconaia edgariana* | Shiny pigtoe | LE | E |
| *Fusconaia cuneolus* | Fine-rayed pigtoe | LE | E |
| *Lampsilis abrupta* | Pink mucket | LE | E |
| *Conradilla caelata* | Birdwing pearl mussel | LE | E |
| *Plethobasus cooperianus* | Orange-foot pimpleback | LE | E |
| | | | |
| *Paravitrea clappi* | Mirey ridge supercoil | | |
| *Pilsbryna aurea* | Ornate bud | | |
| *Mesodon jonesianus* | Big-toothed covert | | |
| *Io fluvialis* | Spiny riversnail | | |
| *Athearnia anthonyi* | Anthony's riversnail | LE | E |
| *Lithasia geniculata* | Ornate rocksnail | | |

***Table 2-4. Rare Aquatic Species in the Fort Loudoun 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.

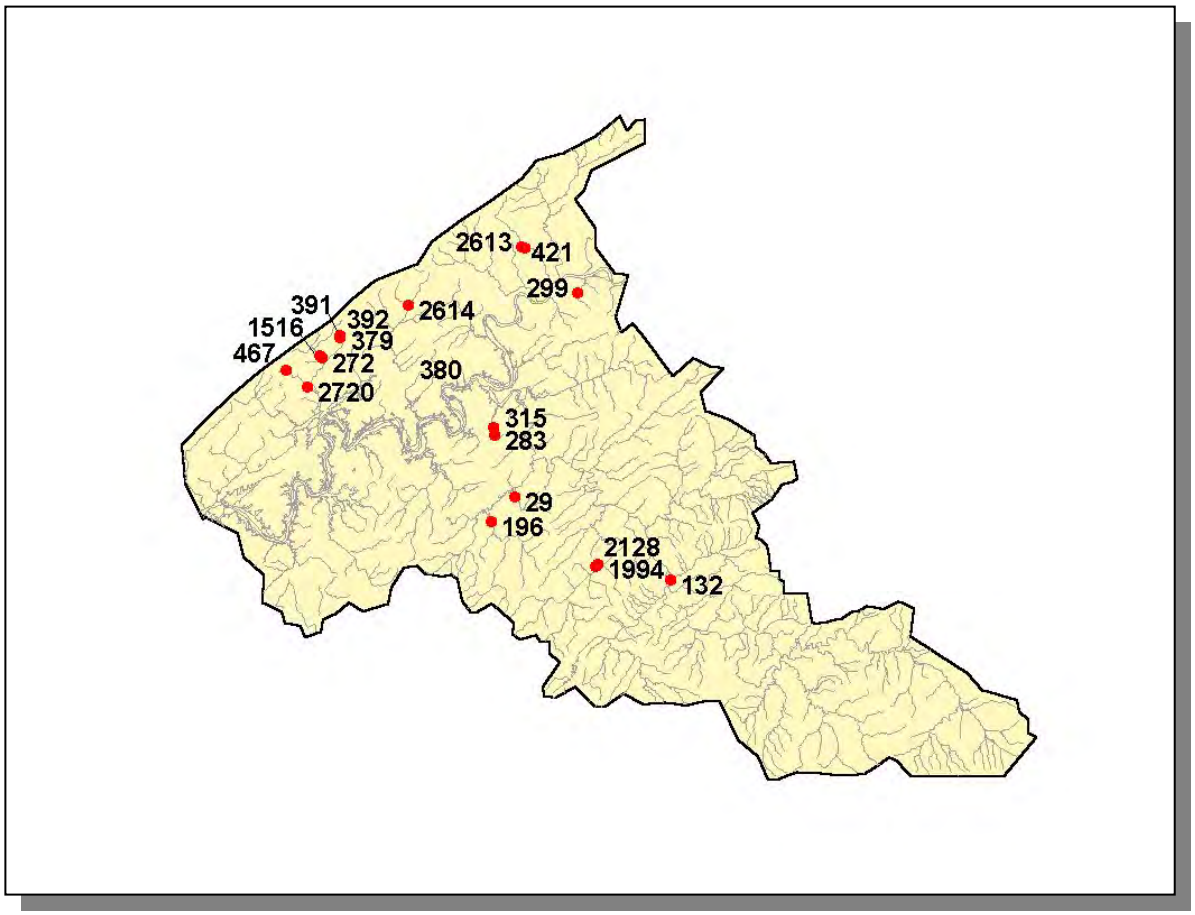



***Figure 2-10. Location of Wetland Sites in TDEC Division of Natural Heritage Database in the Fort Loudoun Lake Watershed.*** ***This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands.*** *There may be additional wetland sites in the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

## 2.7. CULTURAL RESOURCES.

2.7.A. Greenways. In 1997, Knoxville was named Greenway City of the Year by National Geographic Society. The city's 20.75 miles of paved greenway include 15 trails. The Maryville Greenway Trail is a well-lit, picturesque walking path of 4 miles.

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

- House Mountain State Park, a 500 acre park with hiking trails
- Ijams Nature Center, a public park and environmental education center with trails overlooking the Tennessee River
- Great Smoky Mountains National Park, world renowned for the diversity of its plant and animal resources
- Marble Springs, state-owned historic plantation home of John Sevier, an early Tennessee politician

In addition, many local interpretive areas are common, most notably, Island Home Park in Knoxville and Maryville's Bicentennial Park.

2.7.C. Wildlife Management Area. The Tennessee Wildlife Resources Agency manages the Cove Mountain Wildlife Management Area.

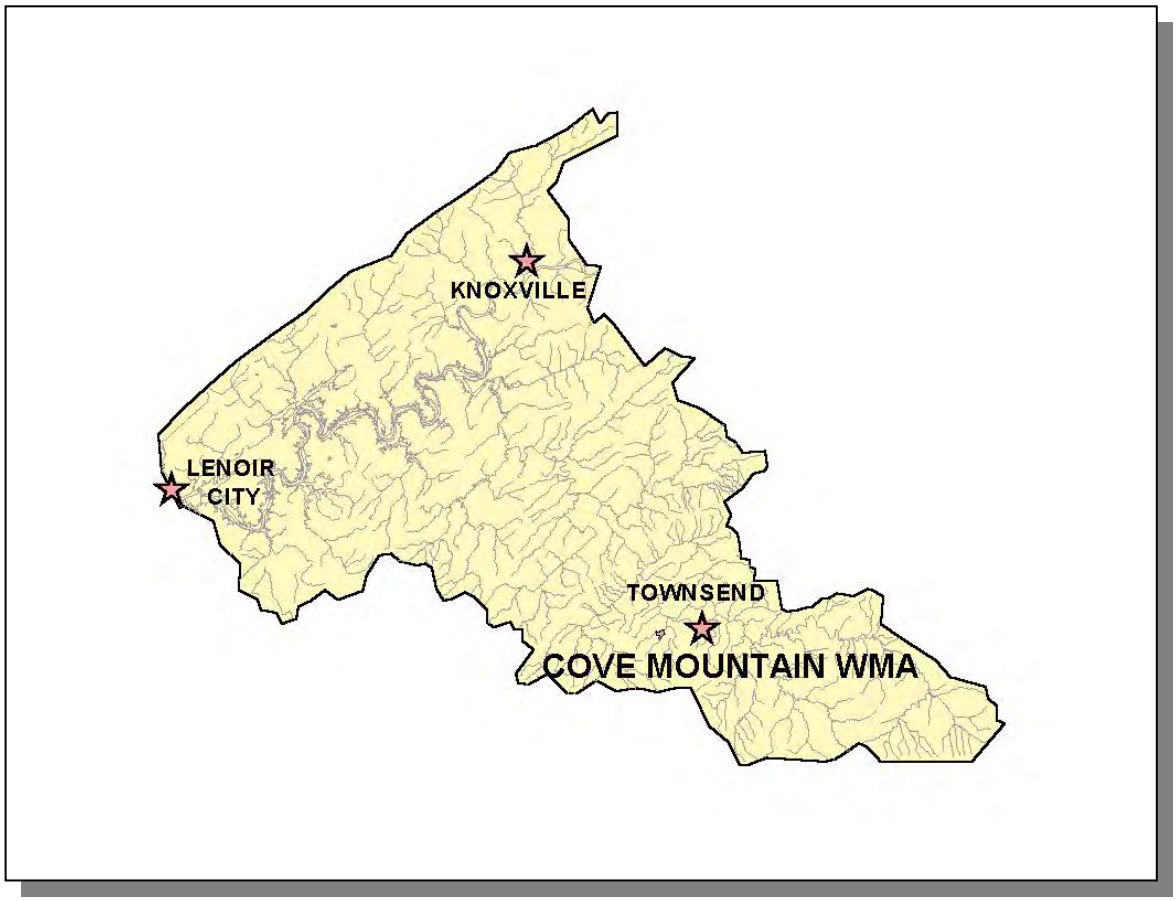



***Figure 2-11. TWRA Manages Cove Mountain Wildlife Management Area in the Fort Loudoun Lake Watershed.*** *Locations of Knoxville, Lenoir City, and Townsend are shown for reference.*

**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 |
|---|---|---|---|---|---|---|---|
| Buck Creek | 3 | | 2 | Paint Rock Creek | 3 | 2 | 3 |
| Cane Creek | 1 | | | Piney Creek | 1 | 2 | 3 |
| Carr Creek | 4 | | | Piney River | 1 | | |
| Cave Creek | 3 | | 2 | Pistol Creek | 3 | | |
| Cloyd Creek | 3 | | | Pitner Creek | 3 | | |
| Crooked Creek | 3 | | | Polecat Creek | 3 | | |
| Dunlap Creek | 2 | | | Pond Cave Creek | 2 | | |
| Duskin Creek | 2 | | | Pond Creek | 4 | | 2 |
| Ellejoy Creek | 3 | | 2 | Reed Creek | 3 | | |
| Fall Creek | 1 | | 3 | Riley Creek | 3 | | 2 |
| First Creek | 4 | | | Roddy Creek | 4 | | |
| Flag Creek | 4 | | | Sandy Creek | 2 | | |
| Flat Creek | 2 | | | Second Creek | 4 | | |
| Hesse Creek | 1,3 | | | Smith Creek | 3 | | |
| Hines Creek | 3 | | | Soak Creek | 2,3 | | |
| Laurel Creek | 1 | | | Stamp Creek | 3 | | |
| Little Ellejoy Creek | 3 | | | Steekee Creek | 3 | | |
| Little Paint Rock Creek | 3 | 3 | | Sweetwater Creek | 3 | 3 | |
| Little River | 2 | 1,2 | 1,2,4 | Taylor Branch Creek | 4 | | |
| Little Turkey Creek | 4 | | | Third Creek | 4 | | |
| Mammy's Creek | 1 | 2 | | Town Creek | 4 | | |
| Middle Prong Little River | 1 | | | Tributary to Laurel Lake | 3 | | |
| Moccasin Creek | 1 | | | Turkey Creek | 3 | | 2 |
| Nails Creek | 3 | | | Unnamed tributary to Watts Bar Reservoir | 3 | | |
| North Fork Basin Creek | 2 | | | Whites Creek | 3 | 2 | |
| North Fork Turkey Creek | 3 | | | Wolf Creek | 2,4 | | 2 |

***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 FORT LOUDOUN 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 Fort Loudoun Lake Watershed, summarizes data collection and assessment results, and describes impaired waters.

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

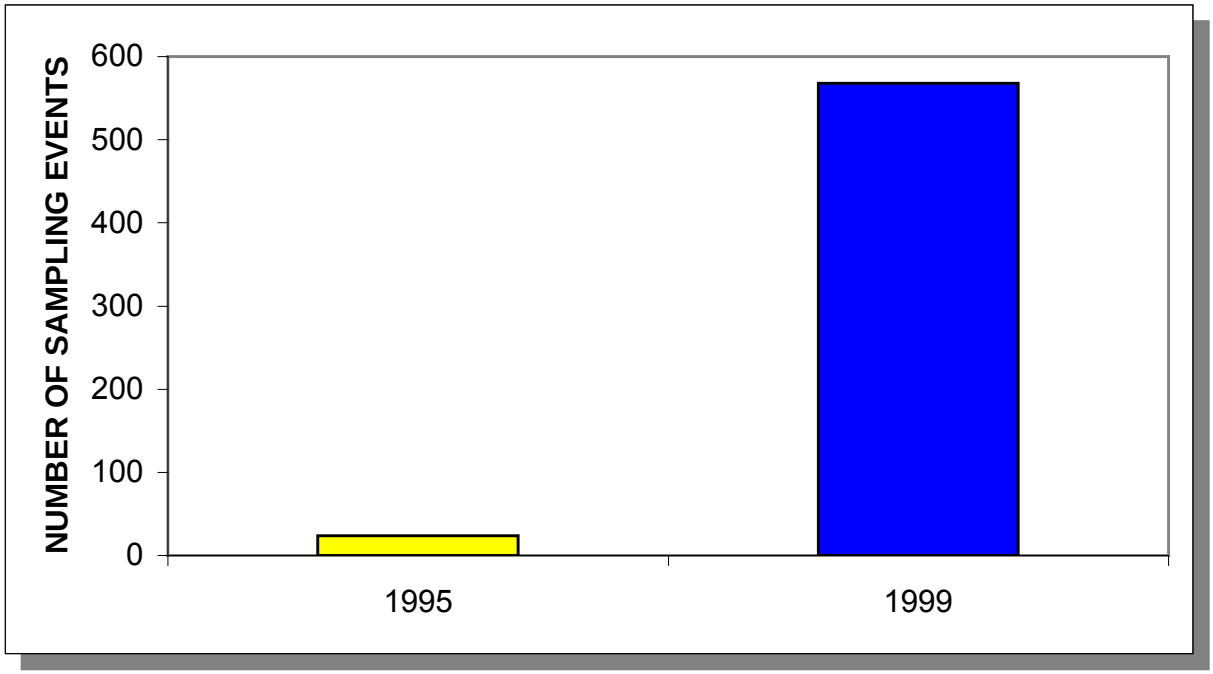



***Figure 3-1. Number of Sampling Events Using the Traditional Approach (1995) and Watershed Approach (1999) in the Fort Loudoun Lake Watershed.***

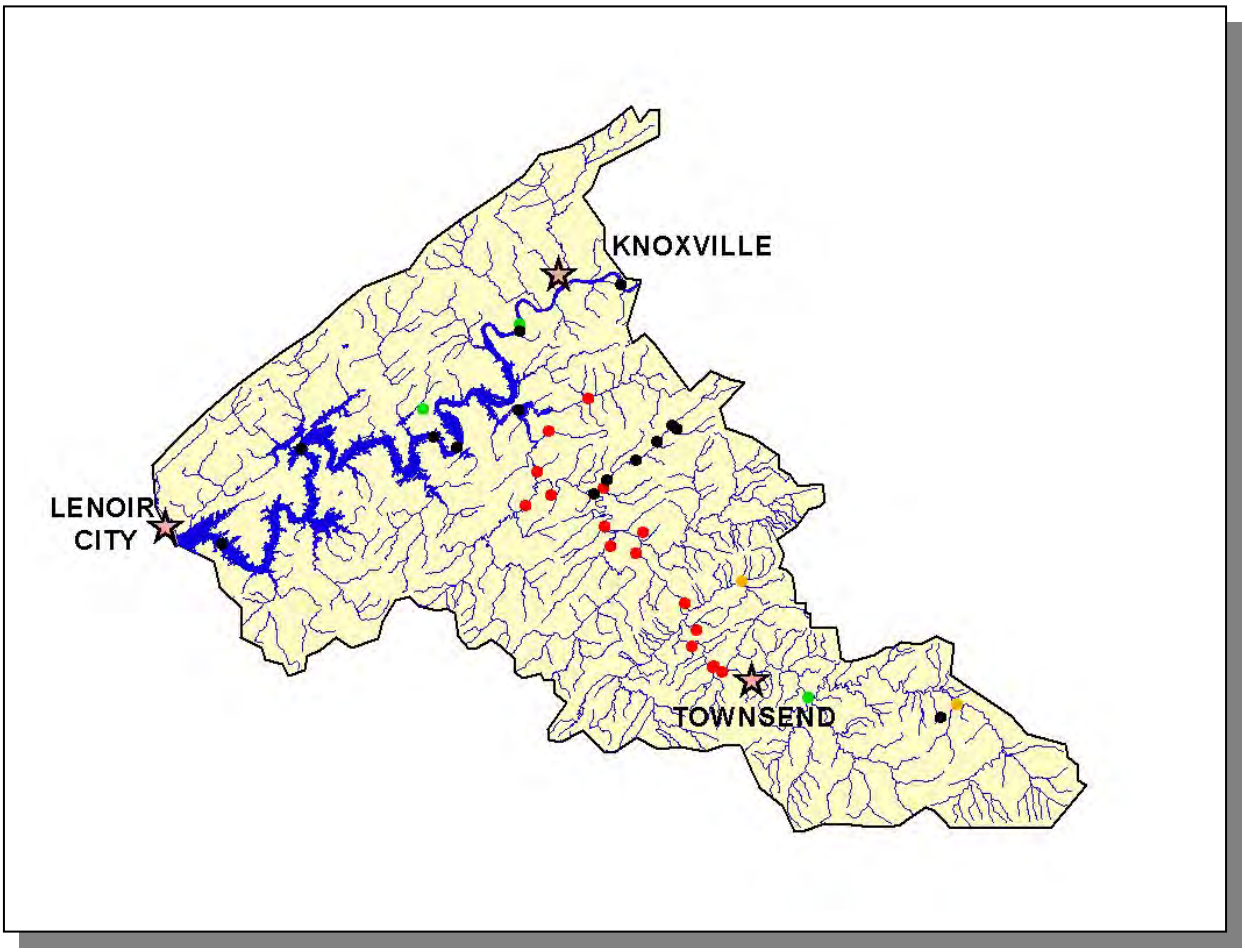



***Figure 3-2. Location of Monitoring Sites in the Fort Loudoun Lake Watershed.*** *Red, Watershed Monitoring Sites; Black, Special Survey Sites; Green, Ambient Monitoring Sites, Orange, Ecoregion Monitoring Sites. Locations of Knoxville, Lenoir City, and Townsend are shown for reference.*

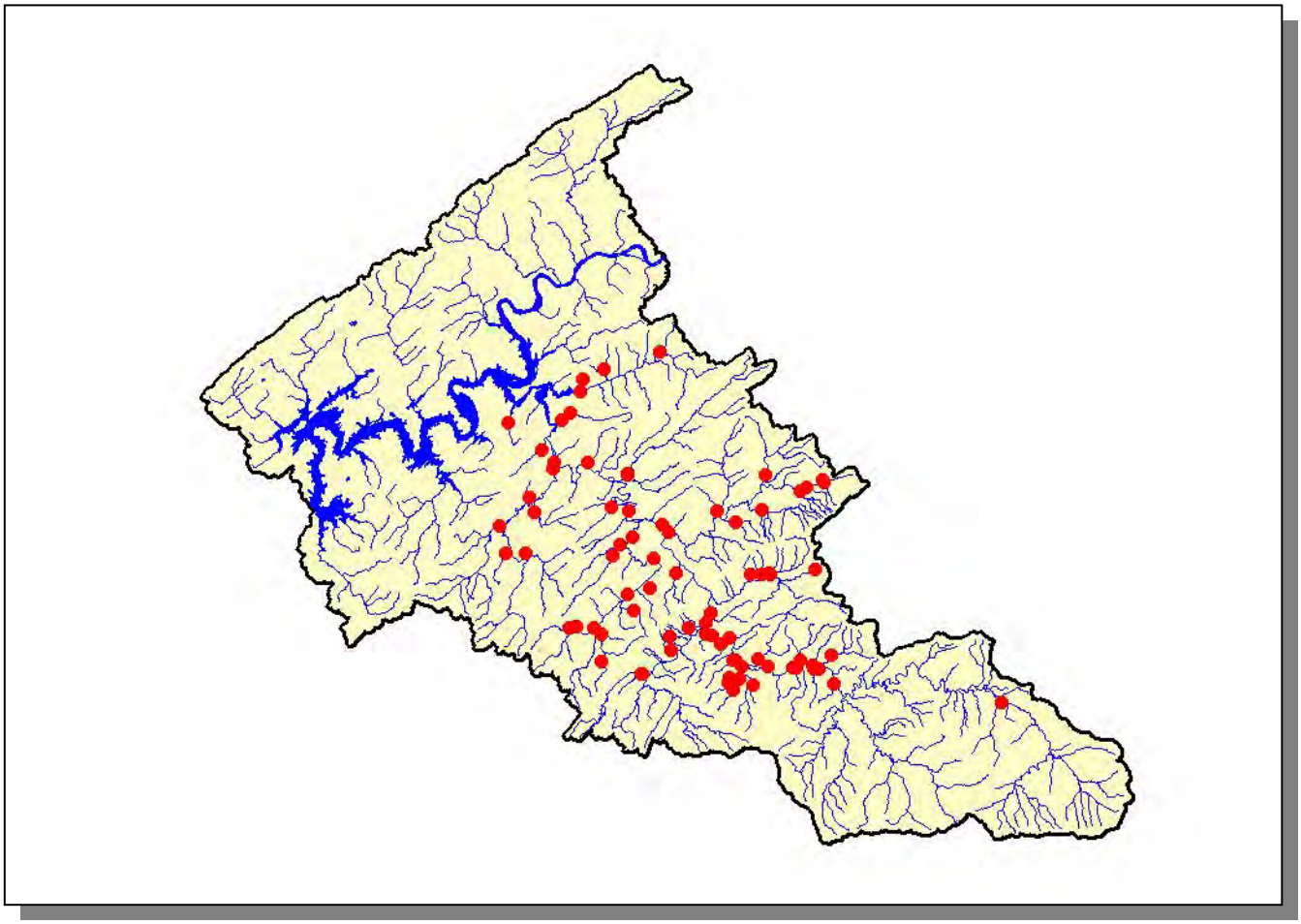


***Figure 3-3. Location of Monitoring Sites Used by Tennessee Department of Health Lab Services Aquatic Biology Section in the Fort Loudoun Lake Watershed.*** *Chemmical and biological sampling was funded under an agreement with the Tennessee Department of Agriculture, Nonpoint Source Program and the U.S. Environmental Protection Agency, Assistance Agreement #C9994674-98-0.*

| TYPE | NUMBER | TOTAL NUMBER OF SAMPLING EVENTS | | |
|---|---|---|---|---|
| | | CHEMICAL ONLY | BIOLOGICAL ONLY | BIOLOGICAL PLUS CHEMICAL (FIELD PARAMETERS) |
| Ambient | 26 | 190 | | |
| Ecoregion | 2 | | | 2 |
| Special Survey | 28 | | 358 | |
| Watershed | 20 | | 20 | |
| **Totals** | **76** | **190** | **378** | **2** |

***Table 3-1. Monitoring Sites in the Fort Loudoun Lake Watershed During the Data Collection Phase of the Watershed Approach.***

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Assistance Center-Knoxville 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 Fort Loudoun Watershed are provided in Fort Loudoun-Appendix IV.

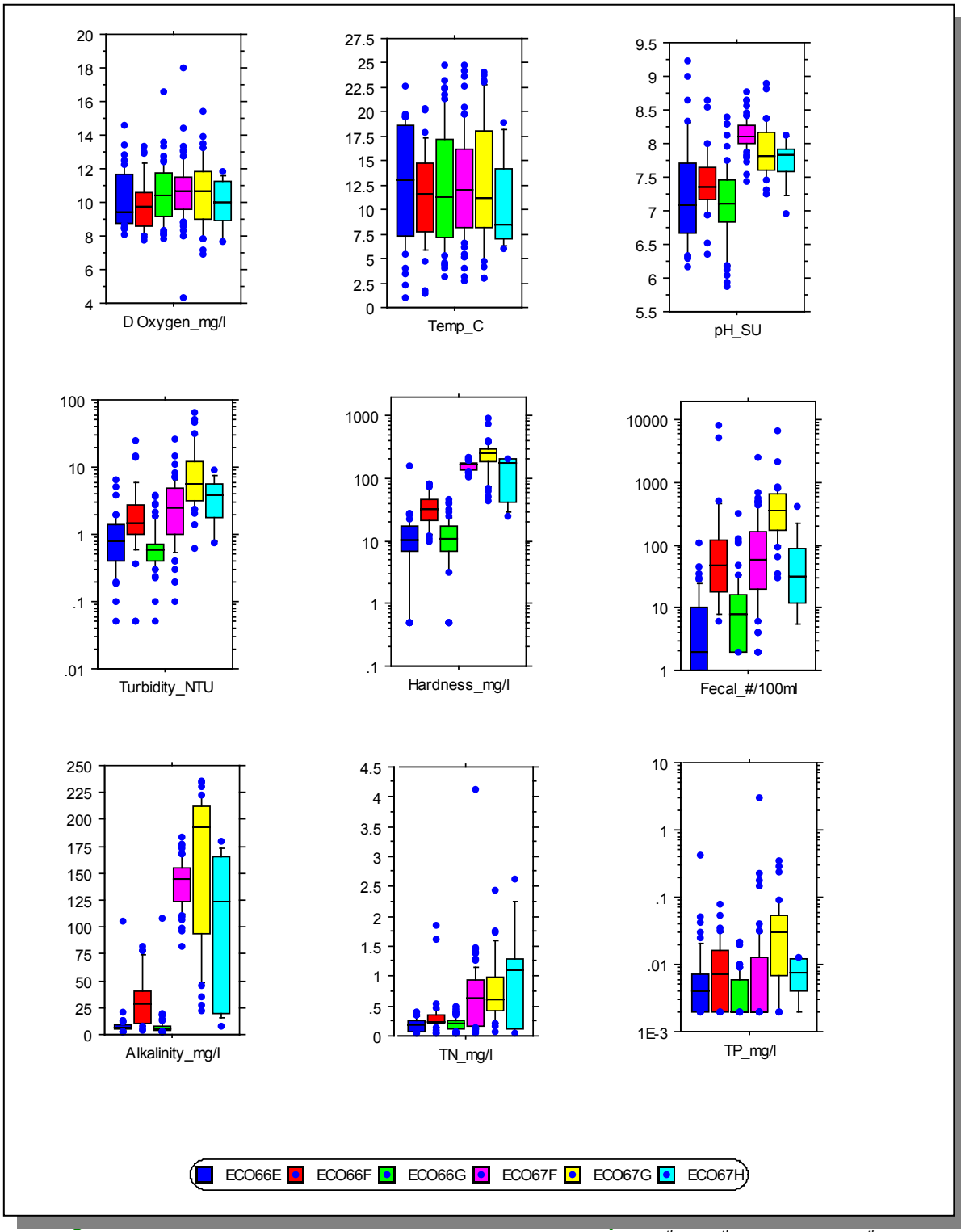
Data from ambient monitoring stations are entered into the STORET (Storage and Retrieval) system administered by EPA. Some ambient monitoring stations are scheduled to be monitored as watershed sampling sites.

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 Fort Loudoun Watershed lies within 2 Level III ecoregions (Blue Ridge Mountains and Ridge and Valley) and contains 7 subecoregions (Level IV):

- Southern Sedimentary Ridges (66e)
- Limestone Valleys and Coves (66f)
- Southern Metasedimentary Mountains (66g)
- Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)
- Southern Shale Valleys (67g)
- Southern Sandstone Ridges (67h)
- Southern Dissected Ridges and Knobs (67i)

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

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




***Watershed Ecoregion Sites.*** *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots.* Fecal, fecal coliform bacteria; TN, Total Nitrogen; TP, Total Phosphorus.

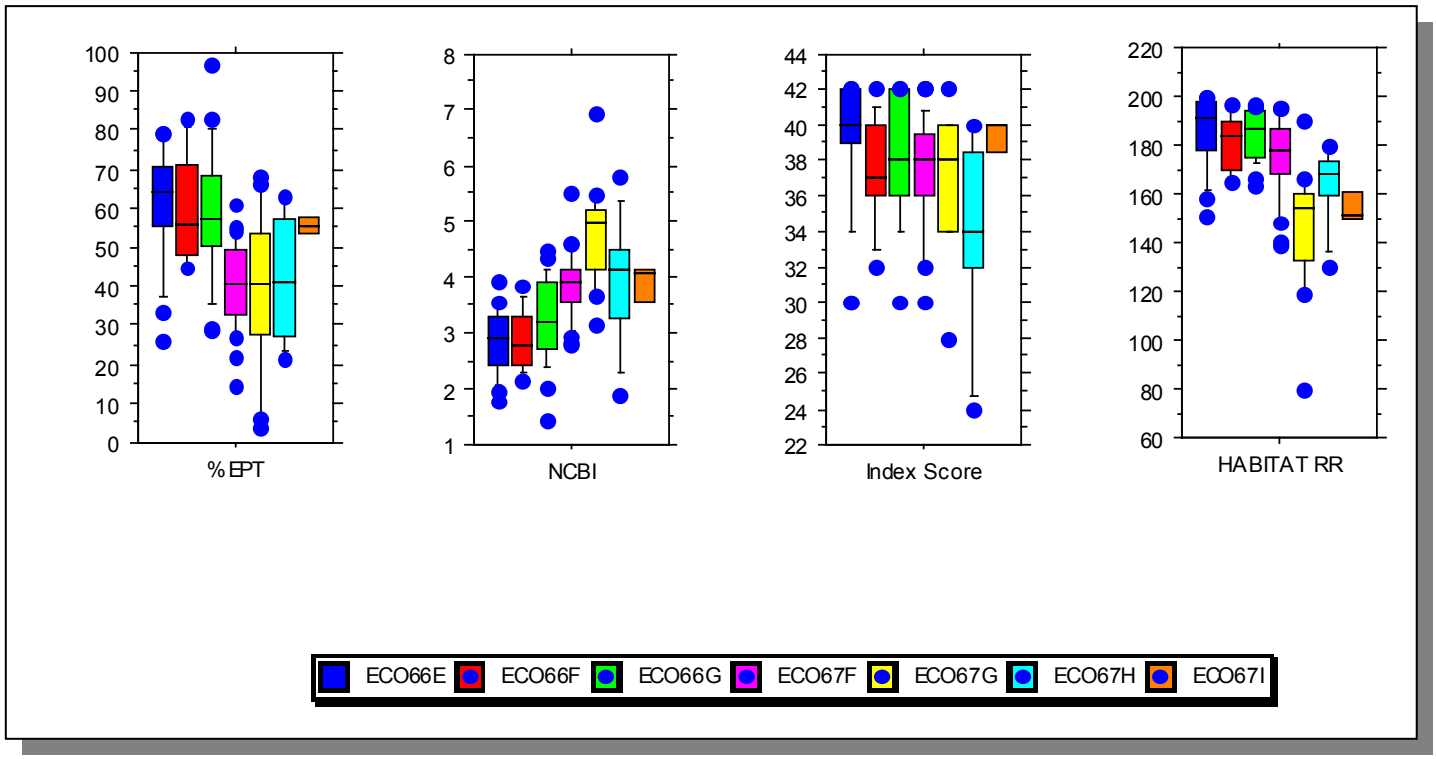



***Figure 3-5. Benthic Macroinvertebrate and Habitat Scores for Group 2 Portion of Fort Loudoun Lake Watershed Ecoregion Sites.*** *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score and Habitat Riffle/Run scoring system are described in TDEC's Quality System Standard Operating Procedure for Macroinvertebrate Surveys (2002).*

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

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

- The current 303(d) list,
- HUC-10 maps (every HUC-10 is scheduled for a BioRecon)
- Land Use/Land Cover maps
- Topographic maps
- Locations of NPDES facilities
- Sites of recent ARAP activities.

An intensive multiple or single habitat assessment involves the regular monitoring of a station over a fixed period of time. Intensive surveys (Rapid Bioassessment Protocols) are performed when BioRecon results warrant it.

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

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

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

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

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

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

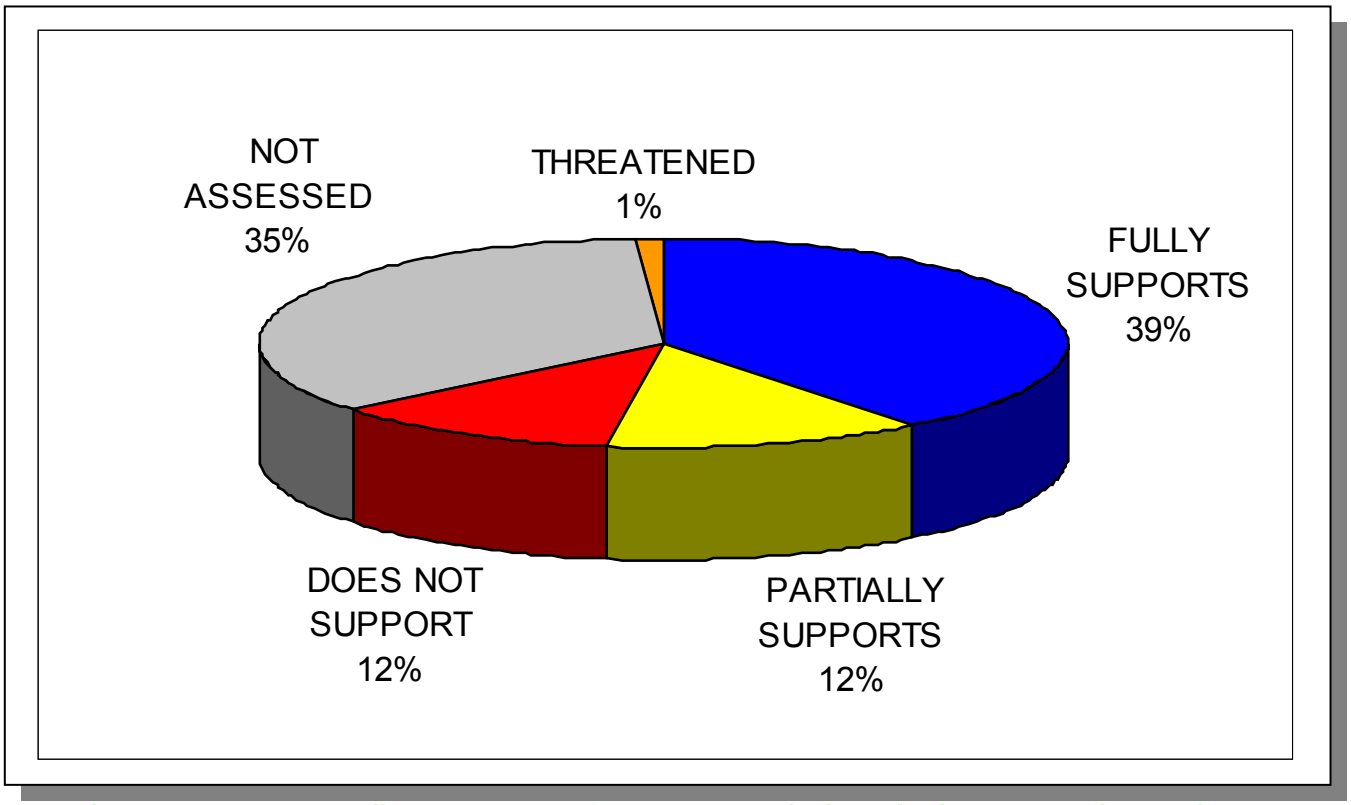



***Figure 3-6a. Water Quality Assessment for Streams and Rivers in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. More information is provided in Fort Loudoun- Appendix III.*

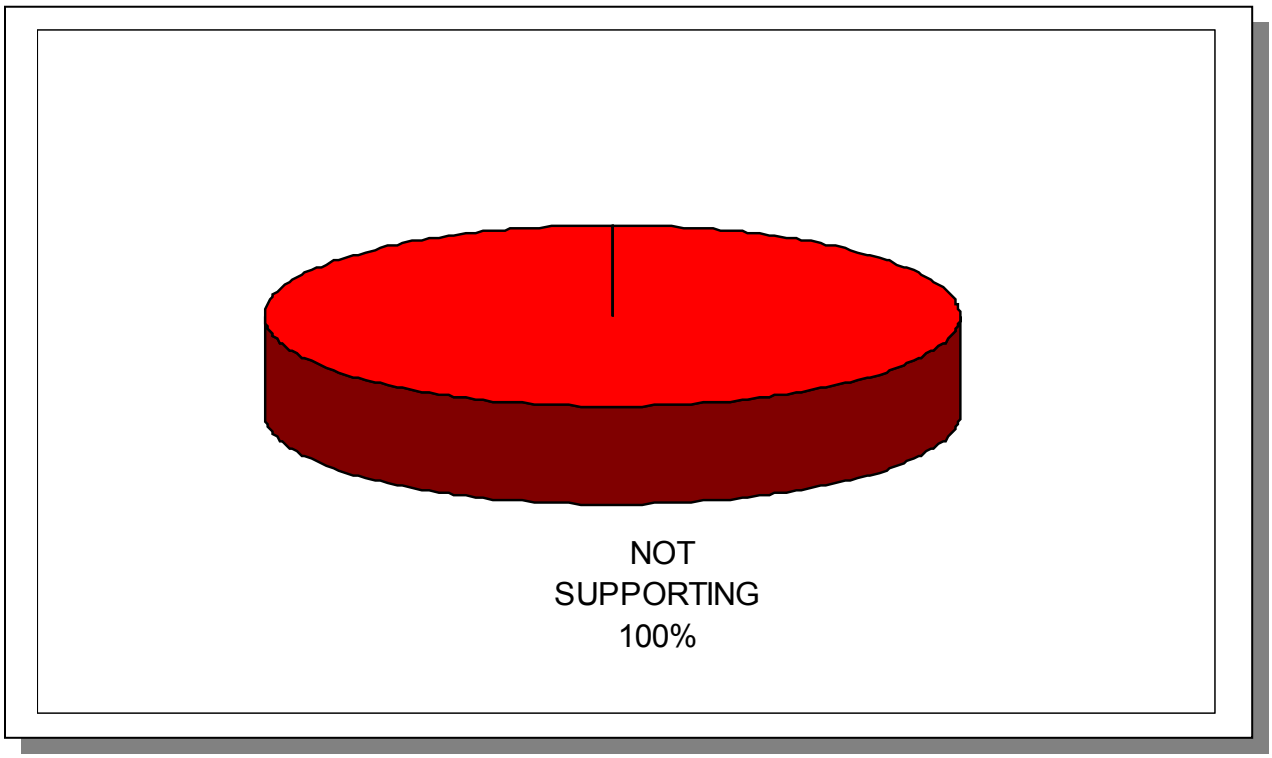



***Figure 3-6b. Water Quality Assessment for Lakes in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. More information is provided in Fort-Loudoun-Appendix III.*

## 3.3.A. Assessment Summary.

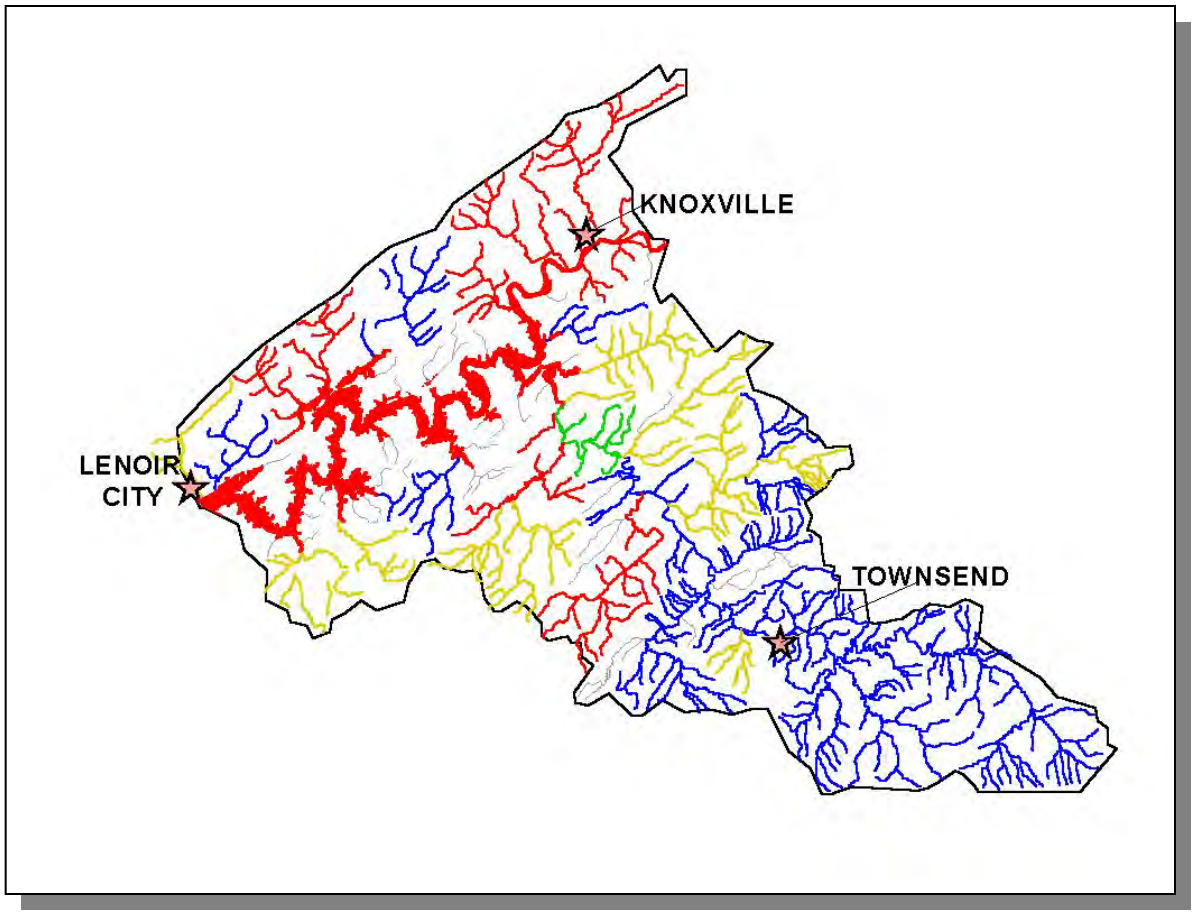



***Figure 3-7a. Overall Use Support Attainment in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Green, Threatened; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

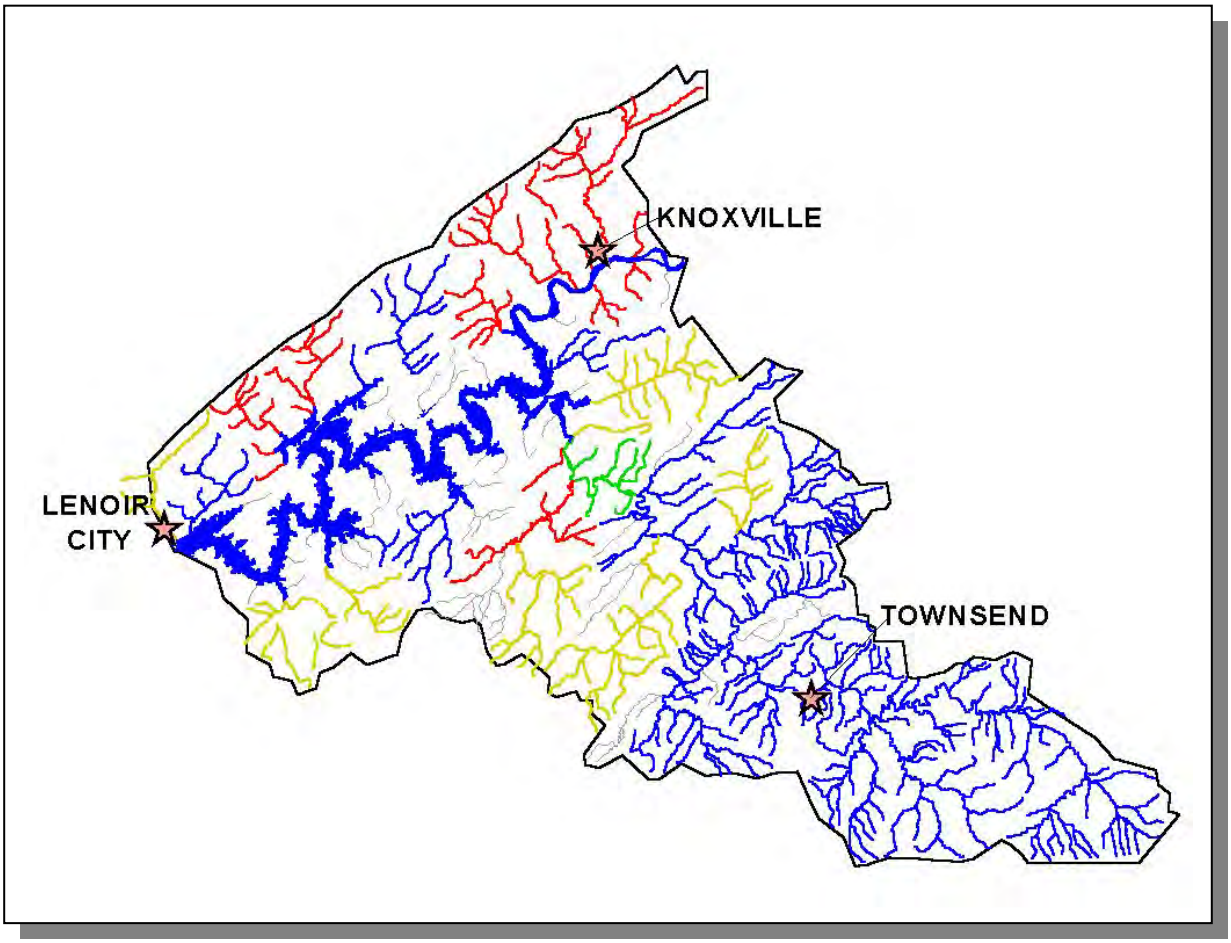



***Figure 3-7b. Fish and Aquatic Life Use Support Attainment in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Green, Threatened; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

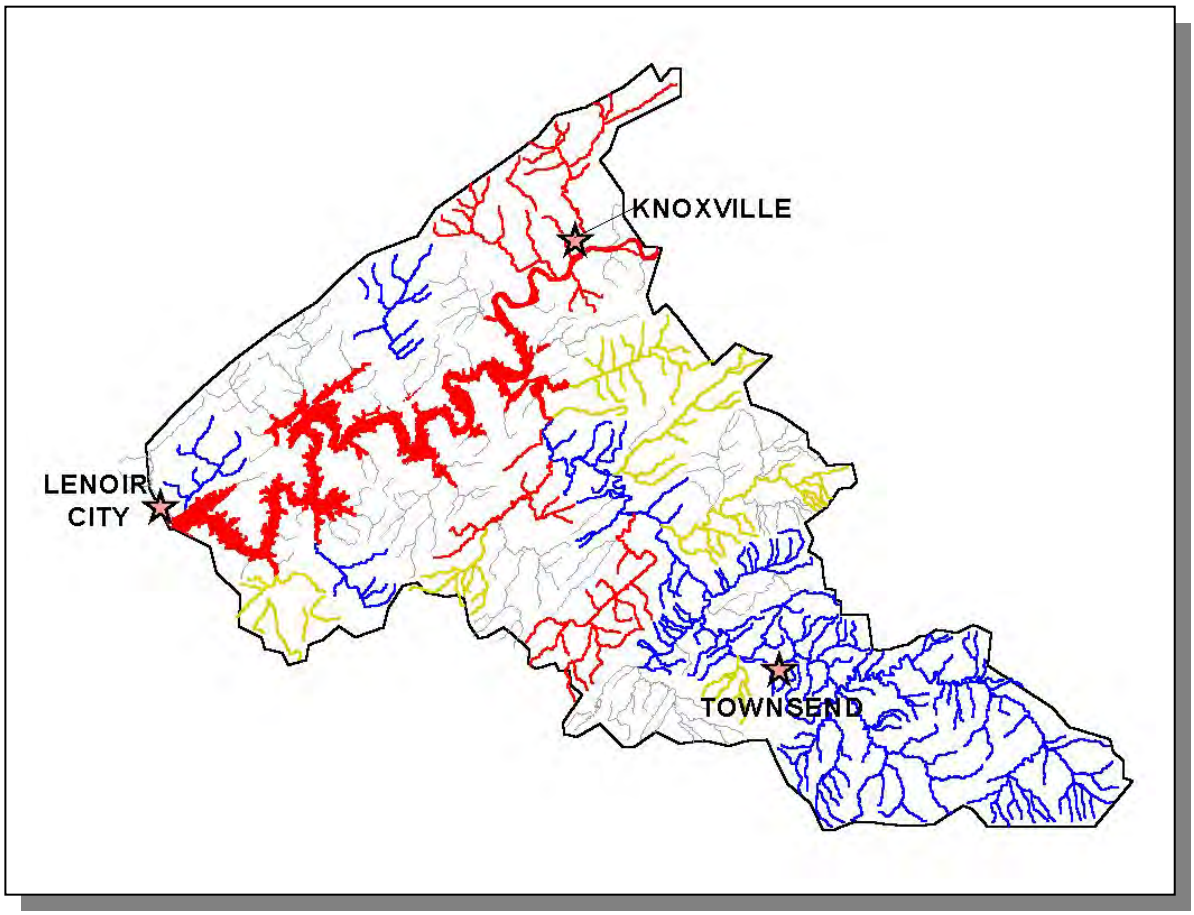



***Figure 3-7c. Recreation Use Support Attainment in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Green, Threatened; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

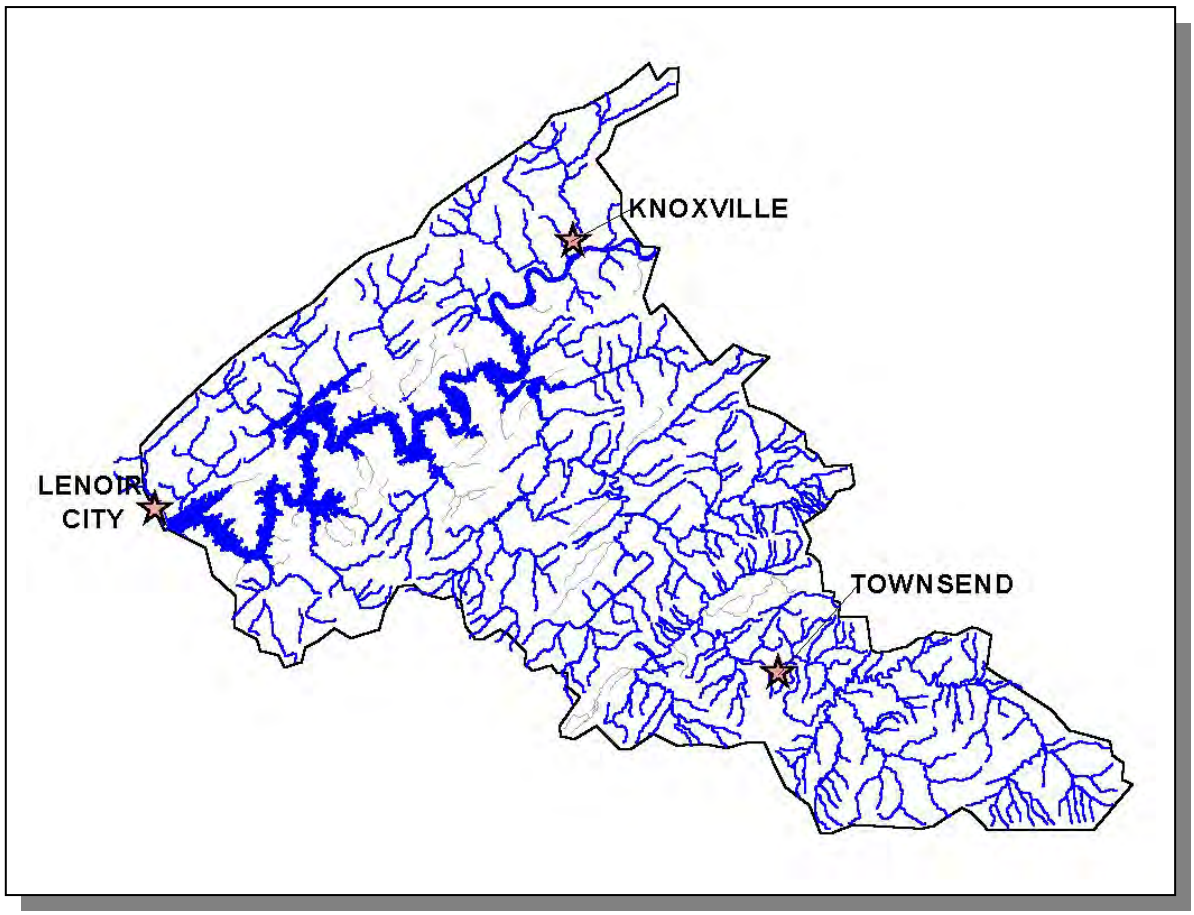



***Figure 3-7d. Irrigation Use Support Attainment in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Green, Threatened; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

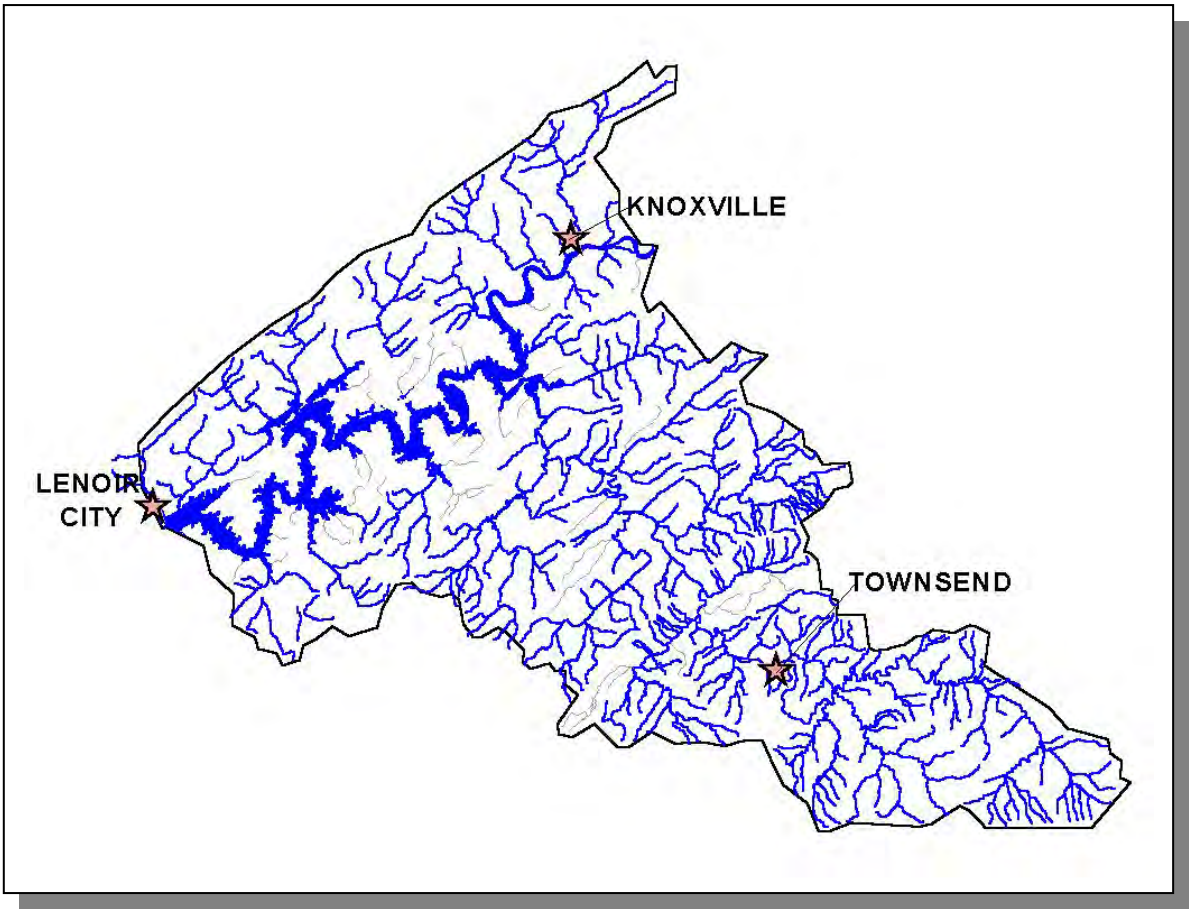



***Figure 3-7e. Livestock Watering and Wildlife Use Support Attainment in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Green, Threatened; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

## 3.3.B. Use Impairment Summary.

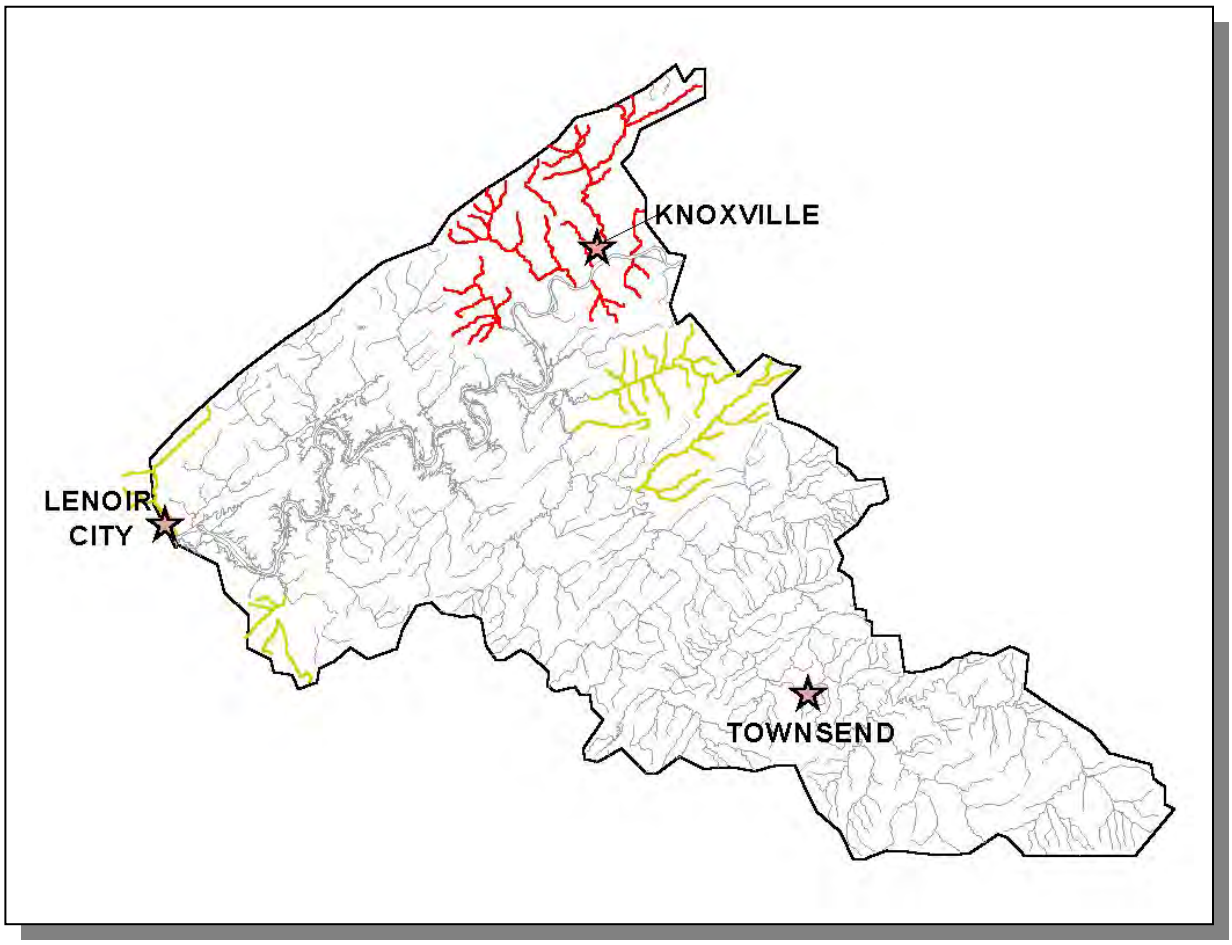



***Figure 3-8a. Impaired Streams Due to Habitat Alteration in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment.; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

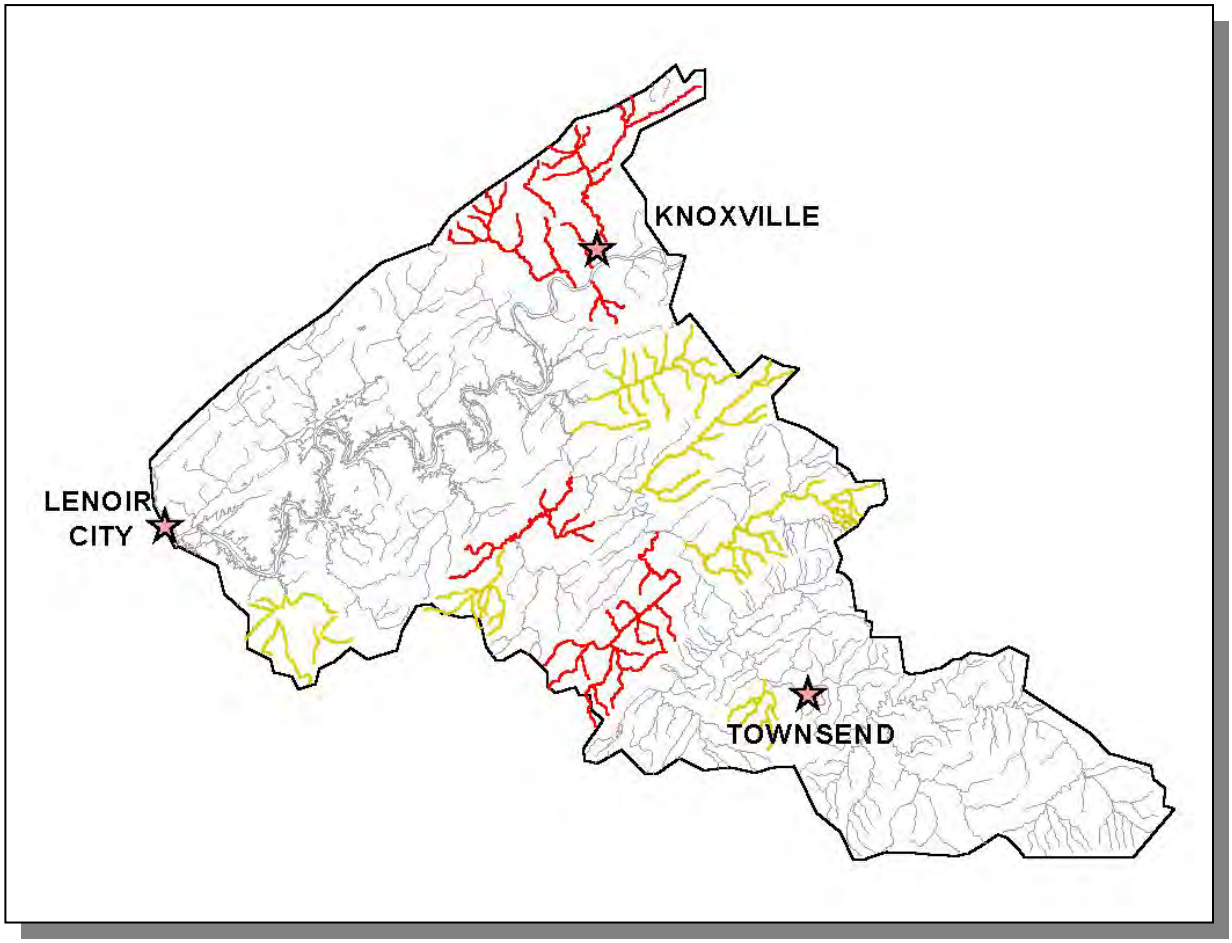



***Figure 3-8b. Impaired Streams Due to Pathogens in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment.; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

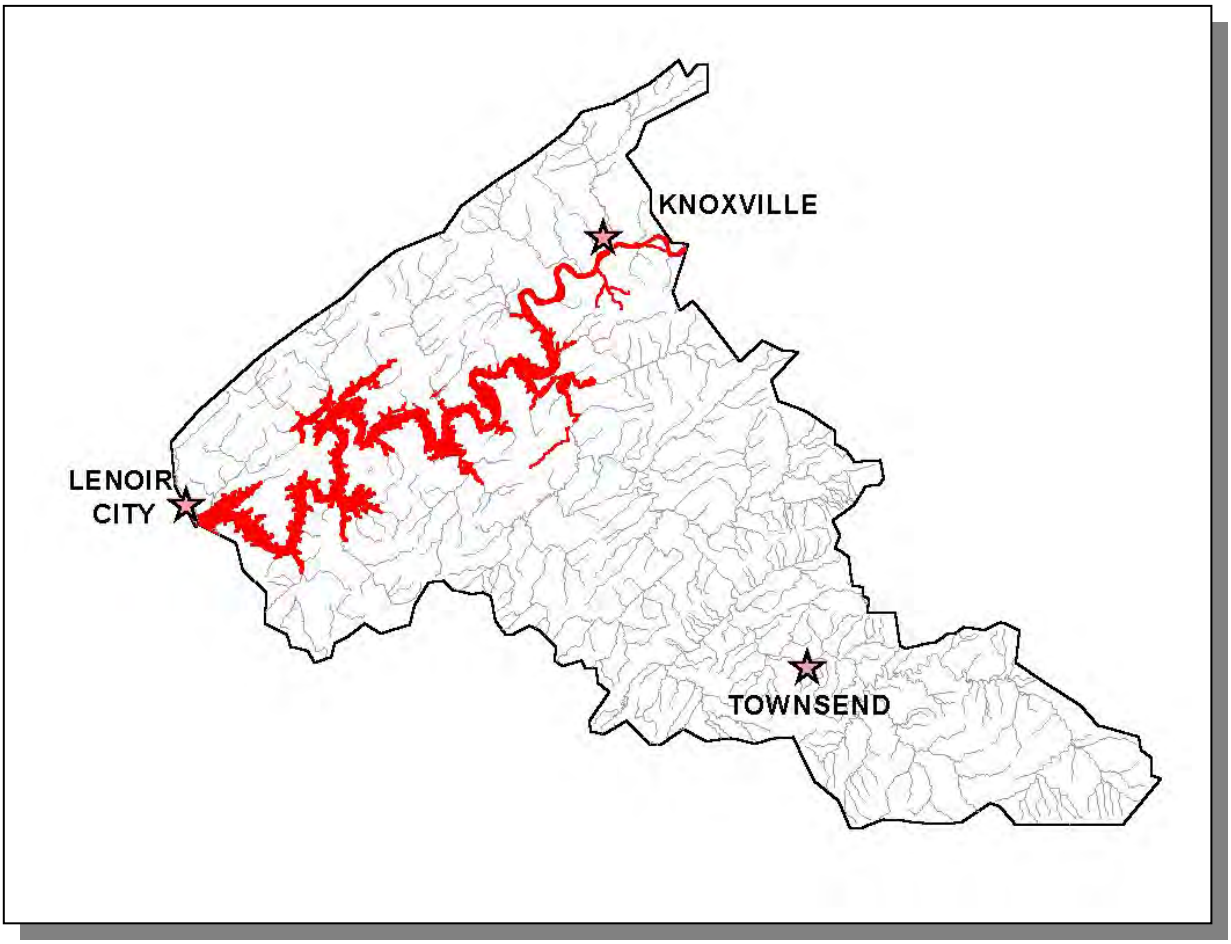



***Figure 3-8c. Impaired Streams Due to PCBs in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment.; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-Appendix III.*

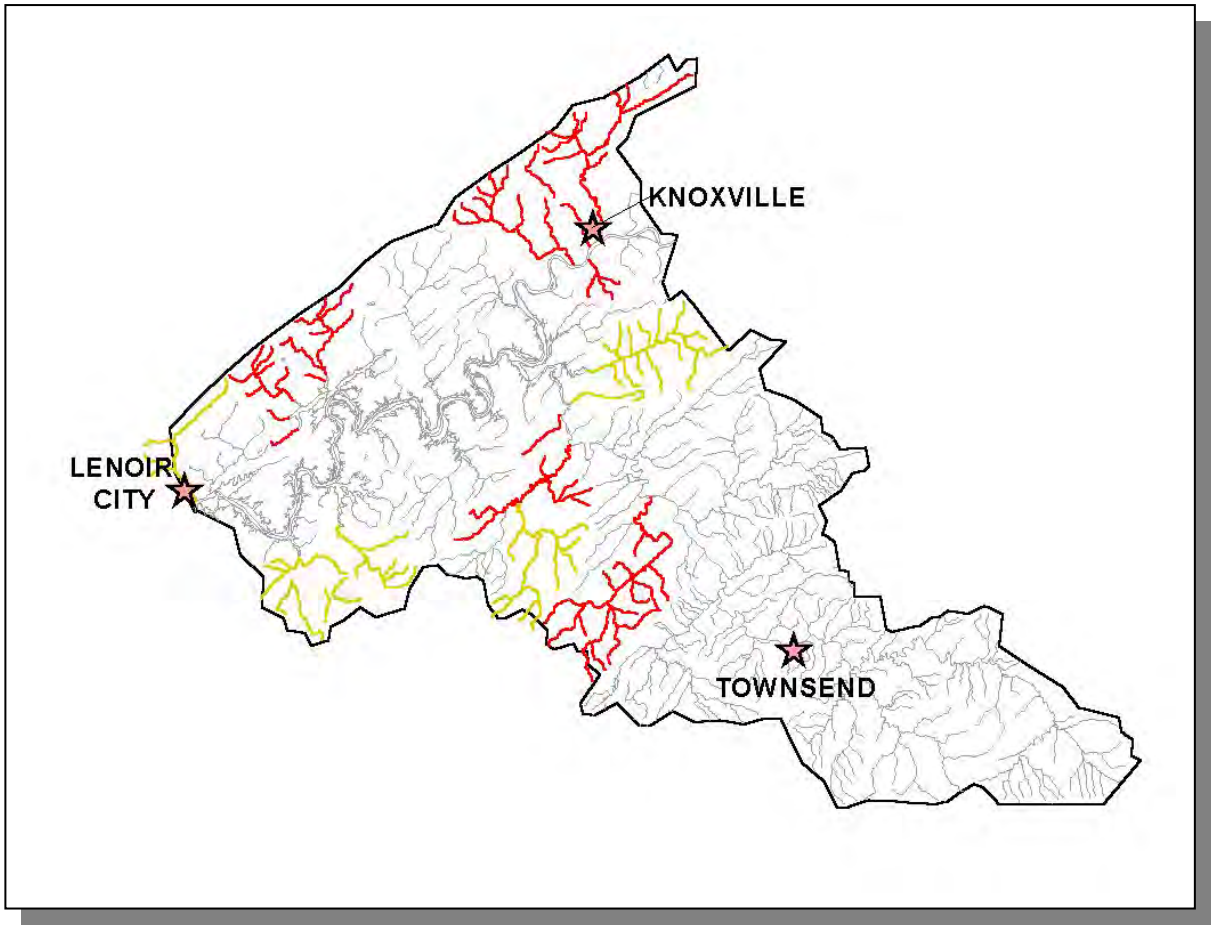



***Figure 3-8d. Impaired Streams Due to Siltation in the Fort Loudoun Lake Watershed.*** *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Knoxville, Lenoir City, and Townsend are shown for reference. More information is provided in Fort Loudoun-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 bankfull width and drainage area.

# CHAPTER 4

## POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE FORT LOUDOUN 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 Fort Loudoun Lake Watershed (HUC 06010201) has been delineated into two 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.

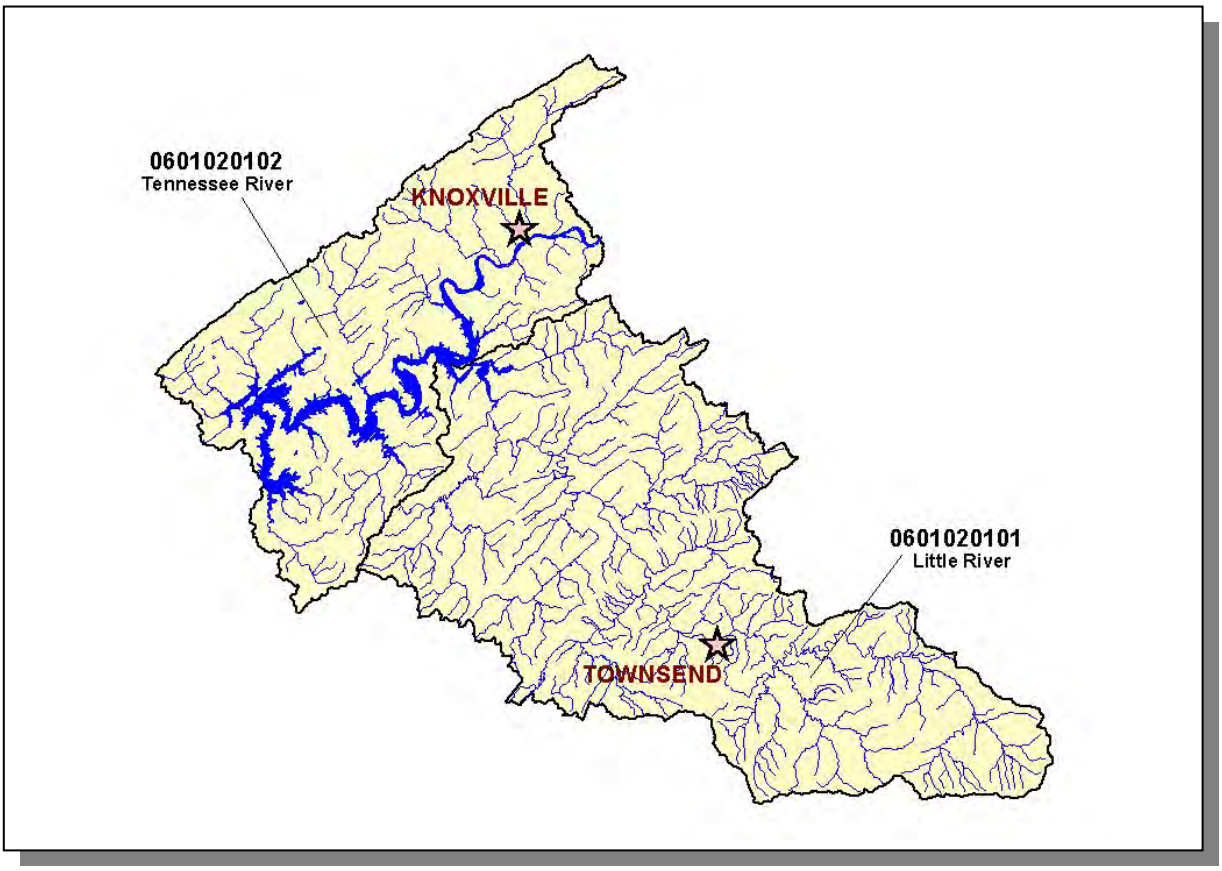



***Figure 4-1. The Fort Loudoun Lake Watershed is Composed of Two USGS-Delineated Subwatersheds (10-Digit Subwatersheds).*** *Locations of Knoxville and Townsend are shown for reference.*

**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 Fort Loudoun Lake Watershed.

| HUC-10 | HUC-12 |
|---|---|
| 0601020101 | 060102010101 (Little River) |
| | 060102010102 (Middle Prong Little River) |
| | 060102010103 (Little River) |
| | 060102010104 (Little River) |
| | 060102010105 (Little River) |
| | 060102010106 (Little River) |
| | 060102010107 (Pistol Creek) |
| | 060102010108 (Stock Creek) |
| | |
| 060102010102 | 06010201010201 (Tennessee River) |
| | 06010201010202 (First Creek) |
| | 06010201010203 (Second Creek) |
| | 06010201010204 (Third Creek) |
| | 06010201010205 (Tennessee River) |
| | 06010201010206 (Lackey Creek) |
| | 06010201010207 (Fort Loudoun Lake) |
| | 06010201010208 (Ten Mile Creek) |
| | 06010201010209 (Turkey Creek) |
| | 06010201010210 (Ish Creek) |

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

4.2.A. 0601020101.

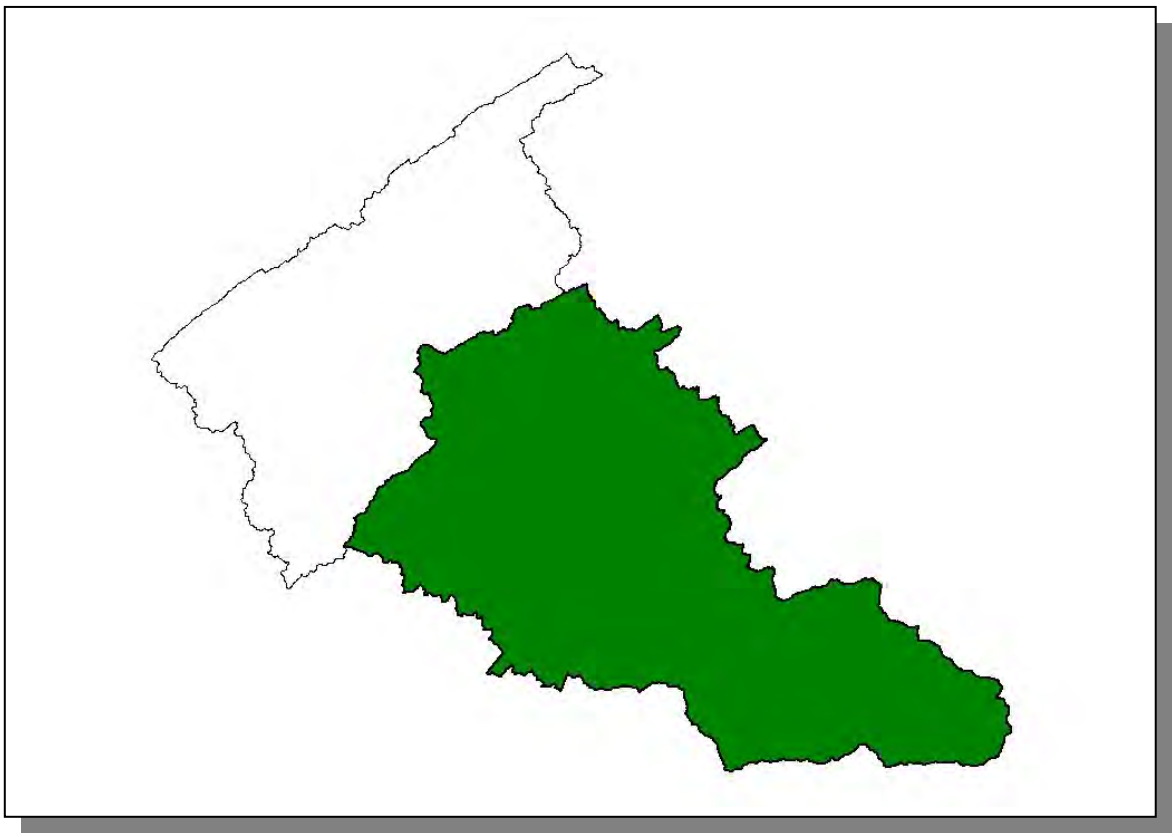


***Figure 4-2. Location of Subwatershed 0601020101.*** *All Fort Loudoun HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.A.i. General Description.

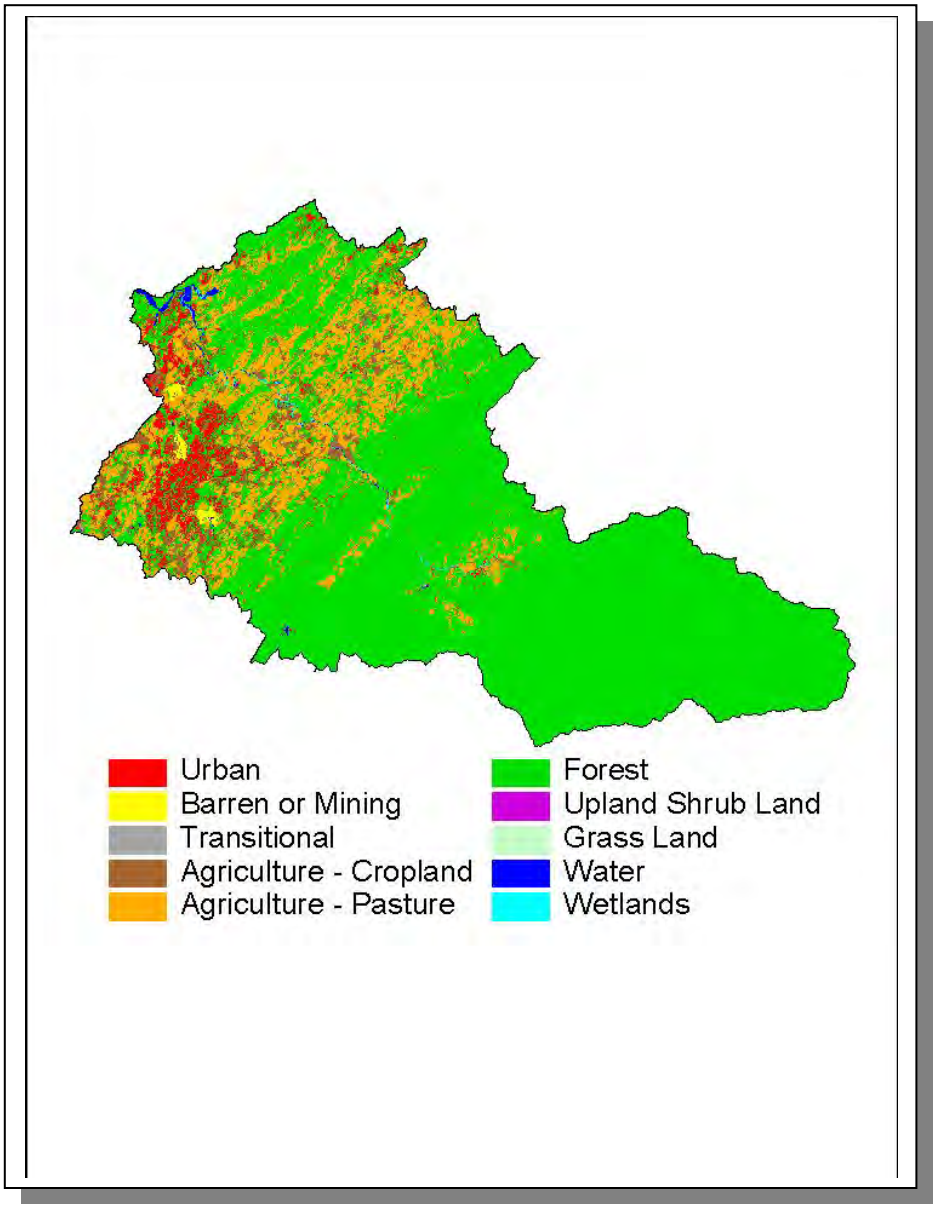



***Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0601020101.***

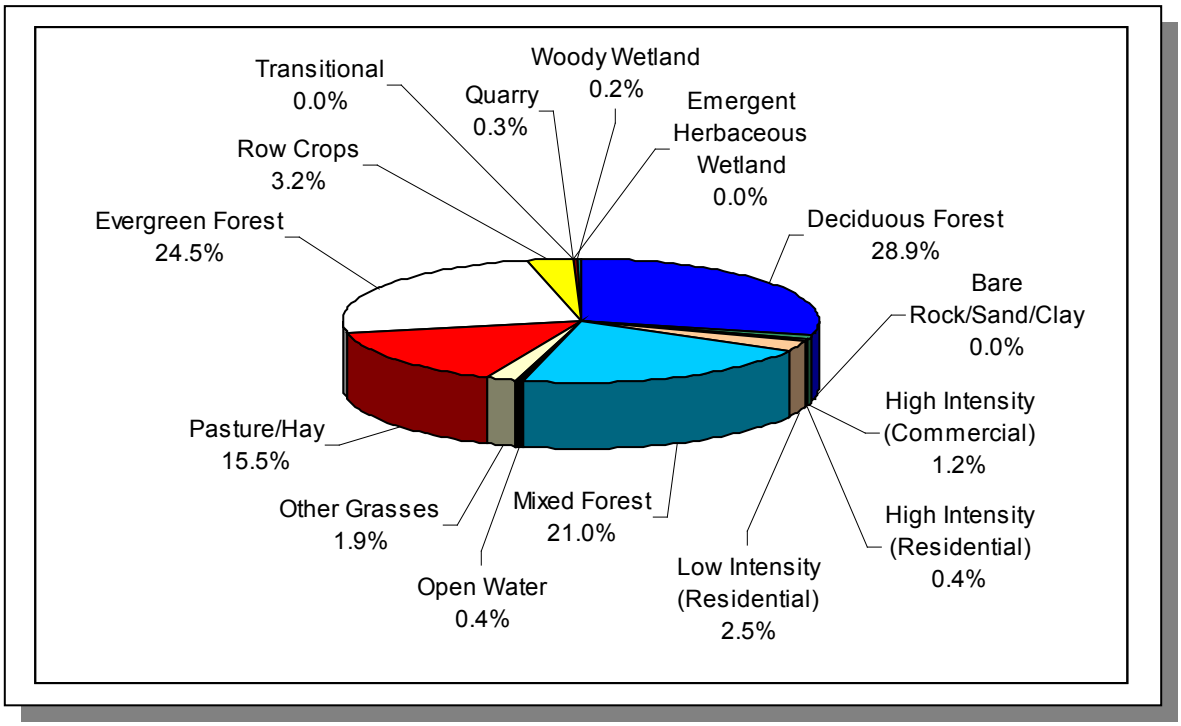



***Figure 4-4. Land Use Distribution in Subwatershed 0601020101.*** *More information is provided in Fort Loudoun-Appendix IV.*

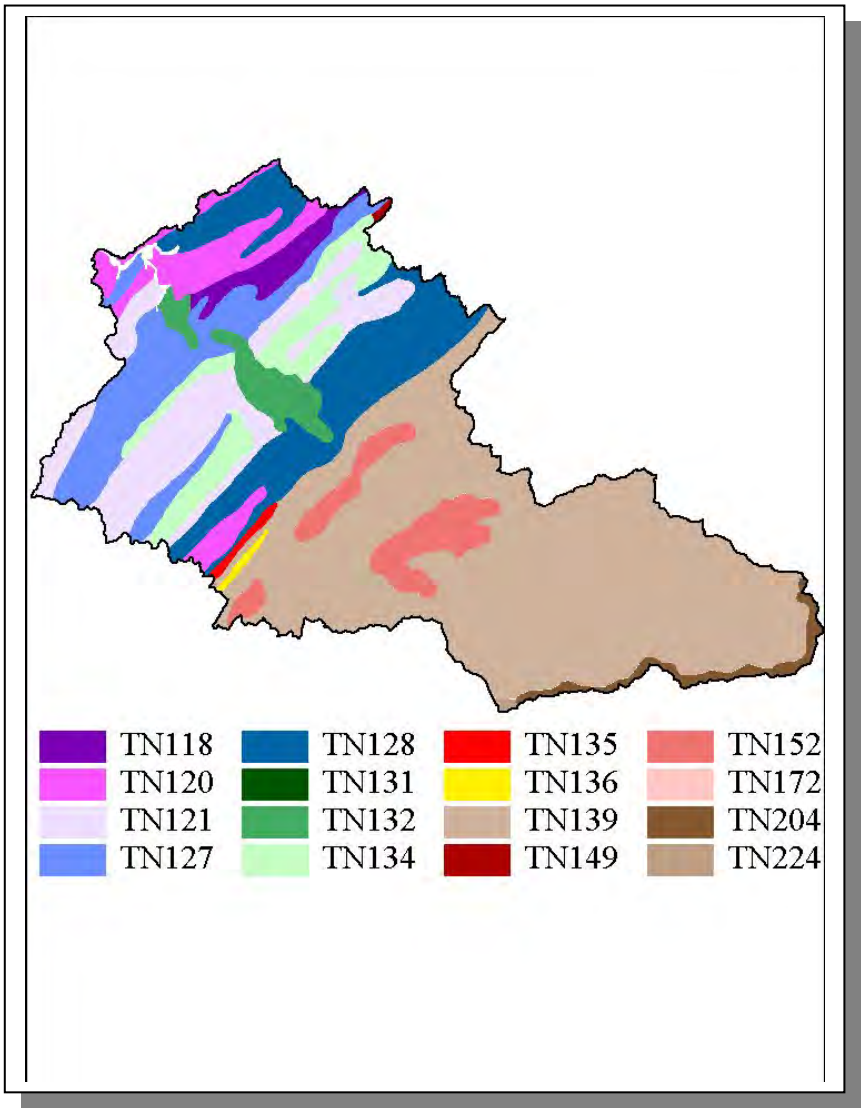



***Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020101.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN118 | 0.00 | C | 6.52 | 5.12 | Loam | 0.29 |
| TN120 | 0.00 | B | 1.68 | 5.11 | Loam | 0.27 |
| TN121 | 0.00 | B | 1.30 | 5.21 | Loam | 0.33 |
| TN127 | 3.00 | C | 1.31 | 5.20 | Loam | 0.35 |
| TN128 | 0.00 | C | 1.30 | 6.53 | Clayey/Loam | 0.26 |
| TN131 | 0.00 | C | 1.17 | 4.95 | Silty Loam | 0.33 |
| TN132 | 0.00 | B | 1.46 | 5.38 | Loam | 0.36 |
| TN134 | 0.00 | B | 1.38 | 5.18 | Loam | 0.31 |
| TN135 | 0.00 | C | 1.30 | 5.84 | Loam | 0.33 |
| TN136 | 0.00 | B | 3.16 | 5.11 | Loam | 0.27 |
| TN139 | 0.00 | C | 11.84 | 4.82 | Loam | 0.20 |
| TN149 | 1.00 | B | 1.29 | 5.01 | Loam | 0.30 |
| TN152 | 0.00 | B | 2.11 | 5.26 | Loam | 0.31 |
| TN172 | 0.00 | B | 3.87 | 5.13 | Loam | 0.26 |
| TN204 | 0.00 | B | 3.95 | 4.80 | Sandy Loam | 0.19 |
| TN224 | 1.00 | B | 3.97 | 5.27 | Loam | 0.24 |

***Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020101.*** *More details are provided in Fort Loudoun-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | PERCENT CHANGE |
|---|---|---|---|---|---|---|
| County | 1990 | 1997 Est. | Portion of Watershed (%) | 1990 | 1997 | |
| | | | | | | |
| Blount | 85,969 | 100,218 | 48.04 | 41,301 | 48,146 | 16.6 |
| Knox | 335,749 | 365,900 | 4.4 | 14,784 | 16,111 | 9.0 |
| Sevier | 51,043 | 62,774 | 13.57 | 6,927 | 8,519 | 23.0 |
| **Totals** | **472,761** | **528,892** | | **63,012** | **72,776** | **15.5** |

***Table 4-3. Population Estimates in Subwatershed 0601020101.***

| | | | NUMBER OF HOUSING UNITS | | | |
|---|---|---|---|---|---|---|
| Populated Place | County | Population | Total | Public Sewer | Septic Tank | Other |
| | | | | | | |
| Alcoa | Blount | 6,400 | 2,892 | 2,799 | 88 | 5 |
| Knoxville | Knox | 165,121 | 76,453 | 74,884 | 1,521 | 48 |
| Maryville | Blount | 19,208 | 8,280 | 7,478 | 802 | 0 |
| Rockford | Blount | 676 | 260 | 14 | 242 | 4 |
| Townsend | Blount | 386 | 238 | 19 | 216 | 3 |
| **Total** | | **191,791** | **88,123** | **85,194** | **2,869** | **60** |

***Table 4-4. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0601020101.***

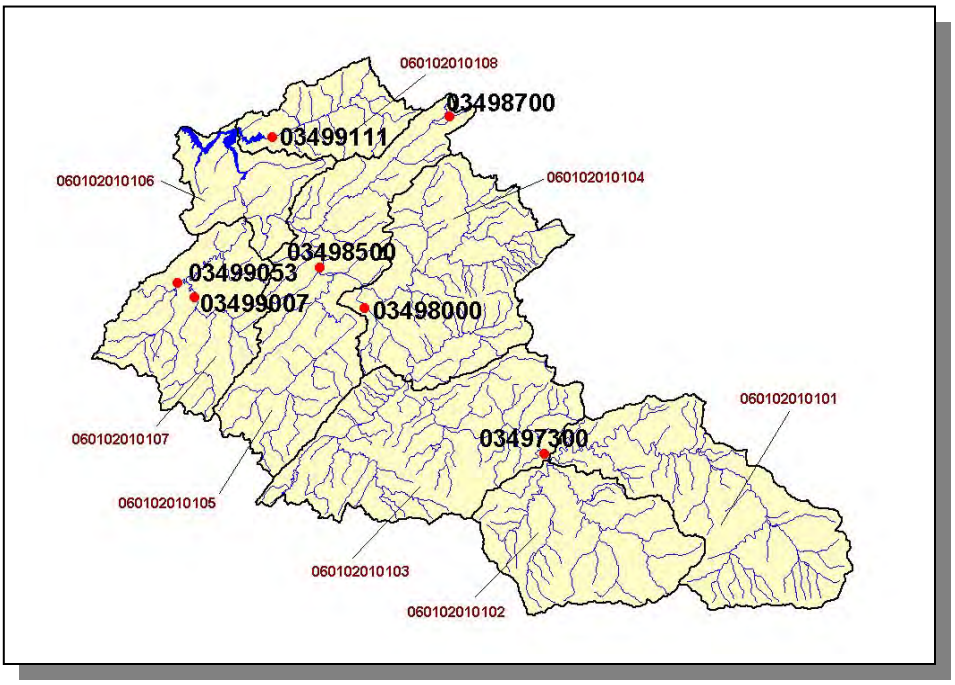



***Figure 4-6. Location of Historical Streamflow Data Collection Sites in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

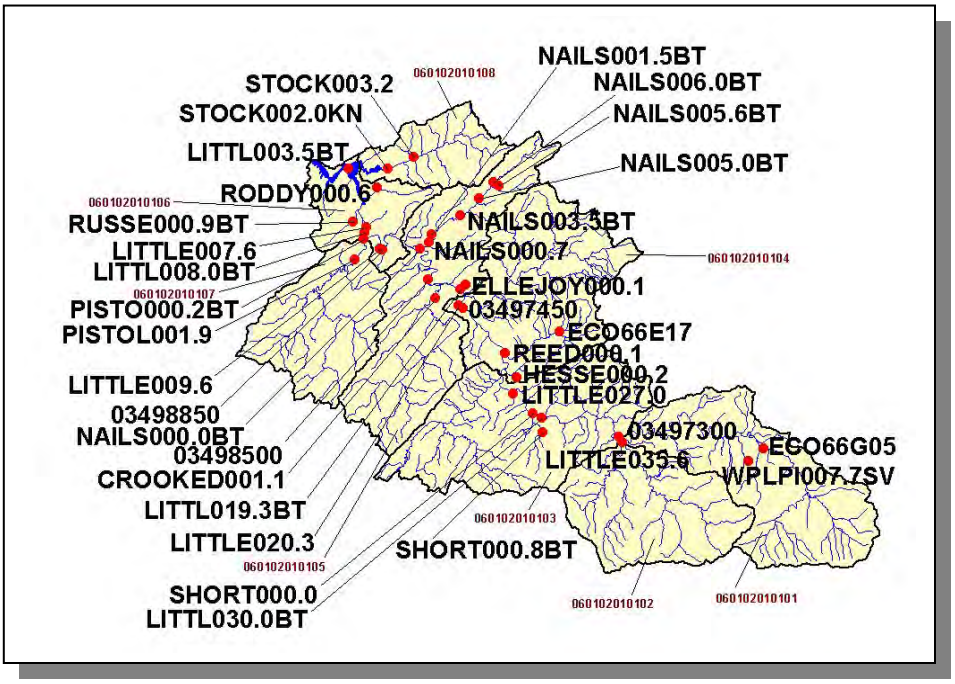



***Figure 4-7. Location of STORET Monitoring Sites in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

4.2.A.ii. Point Source Contributions.

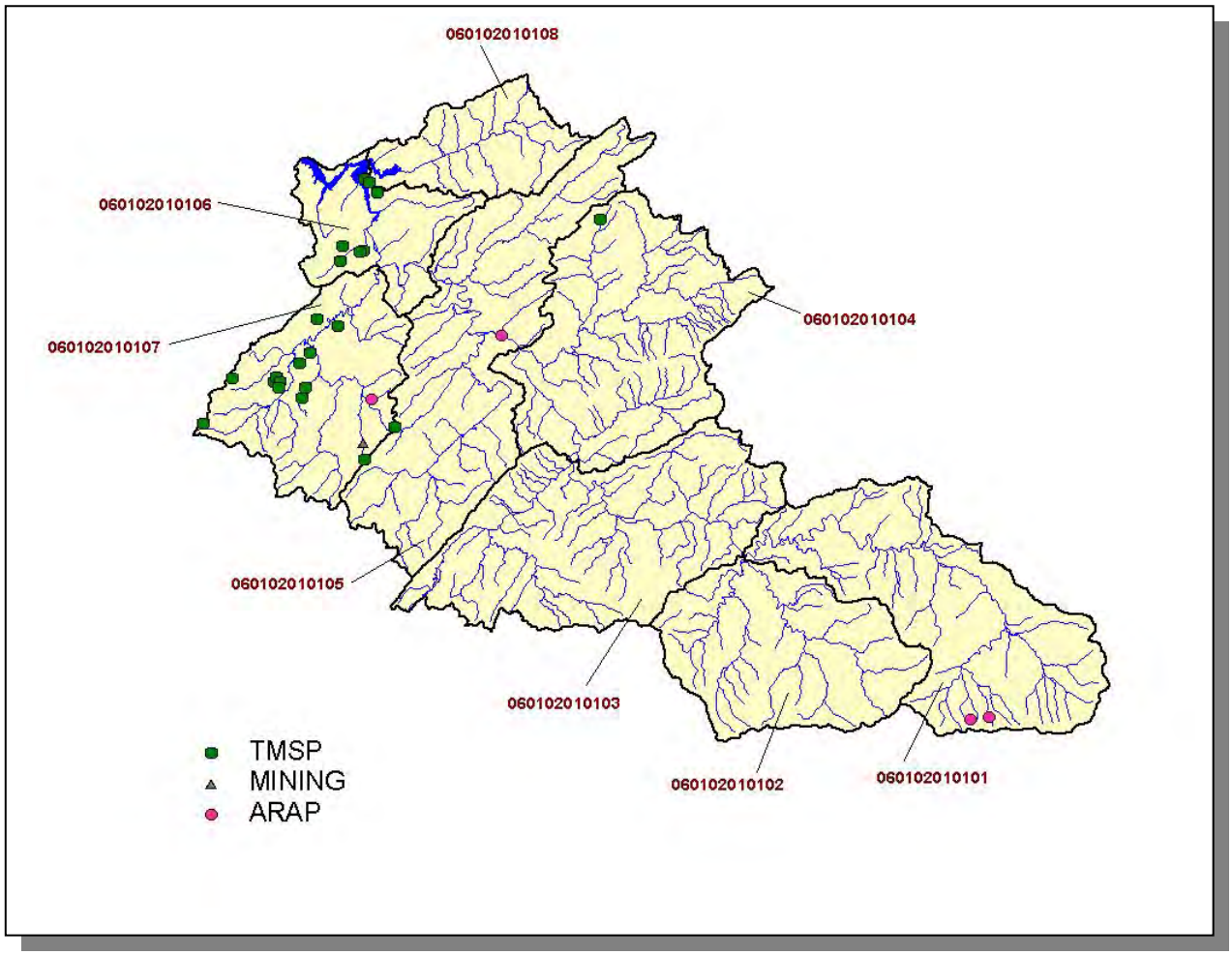



***Figure 4-8. Location of Active Point Source Facilities in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in the following charts.*

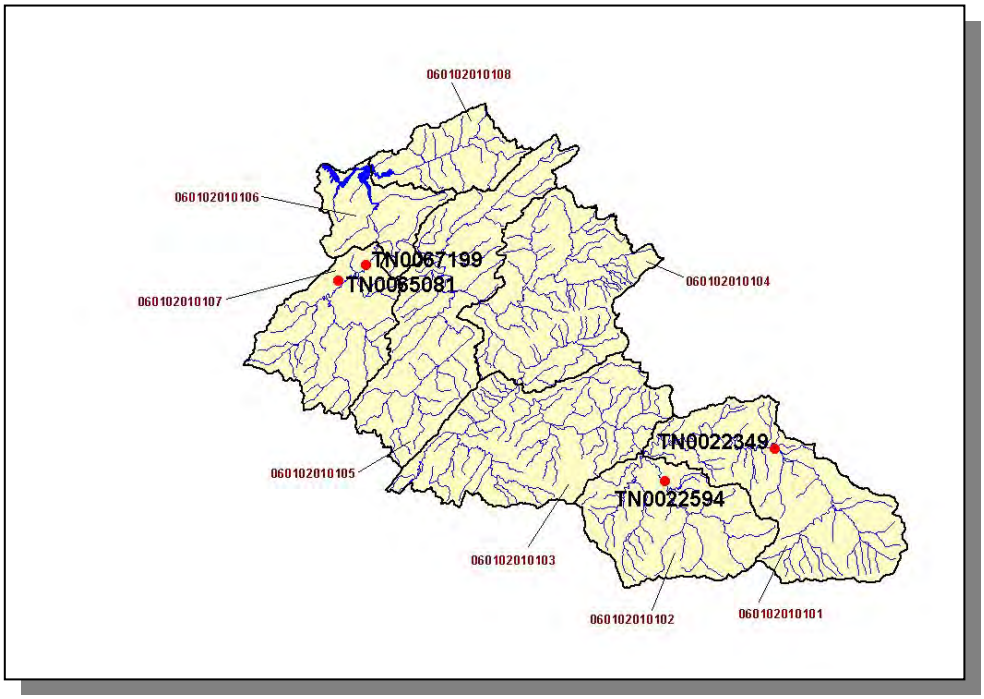



***Figure 4-9. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

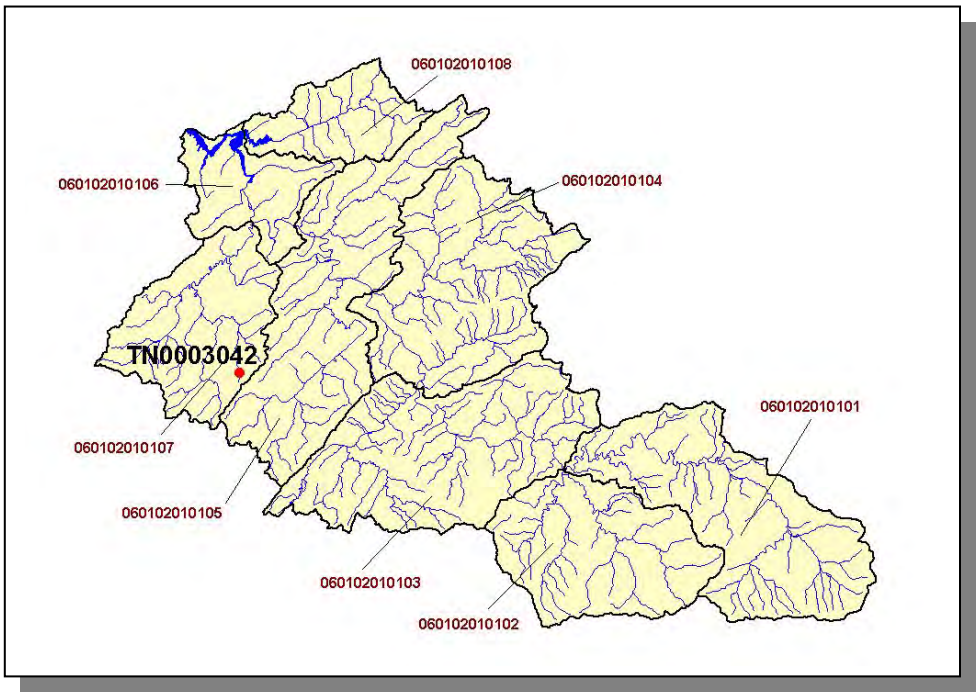



***Figure 4-10. Location of Active Mining Sites in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

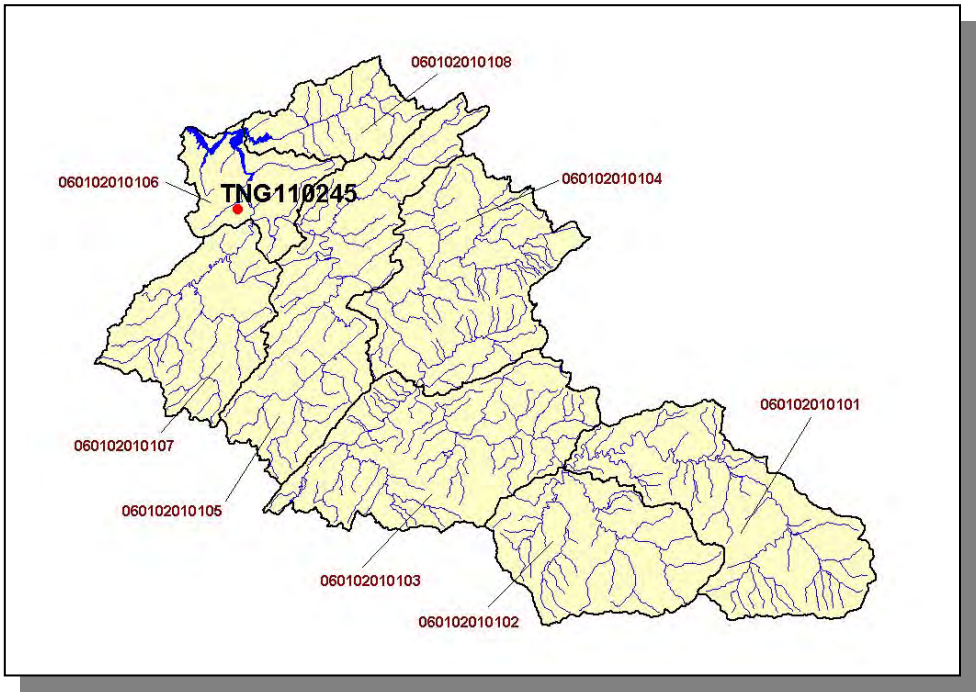



***Figure 4-11. Location of Ready Mix Concrete Facilities in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

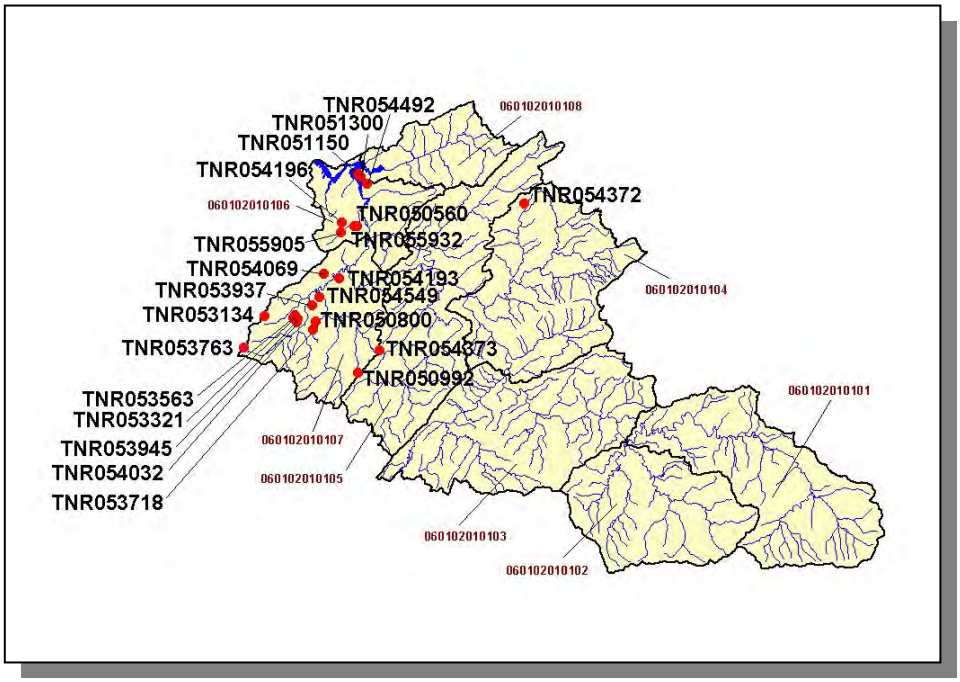



***Figure 4-12. Location of TMSP Facilities in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

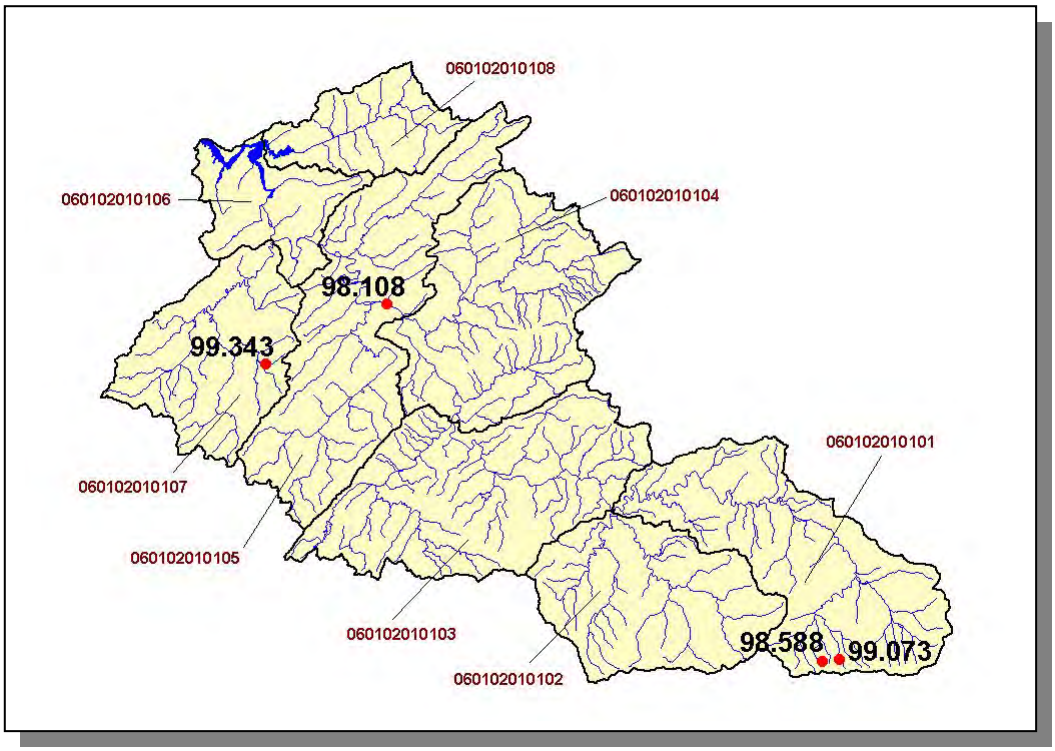



***Figure 4-13. Location of ARAP Sites (Individual Permits) in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

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

There are two NPDES facilities discharging to water bodies listed on the 1998 303(d) list in Subwatershed 0601020101:

- TN0065081(Alcoa) discharges to a wet weather conveyance to Pistol Creek @ RM 27.5, to Pistol Creek @ RM 4.7, to an unnamed trib to Pistol Creek, to an unnamed trib to Springfield Branch, and to a sinkhole
- TN0067199 (Alcoa) discharges to wet weather conveyances to Duncan Creek and Russell Branch, to Russell Branch @ RM 2.2, and to Duncan Creek @ RM 0.6

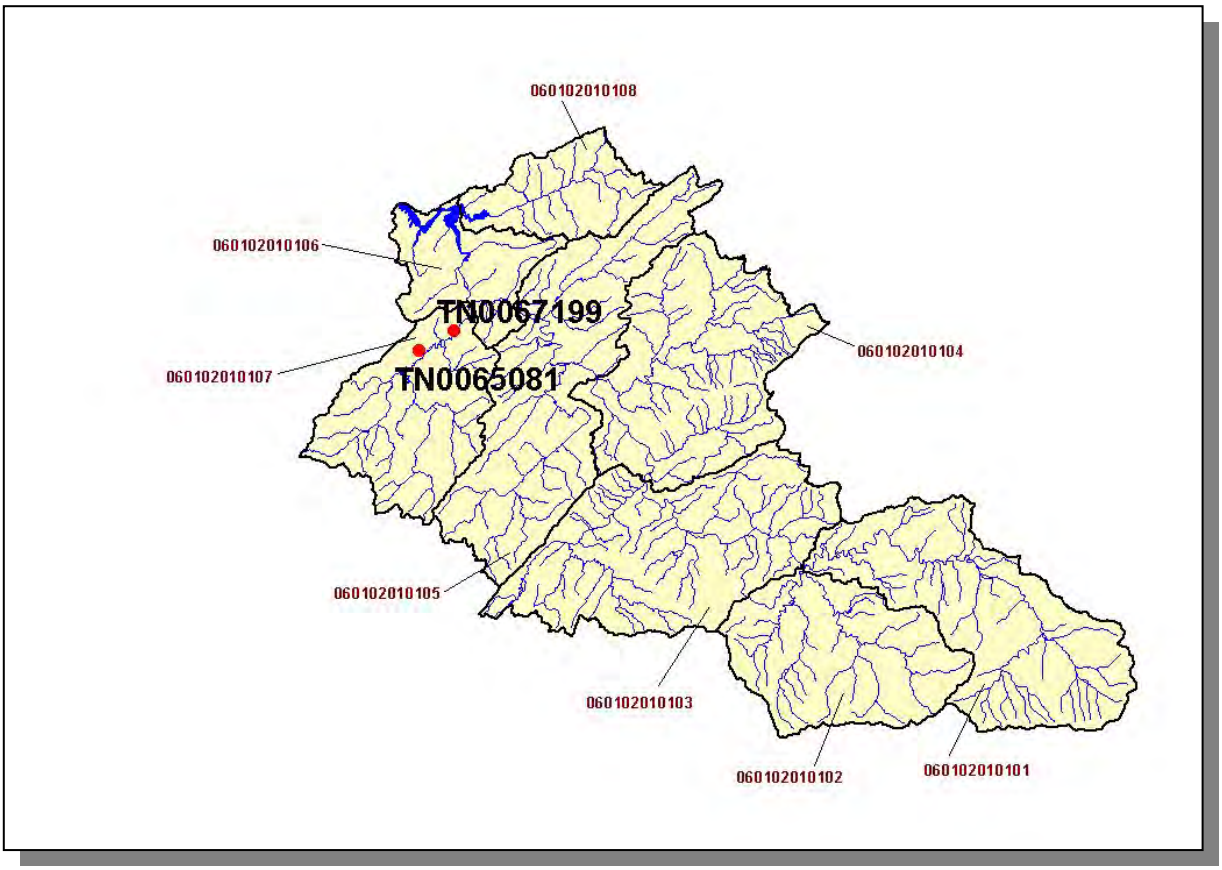



***Figure 4-14. Location of NPDES Dischargers to Water Bodies Listed on the 1998 303(d) List in Subwatershed 0601020101.*** *Subwatershed 060102010101, 060102010102, 060102010103, 060102010104, 060102010105, 060102010106, 060102010107, and 060102010108 boundaries are shown for reference. More information is provided in Fort Loudoun-Appendix IV.*

| PERMIT # | 1Q10 | 3Q10 | 7Q10 | 3Q20 | QDESIGN |
|---|---|---|---|---|---|
| TN0065081 | 5.17 | 8.60 | 5.56 | 4.72 | 1.67200 |
| TN0067199 | 0.00 | 0.00 | 0.00 | 0.00 | 0.64400 |

***Table 4-5. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020101.*** *Data are in million gallons per day (MGD). Data were obtained from the USGS publication Flow Duration and Low Flows of Tennessee Streams Through 1992 or from permit files.*

| PERMIT # | $CBOD_5$ | COD | $BOD_5$ | Cr | Fe | Zn | CN |
|---|---|---|---|---|---|---|---|
| TN0065081 | X | | | X | X | X | X |
| TN0067199 | | X | X | | X | | |

***Table 4-6. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020101.*** *$CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); COD, Chemical Oxygen demand; $BOD_5$, Biochemical Oxygen Demand (5-Day).*

| PERMIT # | $CBOD_5$ | pH | WET | $NH_3$ | Al | Zn | Cr | CN | TRC | F (SOLUBLE) | TSS | DO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TN0065081 | | X | X | X | X | | | | X | X | X | |
| TN0067199 | X | X | X | X | X | X | X | X | X | | X | X |

***Table 4-7a. Inorganic Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020101.*** *$CBOD_5$, Carbonaceous Biochemical Oxygen Demand; WET, Whole Effluent Toxicity; TRC, Total Residual Chlorine; TSS, Total Suspended Solids; DO, Dissolved Oxygen.*

| PERMIT # | PCB | BENZOPYRENE | OIL and GREASE | PHENOL |
|---|---|---|---|---|
| TN0065081 | | X | X | |
| TN0067199 | X | | X | X |

***Table 4-7b. Organic Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020101.*** *PCB, Polychlorinated Biphenyls.*

4.2.A.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | | |
|---|---|---|---|---|---|---|
| Beef Cow | Cattle | Milk Cow | Chickens | Chickens Sold | Hogs | Sheep |
| | | | | | | |
| 8,717 | 17,986 | 949 | 24 | 32,711 | 386 | 269 |

***Table 4-8. Summary of Livestock Count Estimates in Subwatershed 0601020101.*** *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) |
| | | | | |
| Blount | 165.5 | 69.9 | 1.8 | 9.3 |
| Knox | 127.5 | 127.0 | 2.2 | 8.2 |
| Sevier | 254.5 | 127.4 | 0.3 | 0.9 |
| **Totals** | **547.5** | **324.3** | **4.3** | **18.4** |

***Table 4-9. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0601020101.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Corn (Row Crops) | 12.35 |
| Soybeans (Row Crops) | 15.54 |
| Tobacco (Row Crops) | 16.31 |
| Grass (Hayland) | 0.19 |
| Legume/Grass (Hayland) | 0.07 |
| Grass (Pastureland) | 0.32 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.28 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Wheat (Close Grown Cropland) | 6.27 |
| Oats (Close Grown Cropland) | 0.32 |
| Summer Fallow (Other Cropland) | 3.31 |
| Other Land in Farms | 0.14 |
| Nonagricultural Land Use | 0.00 |
| Farmsteads and Ranch Headquarters | 0.27 |

***Table 4-10. Annual Estimated Total Soil Loss in Subwatershed 0601020101.***

4.2.B. 0601020102.

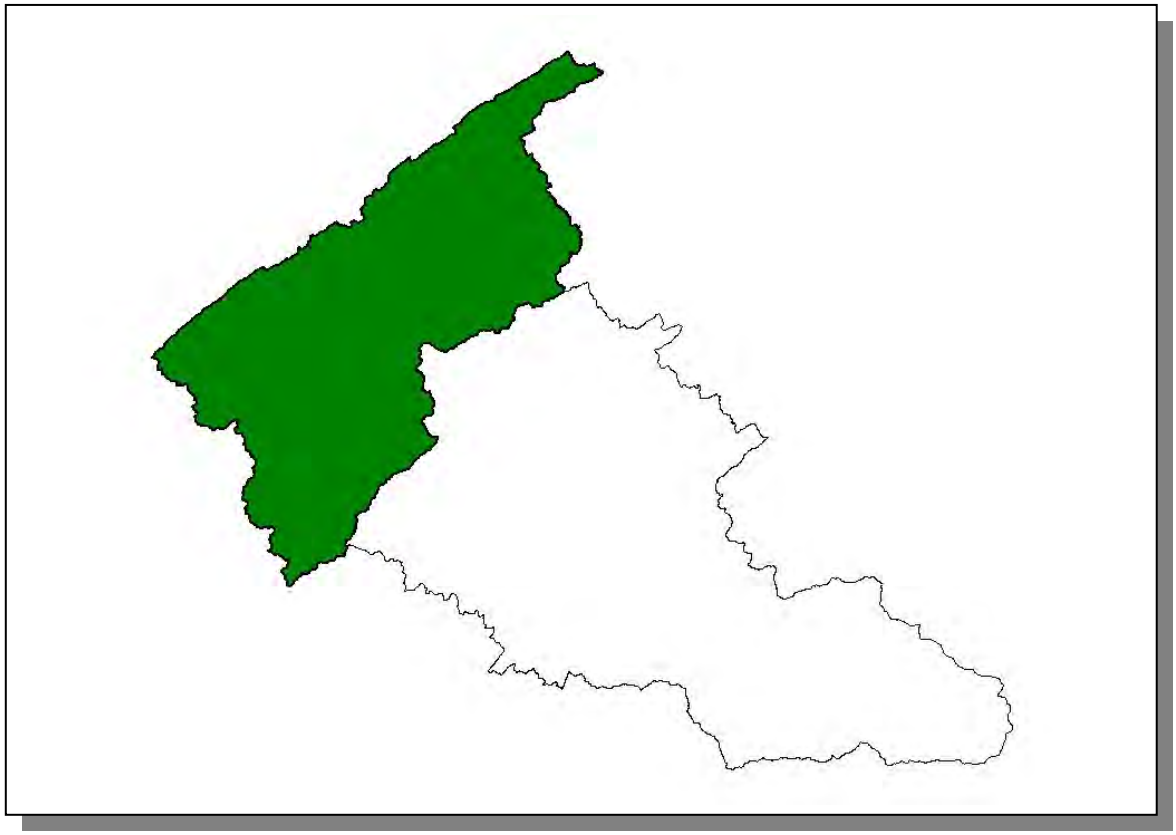


***Figure 4-15. Location of Subwatershed 0601020102.*** *All Fort Loudoun HUC-10 subwatershed boundaries in Tennessee are shown for reference.*

4.2.B.i. General Description.

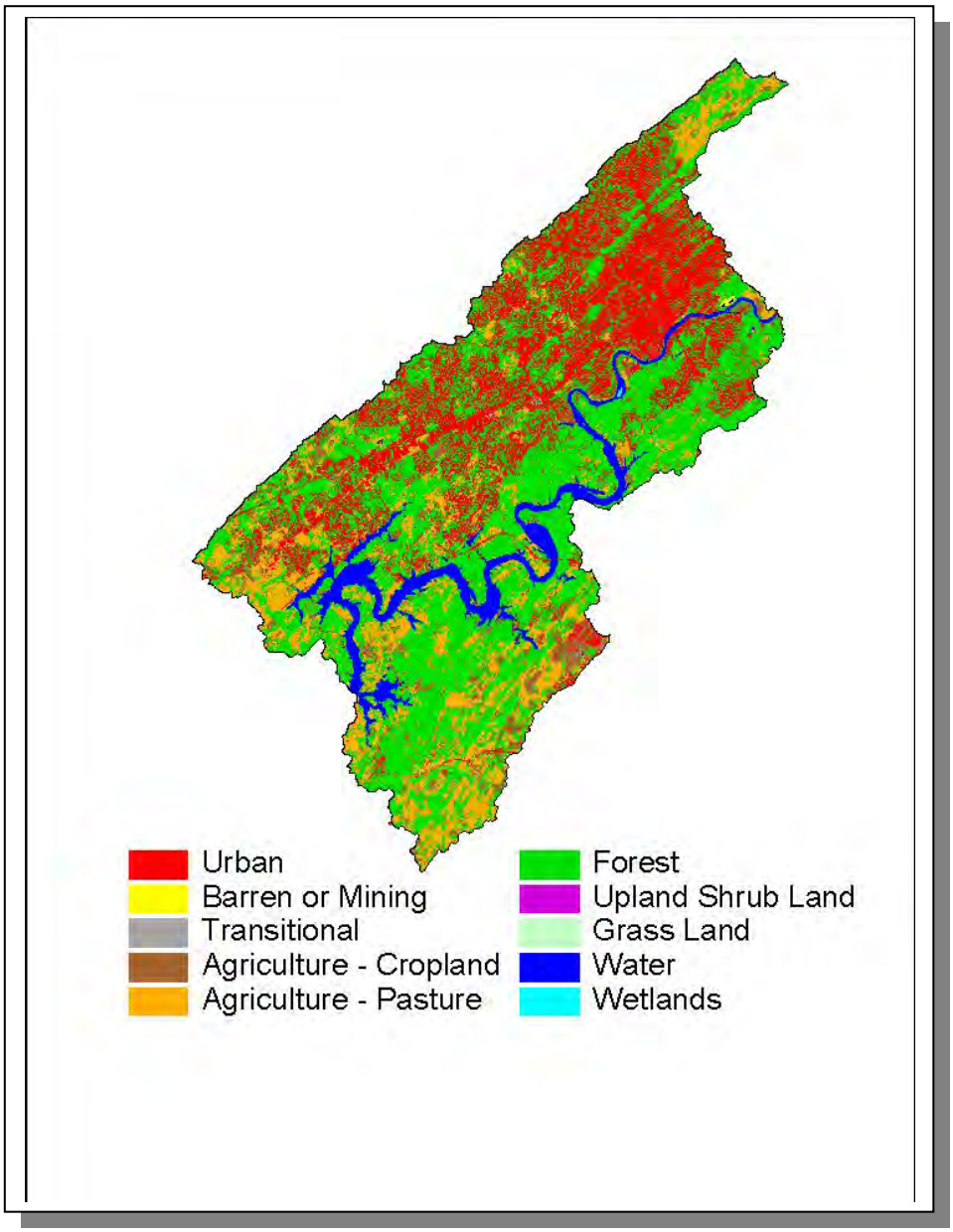



***Figure 4-16. Illustration of Land Use Distribution in Subwatershed 0601020102.***

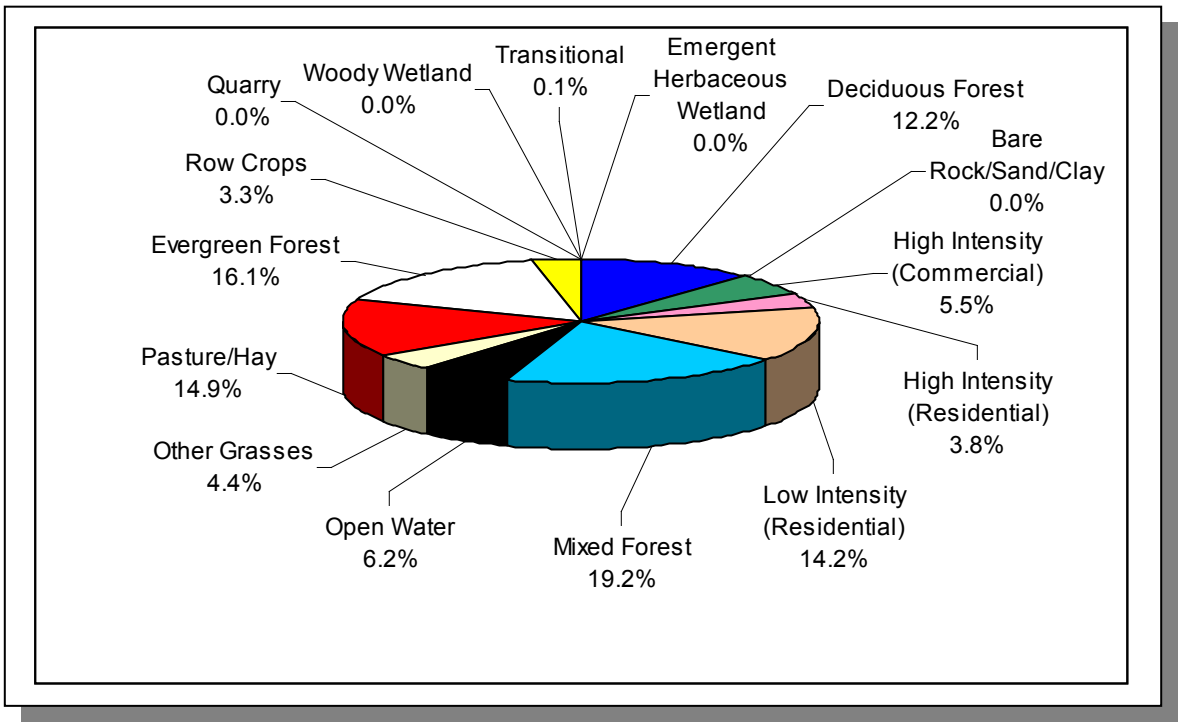



***Figure 4-17. Land Use Distribution in Subwatershed 0601020102.*** *More information is provided in For Loudoun-Appendix IV.*

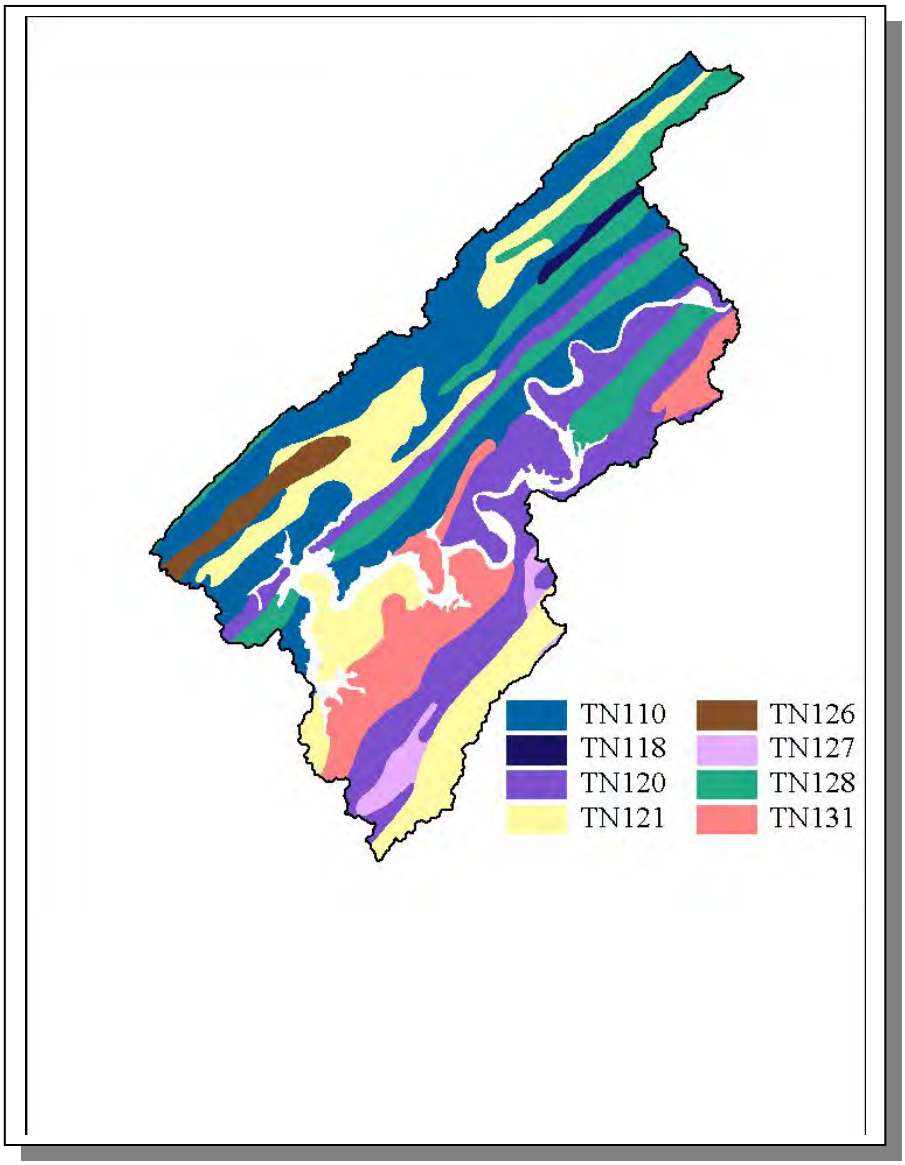



***Figure 4-18. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020102.***

| STATSGO MAP UNIT ID | PERCENT HYDRIC | HYDROLOGIC GROUP | PERMEABILITY (in/hour) | SOIL pH | ESTIMATED SOIL TEXTURE | SOIL ERODIBILITY |
|---|---|---|---|---|---|---|
| TN110 | 0.00 | B | 2.22 | 4.96 | Loam | 0.31 |
| TN118 | 0.00 | C | 6.52 | 5.12 | Loam | 0.29 |
| TN120 | 0.00 | B | 1.68 | 5.11 | Loam | 0.27 |
| TN121 | 0.00 | B | 1.30 | 5.21 | Loam | 0.33 |
| TN126 | 19.00 | C | 1.30 | 5.12 | Loam | 0.33 |
| TN127 | 3.00 | C | 1.31 | 5.20 | Loam | 0.35 |
| TN128 | 0.00 | C | 1.30 | 6.53 | Clayey Loam | 0.26 |
| TN131 | 0.00 | C | 1.17 | 4.95 | Silty Loam | 0.33 |

***Table 4-11. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020102.*** *More information is provided in Fort Loudoun-Appendix IV.*

| | COUNTY POPULATION | | | ESTIMATED POPULATION IN WATERSHED | | % CHANGE |
|---|---|---|---|---|---|---|
| County | 1990 | 1997 Est. | Portion of Watershed (%) | 1990 | 1997 | |
| | | | | | | |
| Blount | 85,969 | 100,218 | 10.87 | 9,345 | 10,894 | 16.6 |
| Knox | 335,749 | 365,900 | 32.37 | 108,687 | 118,447 | 9.0 |
| Loudon | 31,255 | 38,245 | 0.95 | 297 | 364 | 22.6 |
| **Total** | **452,973** | **504,363** | | **118,329** | **129,705** | **9.6** |

***Table 4-12. Population Estimates in Subwatershed 0601020102.***

| | | | NUMBER OF HOUSING UNITS | | | |
|---|---|---|---|---|---|---|
| Populated Place | County | Population | Total | Public Sewer | Septic Tank | Other |
| | | | | | | |
| Alcoa | Blount | 6,400 | 2,892 | 2,799 | 88 | 5 |
| Farragut | Knox | 12,804 | 44,463 | 3,392 | 1,064 | 7 |
| Friendsville | Blount | 786 | 334 | 17 | 308 | 9 |
| Knoxville | Knox | 165,121 | 76,453 | 74,884 | 1,521 | 48 |
| Maryville | Blount | 19,208 | 8,280 | 7,478 | 802 | 0 |
| **Total** | | **204,319** | **132,422** | **88,570** | **3,783** | **69** |

***Table 4-13. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0601020102.***

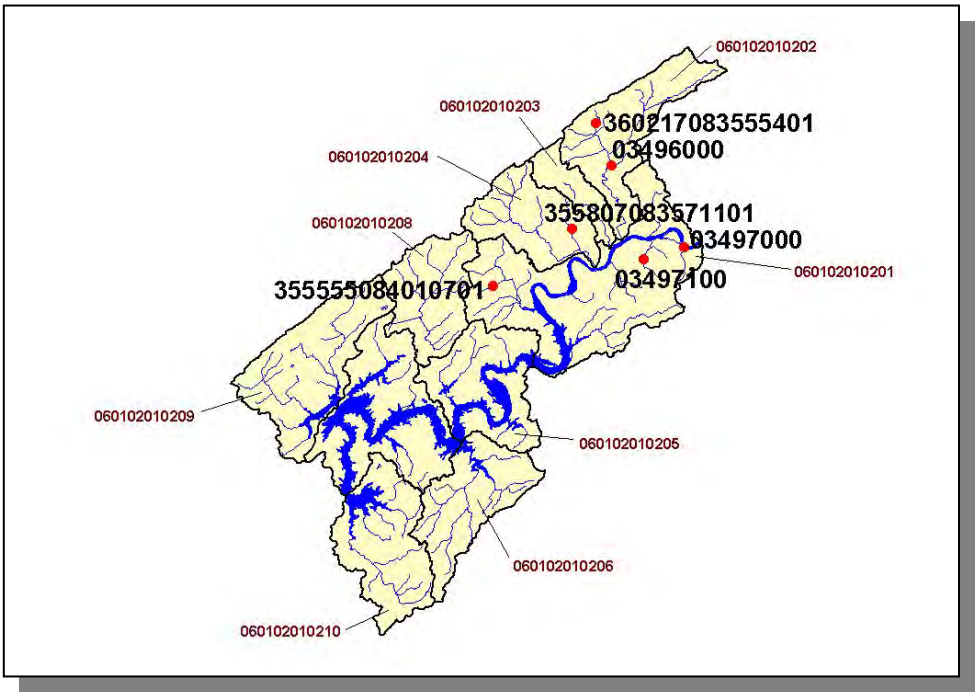



***Figure 4-19. Location of Historical Streamflow Data Collection Sites in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in Fort Loudoun -Appendix IV.*

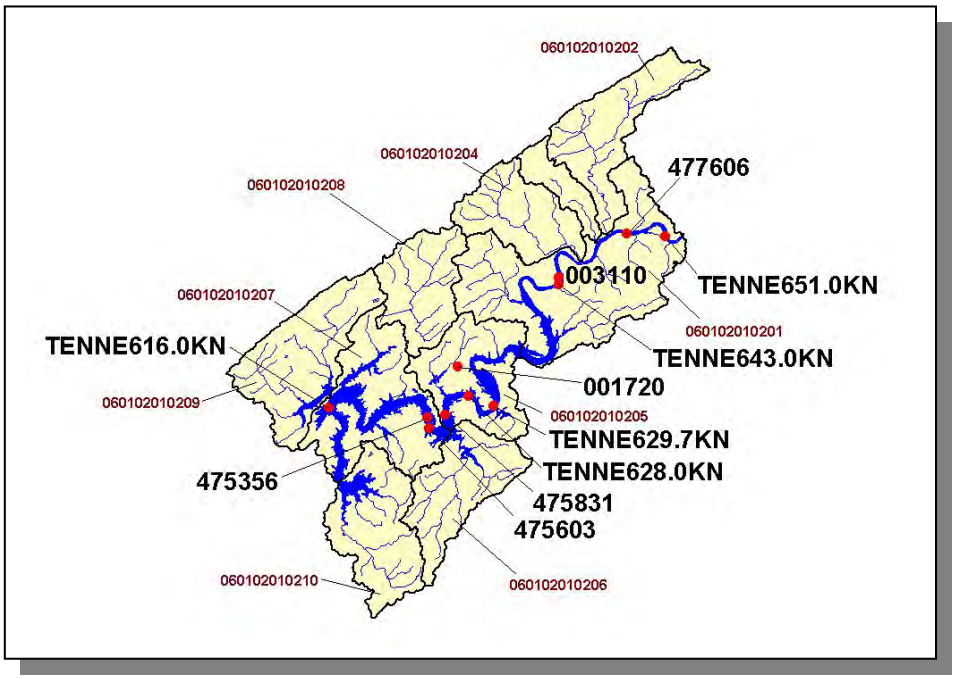



***Figure 4-20. Location of STORET Monitoring Sites in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in Fort Loudoun -Appendix IV.*

4.2.B.ii. Point Source Contributions.

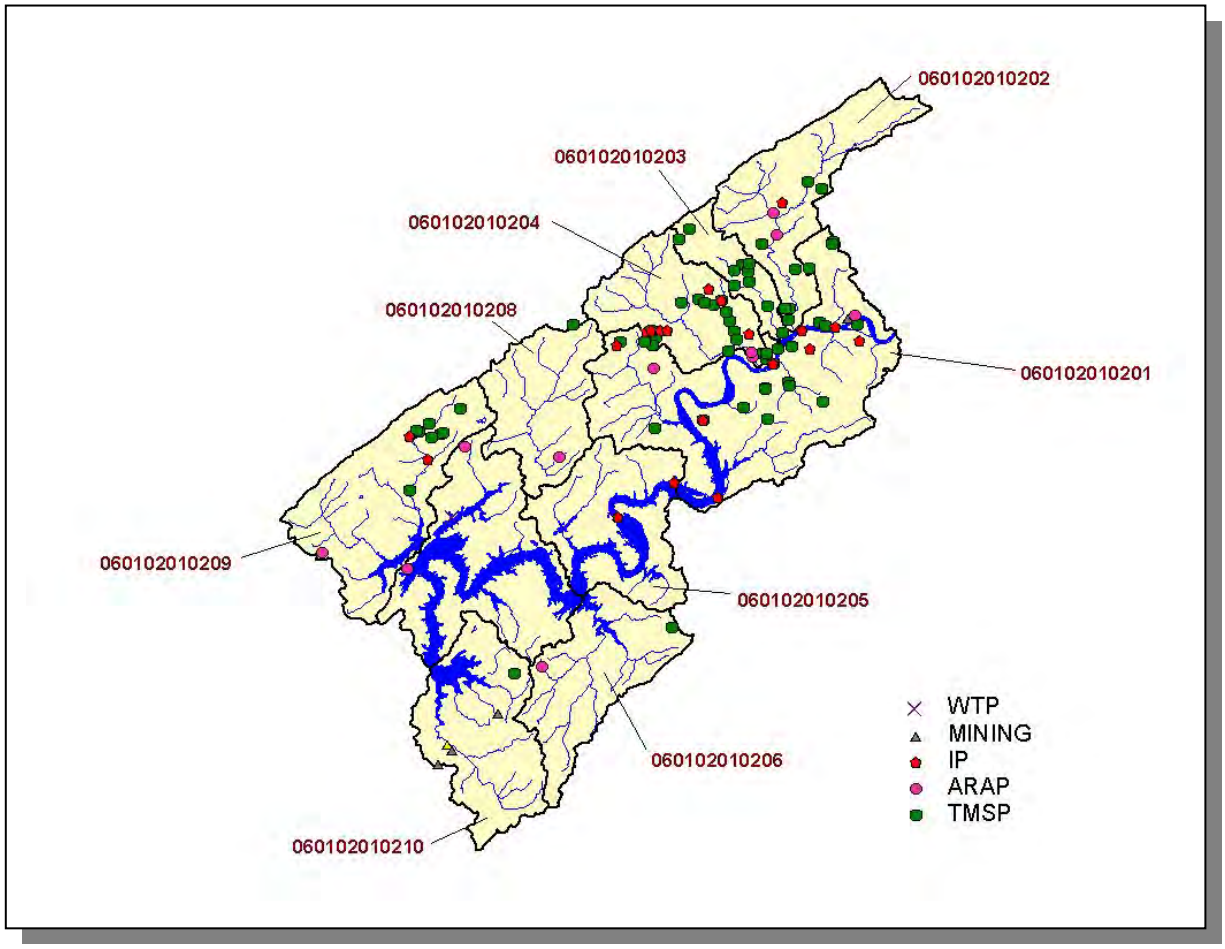



***Figure 4-21. Location of Active Point Source Facilities in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in the following charts.*

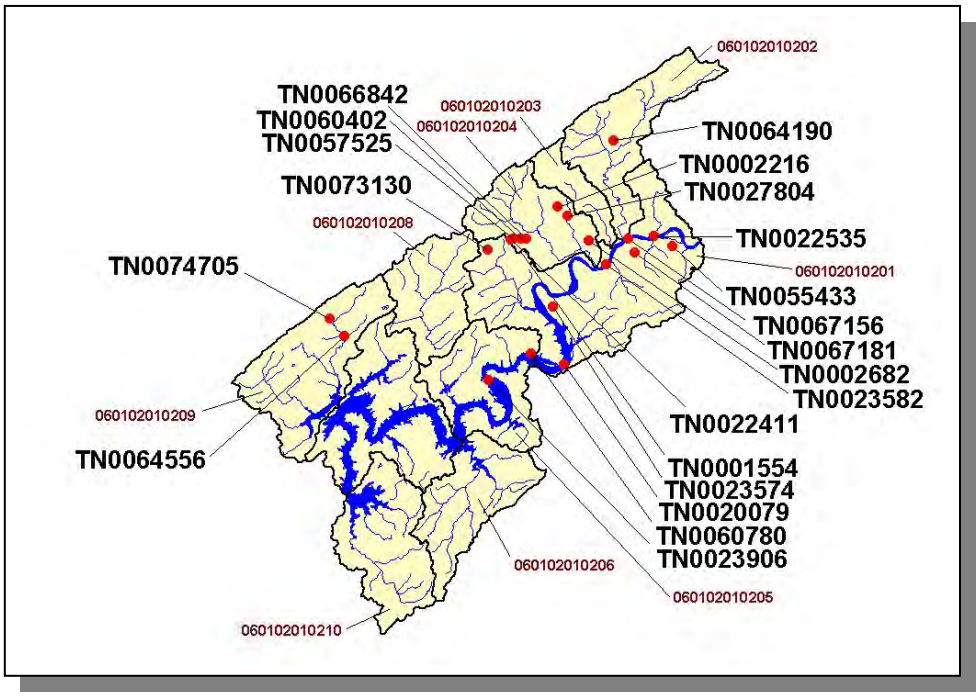



***Figure 4-22. Location of Active Mining Sites in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in Fort Loudoun -Appendix IV.*

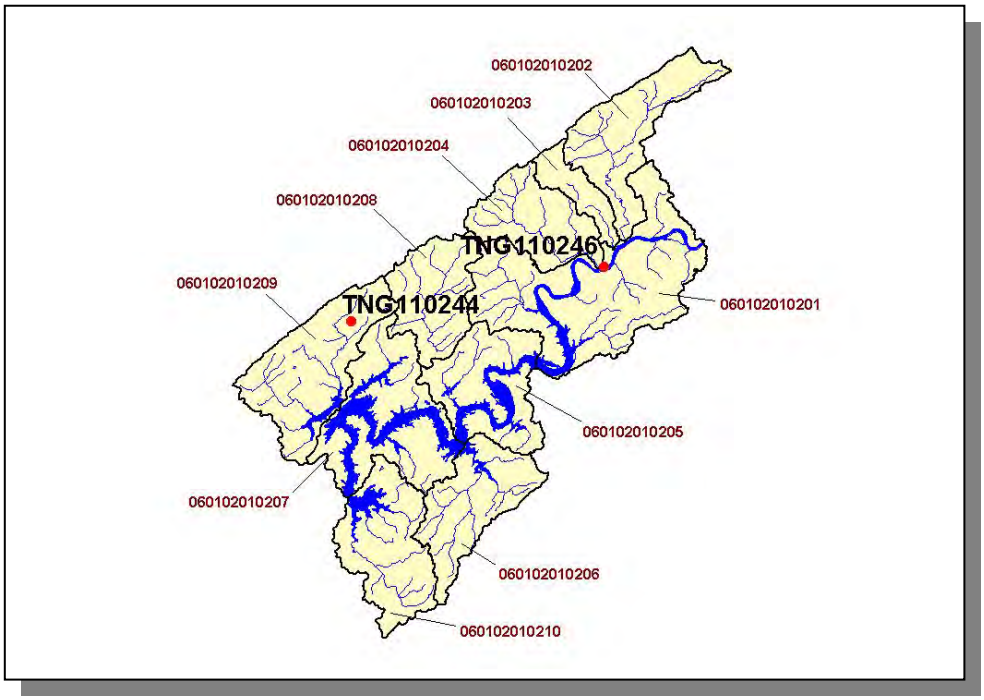



***Figure 4-23. Location of Ready Mix Concrete Facilities in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in Fort Loudoun -Appendix IV.*

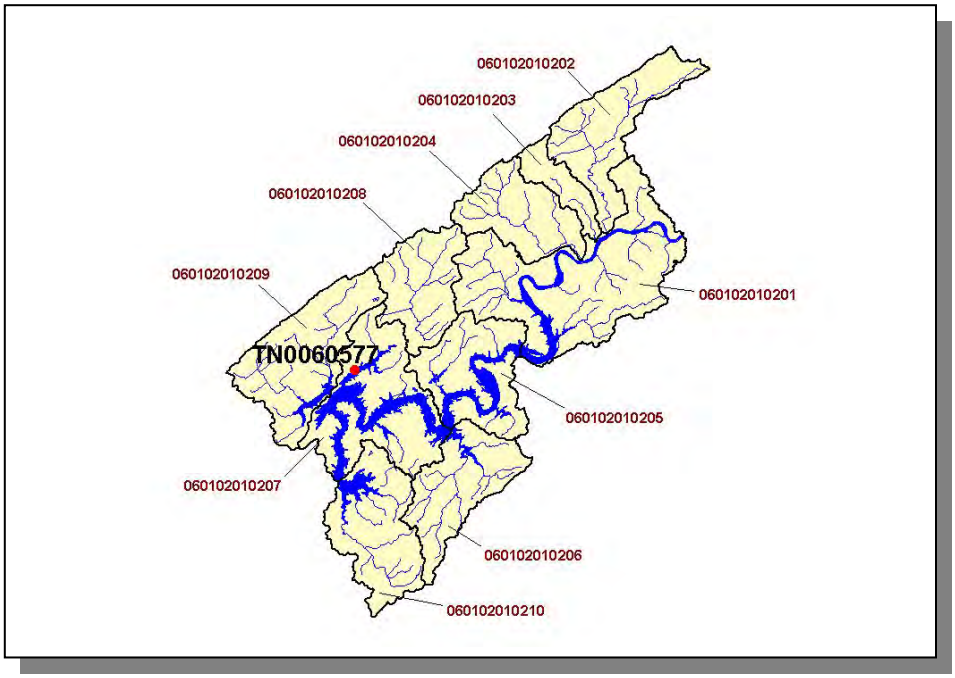



***Figure 4-24. Location of Water Treatment Plant Sites in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in Fort Loudoun -Appendix IV.*

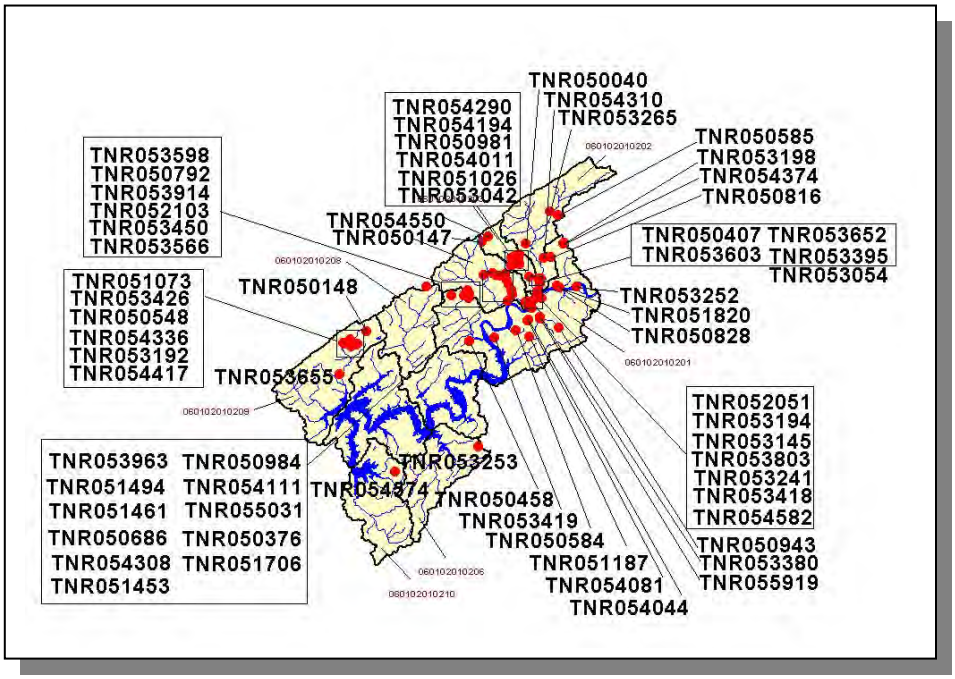



***Figure 4-25. Location of TMSP Facilities in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in Fort Loudoun -Appendix IV.*

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

There are eleven NPDES facilities discharging to water bodies listed on the 1998 303(d) list in Subwatershed 0601020102:

- TN0002216 (Exxon-Mobil) discharges to an unnamed trib to 3rd Creek @ RM 5.3
- TN0002682 (Rohm and Haas) discharges to East Fork 3rd Creek @ RM 0.1
- TN0020079 (Maryville STP) discharges to the Tennessee River @ RM 637.0
- TN0023574 (KUB-4th Creek STP) discharges to the Tennessee River @ RM 640.0
- TN0023906 (Penninsula Psychiatric Hospital) discharges to the Tennessee River @ RM 632.0
- TN0027804 (Ameristeel) discharges to East Fork 3rd Creek @ RM 2.3
- TN0060402 (Cummins Terminals) discharges to an unnamed trib to 3rd Creek @ RM 5.3
- TN0060780 (Duncan's landing) discharges to the Tennessee River @ RM 635.0
- TN0064190 (B.P. Oil Co.) discharges to 1st Creek @ RM 6.2
- TN0064556 (Pilot Travel centers) discharges to an unnamed trib to Turkey Creek @ RM 4.2
- TN0066842 (Conoco) discharges to 3rd Creek

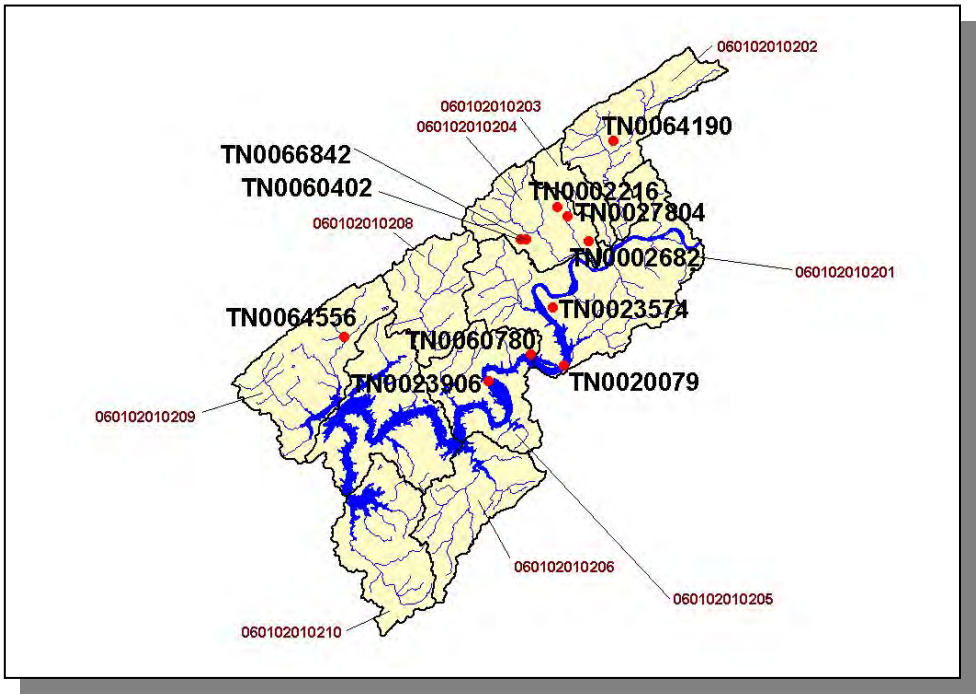



***Figure 4-26. Location of NPDES Dischargers to Water Bodies Listed on the 1998 303(d) List in Subwatershed 0601020102.*** *Subwatershed 060102010201, 060102010202, 060102010203, 060102010204, 060102010205, 060102010206, 060102010207, 060102010208, 060102010209, and 060102010210 boundaries are shown for reference. More information is provided in Fort Loudoun -Appendix IV.*

| PERMIT # | 1Q10 | 3Q10 | 7Q10 | 3Q20 | QDESIGN |
|---|---|---|---|---|---|
| TN0002216 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01636 |
| TN0002682 | | | | 0.00 | |
| TN0020079 | 30.70 | 31.93 | 33.74 | 28.31 | 10.00000 |
| TN0023574 | 807.90 | 1182.76 | 1577.01 | 1092.28 | 10.80000 |
| TN0023906 | 807.90 | 1182.76 | 1577.01 | 1092.28 | 0.02500 |
| TN0027804 | | | | 2.78 | 0.07800 |
| TN0060402 | | | | | 0.00220 |
| TN0060780 | | | | | 0.01200 |
| TN0064190 | | | | 0.71 | 0.00040 |
| TN0064556 | | | | 0.00 | 0.00040 |
| TN0066842 | | | | 0.00 | |

***Table 4-14. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020102.*** *Data are in million gallons per day (MGD). Data were obtained from the USGS publication Flow Duration and Low Flows of Tennessee Streams Through 1992 or from permit files.*

| PERMIT # | TSS | $BOD_5$ | OIL and GREASE | P | Al |
|---|---|---|---|---|---|
| TN0002682 | X | X | X | | |
| TN0023574 | | | | X | |
| TN0060402 | | | | | X |

***Table 4-15. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020102.*** *TSS, Total Suspended Solids; $BOD_5$, Biochemical Oxygen Demand (5-Day).*

| PERMIT # | pH | $NH_3$ | Ag | Al | B | Cd | Cu | Mn | Pb | Zn | TRC | SETTLEABLE SOLIDS | TSS | DO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TN0002216 | X | | | | | | | | | | | X | X | |
| TN0002682 | X | | | | | | | | | | | | | |
| TN0020079 | X | X | | | | | | | | | X | X | X | X |
| TN0023574 | X | | | | | | | | | | X | X | X | X |
| TN0023906 | X | | | | | | | | | | X | X | X | X |
| TN0027804 | X | | X | X | X | X | X | X | X | X | | | X | |
| TN0060402 | X | | | | | | | | | | | X | X | |
| TN0060780 | X | | | | | | | | | | X | X | X | X |
| TN0064190 | X | | | | | | | | X | | | | X | |
| TN0064556 | X | | | | | | | | X | X | | X | X | |
| TN0066842 | X | | | | | | | | | | | X | X | |

***Table 4-16a. Inorganic Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020102.*** *TRC, Total Residual Chlorine; TSS, Total Suspended Solids; DO, Dissolved Oxygen.*

| PERMIT # | FECAL | $CBOD_5$ | WET | $BOD_5$ |
|---|---|---|---|---|
| TN0020079 | X | X | X | |
| TN0023574 | X | | X | X |
| TN0023906 | X | | | X |
| TN0027804 | | | X | |
| TN0060402 | | | X | |
| TN0060780 | X | | | X |
| TN0064190 | | | X | |
| TN0064556 | X | | | X |

***Table 4-16b. Biological Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020102.*** *$CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); WET, Whole Effluent Toxicity; $BOD_5$, Biochemical Oxygen Demand (5-Day).*

| PERMIT # | OIL and GREASE | BENZENE | ETHYL BENZENE | TOLUENE | XYLENE |
|---|---|---|---|---|---|
| TN0002216 | X | X | X | X | X |
| TN0027804 | X | | | | |
| TN0060402 | X | X | X | X | X |
| TN0064190 | X | X | X | X | X |
| TN0064556 | X | X | X | X | X |
| TN0066842 | X | X | X | X | X |

***Table 4-16c. Organic Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 0601020102.***

4.2.B.iii. Nonpoint Source Contributions.

| LIVESTOCK (COUNTS) | | | | | | |
|---|---|---|---|---|---|---|
| Beef Cow | Cattle | Milk Cow | Chickens | Chickens Sold | Hogs | Sheep |
| | | | | | | |
| 5,057 | 10,323 | 503 | 14 | 0 | 273 | 204 |

Table 4-17. Summary of Livestock Count Estimates in Subwatershed 0601020102. *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) |
| | | | | |
| Blount | 165.5 | 69.9 | 1.8 | 9.3 |
| Knox | 127.5 | 127.0 | 2.2 | 8.2 |
| Loudon | 62.3 | 62.3 | 1.1 | 3.5 |
| **Total** | **355.3** | **259.2** | **5.1** | **21.0** |

***Table 4-18. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0601020102.***

| CROPS | TONS/ACRE/YEAR |
|---|---|
| Legume/Grass (Hayland) | 0.20 |
| Grass (Hayland) | 0.15 |
| Legume (Hayland) | 0.77 |
| Forest Land (Grazed) | 0.00 |
| Forest Land (Not Grazed) | 0.00 |
| Corn (Row Crops) | 4.92 |
| Soybeans (Row Crops) | 15.54 |
| Tobacco (Row Crops) | 2.98 |
| Wheat (Close Grown Cropland) | 4.69 |
| Oats (Close Grown Cropland) | 0.32 |
| Grass (Pastureland) | 0.72 |
| Grass, Forbs, Legumes (Mixed Pasture) | 0.40 |
| Other Land in Farms (Other Farmland) | 0.14 |
| Non Agricultural Land Use | 0.00 |
| Farmsteads and Ranch Headquarters | 0.20 |

***Table 4-19. Annual Estimated Total Soil Loss in Subwatershed 0601020102.***

# CHAPTER 5

## WATER QUALITY PARTNERSHIPS IN THE FORT LOUDOUN LAKE WATERSHED



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

- Partnerships between agencies
- Partnerships between agencies and landowners

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

## 5.2. FEDERAL PARTNERSHIPS.

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

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

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

| CONSERVATION PRACTICE | TOTAL |
|---|---|
| Comprehensive Nutrient Management Plans (Number) | 2 |
| Conservation Buffers (Acres) | 29 |
| Erosion Reduction (Tons/Year) | 19,191 |
| Inventory and Evaluations (Number) | 17 |
| Irrigation Management (Acres) | 0 |
| Nutrient Management (Acres) | 1,753 |
| Pest Management (Acres) | 2,690 |
| Prescribed Grazing (Acres) | 994 |
| Residue Management (Acres) | 1,240 |
| Tree and Shrub Practices (Acres) | 1,099 |
| Waste Management (Number) | 3 |
| Wetlands Created, Restored, or Enhanced (Acres) | 0 |
| Wildlife Habitat (Acres) | 1,596 |

***Table 5-1. Landowner Conservation Practices in Partnership with NRCS in the Fort Loudoun Lake Watershed.*** *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period. More information is provided in Fort Loudoun-Appendix V.*

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

The USGS collects hydrologic data to document current conditions and provide a basis for understanding hydrologic systems and solving hydrologic problems. In Tennessee, the USGS records streamflow continuously at more than 89 gaging stations equipped with recorders and makes instantaneous measurements of streamflow at many other locations. Ground-water levels are monitored Statewide, and the physical, chemical, and biologic characteristics of surface and ground waters are analyzed. USGS activities also include the annual compilation of water-use records and collection of data for National baseline and water-quality networks. National programs conducted by the USGS include the National Atmospheric Deposition Program (http://bqs.usgs.gov/acidrain/), National Stream Quality Accounting Network (http://water.usgs.gov/nasqan/), and the National Water-Quality Assessment Program (http://water.usgs.gov/nawqa/).

USGS Water Resources Information on the Internet. Real-time and historical streamflow, water levels, and water-quality data at sites operated by the Tennessee District can be accessed at http://waterdata.usgs.gov/tn/nwis/nwis. Data can be retrieved by county, hydrologic unit code, or major river basin using drop-down menus. Contact Donna Flohr at (615) 837-4730 or dfflohr@usgs.gov for specific information about streamflow data.

Recent publications by the USGS staff in Tennessee can be accessed by visiting http://tn.water.usgs.gov/pubpg.html. This web page provides searchable bibliographic information to locate reports and other products about specific areas.

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

*Endangered Species Program.* Through the Endangered Species Program, the Service consults with other federal agencies concerning their program activities and their effects on endangered and threatened species. Other Service activities under the Endangered Species Program include the listing of rare species under the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.) and the recovery of listed species. Once listed, a species is afforded the full range of protections available under the ESA, including prohibitions on killing, harming or otherwise taking a species. In some instances, species listing can be avoided by the development of Candidate Conservation Agreements, which may remove threats facing the candidate species, and funding efforts such as the Private Stewardship Grant Program. For a complete listing of endangered and threatened species in the Ft. Loudon 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 which 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 Fort Loudoun watershed.

MONITORING

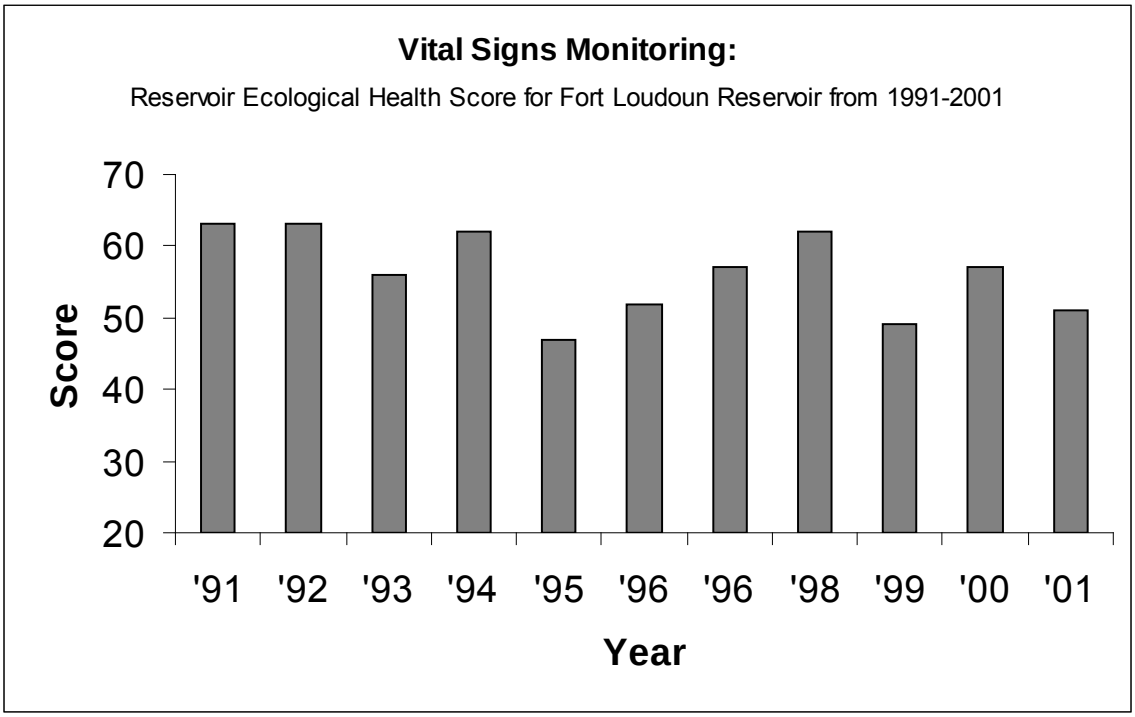
*Vital Signs Monitoring*

*Reservoir Monitoring*: TVA has monitored the quality of water resources of Fort Loudoun 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 Fort Loudoun Dam (TRM 605.5), at mid-reservoir (TRM 624.6), and at the inflow station downstream of the confluence of the Holston and French Broad Rivers (TRM 652).

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 Fort Loudoun Reservoir Vital Signs scores for each year for which data are comparable. Overall ecological health rating was poor in most years. High chlorophyll concentration and low diversity and abundance of benthic

macroinvertebrates contributed to these poor ratings. Dissolved oxygen at the forebay station rated poor in low-flow years (1995, 1999, and 2001). Sediment analysis indicated elevated levels of arsenic, chlordane, and PCBs in 2001. As can be seen in the chart below, ecological health has tended to decline since sampling began in 1991. Meteorological conditions and related changes in reservoir flows associated with the recent drought may account for this decline in reservoir health. Reservoir Vital Signs samples were collected again in 2002, however results are not yet available.



*Bacteriological sampling:* Twelve sites on Fort Loudoun Reservoir were sampled ten times each for fecal coliform bacteria in 2002. All 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 |
|---|---|---|
| Ft. Loudoun Day Use Area Beach | TRM 602.4 R | swim |
| Lenoir City Park Beach | TRM 602.7R | swim |
| Yarberry Peninsula Boat Ramp | TRM 604.5L | boat ramp |
| Little Turkey Creek Fishing Pier | TRM 616.5R | boat ramp |
| Concord Marina (boat dock) | TRM 617.1R | boat ramp |
| Willow Point Marina | TRM 637L | boat ramp |
| Poland Creek Recreation Area Swim Site | TRM 620.0L | swim |
| Gallager Creek Boat Ramp | TRM 612L | boat ramp |
| Admiral Farragut Park | TRM 622.2R | swim |
| Louisville Park Beach | TRM 625.4L | swim |
| Concord Park Beach (the Cove) | TRM 616.5R | swim |
| Maloney Road Park | TRM 638.9 L | boat ramp |

Swimming beaches are sampled every year and boat ramps every other 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 advises against eating catfish from Fort Loudoun Reservoir because of PCB contamination. The state has also issued an advisory against eating largemouth bass weighing more than two pounds and against eating largemouth bass caught in the Litter River embayment. TVA collects channel catfish from the middle section of Fort Loudoun Reservoir annually and fillets are analyzed for selected pesticides and PCBs. Results are provided to state agencies for appropriate action. In the fall of 2002, channel catfish and largemouth bass were collected from the upper, middle and lower sections of Fort Loudoun Reservoir. Catfish will be analyzed for an array of contaminants (including pesticides and PCBs). Largemouth bass will be analyzed for mercury. Results of the 2002 analyses are not yet available.

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.* The condition of water resources in Fort Loudoun 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. A total of 53 sites have been sampled in the Fort Loudoun watershed since 1995. These sites are typically sampled every five years to keep a current picture of watershed condition.

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.

The Little River Watershed Association (LRWA) is a citizen based organization formed to protect and improve the Little River's health through community-based improvement and protection activities. TVA has supported the LRWA by providing financial and technical

assistance. For information about LRWA contact Melissa Nance-Richwine at 865-980-2130.

*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. The Little Tennessee Watershed Team assists two inter-agency partnerships, the Little River Water Quality Forum and the Knoxville/Knox County Water Quality Forum (KKWQF), with efforts to improve and protect water resources in the Fort Loudoun 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.

*WaterFest*: WaterFest is an annual festival designed to educate youth about the many values of water. WaterFest was initiated in 1995 by the KKWQF and has grown into an event with hundreds of elementary and middle school children attending from across Knox County.

*Tennessee Growth Readiness Initiative:* The Tennessee Growth Readiness Initiative (TGRI) is an educational program developed by TVA to teach local officials, and other decision makers about the sources and impacts of nonpoint source pollution, how different land uses affect water quality, and what communities can do to protect water quality. The Little River watershed served as the pilot area for TGRI. Funding for development of TGRI was obtained through a 319(h) grant.

## 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. In 2002, TVA provided the Blount County Soil Conservation District with funds to develop a “model farm” in the Ellejoy Creek watershed that demonstrates a variety of BMPs. In the summer of 2003, farmers from throughout the watershed will be invited to a tour of this farm. Presentations describing each BMP will be made during the farm tour.

*Environmental Stewardship Program:* The Environmental Stewardship Program is a cooperatively sponsored cost-share program that allows Knox County organizations and citizens access to professional expertise and funding required to implement environmentally friendly solutions to urban non point pollution problems. These solutions include using vegetation and soil bioengineering to stabilize stream banks and grassy swales to collect stormwater runoff and absorb pollutants. Projects also serve as educational opportunities for landscape professionals, contractors, engineers and public works/utility maintenance crews by illustrating how water quantity and erosion problems can be solved while providing tangible benefits to water quality.

*Support Clean Up Efforts:* River Rescue is a community action event that involves hundreds of volunteers. This annual cleanup covers 50 miles of Tennessee River shoreline. River Rescue is in its 14th year. Over the years, River Rescue has attracted 5623 volunteers who picked up 212 tons of debris and 1572 tires.

Clean, Protect and Restore (CPR) is an annual effort lead by CAC AmeriCorps Water Quality Team in conjunction with its KKWQF partners to remove trash from Knox County's streams. CPR has been held each year since 1995. In total, CPR has removed over 166 tons of trash from Knox County's waterways.

The Friends of First Creek (FOFC) is a community-wide effort to reduce the amount of trash and other pollutants entering First Creek and ultimately the Tennessee River. Over 1500 students and 125 teachers from Gresham Middle, Central High and Fulton High Schools have learned about what it takes to protect the health of their watershed and have helped remove over six tons of trash from First Creek over the past three years. FOFC Creek has also educated restaurant owners and managers on what their businesses can do to help safeguard First Creek. Fifteen restaurants in the First Creek Watershed have joined this program. FOFC was initiated by the Tennessee Valley Authority, City of Knoxville, Keep Knoxville Beautiful, Ijams Nature Center, UT Water Resources Center and the CAC AmeriCorps Water Quality Team.

Little River Appreciation Day (LRAD) is an annual event to raise awareness of the value of the Little River. As part of LRAD, volunteers pick-up trash from the banks of the Little River and its tributaries. LRAD co-sponsored by the LRWA and Keep Blount Beautiful.

*Shoreline stabilization:* Between 2000 and 2002, the Little Tennessee Watershed Team successfully stabilized over 11,000 feet of critically eroding reservoir shoreline. Working closely with cooperators and partners, the team has implemented innovative and cost effective methods for minimizing the erosion from these public lands. 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. It is estimated that through these efforts, approximately 2600 tons of sediment has been kept from entering the reservoir system. Additional stabilization is scheduled for 2003.

*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 Little River Watershed

and the City of Maryville to sponsor a riparian buffer workshop. Packages of 50 of native riparian plant seedlings were distributed to riparian property owners in the Little River 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.

*Integrated Pollution Source Identification System:* Integrated Pollution Source Identification (IPSI) system is a GIS database and set of analysis tools developed by TVA environmental engineers and remote sensing specialist to help plan and implement watershed restoration efforts. IPSI is based on interpretation of color infrared photography. In 2002, IPSI systems were completed for Blount County and the Little River Watershed. This project was made possible by funding from The Tennessee Valley Authority, Blount County, Knox County, and the 319(h) grant program. IPSI is being used to support several ongoing or planned water quality improvement efforts.

Further information on TVA's Watershed Assistance activities in the Fort Loudoun Watershed can be obtained by writing the Little Tennessee Watershed Team at: Tennessee Valley Authority, 804 Highway 321 North (HWY 1A-LCT), Lenoir City, TN 37771-6440 or calling them at 865/988-2420.

**5.2.E.** National Park Service. Great Smoky Mountains National Park (GSMNP) is rich with nearly 3,400 kilometers (2,100 miles) of cool and cold-water stream habitats. Of this total, 1,280 km (800 miles) support a diverse fish community. Large stream systems ($4^{th}$-$5^{th}$ order) support the greatest diversity of fishes in GSMNP, including 12 families and over 60 species. Many of the fish species found in these large stream systems are excellent indicators of natural and anthropogenic environmental impacts. Large stream systems in GSMNP are sampled each fall in an attempt to provide a snapshot of the diversity of habitat and fish species found in the Park's larger stream systems. Backpack electrofishing gear and three-pass depletion estimates are used to evaluate year-class strength, reproductive success, density (# fish/100$m^2$), biomass (kg/ha), and other trend information.

Four of the Park's large stream systems were sampled in 2000: Abrams Creek, Cataloochee Creek, Hazel Creek, and Straight Fork. A comparison of current and historic US Fish and Wildlife Service (USFWS) monitoring data of species composition among these large stream sites has not significantly changed since the early 1970's. Species richness in the Park's large stream systems indicates excellent habitat and water quality conditions in nearly every stream. Elevation and habitat differences among sites account for most of the species variability.

Despite a high degree of annual variation, analysis of monitoring data from 1990-2000 indicates no long-term trends in sensitive species such as trout and dace. Three years of consecutive drought conditions have reduced many populations by as much as 50%, but population and community structures remain stable. In 2000, brown and rainbow trout densities ranged from 1.1-7.0 fish/100$m^2$ (~24-1,352 fish/mile) and 4.1-30.5 fish/100$m^2$ (600-9,112 fish/mile) respectively, throughout GSMNP. Young-of-year (YOY) brown trout comprised between 33-93% brown trout collected in 2000 large stream samples indicating a strong year class for brown trout in GSMNP. However, only 19-

50% of all rainbow trout collected during 2000 were YOY rainbow trout, which is slightly below average for large streams in GSMNP. Annual changes in density and biomass indicate annual variation in these populations is mainly due to abiotic events such as droughts and floods. Young-of-year trout production is indirectly related to the timing and magnitude of severe flood events (>1000 $ft^3$/sec).

Rainbow trout typically live 3-4 years in the Park, while an occasional 5-year-old fish is collected. Historic data indicate annual mortality rates for rainbow trout in GSMNP ranges from 60-70% from ages 1-4. Brown trout typically live 5-8 years with an occasional fish living to 12 years of age. Most rainbow trout average 4-10 inches with an occasional fish reaching 14 inches. Most brown trout average 6-14 inches with an occasional fish reaching 25 to 30 inches and 8-10 pounds.

Smallmouth bass and rock bass biomass continued to increase in Abrams Creek (Figure 5-1) during 2000, indicating these species continue to recover following sediment and flood impacts during the early 1990's. Reduction in sediment inputs appears to be related to streambank restoration and fencing projects (1993-1994) which eliminated cattle access to streams in Cades Cove and reduced erosion. Both species also demonstrated good reproduction in 2000 indicating that sediment which may have previously impacted spawning habitat may have been reduced. Data indicate that many of the riffle species (i.e. darters) which live in areas unaffected by sediment inputs have remained relatively stable throughout the 1990-2000 period.

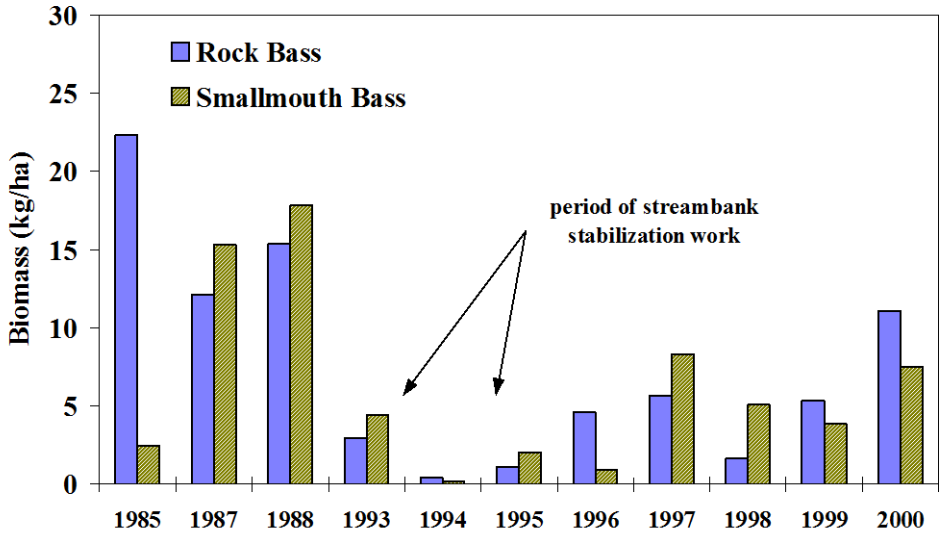



***Figure 5-1. Summary of rock bass and smallmouth bass biomass (kg/ha) from Abrams Creek large stream sampling efforts between 1985 and 2000.*** *Samples were not conducted in 1986 and 1989-1992 due to inadequate funding and manpower. This site was added to the annual monitoring scheme in 1993 to assess streambank stabilization and water quality improvement efforts in Cades Cove. Note that biomass estimates for 1985, 1987, and 1988 are elevated because standardized protocols were not in place resulting in an insufficient number of electrofishing units being used given the size of the stream.*

The aquatic macroinvertebrate component of the Inventory and Monitoring program has been operating in the park since 1992. This aspect of the program is designed to provide data on the health of streams and aquatic biodiversity, and to determine relationships among macroinvertebrates, fishes, and water quality. In addition to this program, the park also is making headway in a comprehensive, systematic inventory of all invertebrates, as well as all other life forms, with the All Taxa Biodiversity Inventory (ATBI). The park's goals are to (a) discover all species in the park, (b) compile natural history information on each species, (c) map species distributions in the park, and (d) organize the information and make it available to the general public as well as the scientific community.

There are an estimated 76,000 species of invertebrates in the park, of which 4,280 currently are known. Aquatic invertebrates are the best-known group since the park has an Inventory and Monitoring component dealing specifically with them. Other invertebrate groups have received attention from specialists and therefore have distributional and other ecological data compiled for them. However, excluding the aquatic fauna, very few of the park's invertebrate distributions are known and most groups are not even at the simple "checklist" stage.

For aquatic macroinvertebrates, annual stream samples are collected from 27 permanent sites to permit comparisons of the health of these sites from year to year. Annual samples are taken from another 15 sites on a rotating basis to provide wider coverage of streams in the park. Complete coverage of the more then 3,400 km (2,100 miles) of streams in the park is a long-term objective.

Biotic Index (BI) values, which are based on species tolerance values and abundance class, have been calculated for each site. Tolerance values are determined in large-scale studies of species in a range of water quality conditions. A species that is found only in pristine, unpolluted water is considered intolerant, whereas a species that occurs in polluted waters is considered tolerant. A value is assigned that ranges from zero (most intolerant) to ten (most tolerant). The combined values are summed over all species and converted to a site value. Over the years (1992-2001), there has been a tendency for the BI to remain stable or, in some cases, increase (improve) which probably signifies increased sampling efficiency. EPT (Ephemeroptera, Plecoptera, Trichoptera) indices also have been calculated, and generally are very similar to the BI or occasionally higher. Final Rapid Bioassessment scores for each site, based on BI and EPT values, have generally been in the 'good' to 'excellent' categories, except in areas with Anakeesta rock formations (pyritic slate) or in mine drainage areas.

Analysis of monitoring data for aquatic invertebrates reveals a continuing rapid increase in the number of new taxa encountered each year. Over the years, a total of nearly 500 taxa has been documented in streams and the species accumulation curve is still climbing, indicating that there are many more taxa yet to be encountered. Many of the threats affecting the integrity of the park as a whole, such as nitrate deposition, directly affect native invertebrates. Park streams are subject to runoff from precipitation that deposits some of the highest total nitrate and sulfate levels in the nation. A single storm may acidify streams at high elevations in the park by more than a full pH unit. Thus, the biota of streams are subject to high levels of pollution, and the impaired health of these streams will be seen in the responses of the aquatic biota. As intolerant species are

replaced by tolerant species, the trend in the biotic index will begin to slant downward. Such trends may be among the earliest indications of biotic effects of pollution in aquatic ecosystems in the park.

Thousands of species of invertebrates in the park remain undiscovered and undescribed. With the inception of the ATBI, many will be discovered, and a tremendous amount of additional data will be accumulated. Doubtless many invertebrate species have been (and will continue to be) affected by extensive and/or intensive threats. The ATBI will provide the knowledge necessary to make better-informed management decisions in the effort to preserve the greatest number of resources. Although there is a widespread belief among park visitors that all information is known about species in the park, sustained inventory work and the continuation of long-term monitoring programs over a period of years will be necessary to reach that level of knowledge.

For more information on biological monitoring, contact the Great Smoky Mountains National Park at grsm_smokies_information@nps.gov.

## 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.

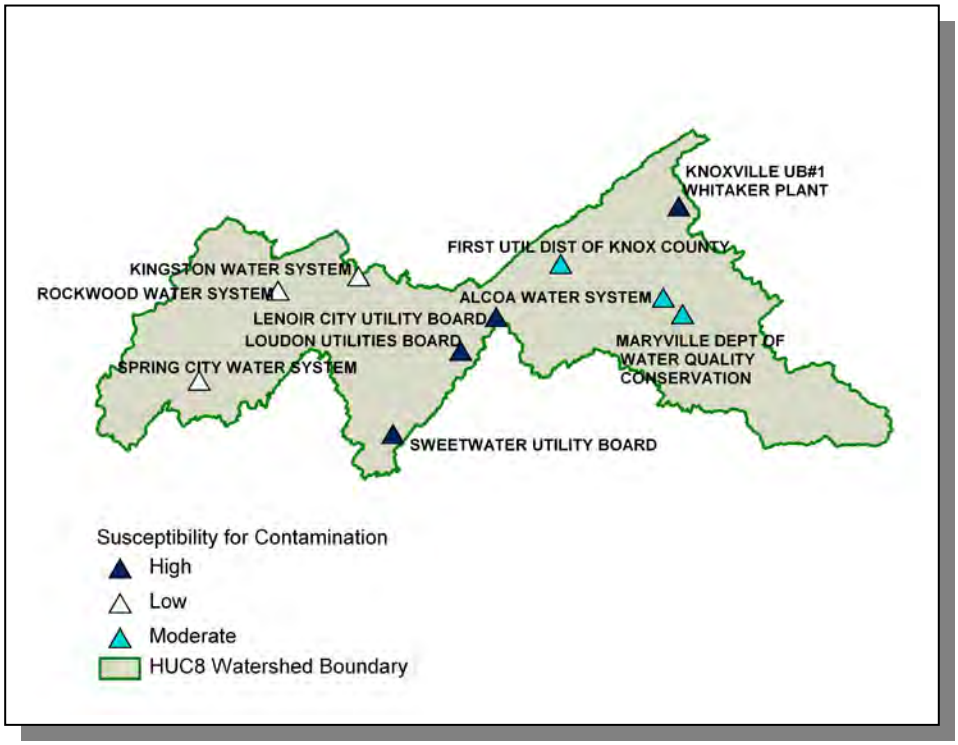



*Figure 5-2. Susceptibility for Contamination in the Ft. Loudon/Watts Bar Lake Watershed.*

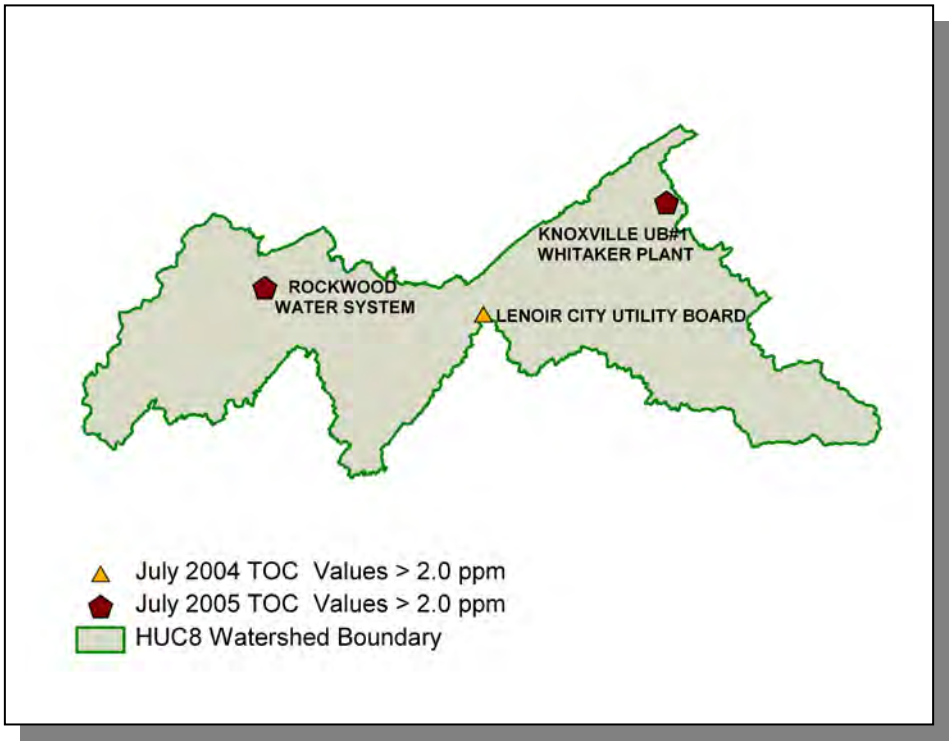



*Figure 5-3. July 2004 and 2005 Raw Water Total Organic Carbon (TOC) Analysis in the Ft. Loudon/Watts Bar Lake Watershed.*

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.

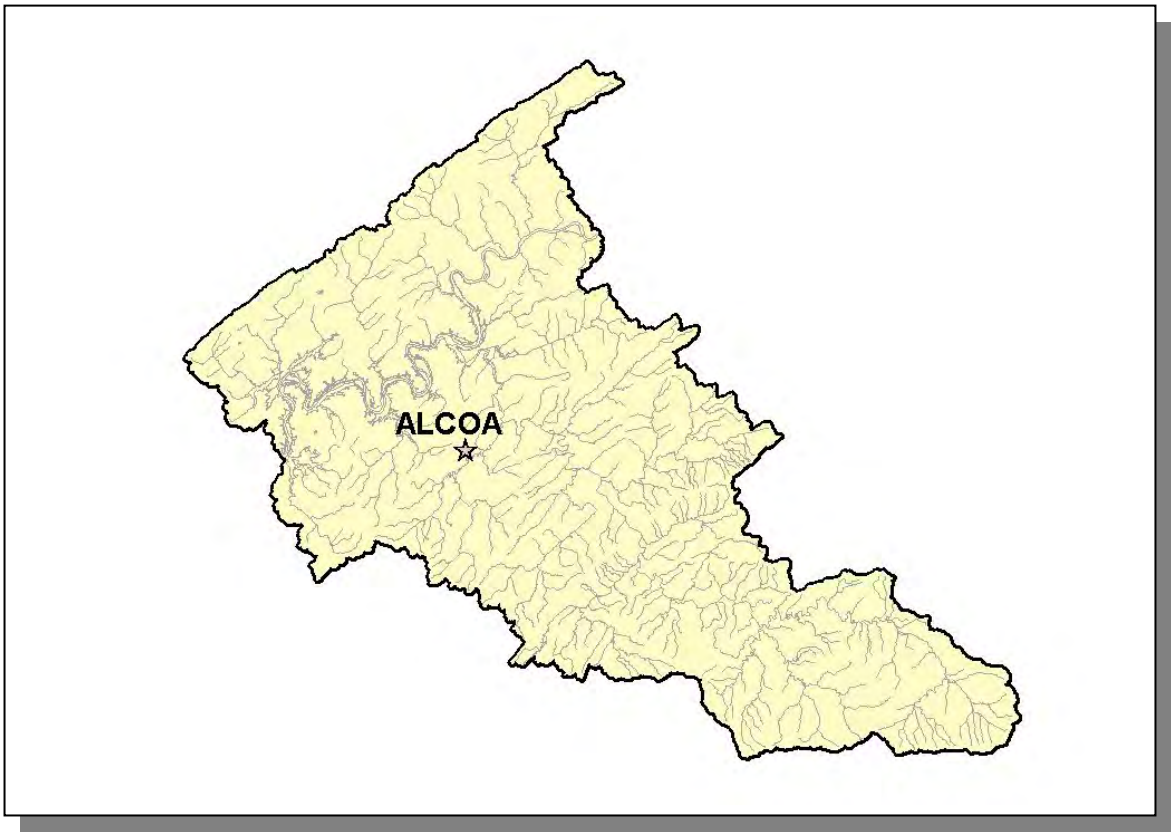



***Figure 5-4. Location of Communities Receiving SRF Loans or Grants in the Group 2 Portion of the Fort Loudoun Lake Watershed.*** *More information is provided in Fort Loudoun-Appendix V.*

**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 Fort Loudoun 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 C9994674-98-1, 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

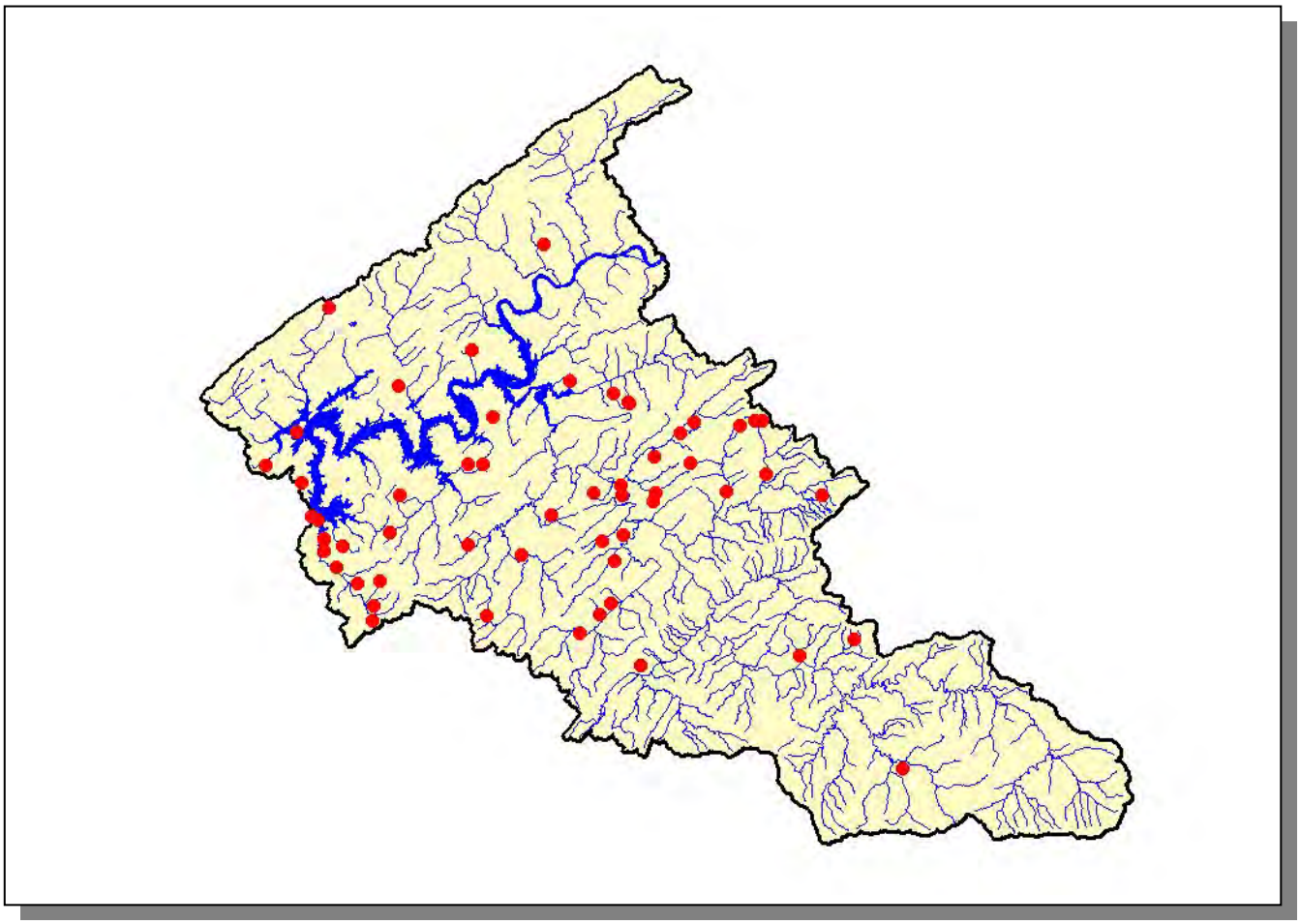


***Figure 5-5. Location of BMPs installed from 1999 through 2002 in the Group 2 Portion of the Fort Loudoun Lake Watershed with Financial Assistance from the Tennessee Department of Agriculture's Nonpoint Source and Agricultural Resources Conservation Fund Grant Programs.***

## 5.4. LOCAL INITIATIVES.

**5.4.A.** Tennessee Izaak Walton League. The Tennessee Izaak Walton League has been working for clean water, wildlife and public lands since its founding in 1977. In June, 2000 offices were established on the Knoxville Waterfront, staffed by seven full time professional staff. We also employ several part time employees and utilize the services of student interns from area universities and colleges while managing a base of more than 400 volunteers. Our goals are centered around finding solutions to problems caused by trash and debris, silt and sewage that impact the waters of an eight county region served by our Clean Water Center. Five of these counties, Jefferson, Sevier, Knox, Blount and Loudon are in the Fort Loudoun Lake Watershed.

We work closely and in cooperation with citizens, corporations, city, county, state and federal agencies and other conservation/environmental organizations. Our working policy is to avoid conflict, work behind the scene taking a common sense approach to finding solutions to water quality problems. Although we do real work on a daily basis, we also focus on providing a bridge between citizens and corporations or governmental agencies and function as a catalyst to foster cleaner water.

We participate in the annual River Rescue sponsored by Ijams Nature Center. Last year, we recovered 120 tires and some 100 bags of trash along with many other large items off the lakeshore at Craigs Cove.

*Facility:* We maintain fully equipped, seven room, office and a 20X70 foot boat slip, with three work boats and six canoes at the Volunteer Landing Marina on Knoxville's Waterfront. All staff have computers that are networked to a high speed laser black and white printer and a high definition color printer. We have full mapping services provided to us by the City of Knoxville and TVA.

*Staff:* We have seven degreed professionals each of whom is responsible for a division of our work, is assigned the lead on various projects, and is assisted by other staff members from which teams are built to accomplish certain aspects of each project. Full time staff, and areas of expertise, are an Executive Director (Nelson Ross), Director of Operations (Alicia Kelley), Water Resources Project Manager (Ben Ramsbottom), Wildlife and Riparian Specialist (Mark Campen), Education Director and Wetlands Specialist (Dana Ball), Fisheries Biologist and Stream Ecologist (Robert Sain), and Erosion Control Specialist (Robert Toole).

*Funding:* We are funded through grants from foundations, counties, cities, state and federal agencies; supplemented by private donations.

*Watershed Focus:* Our clean water focus in the Fort Loudoun Lake Watershed is on trash and debris, sewage and silt. Here is a brief description of the nature of the work we do in each area:

*Trash and Debris:* We have been tracking the flow of trash and debris into Fort Loudoun Lake since 1997, established the First Creek First study in 1999 to do a concentrated study of trash flow from urban streams. We have observed and recorded the flow of woody debris into the lake since 2000.

The First Creek First Study developed a data base for nine categories of trash based on the standards used by Keep America Beautiful. We found that the flow of trash can be reduced significantly from streams into lakes by concentrating on litter control at sites where roads cross are proximal to the water. Also, by using a series of floating skimmers across the stream successfully collects floating trash so it can be extracted using dip nets with extended poles. Combined with litter education programs using this information and techniques, stream litter can be controlled, if addressed on a weekly basis. We have observed that annual litter clean ups, although important, seem to have little effect on the amount of trash entering lakes from streams.

Observations of the floating woody debris have revealed a pattern of many very large trees, some with foliage, entering the lake and causing considerable problems related to boat damage, clogging docks and coves and generally creating a nuisance to water recreation. We have found that major sources of these trees, in order of impact, are streambank erosion in the Holston River, lake shoreline erosion, residual action of raising and lowering of lake levels that redistribute logs collected historically in the lake and streambank erosion in the French Broad River. In addition, large mats of smaller woody debris washes in from the upper reach of the lake where the two rivers come together. Our work crews deal with these problems by identifying areas of river streambank erosion that can be improved, pulling floating trees from the lake and securing them to shore. We use these trees not only for shoreline erosion control, but as a way to attract fish. In constructing the latter we work inside the permitting required by the Corps of Engineers and the Tennessee Valley Authority and with the landowner's approval. We remove litter from the large floating mats of woody debris and break them into smaller masses, when possible.

*Sewage:* Many area streams listed on the 303(d) list as “Not Supporting” have sewage impacts listed as a major pollution source. We have developed the expertise needed to monitor Sanitary Sewage Overflows (SSO's), collect related data and document the location, amount of flow, time of flow and the stream impacted by the sewage. In reporting this information, we deal with utilities, TDEC, EPA, City and County agencies who have a responsibility to respond and correct the problem. We do not report these SSO's to the media. However, we do counsel citizens about the nature of the impact and advise them on actions they may want to take related to the problem.

*Silt:* Siltation causes the most pollution to the watershed. It comes from agriculture, construction and the erosion of streambanks and lakeshore. We have staff trained in erosion control who report problem locations that are illegal to the proper regulatory agency and track the enforcement action. Also, we offer erosion control services to contractors who request assistance.

Our first objective is erosion prevention. To do this, we have discussions with developers and contractors prior to construction activities. Second, we educate the public about the need to report dirty water or soil washing into stormdrains from construction sites. Streambank and lake shoreline erosion projects are trigered by observations made by staff or as they are reported by citizens. Restoration of these sites are done under grant or private funding as separate projects. Currently (early 2003) we have seven sites being serviced. One is a cooperative effort with Trout Unlimited, Tennessee Wildlife Resources Agency, Tennessee Valley Authority and others on the Clinch River below Norris Dam Tailwaters. Another is on Williams Creek in Knoxville, funded by a grant

from the Tennessee Department of Agriculture, Nonpoint Source Program (EPA 319 money). Citizen education is a major element in protecting and restoring streambank and shoreline erosion. The Tennessee Wildlife Resources Agency provides some annual funds that allow us to provide service in citizen education type programs.

*General Information:* In addition to the above activity, we remove dead cattle and other animals that interfere with water recreation or create health risks, and monitor water for containers or leaks of toxic waste. In addition, we track abandoned sunken boats and illegally docked and facilitated houseboats in the rivers and lake, reporting them to the agency responsible for enforcement. Wildlife study and observation is promoted as a key to understanding ecology and the effects of water pollution on wildlife. We are contracted to do an Index of Biotic Integrity (IBI) on seven urban streams in the City of Knoxville and use each report to guide future rehabilitation and education projects. Our Education Director has active programs with schools on wetland study and conservation and our Wildlife Specialist, has developed a program called "Birds and the Trees" that teaches citizens about the relationship between birds, trees and water. We also promote birdhouse construction to help teach that bird ecosystems along riparian zones are essential to good water quality.

*Concluding Comments:* Although we believe that addressing water quality problems through the watershed approach is the best way to improve and protect water quality, more emphasis needs to be placed on growing the number of organizations involved. The needs are just too great to be served by the relatively few demonstration projects that are out there. Neither funding nor staffing is the problem in doing this. We feel that promoting sustainability, uniformly, is where water quality comes up short. All of us must find a way, together, to get this job done or we will continue to fight a major losing battle for clean water.

More information is available on the Tennessee Izaak Walton League web site at:

http://www.tnike.com

**5.4.B.** Little River Watershed Association. The Little River Watershed Association was formed in 1998 to bring together people with common interests in the river--those who:

- live by the river
- enjoy the river for recreation and scenic beauty
- treasure the river's rich historical value
- depend on the river for their livelihood
- study and teach about the river, and
- make decisions that impact the river

The Little River Watershed Association is a non-profit organization with the mission *to protect, preserve, and enhance the Little River and its tributaries through mobilizing public support, building public awareness and promoting best management practices*. The key aims of the Association are to promote educational activities that benefit the river and the watershed; to focus attention on efforts to protect the river; to distribute current information to the community; and to assist citizens in taking positive action.

The Association's activities include:

- An educational program delivered in area schools
- Presentations to school, church, and community groups
- Hosting public forums and "expert" panel discussions
- Co-sponsoring native plant workshops
- Organizing a Spring river cleanup
- Managing an educational multi-media kiosk that travels to area businesses and public places throughout the watershed
- Assisting local, state and federal agencies and other groups working to protect the Little River
- Hosting canoe trips along the river for area government & business leaders
- Participating in the National RiverSmart media campaign
- Participating in stream bank planting projects along Alcoa & Maryville's Greenway
- Hosting the annual Little River Awareness Day

The Little River Watershed Association is a volunteer citizen's organization open to anyone sharing the aims of the organization. The Association receives technical guidance from water quality professionals who participate in the Little River Water Quality Forum. Currently staffed by two part-time workers, the Little River Watershed Association offices are located at 1004 East Lamar Alexander Parkway, Maryville, Tennessee 37804.

Voice: 865-980-2130
Fax: 865-980-2129
E-mail: littleriverwatershed@hotmail.com
Web: http://www.littleriverwatershed.org

**5.4.C.** Blount County Planning Commission. The Blount County Planning Commission adopted a county-wide Water Quality Plan April 24, 2003. The Plan contains both policies and an implementation agenda which were developed after extensive public participation. The Blount County Planning Department conducted 22 citizen input workshops at community sites throughout the county in support of the plan. A total of 189 citizens participated fully in the workshops. The County Commission also appointed a Citizen Advisory Committee to aid on formulation of the Plan

The planning process and particularly the workshops were supported by an education module developed for the Tennessee Growth Readiness project of the Tennessee Valley Authority and the Tennessee Department of Agriculture. Blount County was a pilot community for testing the education module. The planning process was also supported by research under the Integrated Pollution Source Identification project by the Tennessee Valley Authority.

A copy of the Blount County Water Quality Plan can be accessed at http://www.blount.state.tn.us/planning/ along with results of the citizen input workshops. For more information, contact Mr. John Lamb at planning@mail.blount.state.tn.us.

# CHAPTER 6

## FUTURE DIRECTIONS IN THE FORT LOUDOUN LAKE WATERSHED



### 6.1. BACKGROUND.

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

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

This Chapter addresses point and nonpoint source approaches to water quality problems in the Fort Loudoun 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 Fort Loudoun Lake Watershed public meeting was held April 8, 1997 in Maryville. 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

- The Watershed Approach affecting permits up for renewal
- Continuing development effects on the Little River
- Effects of water removal (for drinking water)
- Nonpoint source pollution

6.2.B. Year 3 Public Meeting. The second Fort Loudoun Lake Watershed public meeting was held July 27, 1999 in Townsend City Hall. 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 Fort Loudoun Lake Watershed public meeting was held October 27, 2003 at Heritage High School in cooperation with the Little River Watershed Association. The meeting featured nine 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
- Citizen Group Displays (Little River Watershed Association, Izaak Walton League, Stock Creek Watershed, Trout Unlimited)
- University of Tennessee display
- Blount County SCD display
- 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.

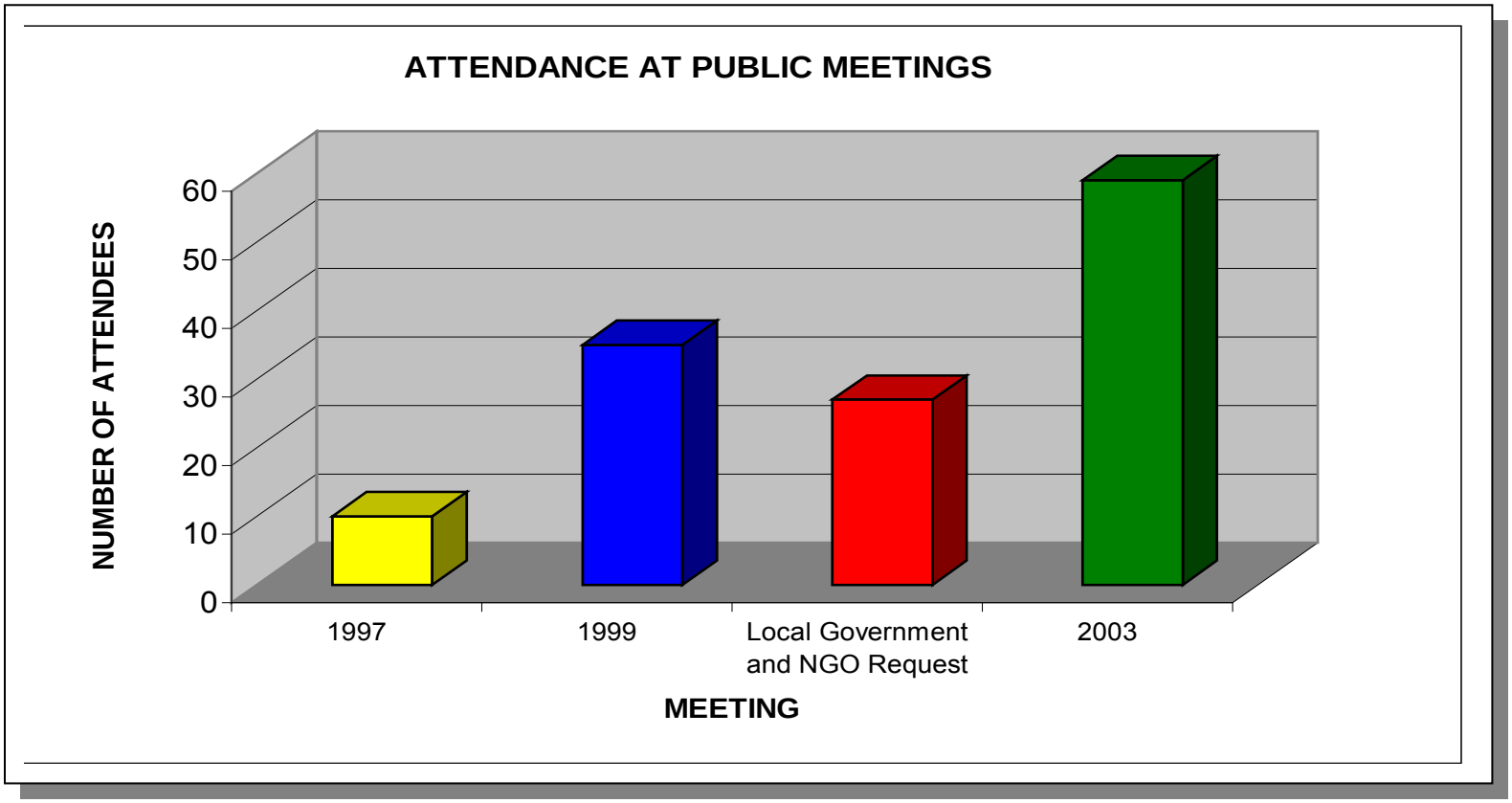



***Figure 6-1. Attendance at Public Meetings in the Fort Loudoun Lake Watershed.*** *Attendance numbers do not include TDEC personnel. The 2003 meeting was held in cooperation with the Little River Watershed Association.*

***Figure 6-2. The SmartBoard™ is an effective interactive tool to teach citizens about the power of GIS (Photo courtesy of Melissa Nance-Richwine/Little River Watershed Association).***


***Figure 6-3. The Stock Creek Watershed display is typical of the displays set up by local partners.*** *The Watershed Approach encourages and fosters local partnerships in the watershed.*

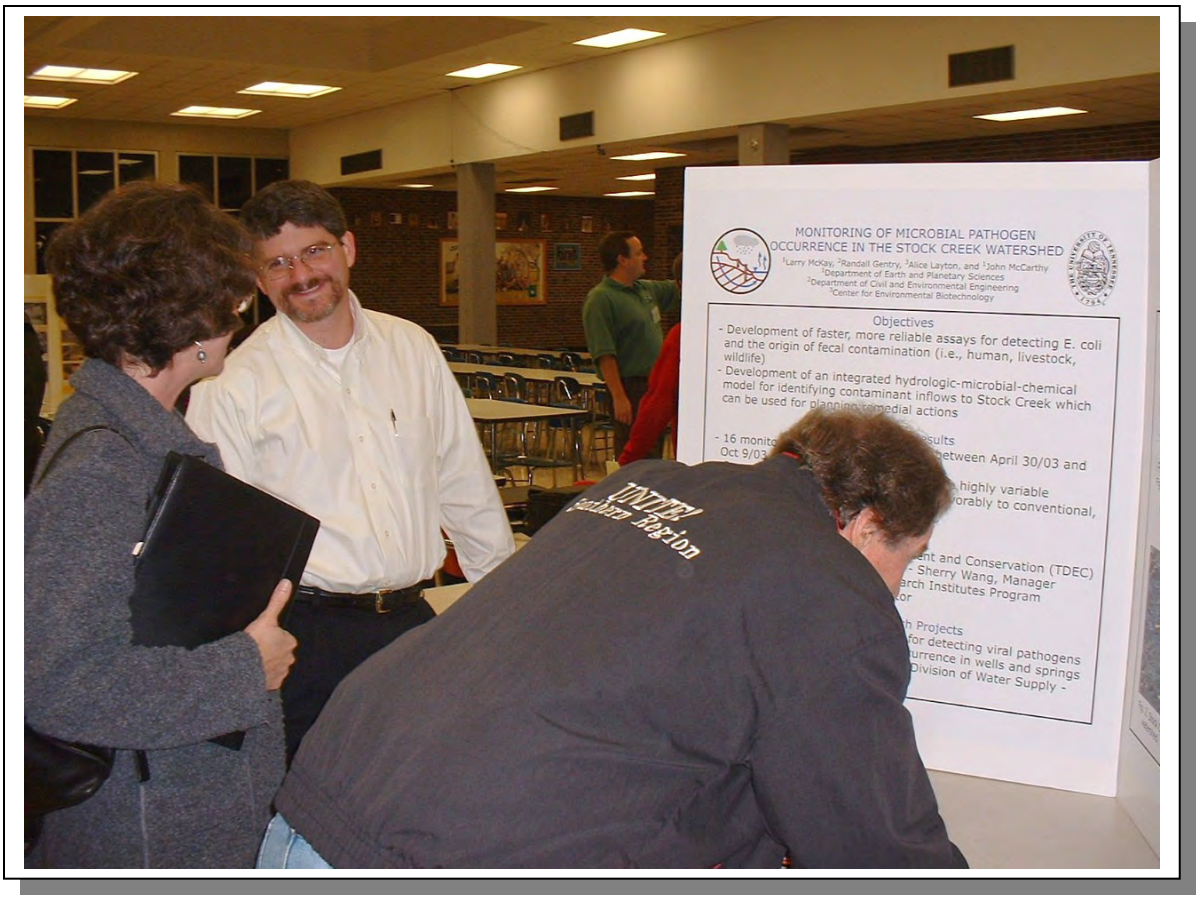



***Figure 6-4. Universities, like the University of Tennessee, are important partners in the watershed approach, and use the watershed meetings to communicate their activities to the public.***

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

Approved TMDLs:

**First, Creek, Second Creek, Third Creek, and Goose Creek TMDL.** TMDL for fecal coliform in the Fort Loudoun Lake Watershed approved February 11, 2003: http://www.state.tn.us/environment/wpc/FtLoudF2.pdf

**Baker Creek, Williams Creek, and Fourth Creek TMDL.** TMDL for fecal coliform in the Fort Loudoun Lake Watershed approved February 13, 2003: http://www.state.tn.us/environment/wpc/FtLd2F1.pdf

TMDLs are prioritized for development based on many factors.

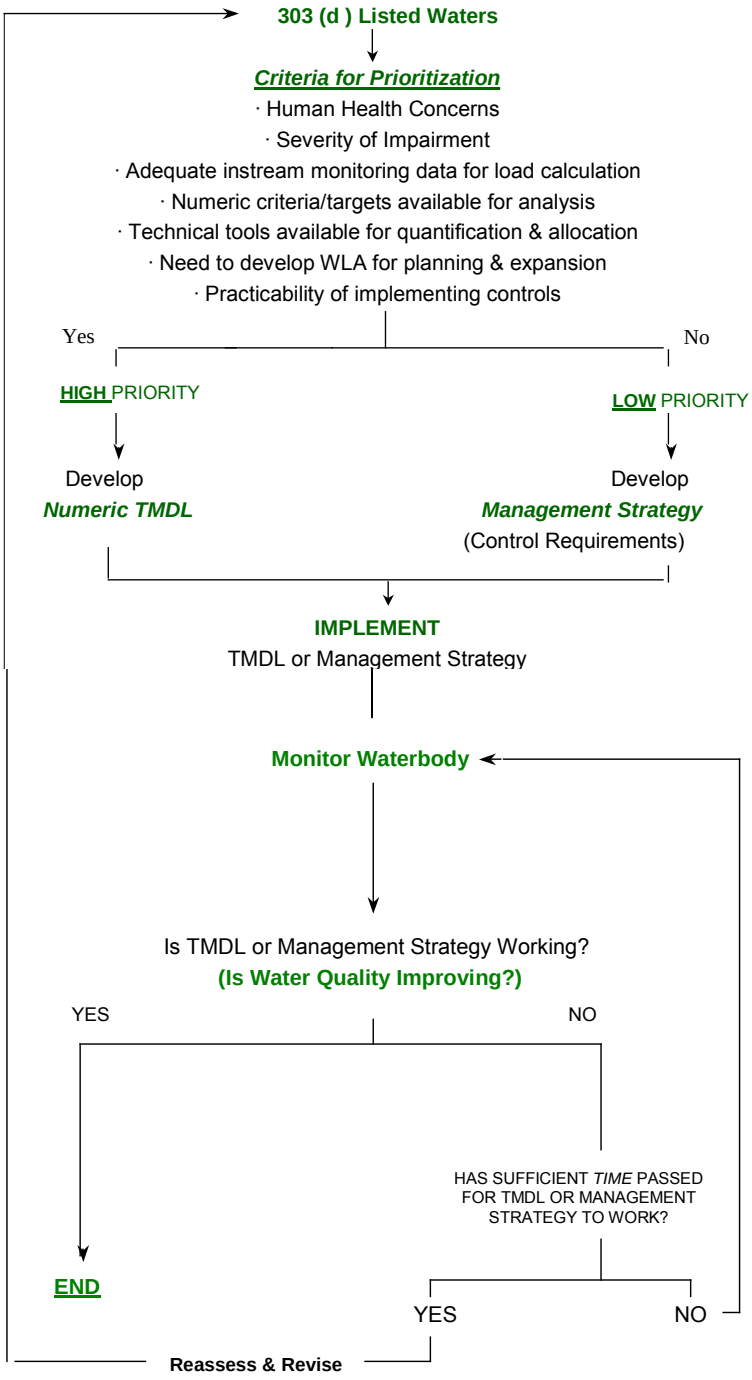



***Figure 6.5. Prioritization scheme for TMDL Development.***

## 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 Fort Loudoun 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. Examples in the Fort Loudoun Lake Watershed are Third Creek and Knox County and Russell Branch in Blount County. 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.

The same requirements apply to sites in the drainage of high quality waters. Little River and Double Branch in Blount County are examples of high quality streams in Fort Loudoun Lake Watershed.

6.3.B.i.b. From Channel and/or Bank Erosion. Due to the past alteration of Fourth Creek and Nails Creek, and other Fort Loudoun Lake tributaries, the channels are unstable. Several agencies are working to stabilize portions of stream banks. These include NRCS and the Tennessee Valley Authority, as well as watershed citizen groups. Other methods or controls that might be necessary to address common problems are:

*Voluntary activities*

- Re-establishment of bank vegetation (examples: Nails Creek).
- Establish off channel watering areas for cattle by moving watering troughs and feeders back from stream banks (examples: tributaries of Ellejoy Creek and Nails Creek).
- Limit cattle access to streams and bank vegetation (examples: Ellejoy Creek and Nails Creek).

*Additional strategies*

- Better community planning for the impacts of development on small streams (example: Stock Creek).
- Restrictions requiring post-construction run-off rates to be no greater than pre-construction rates in order to avoid in-channel erosion, (examples: First Creek, Third Creek, and other Knox County urban 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 which states that normal agricultural and silvicultural practices which 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. Any timber harvest in the Fort Loudoun Lake Watershed are small and isolated.

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. Nails Creek, for example, has already had several BMPs installed to address the sediment lost from fields in this watershed.

## 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 Knoxville Environmental Assistance Center 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: tributaries of Ellejoy Creek).
- Limiting livestock access to streams (examples: Ellejoy Creek).
- Proper management of animal waste from feeding operations.

### *Enforcement strategies*

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

### *Additional strategies*

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

### 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*

- Educate homeowners and lawn care companies in the proper application of fertilizers.
- Encourage landowners, developers, and builders to leave stream buffer zones (examples of streams that could benefit are the Third Creek, Brown Creek, Turkey Creek, and areas along stream channels). 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 (example: Flat Fork).
- 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 (this has been done on Third Creek and other Knoxville urban streams).
- Sponsoring community clean-up days (this has already benefited First Creek, Fourth Creek, and Fort Loudoun Lake.
- 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 Sequoyah Hills park along Fort Loudoun Lake has had long segments bioengineered using matting and tree plantings to revegetate).
- 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.

*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 active plant permit holders in the Fort Loudon 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 Ft. Loudon Lake*.

## 6.4.A. Municipal Permits

### TN0026271 Friendsville Elementary School

**Discharger rating:** Minor
**City:** Friendsville
**County:** Blount
**EFO Name:** Knoxville
**Issuance Date:** 10/31/02
**Expiration Date:** 10/31/07
**Receiving Stream(s):** Gallagher Creek at mile 3.5
**HUC-12:** 060102010201
**Effluent Summary:** Treated domestic wastewater from Outfall 001
**Treatment system:** Extended aeration

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| TSS | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |

***Table 6-1. Permit Limits for Friendsville Elementary School.***

***EFO Comments:***
None.

## TN0028177 Ritta School Waste Water Treatment Plant

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 10/30/03
**Expiration Date:** 10/30/08
**Receiving Stream(s):** Tennessee River Mile 651.5
**HUC-12:** 060102010202
**Effluent Summary:** Treated domestic wastewater from Outfall 001
**Treatment system:** Extended aeration

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| TSS | All Year | 45 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | Monthly | Grab | Effluent |

***Table 6-2. Permit Limits for Ritta School Waste Water Treatment Plant.***

***EFO Comments:***
None.

## TN0022349 Great Smoky Mountains National Park - Elkmont Camp Ground

**Discharger rating:** Minor
**City:** Gatlinburg
**County:** Sevier
**EFO Name:** Knoxville
**Issuance Date:** 4/30/02
**Expiration Date:** 4/29/07
**Receiving Stream(s):** Little River at mile 49.6
**HUC-12:** 060102010101
**Effluent Summary:** Treated domestic wastewater from Outfall 001
**Treatment system:** WAS to aerobic dig to drybeds to hauler to compost site.

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| BOD5 | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| D.O. | All Year | 1 | DMin Conc | mg/L | Weekdays | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | 2/Month | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | 2/Month | Grab | Effluent |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | 2/Week | Grab | Effluent |
| TRC | All Year | 2 | DMax Conc | mg/L | Weekdays | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Week | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Week | Grab | Effluent |

***Table 6-3. Permit Limits for Elkmont Camp Ground.***

***EFO Comments:***
None

## TN0022594 Tremont Institute

**Discharger rating:** Minor
**City:** Townsend
**County:** Sevier
**EFO Name:** Knoxville
**Issuance Date:** 8/30/02
**Expiration Date:** 8/29/07
**Receiving Stream(s):** Middle Prong Little River at mile 2.5
**HUC-12:** 060102010102
**Effluent Summary:** Treated domestic wastewater from Outfall 001
**Treatment system:** extended aeration

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | 45 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| BOD5 | All Year | 30 | MAvg Conc | mg/L | Monthly | Grab | Effluent |
| D.O. | All Year | 1 | DMin Conc | mg/L | Weekdays | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | Monthly | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | Monthly | Grab | Effluent |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | 2/Week | Grab | Effluent |
| TRC | All Year | 2 | DMax Conc | mg/L | Weekdays | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Week | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Week | Grab | Effluent |

***Table 6-4. Permit Limits for Tremont Institute.***

## TN0023353 First Utility District of Knox County - Turkey Creek STP

**Discharger rating:** Major
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 10/31/02
**Expiration Date:** 2/28/07
**Receiving Stream(s):** Ft. Loudoun Reservoir
**HUC-12:** 060102010207
**Effluent Summary:** Treated municipal wastewater from Outfall 001
**Treatment system:** WAS, belt press, land application.

| | |
|---|---|
| **Segment** | TN06010201020_1000 |
| **Name** | Fort Loudoun Reservoir |
| **Size** | 14600 |
| **Unit** | Acres |
| **First Year on 303(d) List** | 1990 |
| **Designated Uses** | Irrigation (Supporting), Livestock Watering and Wildlife (Supporting), Domestic Water Supply (Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Supporting), Recreation (Non-Supporting) |
| **Causes** | Polychlorinated biphenyls |
| **Sources** | Contaminated Sediments |

***Table 6-5. Stream Segment Information for Turkey Creek STP.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Ammonia as N (Total) | All Year | | MAvg Conc | mg/L | 2/Month | Composite | Effluent |
| BOD % removal | All Year | 40 | DMin % Removal | Percent | Daily | Calculated | % Removal |
| BOD % removal | All Year | 85 | MAvg % Removal | Percent | Daily | Calculated | % Removal |
| BOD5 | All Year | 45 | DMax Conc | mg/L | Daily | Composite | Effluent |
| BOD5 | All Year | 30 | WAvg Conc | mg/L | Daily | Composite | Effluent |
| BOD5 | All Year | 40 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| BOD5 | All Year | 5004 | DMax Load | lb/day | Daily | Composite | Effluent |
| BOD5 | All Year | 3753 | MAvg Load | lb/day | Daily | Composite | Effluent |
| Bypass of Treatment (occurrences) | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Wet Weather |
| D.O. | All Year | 5 | DMin Conc | mg/L | Daily | Grab | Effluent |
| Dissolved Solids, Total (TDS) | All Year | | MAvg Conc | mg/L | 2/Month | Composite | Effluent |
| Escherichia coli | All Year | 126 | MAvg Geo Mean | #/100mL | Daily | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | Daily | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | Daily | Grab | Effluent |
| NOEL 7day Ceriodaphnia Dubia | All Year | 2 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| NOEL 7day Fathead Minnows | All Year | 2 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| Nitrite + Nitrate Total (as N) | All Year | | MAvg Conc | mg/L | 2/Month | Composite | Effluent |

***Table 6-6a.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Nitrogen Organic Total (as N) | All Year | | MAvg Conc | mg/L | 2/Month | Composite | Effluent |
| Nitrogen Total (as N) | All Year | | MAvg Conc | mg/L | 2/Month | Calculated | Effluent |
| Overflow Use Occurences | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Wet Weather |
| Overflow Use Occurences | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Non Wet Weather |
| Phosphate Ortho (as PO4) | All Year | | MAvg Conc | mg/L | 2/Week | Composite | Effluent |
| Phosphorus, Total | All Year | | MAvg Conc | mg/L | 2/Month | Composite | Effluent |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | Daily | Composite | Effluent |
| TKN - Total Kjeldahl Nitrogen | All Year | | MAvg Conc | mg/L | 2/Month | Composite | Effluent |
| TOC | All Year | | MAvg Conc | mg/L | 2/Week | Composite | Effluent |
| TRC | All Year | 1.7 | DMax Conc | mg/L | Daily | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 30 | WAvg Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 40 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 5004 | DMax Load | lb/day | Daily | Composite | Effluent |
| TSS | All Year | 3753 | MAvg Load | lb/day | Daily | Composite | Effluent |
| TSS % Removal | All Year | 40 | DMin % Removal | Percent | Daily | Calculated | % Removal |
| TSS % Removal | All Year | 85 | MAvg % Removal | Percent | Daily | Calculated | % Removal |
| pH | All Year | 9 | DMax Conc | SU | Daily | Grab | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | Daily | Grab | Effluent |

***Table 6-6b.***

***Table 6-6a-b. Permit Limits for Turkey Creek STP.***

### *Compliance History:*

The following exceedences were noted in PCS:

- 9 Settleable Solids
- 4 BOD
- 4 Suspended Solids % Removal
- 8 TSS
- 2 Dissolved Oxygen
- 3 Escherichia coli
- 5 Fecal Coliform
- 105 Overflows
- 20 Bypasses

### *Enforcement History:*

Commissioner's Order # 02-0824
Database Notes: *STATE ORDER SUPERCEDED BY FEDERAL CONSENT ORDER SIGNED - COMPLIANCE WILL BE TRACKED BY EPA.*
Order issued for collection system overflows during '01 and '02. Requires extensive "MOMs" corrective action.
OGC received petition to intervene from city of Knoxville on 3/17/03.
Submitted documentation of funding on-going public awareness/education program. KUB funded Ijams program for $61,131 in July '03.

SSOER submitted 9/15/03. Public Information/Public Input Plan received 11/18/03.
WPC sent letter 12/10/03 withholding approval of SORP until comments on the plan have been addressed.
Summary of the elements of KUB's MOM program received 2/13/04.
Notice that CAP had been implemented on May 20, 2004.
Revised SSOER submitted 9/30/04, and approved on 10/21/04.
Received the following:
4/5/05 - Operations Record Keeping Program for Waste Water Treatment Plants,
4/5/05 - Comprehensive Performance Evaluation (CPE) Program,
4/6/05 - List of authorized sewer connections or increases in flow from existing connections that have not yet been introduced into the WCTS.
4/7/05 - Revised Sewer Overflow Response Plan (SORP),
4/14/05 - Private Lateral Legal Support Program
Documentation of payment of $150,000 to the SEP escrow account received 9/9/05.

***EFO Comments:***
First Utility is planning a plant expansion.

## TN0023574 KUB- Fourth Creek STP

**Discharger rating:** Major
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 4/30/04
**Expiration Date:** 4/29/07
**Receiving Stream(s):** Tennessee River Mile 640
**HUC-12:** 060102010201
**Effluent Summary:** Treated municipal wastewater from Outfall 001
**Treatment system:** Primary and WAS pumped to Kuwahee Sewage Treatment Plant

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD % removal | All Year | 40 | DMin % Removal | Percent | Daily | Calculated | % Removal |
| BOD % removal | All Year | 85 | MAvg % Removal | Percent | Daily | Calculated | % Removal |
| BOD5 | All Year | 45 | DMax Conc | mg/L | Daily | Composite | Effluent |
| BOD5 | All Year | 30 | WAvg Conc | mg/L | Daily | Composite | Effluent |
| BOD5 | All Year | 40 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| BOD5 | All Year | 3603 | DMax Load | lb/day | Daily | Composite | Effluent |
| BOD5 | All Year | 2702 | MAvg Load | lb/day | Daily | Composite | Effluent |
| D.O. | All Year | 1 | DMin Conc | mg/L | Daily | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | Daily | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | Daily | Grab | Effluent |
| IC25 7day Ceriodaphnia Dubia | All Year | 1.6 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| IC25 7day Fathead Minnows | All Year | 1.6 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | Daily | Composite | Effluent |
| TRC | All Year | 1 | DMax Conc | mg/L | Weekdays | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 30 | WAvg Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 40 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 3603 | DMax Load | lb/day | Daily | Composite | Effluent |
| TSS | All Year | 2702 | MAvg Load | lb/day | Daily | Composite | Effluent |
| TSS % Removal | All Year | 40 | DMin % Removal | Percent | Daily | Calculated | % Removal |
| TSS % Removal | All Year | 85 | MAvg % Removal | Percent | Daily | Calculated | % Removal |
| pH | All Year | 9 | DMax Conc | SU | Weekdays | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Weekdays | Grab | Effluent |

***Table 6-7. Permit Limits for KUB- Fourth Creek STP.***

### *Compliance History:*

The following exceedences were noted in PCS:

- 4 Settleable Solids
- 8 BOD
- 4 Suspended Solids % Removal
- 11 TSS

- 1 Fecal coliform.
- 39 Overflows
- 28 Bypasses

***Enforcement History:***
Commissioner's Order # 02-0824
Database Notes: *STATE ORDER SUPERCEDED BY FEDERAL CONSENT ORDER SIGNED - COMPLIANCE WILL BE TRACKED BY EPA.*
Order issued for collection system overflows during '01 and '02. Requires extensive "MOMs" corrective action.
OGC received petition to intervene from city of Knoxville on 3/17/03.
Submitted documentation of funding on-going public awareness/education program. KUB funded Ijams program for $61,131 in July '03.
SSOER submitted 9/15/03. Public Information/Public Input Plan received 11/18/03.
WPC sent letter 12/10/03 withholding approval of SORP until comments on the plan have been addressed.
Summary of the elements of KUB's MOM program received 2/13/04.
Notice that CAP had been implemented on May 20, 2004.
Revised SSOER submitted 9/30/04, and approved on 10/21/04.
Received the following:
4/5/05 - Operations Record Keeping Program for Waste Water Treatment Plants,
4/5/05 - Comprehensive Performance Evaluation (CPE) Program,
4/6/05 - List of authorized sewer connections or increases in flow from existing connections that have not yet been introduced into the WCTS.
4/7/05 - Revised Sewer Overflow Response Plan (SORP),
4/14/05 - Private Lateral Legal Support Program
Documentation of payment of $150,000 to the SEP escrow account received 9/9/05.

## TN0023582 KUB- Kuwahee STP

**Discharger rating:** Major
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 4/30/04
**Expiration Date:** 4/29/07
**Receiving Stream(s):** Tennessee River Mile 646.2
**HUC-12:** 060102010201
**Effluent Summary:** Treated municipal wastewater from Outfall 001
**Treatment system:** Primary & WAS to anaerobic digesters, filter press, land application

| | |
|---|---|
| **Segment** | TN06010201020_1000 |
| **Name** | Fort Loudoun Reservoir |
| **Size** | 14600 |
| **Unit** | Acres |
| **First Year on 303(d) List** | 1990 |
| **Designated Uses** | Irrigation (Supporting), Livestock Watering and Wildlife (Supporting), Domestic Water Supply (Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Supporting), Recreation (Non-Supporting) |
| **Causes** | Polychlorinated biphenyls |
| **Sources** | Contaminated Sediments |

***Table 6-8. Stream Segment Information for KUB-Kuwahee STP.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Ammonia as N (Total) | Summer | 10 | DMax Conc | mg/L | Daily | Composite | Effluent |
| Ammonia as N (Total) | Summer | 5 | WAvg Conc | mg/L | Daily | Composite | Effluent |
| Ammonia as N (Total) | Summer | 7.5 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| Ammonia as N (Total) | Summer | 2502 | DMax Load | lb/day | Daily | Composite | Effluent |
| Ammonia as N (Total) | Summer | 1668 | MAvg Load | lb/day | Daily | Composite | Effluent |
| Ammonia as N (Total) | Winter | 25 | DMax Conc | mg/L | Daily | Composite | Effluent |
| Ammonia as N (Total) | Winter | 15 | WAvg Conc | mg/L | Daily | Composite | Effluent |
| Ammonia as N (Total) | Winter | 205 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| Ammonia as N (Total) | Winter | 6672 | DMax Load | lb/day | Daily | Composite | Effluent |
| Ammonia as N (Total) | Winter | 5004 | MAvg Load | lb/day | Daily | Composite | Effluent |
| CBOD % Removal | All Year | 40 | DMin % Removal | Percent | Daily | Calculated | % Removal |
| CBOD % Removal | All Year | 85 | MAvg % Removal | Percent | Daily | Calculated | % Removal |
| CBOD5 | All Year | 40 | DMax Conc | mg/L | Daily | Composite | Effluent |
| CBOD5 | All Year | 35 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| CBOD5 | All Year | 25 | DMin Conc | mg/L | Daily | Composite | Effluent |
| CBOD5 | All Year | 11676 | DMax Load | lb/day | Daily | Composite | Effluent |
| CBOD5 | All Year | 8340 | MAvg Load | lb/day | Daily | Composite | Effluent |
| D.O. | All Year | 1 | DMin Conc | mg/L | Daily | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | Daily | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | Daily | Grab | Effluent |

***Table 6-9a.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| IC25 7day Ceriodaphnia Dubia | All Year | 5 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| IC25 7day Fathead Minnows | All Year | 5 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | Daily | Composite | Effluent |
| TRC | All Year | 0.6 | DMax Conc | mg/L | Daily | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 40 | MAvg Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 30 | WAvg Conc | mg/L | Daily | Composite | Effluent |
| TSS | All Year | 13344 | DMax Load | lb/day | Daily | Composite | Effluent |
| TSS | All Year | 10008 | MAvg Load | lb/day | Daily | Composite | Effluent |
| TSS % Removal | All Year | 40 | DMin % Removal | Percent | Daily | Calculated | % Removal |
| TSS % Removal | All Year | 85 | MAvg % Removal | Percent | Daily | Calculated | % Removal |
| pH | All Year | 9 | DMax Conc | SU | Daily | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Daily | Grab | Effluent |

***Table 6-9b.***

***Tables 6-9a-b. Permit Limits for KUB-Kuwahee STP.***

***Compliance History:***
The following exceedences were noted in PCS:

- 14 Settleable Solids
- 1 Ammonia
- 2 CBOD
- 3 Suspended Solids % Removal
- 18 TSS
- 5 Fecal Coliform.
- 285 Overflows
- 68 Bypasses

**Enforcement:**
Commissioner's Order # 02-0824
Database Notes: *STATE ORDER SUPERCEDED BY FEDERAL CONSENT ORDER SIGNED - COMPLIANCE WILL BE TRACKED BY EPA.*
Order issued for collection system overflows during '01 and '02. Requires extensive "MOMs" corrective action.
OGC received petition to intervene from city of Knoxville on 3/17/03.
Submitted documentation of funding on-going public awareness/education program. KUB funded Ijams program for $61,131 in July '03.
SSOER submitted 9/15/03. Public Information/Public Input Plan received 11/18/03.
WPC sent letter 12/10/03 withholding approval of SORP until comments on the plan have been addressed.
Summary of the elements of KUB's MOM program received 2/13/04.
Notice that CAP had been implemented on May 20, 2004.
Revised SSOER submitted 9/30/04, and approved on 10/21/04.
Received the following:
4/5/05 - Operations Record Keeping Program for Waste Water Treatment Plants,
4/5/05 - Comprehensive Performance Evaluation (CPE) Program,

4/6/05 - List of authorized sewer connections or increases in flow from existing connections that have not yet been introduced into the WCTS.
4/7/05 - Revised Sewer Overflow Response Plan (SORP),
4/14/05 - Private Lateral Legal Support Program
Documentation of payment of $150,000 to the SEP escrow account received 9/9/05.

## TN0023906 Peninsula Psychiatric Hospital

**Discharger rating:** Minor
**City:** Louisville
**County:** Blount
**EFO Name:** Knoxville
**Issuance Date:** 4/30/04
**Expiration Date:** 4/29/07
**Receiving Stream(s):** Tennessee River (Fort Loudon Reservoir) at mile 632.0
**HUC-12:** 060102010205
**Effluent Summary:** Treated domestic wastewater from Outfall 001
**Treatment system:** Sludge to hauler to Maryville Sewage Treatment Plant

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| BOD5 | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| D.O. | All Year | 1 | DMin Conc | mg/L | Weekdays | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | 2/Month | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | 2/Month | Grab | Effluent |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | 2/Week | Grab | Effluent |
| TRC | All Year | 2 | DMax Conc | mg/L | Weekdays | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Week | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Week | Grab | Effluent |

***Table 6-10. Permit Limits for Peninsula Psychiatric Hospital***

***EFO Comments:***
None.

## TN0020079 Maryville Sewage Treatment Plant

**Discharger rating:** Major
**City:** Louisville
**County:** Blount
**EFO Name:** Knoxville
**Issuance Date:** 3/31/03
**Expiration Date:** 3/30/08
**Receiving Stream(s):** Outfall 001 to mile 637 of the Tennessee River; Outfall 002 to mile 5 of the Little River Embayment
**HUC-12:** 060102010201
**Effluent Summary:** Treated municipal wastewater from Outfalls 001 and 002
**Treatment system:** WAS to vacfilt to limestab to land appl

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Bypass of Treatment (occurrences) | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Wet Weather |
| CBOD % Removal | All Year | 40 | DMin % Removal | Percent | 3/Week | Calculated | % Removal |
| CBOD % Removal | All Year | 85 | MAvg % Removal | Percent | 3/Week | Calculated | % Removal |
| CBOD5 | All Year | 40 | DMax Conc | mg/L | 3/Week | Composite | Effluent |
| CBOD5 | All Year | | DMax Conc | mg/L | 3/Week | Composite | Influent (Raw Sewage) |
| CBOD5 | All Year | 25 | DMin Conc | mg/L | 3/Week | Composite | Effluent |
| CBOD5 | All Year | 35 | MAvg Conc | mg/L | 3/Week | Composite | Effluent |
| CBOD5 | All Year | | DMin Conc | mg/L | 3/Week | Composite | Influent (Raw Sewage) |
| CBOD5 | All Year | 2919 | DMax Load | lb/day | 3/Week | Composite | Effluent |
| CBOD5 | All Year | 2085 | MAvg Load | lb/day | 3/Week | Composite | Effluent |
| D.O. | All Year | 3 | DMin Conc | mg/L | Weekdays | Grab | Effluent |
| Escherichia coli | All Year | 126 | MAvg Geo Mean | #/100mL | 3/Week | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | 3/Week | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | 3/Week | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Daily | Continuous | Effluent |
| Flow | All Year | | MAvg Load | MGD | Daily | Continuous | Influent (Raw Sewage) |
| Flow | All Year | | MAvg Load | MGD | Daily | Continuous | Effluent |
| Flow | All Year | | DMax Load | MGD | Daily | Continuous | Influent (Raw Sewage) |
| NOEL 7day Ceriodaphnia Dubia | All Year | 1.25 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| NOEL 7day Fathead Minnows | All Year | 1.25 | DMin Conc | Percent | Quarterly | Composite | Effluent |
| Overflow Use Occurences | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Wet Weather |
| Overflow Use Occurences | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Non Wet Weather |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | 3/Week | Composite | Effluent |
| TRC | All Year | 1.5 | DMax Conc | mg/L | Weekdays | Grab | Effluent |

***Table 6-11a.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| TRC | All Year | 1.5 | DMax Conc | mg/L | Weekdays | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | 3/Week | Composite | Effluent |
| TSS | All Year | 30 | WAvg Conc | mg/L | 3/Week | Composite | Effluent |
| TSS | All Year | | DMax Conc | mg/L | 3/Week | Composite | Influent (Raw Sewage) |
| TSS | All Year | 40 | MAvg Conc | mg/L | 3/Week | Composite | Effluent |
| TSS | All Year | | MAvg Conc | mg/L | 3/Week | Composite | Influent (Raw Sewage) |
| TSS | All Year | 3336 | DMax Load | lb/day | 3/Week | Composite | Effluent |
| TSS | All Year | 2502 | MAvg Load | lb/day | 3/Week | Composite | Effluent |
| TSS % Removal | All Year | 40 | DMin % Removal | Percent | Weekdays | Calculated | % Removal |
| TSS % Removal | All Year | 85 | MAvg % Removal | Percent | Weekdays | Calculated | % Removal |
| pH | All Year | 9 | DMax Conc | SU | Weekdays | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Weekdays | Grab | Effluent |

***Table 6-11b.***

***Tables 6-11a-b. Permit Limits for Maryville STP (Outfall 001).***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| 48hr LC50: Ceriodaphnia Dubia | All Year | 16 | DMin Conc | Percent | Monthly | Grab | Effluent |
| 48hr LC50: Fathead Minnows | All Year | 16 | DMin Conc | Percent | Monthly | Grab | Effluent |
| Ammonia as N (Total) | Summer | 2 | MAvg Conc | mg/L | 1/Discharge | Composite | Effluent |
| Ammonia as N (Total) | Winter | 5 | MAvg Conc | mg/L | 1/Discharge | Composite | Effluent |
| Bypass of Treatment (occurrences) | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Wet Weather |
| CBOD % Removal | All Year | 40 | DMin % Removal | Percent | 1/Discharge | Calculated | % Removal |
| CBOD5 | Summer | 10 | MAvg Conc | mg/L | 1/Discharge | Composite | Effluent |
| CBOD5 | Winter | 25 | MAvg Conc | mg/L | 1/Discharge | Composite | Effluent |
| D.O. | All Year | | DMax Conc | mg/L | 1/Discharge | Grab | Effluent |
| D.O. | All Year | 6 | DMin Conc | mg/L | 1/Discharge | Grab | Effluent |
| Fecal Coliform | All Year | 200 | DMax Conc | #/100mL | 1/Discharge | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | 1/Discharge | Continuous | Effluent |
| Overflow Use Occurences | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Wet Weather |
| Overflow Use Occurences | All Year | | MAvg Load | Occurences/Month | Continuous | Visual | Non Wet Weather |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | 1/Discharge | Composite | Effluent |
| TRC | All Year | 0.4 | DMax Conc | mg/L | 1/Discharge | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | 1/Discharge | Composite | Effluent |
| TSS % Removal | All Year | 40 | DMin % Removal | Percent | 1/Discharge | Calculated | % Removal |
| pH | All Year | 9 | DMax Conc | SU | 1/Discharge | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 1/Discharge | Grab | Effluent |

***Tables 6-12. Permit Limits for Maryville STP (Outfall 002).***

***Compliance History:***
The following exceedences were noted in PCS:

- 2 Settleable Solids
- 8 Ammonia
- 5 CBOD
- 2 Suspended Solids % Removal
- 4 TSS
- 1 Fecal coliform
- 15 Escherichia coli
- 3 Chlorine
- 2 Dissolved Oxygen
- 123 Overflows
- 5 Bypasses

***Enforcement:***
Commissioner's Order #06-0185
Database notes: City of Maryville is a municipality in Blount County that operates a wastewater treatment plant and the associated collection system in Maryville, TN. This Order addresses several violations of the Water Quality Control Act. These violations include, but are not limited to, discharges of wastewater from Waste Water Treatment Plant in excess of NPDES permit. This Order requires the Respondent to submit for approval a CAP/ER for the Waste Water Treatment Plant, submit an SORP, implement the approved plans and make no system connections until the WPC Director allows. 09/08/06 Capacity evaluation received.
10/18/06 Received Quarterly sewer flow readings report.
11/29/06 Municipal Facilities Section sent Maryville a letter acknowledging receipt of the Waste Water Treatment Plant capacity evaluation report.

***EFO Comments:***
STP is at 96% capacity. A Commissioner's Order was issued addressing these issues.

## TN0060780 Duncan's Landing

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 2/11/04
**Expiration Date:** 1/31/07
**Receiving Stream(s):** Fort Loudoun Lake (Tennessee River) at mile 635
**HUC-12:** 060102010205
**Effluent Summary:** Treated domestic wastewater from Outfall 001
**Treatment system:** Activated sludge

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| BOD5 | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| D.O. | All Year | 1 | DMin Conc | mg/L | Weekdays | Grab | Effluent |
| Escherichia coli | All Year | 126 | MAvg Geo Mean | #/100mL | Weekly | Grab | Effluent |
| Fecal Coliform | All Year | 1000 | DMax Conc | #/100mL | 2/Month | Grab | Effluent |
| Fecal Coliform | All Year | 200 | MAvg Geo Mean | #/100mL | 2/Month | Grab | Effluent |
| Settleable Solids | All Year | 1 | DMax Conc | mL/L | 2/Week | Grab | Effluent |
| TRC | All Year | 2 | DMax Conc | mg/L | Weekdays | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Week | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Week | Grab | Effluent |

***Tables 6-13. Permit Limits for Duncan's Landing.***

***EFO Comments:***
None.

## 6.4.B. Industrial Permits

### TN0064556 USDA - Pilot Travel Centers, LLC #270

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 8/31/05
**Expiration Date:** 6/28/07
**Receiving Stream(s):** Unnamed tributary to Turkey Creek at mile 4.2
**HUC-12:** 06010201 (Ft. Louden Lake)
**Effluent Summary:** Treated bay-wash wastewater from Outfall 001, storm water runoff from Outfall 002, and a UST remediation discharge (air stripping tower treating groundwater) from Outfall 01A.
**Treatment system:** Oil water separator for outfalls' 001 (bay-wash wastewater discharge) and 002 (stormwater discharge), air stripping tower for outfall 01A (UST remediation discharge)

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| BOD5 | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Benzene | All Year | 0.1 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Escherichia coli | All Year | 126 | MAvg Geo Mean | #/100mL | 2/Month | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Weekly | Estimate | Effluent |
| Flow | All Year | | MAvg Load | MGD | Weekly | Estimate | Effluent |
| Methylene Blue Active Substances (MBAS) | All Year | | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Methylene Blue Active Substances (MBAS) | All Year | | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Oil and Grease Visual | All Year | | DMax Load | YES=1 NO=0 | 2/Week | Visual | Effluent |
| Pb (T) | All Year | 0.03 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | 2/Month | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Zn (T) | All Year | 0.12 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Month | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Month | Grab | Effluent |

***Tables 6-14. Permit Limits for USDA - Pilot Travel Centers, LLC #270 (Outfall 001).***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Benzene | All Year | 0.005 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Ethylbenzene | All Year | 0.01 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Flow | All Year | 0.1 | DMax Conc | MGD | Weekly | Estimate | Effluent |
| Flow | All Year | | DMax Load | MGD | Weekly | Estimate | Effluent |
| Toluene | All Year | 0.01 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Xylene | All Year | 0.01 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | | DMax Conc | SU | 2/Month | Grab | Effluent |

***Tables 6-15. Permit Limits for USDA - Pilot Travel Centers, LLC #270 (Outfall 01B).***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | 50 | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| Benzene | All Year | | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| Escherichia coli | All Year | 126 | MAvg Geo Mean | #/100mL | Semi-annually | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Semi-annually | Estimate | Effluent |
| Methylene Blue Active Substances (MBAS) | All Year | | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| Settleable Solids | All Year | | DMax Conc | mL/L | Semi-annually | Grab | Effluent |
| TSS | All Year | 200 | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| Zn (T) | All Year | | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| pH | All Year | | DMax Conc | SU | Semi-annually | Grab | Effluent |

***Tables 6-16. Permit Limits for USDA - Pilot Travel Centers, LLC #270 (Outfall SW1).***

***Compliance History:***
The following exceedences were noted in PCS:

- 20 Settleable Solids
- 4 TSS
- 15 BOD
- 9 Oil and Grease
- 5 Escherichia coli
- 21 Fecal coliform
- 5 Toulene
- 35 Zinc
- 15 Benzene
- 3 Ethylbenzene.

***Enforcement:***
Commissioner's Order #05-0188
Database Notes: Pilot Travel Centers, LLC operates 3 NPDES permitted facilities. 2 in Knox Co., and 1 in Davidson Co. Multiple NPDES violations-mostly TSS, Fecal, and Zinc. Few Benzene and BOD5. Order addresses all 3 facilities.

## TN0065081 Alcoa, Inc. - South Plant

**Discharger rating:** Major
**City:** Alcoa
**County:** Blount
**EFO Name:** Knoxville
**Issuance Date:** 3/31/04
**Expiration Date:** 5/29/08
**Receiving Stream(s):** Wet weather conveyance to Pistol Creek at mile 7.5 (005 and SW5), Pistol Creek at mile 4.7 (006 and SW6), Pistol Creek at mile 7.0 (SW4), and unnamed tributary to Springfield Branch (S01), a sink hole to Pistol Creek (S02), an unnamed pond on ALCOA property (S03) and an unnamed tribuatry to Pistol Creek (S04)
**HUC-12:** 060102010107
**Effluent Summary:** Industrial wastewater from Outfalls 005 and 006 and industrial storm water runoff from Outfalls SW4-SW6 and S01-S04
**Treatment system:** Settling, sand filtration, and dechlorination

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 28.3 | DMax Load | lb/day | 2/Month | Grab | Effluent |
| Al (T) | All Year | 12.5 | MAvg Load | lb/day | 2/Month | Grab | Effluent |
| F (T) | All Year | 275 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| F (T) | All Year | 261 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| F (T) | All Year | 340 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| F (T) | All Year | 122 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| F (T) | All Year | 151 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| F (T) | All Year | 116 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Weekly | Instantaneous | Effluent |
| Flow | All Year | | DMax Load | MGD | Continuous | Totalizer | Instream Monitoring |
| Flow | All Year | | MAvg Load | MGD | Weekly | Instantaneous | Effluent |
| Flow | All Year | | MAvg Load | MGD | Continuous | Totalizer | Instream Monitoring |
| Ni (T) | All Year | 2.5 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Ni (T) | All Year | 3.14 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Ni (T) | All Year | 1.7 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Ni (T) | All Year | 2.13 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Ni (T) | All Year | 1.63 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Ni (T) | All Year | 2.41 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Sb (T) | All Year | 8.9 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Sb (T) | All Year | 4.91 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Sb (T) | All Year | 3.77 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Sb (T) | All Year | 8.46 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Sb (T) | All Year | 4 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Sb (T) | All Year | 11.03 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| TSS | All Year | 10080 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| TSS | All Year | 9900 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |

***Table 6-17a.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| TSS | All Year | 12900 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| TSS | All Year | 5220 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| TSS | All Year | 6450 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| TSS | All Year | 4950 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Weekly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Weekly | Grab | Effluent |

***Table 6-17b.***

***Table 6-17a-b. Permit Limits for Alcoa, Inc. - South Plant (Outfall 06a)***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 80 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| Ammonia as N (Total) | Summer | 1.8 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Summer | 0.9 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Winter | 2.6 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Winter | 1.3 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Continuous | Recorder | Effluent |
| Flow | All Year | | MAvg Load | MGD | Continuous | Recorder | Effluent |
| Fluoride Dissolved (as F) | All Year | 20 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| IC25 7day Ceriodaphnia Dubia | All Year | 3.3 | DMin Conc | Percent | Monthly | Composite | Effluent |
| IC25 7day Fathead Minnows | All Year | 3.3 | DMin Conc | Percent | Monthly | Composite | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| TRC | All Year | 0.58 | DMax Conc | mg/L | Weekly | Grab | Effluent |
| TRC | All Year | 0.33 | MAvg Conc | mg/L | Weekly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Weekly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Weekly | Grab | Effluent |

***Table 6-18. Permit Limits for Alcoa, Inc. - South Plant (Outfall 005)***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 35.9 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| Benzo(A)Pyrene | All Year | 0.01 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Benzo(A)Pyrene | All Year | 0.005 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Continuous | Recorder | Effluent |
| Flow | All Year | | MAvg Load | MGD | Continuous | Recorder | Effluent |
| Fluoride Dissolved (as F) | All Year | 20 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| IC25 7day Ceriodaphnia Dubia | All Year | 32.3 | DMin Conc | Percent | Monthly | Composite | Effluent |
| IC25 7day Fathead Minnows | All Year | 32.3 | DMin Conc | Percent | Monthly | Composite | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |

***Table 6-19a.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| TRC | All Year | 0.06 | DMax Conc | mg/L | Weekly | Grab | Effluent |
| TRC | All Year | 0.03 | MAvg Conc | mg/L | Weekly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Weekly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Weekly | Grab | Effluent |

***Table 6-19b.***

***Tables 6-19a-b. Permit Limits for Alcoa, Inc. - South Plant (Outfall 006)***

***EFO Comments:***

The South Plant is an aluminum primary smelting and reclamation facility with related support facilities.

## TN0067199 Alcoa, Inc. - North Plant

**Discharger rating:** Major
**City:** Alcoa
**County:** Blount
**EFO Name:** Knoxville
**Issuance Date:** 3/31/04
**Expiration Date:** 5/29/08
**Receiving Stream(s):** Duncan Creek at mile 0.6 (001 and SW1), an unnamed tributary to Russell Branch at mile 2.2 (007), and various wet weather discharge points along Duncan Creek and Russell Branch (01N, 01S, 01E, N01-N06, N08-N12)
**HUC-12:** 060102010107
**Effluent Summary:** Industrial wastewater from Outfall 001, industrial wastewater, landfill leachate and storm water runoff from Outfall 007, and industrial wastewater and storm water runoff from SW1, and storm water runoff from 01N, 01S, 01E, N01-N06 and N08-N12
**Treatment system:** Settling, sand filtration, and dechlorination

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 3.69 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| Ammonia as N (Total) | Summer | 1.8 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Summer | 0.9 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Winter | 2.6 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Winter | 1.3 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| CBOD5 | Summer | 20 | DMax Conc | mg/L | 2/Month | Composite | Effluent |
| CBOD5 | Summer | 10 | MAvg Conc | mg/L | 2/Month | Composite | Effluent |
| CBOD5 | Winter | 30 | DMax Conc | mg/L | 2/Month | Composite | Effluent |
| CBOD5 | Winter | 20 | MAvg Conc | mg/L | 2/Month | Composite | Effluent |
| Cr (T) | All Year | 0.1 | MAvg Conc | mg/L | Bi-monthly | Composite | Effluent |
| Cyanide Free (Amen. To Chlorination) | All Year | 0.022 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Cyanide Free (Amen. To Chlorination) | All Year | 0.005 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| D.O. | All Year | 5 | DMin Conc | mg/L | Weekly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Continuous | Recorder | Effluent |
| Flow | All Year | | MAvg Load | MGD | Continuous | Recorder | Effluent |
| IC25 7day Ceriodaphnia Dubia | All Year | 100 | DMin Conc | Percent | Monthly | Composite | Effluent |
| IC25 7day Fathead Minnows | All Year | 100 | DMin Conc | Percent | Monthly | Composite | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Polychlorinated Biphenyls (PCBs) | All Year | 0.000002 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Polychlorinated Biphenyls (PCBs) | All Year | 0.000001 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| TRC | All Year | 0.019 | DMax Conc | mg/L | Weekly | Grab | Effluent |
| TRC | All Year | 0.011 | MAvg Conc | mg/L | Weekly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |
| Zn (T) | All Year | 0.36 | DMax Conc | mg/L | Bi-monthly | Composite | Effluent |

***Table 6-20a.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Zn (T) | All Year | 0.33 | MAvg Conc | mg/L | Bi-monthly | Composite | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Weekly | Grab | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | Weekly | Grab | Effluent |

***Table 6-20b.***

***Tables 6-20a-b. Permit Limits for Outfall 001 at Alcoa, Inc. - North Plant.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Ammonia as N (Total) | Summer | 1.8 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Summer | 0.9 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Winter | 2.6 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Ammonia as N (Total) | Winter | 1.3 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Cyanide Free (Amen. To Chlorination) | All Year | 0.022 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Cyanide Free (Amen. To Chlorination) | All Year | 0.005 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Continuous | Recorder | Effluent |
| Flow | All Year | | MAvg Load | MGD | Continuous | Recorder | Effluent |
| IC25 7day Ceriodaphnia Dubia | All Year | 100 | DMin Conc | Percent | Monthly | Composite | Effluent |
| IC25 7day Fathead Minnows | All Year | 100 | DMin Conc | Percent | Monthly | Composite | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| Phenols | All Year | 1 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Polychlorinated Biphenyls (PCBs) | All Year | 2E-06 | DMax Conc | mg/L | Bi-monthly | Grab | Effluent |
| Polychlorinated Biphenyls (PCBs) | All Year | 1E-06 | MAvg Conc | mg/L | Bi-monthly | Grab | Effluent |
| pH | All Year | 8 | DMax Conc | SU | Continuous | Recorder | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | Continuous | Recorder | Effluent |

***Tables 6-21. Permit Limits for Outfall 007 at Alcoa, Inc. - North Plant.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 3.93 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 5.64 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 7.35 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 9.06 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 2.81 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 4.52 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 6.22 | MAvg Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Al (T) | All Year | 5.37 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 3.66 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 1.96 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Al (T) | All Year | 12.48 | DMax Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Al (T) | All Year | 10.77 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.27 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.39 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.63 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |

***Table 6-22a.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Cr (T) | All Year | 0.74 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.51 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.86 | DMax Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Cr (T) | All Year | 0.16 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.25 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.35 | MAvg Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Cr (T) | All Year | 0.3 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.21 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cr (T) | All Year | 0.11 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.18 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.26 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.34 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.41 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.11 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.17 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.23 | MAvg Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Cyanide, Total (CN-) | All Year | 0.2 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.14 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.07 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Cyanide, Total (CN-) | All Year | 0.57 | DMax Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Cyanide, Total (CN-) | All Year | 0.49 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Bi-weekly | Instantaneous | Effluent |
| Flow | All Year | | MAvg Load | MGD | Bi-weekly | Instantaneous | Effluent |
| Flow, General Measurement, Not For Outfalls | All Year | | DMax Load | MGD | Continuous | Totalizer | Effluent |
| Flow, General Measurement, Not For Outfalls | All Year | | MAvg Load | MGD | Continuous | Totalizer | Effluent |
| Oil and Grease (Freon EM) | All Year | 12.2 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 17.5 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 22.9 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 38.8 | DMax Load | lb/day | Bi-weekly | Grab | Wet Weather |
| Oil and Grease (Freon EM) | All Year | 7.3 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 33.5 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 28.2 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10.5 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 16.9 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 23.3 | MAvg Load | lb/day | Bi-weekly | Grab | Wet Weather |
| Oil and Grease (Freon EM) | All Year | 20.1 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 13.7 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 25.1 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 36 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 46.9 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 57.8 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 79.6 | DMax Load | lb/day | Bi-weekly | Grab | Wet Weather |
| TSS | All Year | 17.1 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 27.5 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 37.8 | MAvg Load | lb/day | Bi-weekly | Grab | Wet Weather |
| TSS | All Year | 32.7 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 22.3 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |
| TSS | All Year | 11.9 | MAvg Load | lb/day | Bi-weekly | Grab | Effluent |

***Table 6-22b.***

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| TSS | All Year | 68.7 | DMax Load | lb/day | Bi-weekly | Grab | Effluent |
| Zn (T) | All Year | 0.89 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 2.83 | DMax Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Zn (T) | All Year | 0.53 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 1.18 | MAvg Load | lb/day | Bi-monthly | Grab | Wet Weather |
| Zn (T) | All Year | 1.02 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 0.86 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 0.7 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 0.37 | MAvg Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 2.44 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 1.28 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 1.67 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| Zn (T) | All Year | 2.06 | DMax Load | lb/day | Bi-monthly | Grab | Effluent |
| pH | All Year | 10 | DMax Conc | SU | Bi-weekly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Bi-weekly | Grab | Effluent |

***Table 6-22c.***

***Table 6-22a-c. Permit Limits for Outfall 01A at Alcoa, Inc. - North Plant.***

***EFO Comments:***

The North Plant is an aluminum forming and fabrication operation with hot and cold rolling capabilities. This plant also has the capacity to remelt aluminum scrap and cast ingots.

## TN0027804 Gerdau AmeriSteel US Inc.

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 3/31/03
**Expiration Date:** 3/30/08
**Receiving Stream(s):** East Fork Third Creek at mile 2.3
**HUC-12:** 06010201 (Ft. Louden Lake)
**Effluent Summary:** Storm water runoff associated with industrial activities through Outfall 001
**Treatment system:** Retention pond, sedimentation, neutralization (CO2), solid disposal to landfill

| | |
|---|---|
| **Segment** | TN06010201067_1000 |
| **Name** | Third Creek |
| **Size** | 20.7 |
| **Unit** | Miles |
| **First Year on 303(d) List** | 2004 |
| **Designated Uses** | Domestic Water Supply (Non-Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Non-Supporting), Recreation (Non-Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting) |
| **Causes** | Escherichia coli, Nitrates, Other anthropogenic substrate alterations, Sedimentation/Siltation |
| **Sources** | Discharges from Municipal Separate Storm Sewer Systems (MS4), Municipal (Urbanized High Density Area), Site Clearance (Land Development or Redevelopment), Sanitary Sewer Overflows (Collection System Failures) |

*Table 6-23. Stream Segment Information for Gerdau AmeriSteel US Inc.*

| PARAMETER | SEASON | LIMIT | UNITS | SAMPLE DESIGNATOR | MONITORING FREQUENCY | SAMPLE TYPE | MONITORING LOCATION |
|---|---|---|---|---|---|---|---|
| Ag (T) | All Year | 0.025 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| Al (T) | All Year | 18.7 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| B (T) | All Year | 18.7 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| Cd (T) | All Year | 0.05 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| Cu (T) | All Year | 0.22 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| Mn (T) | All Year | 5 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| NOEL 7day Ceriodaphnia Dubia | All Year | 2.64 | DMin Conc | Percent | Quarterly | Grab | Effluent |
| NOEL 7day Fathead Minnows | All Year | 2.64 | DMin Conc | Percent | Quarterly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Pb (T) | All Year | 0.85 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | 2/Month | Composite | Effluent |
| Zinc Dissolved (as Zn) | All Year | 1.62 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Month | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Month | Grab | Effluent |

*Table 6-24. Permit Limits for Gerdau AmeriSteel US Inc.*

***EFO Comments:***
Steel works, blast furnaces, and rolling mills.

## TN0029769 BP Products North America - Knoxville Terminal

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 11/27/02
**Expiration Date:** 11/26/07
**Receiving Stream(s):** Third Creek at mile 5.0 via wet weather conveyance
**HUC-12:** 060102010204
**Effluent Summary:** Treated process wastewater and storm water runoff from Outfall 001
**Treatment system:** Extended aeration

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Benzene | All Year | 0.5 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Ethylbenzene | All Year | 0.2 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | 2/Month | Estimate | Effluent |
| Flow | All Year | | MAvg Load | MGD | 2/Month | Estimate | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | 2/Month | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | 2/Month | Composite | Effluent |
| Toluene | All Year | 1 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Xylene | All Year | 0.5 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Month | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Month | Grab | Effluent |

***Table 6-25. Permit Limits for BP Products North America - Knoxville Terminal.***

***EFO Comments:***
Petroleum Bulk Stations and Terminals

## TN0055433 Volunteer Asphalt Company

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 11/27/02
**Expiration Date:** 11/26/07
**Receiving Stream(s):** Third Creek at mile 5.0 via wet weather conveyance
**HUC-12:** 060102010201
**Effluent Summary:** Industrial storm water runoff from Outfall 001
**Treatment system:** Oil/Water separator, equalization basin

| | |
|---|---|
| **Segment** | TN06010201020_1000 |
| **Name** | Fort Loudoun Reservoir |
| **Size** | 14600 |
| **Unit** | Acres |
| **First Year on 303(d) List** | 1990 |
| **Designated Uses** | Irrigation (Supporting), Livestock Watering and Wildlife (Supporting), Domestic Water Supply (Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Supporting), Recreation (Non-Supporting) |
| **Causes** | Polychlorinated biphenyls |
| **Sources** | Contaminated Sediments |

***Table 6-26. Stream Segment Information for Volunteer Asphalt Company.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Flow | All Year | | DMax Load | MGD | Quarterly | Instantaneous | Effluent |
| Flow | All Year | | MAvg Load | MGD | Quarterly | Instantaneous | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| TSS | All Year | | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| pH | All Year | | DMax Conc | SU | Quarterly | Grab | Effluent |
| pH | All Year | | DMin Conc | SU | Quarterly | Grab | Effluent |

***Table 6-27. Permit Limits for Volunteer Asphalt Company.***

***EFO Comments:***
Petroleum Bulk Stations and Terminals

## TN0022411 CITGO Petroleum Corporation

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 5/31/02
**Expiration Date:** 4/30/07
**Receiving Stream(s):** Unnamed tributary at mile 0.5 to Third Creek at mile 5.3 which routes to Fort Loudon reservoir at Tennessee River mile 645.9
**HUC-12:** 060102010204
**Effluent Summary:** Treated and untreated storm water runoff and treated rack wash water through Outfall 001 and hydrostatic test water through Outfall 01A
**Treatment system:** Oil/water separator and a 20,000 gallon holding tank

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Benzene | All Year | 0.5 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Ethylbenzene | All Year | 0.2 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Quarterly | Instantaneous | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Quarterly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| Toluene | All Year | 1 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Xylene | All Year | 0.5 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Quarterly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Quarterly | Grab | Effluent |

***Table 6-28. Permit Limits for CITGO Petroleum Corporation.***

***EFO Comments:***
Petroleum Bulk Stations and Terminals

## TN0002216 Kinder Morgan Southeast Terminals LLC

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 3/30/02
**Expiration Date:** 2/28/07
**Receiving Stream(s):** Mile 0.6 of an unnamed tributary to Third Creek at mile 5.3
**HUC-12:** 060102010204
**Effluent Summary:** Non-process wastewater and storm water runoff - rack/pump/pad and equipment washdown, monitoring well purge, tank/piping hydrostatic testing water, stormwater runoff from racks, paved areas, and tank farms from Outfall 001
**Treatment system:** -

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Benzene | All Year | 0.5 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Ethylbenzene | All Year | 0.2 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Monthly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Monthly | Composite | Effluent |
| Toluene | All Year | 1 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Xylene | All Year | 0.5 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Monthly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Monthly | Grab | Effluent |

***Table 6-29. Permit Limits for Kinder Morgan Southeast Terminals LLC.***

***EFO Comments:***
Pipeline terminal that stores and distributes refined petroleum products

## TN0002682 Rohm and Haas Chemicals, LLC

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 6/30/02
**Expiration Date:** 6/29/07
**Receiving Stream(s):** East Fork Third Creek at mile 0.1
**HUC-12:** 060102010204
**Effluent Summary:** Industrial storm water runoff from Outfalls SW1, SW2 and SW3
**Treatment system:** -

| | |
|---|---|
| **Segment** | TN06010201067_1000 |
| **Name** | Third Creek |
| **Size** | 20.7 |
| **Unit** | Miles |
| **First Year on 303(d) List** | 2004 |
| **Designated Uses** | Domestic Water Supply (Non-Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Non-Supporting), Recreation (Non-Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting) |
| **Causes** | Escherichia coli, Nitrates, Other anthropogenic substrate alterations, Sedimentation/Siltation |
| **Sources** | Discharges from Municipal Separate Storm Sewer Systems (MS4), Municipal (Urbanized High Density Area), Site Clearance (Land Development or Redevelopment), Sanitary Sewer Overflows (Collection System Failures) |

***Table 6-30. Stream Segment Information for Rohm and Haas Chemicals, LLC.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Semi-annually | Estimate | Effluent |
| Flow | All Year | | MAvg Load | MGD | Semi-annually | Estimate | Effluent |
| Oil and Grease (Freon EM) | All Year | | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| TSS | All Year | | DMax Conc | mg/L | Semi-annually | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Semi-annually | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Semi-annually | Grab | Effluent |

***Table 6-31. Permit Limits for Rohm and Haas Chemicals, LLC.***

***EFO Comments:***
Manufacture of acrylic polymers and emulsions, vinyl acetate emulsions, and maleic co-polymer dispersants. Spray drying of water based acrylic emulsions and polymers.

## TN0074705 Dalen Products, Inc.

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 1/31/02
**Expiration Date:** 12/30/06
**Receiving Stream(s):** Unnamed tributary at mile 0.4 to Turkey Creek at mile 4.9
**HUC-12:** 060102010209
**Effluent Summary:** Noncontact-cooling water from Outfall 001
**Treatment system:** -

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Flow | All Year | | DMax Load | MGD | Weekly | Instantaneous | Effluent |
| Flow | All Year | | MAvg Load | MGD | Weekly | Instantaneous | Effluent |
| Temperature (°C) | All Year | | DMax Conc | °C | Weekly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Weekly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Weekly | Grab | Effluent |

***Table 6-32. Permit Limits for Dalen Products.***

***EFO Comments:***
Converter of rolled goods used in the lawn and garden industry.

## TN0056073 Travel Centers of America Concord

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 11/1/02
**Expiration Date:** 10/31/07
**Receiving Stream(s):** Turkey Creek at mile 4.9
**HUC-12:** 060102010208
**Effluent Summary:** Fuel island wash down water from Outfall 001 and storm water runoff from Outfall SW1
**Treatment system:** -

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | 2/Month | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Month | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | 2/Month | Grab | Effluent |

***Table 6-33. Permit Limits for Travel Centers of America Concord.***

***EFO Comments:***
Facility is a truckstop providing a variety of services including: diesel fueling, maintenance and repair services, short-term parking, restaurant, convenience store, and motel.

## TN0060402 Cummins Terminals, Inc.

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 6/28/02
**Expiration Date:** 4/28/07
**Receiving Stream(s):** Unnamed tributary at mile 0.6 to Third Creek at mile 5.3 to Fort Loudon Reservior at Tennessee River mile 645.9
**HUC-12:** 060102010204
**Effluent Summary:** Storm water from diked area through Outfall 001, storm water from drains outside of rack area, potential overflow from rack and drum storage area through Outfall 002 and air-stripper effluent, monitoring wells and loading rack drains through Outfall 003
**Treatment system:** -

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Benzene | All Year | 0.5 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Ethylbenzene | All Year | 0.2 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Quarterly | Instantaneous | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Quarterly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Quarterly | Composite | Effluent |
| Toluene | All Year | 1 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| Xylene | All Year | 0.5 | DMax Conc | mg/L | Quarterly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Quarterly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Quarterly | Grab | Effluent |

***Table 6-34. Permit Limits for Cummins Terminals, Inc.***

***Comments:***
Petroleum is piped into storage units, marketed and then distributed by tanker trucks.

## TN0060429 Magellan Terminals Holdings, LP - Knoxville Terminal

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 12/09/03
**Expiration Date:** 11/30/07
**Receiving Stream(s):** Unnamed tributary to Third Creek at mile 5.3
**HUC-12:** 060102010204
**Effluent Summary:** Hydrostatic test water, truck loading rack wash water and contaminated stormwater runoff from Outfall 001
**Treatment system:** Oil-water separator

| | |
|---|---|
| **Segment** | TN06010201067_1000 |
| **Name** | Third Creek |
| **Size** | 20.7 |
| **Unit** | Miles |
| **First Year on 303(d) List** | 2004 |
| **Designated Uses** | Domestic Water Supply (Non-Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Non-Supporting), Recreation (Non-Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting) |
| **Causes** | Escherichia coli, Nitrates, Other anthropogenic substrate alterations, Sedimentation/Siltation |
| **Sources** | Discharges from Municipal Separate Storm Sewer Systems (MS4), Municipal (Urbanized High Density Area), Site Clearance (Land Development or Redevelopment), Sanitary Sewer Overflows (Collection System Failures) |

***Table 6-35. Permit Limits for Magellan Terminals Holdings, LP - Knoxville Terminal.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Benzene | All Year | 0.5 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Ethylbenzene | All Year | 0.2 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 10 | MAvg Conc | mg/L | Monthly | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Monthly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Monthly | Composite | Effluent |
| Toluene | All Year | 1 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Xylene | All Year | 0.5 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Monthly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Monthly | Grab | Effluent |

***Table 6-36. Permit Limits for Magellan Terminals Holdings, LP - Knoxville Terminal.***

***EFO Comments:***
Facility receives (by pipeline) and stores (in ASTs) refined petroleum products and loads trucks for distribution

## TN0058483 Cummins Terminals, Inc. (CTI)

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 11/27/03
**Expiration Date:** 11/26/07
**Receiving Stream(s):** Unnamed tributary to Third Creek at mile 5.3
**HUC-12:** 060102010204
**Effluent Summary:** Loading rack drains from Outfall 001 (dry weather discharge) and loading rack drains and contaminated storm water runoff from Outfall SW1 (wet weather discharge) and storm water runoff from Outfall SW2 (wet weather discharge)
**Treatment system:** Oil-water separator

| | |
|---|---|
| **Segment** | TN06010201067_1000 |
| **Name** | Third Creek |
| **Size** | 20.7 |
| **Unit** | Miles |
| **First Year on 303(d) List** | 2004 |
| **Designated Uses** | Domestic Water Supply (Non-Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Non-Supporting), Recreation (Non-Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting) |
| **Causes** | Escherichia coli, Nitrates, Other anthropogenic substrate alterations, Sedimentation/Siltation |
| **Sources** | Discharges from Municipal Separate Storm Sewer Systems (MS4), Municipal (Urbanized High Density Area), Site Clearance (Land Development or Redevelopment), Sanitary Sewer Overflows (Collection System Failures) |

***Table 6-37.*** *Stream Segment Information for Cummins Terminals, Inc. (CTI).*

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Benzene | All Year | 0.5 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Ethylbenzene | All Year | 0.2 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Monthly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Monthly | Composite | Effluent |
| Toluene | All Year | 1 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Xylene | All Year | 0.5 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Monthly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Monthly | Grab | Effluent |

***Table 6-38. Permit Limits for Cummins Terminals, Inc. (CTI).***

***EFO Comments:***
Storage and distribution of bulk petroleum products.

## TN0067181 Marathon Petroleum Company LLC

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 11/27/03
**Expiration Date:** 11/26/07
**Receiving Stream(s):** Tennessee River (Fort Loudon Reservoir) at mile 648.0
**HUC-12:** 060102010201
**Effluent Summary:** Hydrostatic tank test water and contaminated storm water runoff from Outfall 001
**Treatment system:** Retention basin

| | |
|---|---|
| **Segment** | TN06010201020_1000 |
| **Name** | Fort Loudoun Reservoir |
| **Size** | 14600 |
| **Unit** | Acres |
| **First Year on 303(d) List** | 1990 |
| **Designated Uses** | Irrigation (Supporting), Livestock Watering and Wildlife (Supporting), Domestic Water Supply (Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Supporting), Recreation (Non-Supporting) |
| **Causes** | Polychlorinated biphenyls |
| **Sources** | Contaminated Sediments |

***Table 6-39. Stream Segment Information for Marathon Petroleum Company LLC.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Oil and Grease (Freon EM) | All Year | 15 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Monthly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Monthly | Grab | Effluent |
| pH | All Year | 6 | DMin Conc | SU | Monthly | Grab | Effluent |

***Table 6-40. Permit Limits for Marathon Petroleum Company LLC.***

***EFO Comments:***
Storage, blending and distribution of asphalt and asphalt emulsions

## TN0064068 Rockford Manufacturing Company

**Discharger rating:** Minor
**City:** Rockford
**County:** Blount
**EFO Name:** Knoxville
**Issuance Date:** 9/30/03
**Expiration Date:** 9/29/07
**Receiving Stream(s):** Little River
**HUC-12:** 060102010106
**Effluent Summary:** Overflow/condensate and automatic purge wastewater from Outfalls 001, 002, and 004-006, and noncontact cooling water from Outfall 003
**Treatment system:** Retention basin

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Flow | All Year | | DMax Load | MGD | 2/Month | Estimate | Effluent |
| Flow | All Year | | MAvg Load | MGD | 2/Month | Estimate | Effluent |
| Temperature Diff. Downstrm & Upstrm (°C) | All Year | | DMax Conc | °C | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Month | Grab | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | 2/Month | Grab | Effluent |

***Table 6-41. Permit Limits for Rockford Manufacturing Company (Outfall 003)***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| BOD5 | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| BOD5 | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | 2/Month | Estimate | Effluent |
| Flow | All Year | | MAvg Load | MGD | 2/Month | Estimate | Effluent |
| Mo (T) | All Year | | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Mo (T) | All Year | | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Nitrogen Ammonia Total (as NH4) | All Year | | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Nitrogen Ammonia Total (as NH4) | All Year | | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| Oil and Grease (Freon EM) | All Year | | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| TRC | All Year | 2 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| TSS | All Year | 45 | DMax Conc | mg/L | 2/Month | Grab | Effluent |
| TSS | All Year | 30 | MAvg Conc | mg/L | 2/Month | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | 2/Month | Grab | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | 2/Month | Grab | Effluent |

***Table 6-42. Permit Limits for Rockford Manufacturing Company (Outfalls 001, 002, 004, 005, & 006)***

***EFO Comments:***
Yarn Spinning Mill

## 6.4.B. Water Treatment Plant Permits

### TN0055204 Alcoa Water Treatment Plant

**Discharger rating:** Minor
**City:** Maryville
**County:** Blount
**EFO Name:** Knoxville
**Issuance Date:** 10/14/04
**Expiration Date:** 9/27/09
**Receiving Stream(s):** Little River at mile 9.0
**HUC-12:** 060102010106
**Effluent Summary:** Filter backwash and/or sedimentation basin washdown from Outfall 001
**Treatment system:** Conventional water filtration, turbidity removal using aluminum sulfate, chlorine, lime, potassium permanganate

| | |
|---|---|
| **Segment** | TN06010201026_2000 |
| **Name** | Little River |
| **Size** | 17.63 |
| **Unit** | Miles |
| **First Year on 303(d) List** | - |
| **Designated Uses** | Domestic Water Supply (Supporting), Industrial Water Supply (Supporting), Fish and Aquatic Life (Supporting), Recreation (Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting) |
| **Causes** | N/A |
| **Sources** | N/A |

***Table 6-43. Stream Segment Information for Alcoa Water Treatment Plant.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 10 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Monthly | Instantaneous | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Monthly | Grab | Effluent |
| TRC | All Year | 1 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Monthly | Grab | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | Monthly | Grab | Effluent |

***Table 6-44. Permit Limits for Alcoa Water Treatment Plant.***

## TN0004758 Lenoir City Utility Board - Water Treatment Plant B

**Discharger rating:** Minor
**City:** Lenoir City
**County:** Louden
**EFO Name:** Knoxville
**Issuance Date:** 9/29/04
**Expiration Date:** 9/27/09
**Receiving Stream(s):** Muddy Creek to Fort Loudon Dam
**HUC-12:** 060102010301
**Effluent Summary:** Filter backwash and/or sedimentation basin washdown from Outfall 001
**Treatment system:** Iron and turbidity removal Water Treatment Plant

| | |
|---|---|
| **Segment** | TN06010201669_1000 |
| **Name** | Muddy Creek |
| **Size** | 15.3 |
| **Unit** | Miles |
| **First Year on 303(d) List** | - |
| **Designated Uses** | Fish and Aquatic Life (Supporting), Recreation (Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting) |
| **Causes** | N/A |
| **Sources** | N/A |

***Table 6-45. Stream Segment Information for Lenoir City Utility Board - Water Treatment Plant B***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 0.75 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Fe (T) | All Year | 2 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Monthly | Instantaneous | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Monthly | Grab | Effluent |
| TRC | All Year | 0.019 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Monthly | Grab | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | Monthly | Grab | Effluent |

***Table 6-46. Permit Limits for Lenoir City Utility Board - Water Treatment Plant B.***

## TN0060577 First Utility District Water Treatment Plant

**Discharger rating:** Minor
**City:** Knoxville
**County:** Knox
**EFO Name:** Knoxville
**Issuance Date:** 9/29/04
**Expiration Date:** 9/27/09
**Receiving Stream(s):** Sinking Creek Embayment at mile 1.0 to Fort Loudon Reservoir (Tennessee River at mile 617.5)
**HUC-12:** 060102010207
**Effluent Summary:** Filter backwash and/or sedimentation basin washdown from Outfall 001
**Treatment system:** Turbidity removal Water Treatment Plant

| | |
|---|---|
| **Segment** | TN06010204002_1000 |
| **Name** | Fork Creek |
| **Size** | 19.3 |
| **Unit** | Miles |
| **First Year on 303(d) List** | 2000 |
| **Designated Uses** | Recreation (Non-Supporting), Irrigation (Supporting), Livestock Watering and Wildlife (Supporting), Fish and Aquatic Life (Non-Supporting) |
| **Causes** | Nitrates, Sedimentation/Siltation, Escherichia coli |
| **Sources** | Grazing in Riparian or Shoreline Zones |

***Table 6-47. Stream Segment Information for First Utility District Water Treatment Plant.***

| *PARAMETER* | *SEASON* | *LIMIT* | *UNITS* | *SAMPLE DESIGNATOR* | *MONITORING FREQUENCY* | *SAMPLE TYPE* | *MONITORING LOCATION* |
|---|---|---|---|---|---|---|---|
| Al (T) | All Year | 10 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| Flow | All Year | | DMax Load | MGD | Monthly | Instantaneous | Effluent |
| Settleable Solids | All Year | 0.5 | DMax Conc | mL/L | Monthly | Grab | Effluent |
| TRC | All Year | 1 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| TSS | All Year | 40 | DMax Conc | mg/L | Monthly | Grab | Effluent |
| pH | All Year | 9 | DMax Conc | SU | Monthly | Grab | Effluent |
| pH | All Year | 6.5 | DMin Conc | SU | Monthly | Grab | Effluent |

***Table 6-48. Permit Limits for First Utility District Water Treatment Plant.***

# APPENDIX II

| ID | NAME | HAZARD |
|---|---|---|
| 57002 | Laurel | 1 |
| 57003 | Lake In The Sky | 1 |
| 57004 | Sandy Stand | B |
| 57005 | Davis #1 | O |
| 57006 | Davis #2 | 3 |
| 57007 | Gold Pond | 3 |
| 537003 | Thompson Lake | S |

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

| LAND COVER/LAND USE | ACRES | % OF WATERSHED |
|---|---|---|
| Open Water | 10,265 | 2.7 |
| Other Grasses | 11,199 | 2.9 |
| Pasture/Hay | 49,850 | 13.0 |
| Row Crops | 12,773 | 3.3 |
| Woody Wetlands | 427 | 0.1 |
| Emergent Herbaceous Wetlands | 37 | 0.0 |
| Deciduous Forest | 88,237 | 23.1 |
| Mixed Forest | 79,586 | 20.8 |
| Evergreen Forest | 83,406 | 21.8 |
| High Intensity: Commercial/Industrial | 11,232 | 2.9 |
| High Intensity: Residential | 6,766 | 1.8 |
| Low Intensity: Residential | 27,247 | 7.1 |
| Quarries/Strip Mines/Gravel Pits | 819 | 0.2 |
| Bare Rock/Sand/Clay | 4 | 0.0 |
| Transitional | 206 | 0.1 |
| **Total** | **382,054** | **99.8** |

***Figure A2-2. Land Use Distribution in the Fort Loudoun 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) | |
|---|---|---|---|
| | | | |
| Southern Sedimentary Ridges (66e) | Gentry Creek | SF Holston River | 06010102 |
| | Clark Creek | Nolichucky River | 06010108 |
| | Lower Higgins Creek | Nolichucky River | 06010108 |
| | Double Branch | Watts Bar/Fort Loudoun Lake | 06010201 |
| | Gee Creek | Hiwassee | 06020002 |
| | | | |
| Limestone Valleys and Coves (66f) | Abrams Creek | Little Tennessee River | 06010204 |
| | Beaverdam Creek | SF Holston River | 06010102 |
| | | | |
| Southern Metasedimentary Mountains (66g) | Middle Prong Little River | Lower French Broad | 06010107 |
| | Little River | Watts Bar/Fort Loudoun Lake | 06010201 |
| | Citico Creek | Little Tennessee River | 06010204 |
| | North River | Little Tennessee River | 06010204 |
| | Sheeds Creek | Conasauga River | 03150101 |
| | | | |
| Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f) | Clear Creek | Lower Clinch River | 06010207 |
| | White Creek | Upper Clinch River | 06010205 |
| | Powell River | Powell River | 06010206 |
| | Hardy Creek | Powell River | 06010206 |
| | Big War Creek | Upper Clinch River | 06010205 |
| | Martin Creek | Powell River | 06010206 |
| | Powell River | Powell River | 06010206 |
| | | | |
| Southern Shale Valleys (67g) | Little Chuckey Creek | Nolichucky River | 06010108 |
| | Bent Creek | Nolichucky River | 06010108 |
| | Brymer Creek | Hiwassee River | 06020002 |
| | Harris Creek | Hiwassee River | 06020002 |
| | Flat Creek | Lower French Broad | 06010107 |
| | | | |
| Southern Sandstone Ridges (67h) | Blackburn Creek | Hiwassee River | 06020002 |
| | Laurel Creek | Little Tennessee River | 06010204 |
| | Parker Branch | Holston River | 06010104 |
| | | | |
| Southern Dissected Ridges and Knobs (67i) | Mill Branch | Lower Clinch River | 06010207 |

***Table A2-3. Ecoregion Monitoring Sites in Ecoregions 66e, 66f, 66g, 67f, 67g, 67h, and 67i.***

| CODE | NAME | AGENCY | AGENCY ID |
|---|---|---|---|
| 29 | TDEC/DNH ALCOA MARSH STATE NATURAL AREA SITE | TDEC/DNH | M.USTNHP 108 |
| 132 | TDEC/DNH KINZEL SPRINGS SITE | TDEC/DNH | S.USTNHP 25 |
| 196 | TDEC/DNH ALCOA MARSHES SITE | TDEC/DNH | DESELM REPORT |
| 272 | TDEC/WPC TURKEY CREEK WETLAND | TDEC/WPC | |
| 283 | TDOT SR 162 MITIGATION SITE | TDOT | |
| 299 | TDOT SR 71 MITIGATION/PERMIT SITE | TDOT | |
| 315 | TDOT SR 162 MITIGATION SITE | TDOT | |
| 379 | TDOT SR 162 PERMIT SITE | TDOT | |
| 380 | TDOT SR 162 PERMIT SITE | TDOT | |
| 391 | TDOT SR 162 PERMIT SITE | TDOT | |
| 392 | TDOT SR 162 PERMIT SITE | TDOT | |
| 421 | TDOT I-275 PERMIT SITE | TDOT | |
| 467 | TDEC/WPC NORTH FORK TURKEY CREEK WPC PERMIT SITE | TDEC/WPC | |
| 1516 | USACOE-ORN PN 96-41/ CITY OF KNOXVILLE SITE | USFWS | |
| 1994 | TWRA WHITES MILL SITE | TWRA | |
| 2128 | TWRA WHITES MILL SITE | TWRA | |
| 2613 | TDOT I-275 BRIDGE OVER RR YARD & SECOND CREEK SITE | TDOT | |
| 2614 | TDOT SR 169 SITE | TDOT | |
| 2720 | USACOE TURKEY CREEK SITE | USACOE-NASHVILLE | 970001720 |

***Table A2-4. Wetland Sites in the Fort Loudoun 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) |
|---|---|---|
| Carr Creek | TN06010201032_0100 | 3 |
| Double Branch | TN06010201027_0110 | 7.8 |
| Goshen Prong | TN06010201032_0200 | 19.6 |
| Hesse Creek | TN06010201031_1000 | 18.7 |
| Hesse Creek | TN06010201031_2000 | 28.1 |
| Ish Creek | TN060102011002_1000 | 3.1 |
| Knob Creek | TN06010201089_1000 | 11 |
| Lackey Creek | TN06010201090_1000 | 16.5 |
| Little River | TN06010201027_1000 | 30 |
| Little River | TN06010201032_1000 | 14.9 |
| Little River | TN06010201032_2000 | 32.2 |
| Little River | TN06010201032_3000 | 85.3 |
| Lower Reed Creek | TN06010201027_0100 | 5 |
| Middle Prong Little River | TN06010201032_0300 | 36.2 |
| Millstone Creek | TN06010201033_0300 | 14.1 |
| Misc. Tribs to Reed Creek | TN06010201027_0120 | 4.2 |
| Muddy Creek | TN06010201669_1000 | 15.3 |
| Pitner Creek | TN06010201033_0200 | 13.5 |
| Sinking Creek | TN060102011330_1000 | 21.9 |
| Unnamed tributary to Sinking Creek Embayment | TN06010201689_1000 | 2.4 |
| Upper Carr Creek | TN06010201032_0110 | 8.1 |
| Upper Reed Creek | TN06010201027_0140 | 3.9 |
| West Prong Little River | TN06010201032_0400 | 31.2 |

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

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Bank Branch | TN06010201026_0320 | 16.6 |
| Brown Creek | TN06010201026_0310 | 24.7 |
| Cloyd Creek | TN060102011015_1000 | 11.3 |
| Ellejoy Creek | TN06010201033_1000 | 34.9 |
| Floyd Creek | TN06010201083_1000 | 7.7 |
| Gallagher Creek | TN06010201022_1000 | 13.2 |
| Little Ellejoy Creek | TN06010201033_0100 | 14.7 |
| Nails Creek | TN06010201034_1000 | 24.5 |
| Roddy Branch | TN06010201026_0200 | 4.4 |
| Short Creek | TN06010201032_0500 | 10.7 |
| Stock Creek | TN06010201026_0100 | 30 |
| Town Creek | TN06010201038_1000 | 12.9 |

***Table A3-1b. Streams Partially Supporting Designated Uses in the Fort Loudoun lake Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Baker Creek | TN06010201721_1000 | 3.3 |
| Crooked Creek | TN06010201028_1000 | 42.7 |
| First Creek | TN06010201080_1000 | 21.2 |
| Fourth Creek | TN06010201697_1000 | 14.9 |
| Goose Creek | TN06010201723_1000 | 4.9 |
| Little River | TN06010201026_1000 | 7.1 |
| Little Turkey Creek | TN06010201037_1000 | 14 |
| Pistol Creek | TN06010201026_0300 | 19.7 |
| Russell Branch | TN06010201026_0400 | 3 |
| Second Creek | TN06010201097_1000 | 12.8 |
| Sweetwater Creek | TN06010201015_1000 | 29.3 |
| Third Creek | TN06010201067_1000 | 20.7 |
| Turkey Creek | TN06010201340_1000 | 15.8 |
| Williams Creek | TN06010201719_1000 | 2.8 |

***Table A3-1c. Streams Not Supporting Designated Uses in the Fort Loudoun Lake Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Blair Branch | TN06010201031_0100 | 2.1 |
| Clear Branch | TN06010201034_0100 | 3.2 |
| Dick Creek | TN06010201027_0200 | 3.7 |
| Flag Branch | TN06010201028_0100 | 7.8 |
| Flat Creek | TN06010201031_0200 | 8.6 |
| Misc. Tribs to Fort Loudoun | TN06010201020T_0999 | 40.8 |
| Misc. tribs. To Pistol Creek | TN06010201026_0999 | 2.3 |
| Peppermint Branch | TN06010201027_0300 | 2.7 |
| Smith Branch | TN06010201027_0130 | 4.4 |

***Table A3-1d. Streams Not Assessed in the Fort. Loudoun Lake Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MILES) |
|---|---|---|
| Little River | TN06010201026_2000 | 21.2 |

***Table A3-1e. Stream Considered Threatened in the Fort Loudoun Lake Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (ACRES) |
|---|---|---|
| Fort Loudoun Reservoir | TN06010201020_1000 | 14600 |

***Table A3-1f. Lake Not Supporting Designated Uses in the Fort Loudoun lake Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| WATERBODY SEGMENT ID | SEGMENT NAME | SEGMENT SIZE (MILES) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Baker Creek | TN06010201721_1000 | 3.3 | Not supporting |
| Cloyd Creek | TN060102011015_1000 | 11.3 | Partial |
| First Creek | TN06010201080_1000 | 21.2 | Not supporting |
| Fourth Creek | TN06010201697_1000 | 14.9 | Not supporting |
| Goose Creek | TN06010201723_1000 | 4.9 | Not supporting |
| Nails Creek | TN06010201034_1000 | 24.5 | Partial |
| Roddy Branch | TN06010201026_0200 | 4.4 | Partial |
| Second Creek | TN06010201097_1000 | 12.8 | Not supporting |
| Stock Creek | TN06010201026_0100 | 30 | Partial |
| Third Creek | TN06010201067_1000 | 20.7 | Not supporting |
| Town Creek | TN06010201038_1000 | 12.9 | Partial |
| Williams Creek | TN06010201719_1000 | 2.8 | Not supporting |

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

| WATERBODY SEGMENT ID | SEGMENT NAME | SEGMENT SIZE (MILES) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Brown Creek | TN06010201026_0310 | 24.7 | Partial |
| Cloyd Creek | TN060102011015_1000 | 11.3 | Partial |
| Crooked Creek | TN06010201028_1000 | 42.7 | Not supporting |
| First Creek | TN06010201080_1000 | 21.2 | Not supporting |
| Floyd Creek | TN06010201083_1000 | 7.7 | Partial |
| Gallagher Creek | TN06010201022_1000 | 13.2 | Partial |
| Goose Creek | TN06010201723_1000 | 4.9 | Not supporting |
| Little Turkey Creek | TN06010201037_1000 | 14 | Not supporting |
| Pistol Creek | TN06010201026_0300 | 19.7 | Not supporting |
| Roddy Branch | TN06010201026_0200 | 4.4 | Partial |
| Russell Branch | TN06010201026_0400 | 3 | Not supporting |
| Second Creek | TN06010201097_1000 | 12.8 | Not supporting |
| Stock Creek | TN06010201026_0100 | 30 | Partial |
| Sweetwater Creek | TN06010201015_1000 | 29.3 | Not supporting |
| Third Creek | TN06010201067_1000 | 20.7 | Not supporting |
| Town Creek | TN06010201038_1000 | 12.9 | Partial |
| Turkey Creek | TN06010201340_1000 | 15.8 | Not supporting |

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

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MI) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Cloyd Creek | TN060102011015_1000 | 11.3 | Partial |
| Stock Creek | TN06010201026_0100 | 30 | Partial |
| Roddy Branch | TN06010201026_0200 | 4.4 | Partial |
| Pistol Creek | TN06010201026_0300 | 19.7 | Not supporting |
| Crooked Creek | TN06010201028_1000 | 42.7 | Not supporting |
| Short Creek | TN06010201032_0500 | 10.7 | Partial |
| Ellejoy Creek | TN06010201033_1000 | 34.9 | Partial |
| Nails Creek | TN06010201034_1000 | 24.5 | Partial |
| Third Creek | TN06010201067_1000 | 20.7 | Not supporting |
| First Creek | TN06010201080_1000 | 21.2 | Not supporting |
| Second Creek | TN06010201097_1000 | 12.8 | Not supporting |
| Goose Creek | TN06010201723_1000 | 4.9 | Not supporting |
| Floyd Creek | TN06010201083_1000 | 7.7 | Partial |
| Bank Branch | TN06010201026_0320 | 16.6 | Partial |

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

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (MI) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Goose Creek | TN06010201723_1000 | 4.9 | Not supporting |
| Little River | TN06010201026_1000 | 7.1 | Not supporting |
| Russell Branch | TN06010201026_0400 | 3 | Not supporting |

***Table A3-2d. Stream Impairment Due to PCBs in the Fort Loudoun lake Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

| SEGMENT NAME | WATERBODY SEGMENT ID | SEGMENT SIZE (ACRES) | SUPPORT DESCRIPTION |
|---|---|---|---|
| Fort Loudoun Reservoir | TN06010201020_1000 | 14600 | Not supporting |

***Table A3-2e. Lake Impairment Due to PCBs in the Fort Loudoun Lake Watershed.*** *Data are based on Year 2000 Water Quality Assessment.*

# APPENDIX IV

| LAND USE/LAND COVER | AREAS IN HUC-10 SUBWATERSHEDS (ACRES) | |
|---|---|---|
| | 01 | 02 |
| | | |
| Deciduous Forest | 69,933 | 18,304 |
| Emergent Herbaceous Wetlands | 35 | 2 |
| Evergreen Forest | 59,263 | 24,143 |
| High Intensity: Commercial/Industrial/Transportation | 3,015 | 8,217 |
| High Intensity: Residential | 1,047 | 5,719 |
| Low Intensity: Residential | 6,058 | 21,189 |
| Mixed Forest | 50,905 | 28,681 |
| Open Water | 972 | 9,293 |
| Other Grasses: Urban/Recreational | 4,614 | 6,585 |
| Pasture/Hay | 37,522 | 22,328 |
| Row Crops | 7,758 | 5,015 |
| Transitional | 37 | 169 |
| Woody Wetlands | 409 | 18 |
| Bare Rock/Sand/Clay | 1 | 3 |
| Quarries/Strip Mines | 759 | 60 |
| **Total** | **242,327** | **149,725** |

***Table A4-1. Land Use Distribution in the Fort Loudoun 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 |
| | | | | | | | |
| 03498700 | 0601020101 | USGS | Nails Creek | | | | |
| 03499111 | 0601020101 | USGS | Stock Creek | | | | |
| 03498500 | 0601020101 | USGS | Little River | 269.0 | 47.5 | 52.2 | 43.8 |
| 03499053 | 0601020101 | USGS | Culton Creek | 11.8 | 1.65 | 1.80 | 1.5 |
| 03498000 | 0601020101 | USGS | Little River | 192.0 | 30.4 | 36.3 | 30.2 |
| 03499007 | 0601020101 | USGS | Pistol Creek | | | | |
| 03497300 | 0601020101 | USGS | Little River | 106.0 | 28.4 | 31.8 | 26.3 |
| 360217083555401 | 0601020102 | TVA | 1st Creek | | | | |
| 03496000 | 0601020102 | USGS | 1st Creek | 15.7 | 2.3 | 2.5 | 2.2 |
| 355807083571101 | 0601020102 | TVA | East Fork 3rd Creek | | | | |
| 03497000 | 0601020102 | USGS | Tennessee River | 8,934.0 | 1,940 | 2,150 | 1,810 |
| 03497100 | 0601020102 | USGS | Tennessee River | | | | |
| 355555084010701 | 0601020102 | TVA | Trib to 4th Creek | | | | |

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

| PARAMETER | SUBWATERSHED | |
|---|---|---|
| | 01 | 02 |
| E. coli | U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ , π, ψ | √ |
| Fecal Coliform | U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| Fecal Streptococcus | | ¥ |
| Enterococcus | U | |
| | | |
| Acidity | | |
| Alkalinity (Total) | A, B, C, D, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| $BOD_5$ | | ¥ |
| Color (Apparent) | U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √ |
| Color (True) | U, V, W, X, Y, Z, #, $, α, β, γ, λ, π, ψ | √ |
| Conductivity (Field) | A, B, C, D, F, U, V, Y, Z, #, $, α | √, ¥ |
| COD (Low) | | ¥ |
| DO | A, B, C, D, F, U, V, Y, Z, #, $, α | √, ¥ |
| Flow | U, V, W, X, Z, $, α, β, γ, δ, λ, π, ψ | |
| Hardness (Total) | A, B, C, D, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| pH (Field) | A, B, C, D, F, U, V, Y, Z, #, $, α | √, ¥ |
| pH (Lab) | U, α | ¥ |
| Residue (Dissolved) | A, C, D, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| Residue (Settlable) | A, B, C, D, F | ¥ |
| Residue (Suspended) | A, B, C, D, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| Residue (Total) | A, B, C, D, F | |
| Temperature | A, B, C, D, F, U, V, Y, Z, #, $, α | √, ¥ |
| Turbidity | A, B, C, D, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, π. ψ | √ |
| | | |
| Biorecon | T, U, X, δ, π, ψ | |
| RBP III | C, E, T, U | |
| | | |
| Ag | Y, Z, #, $, α | √, ¥ |
| Al | Y, Z, #, $, α | √, ¥ |
| Ammonia N | A, B, C, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| As | U, Y, Z, #, $, α | √, ¥ |
| Ca | U, α | |
| Cd | U, Y, Z, #, $, α | √, ¥ |
| $Cl^-$ | U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √ |
| $CN^-$ | U, α | |
| Cr (Total) | U, Y, Z, #, $, α | √, ¥ |
| Cu | U, Y, Z, #, $, α | √, ¥ |
| Fe | U, Y, Z, #, $, α | √, ¥ |
| Hg | U, Y, Z, #, $, α | ¥ |
| Mn | U, Y, Z, #, $, α | √, ¥ |
| N (Total Kjeldahl) | A, B, C, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| Ni | U, Y, Z, #, $, α | √, ¥ |
| $NO_2$+$NO_3$ | A, B, C, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| P (Total) | A, B, C, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √, ¥ |
| Pb | U, Y, Z, #, $, α | √, ¥ |
| $SO_4$ | U | |
| TOC | A, B, C, F, U, V, W, X, Y, Z, #, $, α, β, γ, δ, λ, π, ψ | √ |
| Zn | U, Y, Z, #, $, α | √, ¥ |

***Table A4-4a. Water Quality Parameters Monitored in the Fort Loudoun Lake Watershed.*** *Codes are described in Table A4-4b.*

| CODE | STATION | ALIAS | AGENCY | LOCATION |
|---|---|---|---|---|
| A | LITTL008.0BT | | TDEC | Little River @ RM 8.0 |
| B | LITTL019.3BT | | TDEC | Little River @ RM 19.3 |
| C | PISTO000.2BT | | TDEC | Pistol Creek @ RM 0.2 |
| D | RUSSE000.9BT | | TDEC | Russell Branch @ RM 0.9 |
| E | SHORT000.8BT | | TDEC | Short Creek @ RM 0.8 |
| F | STOCK002.0KN | | TDEC | Stock Creek @ RM 2.0 |
| G | LITTL003.5BT | TISSUE 32 | TDEC | Little River @ RM 3.5 |
| H | LITTL030.0BT | LITTLE030.0 | TDEC | Little River @ RM 30.0 |
| I | NAILS000.0BT | NAILSCRIS06 | TDEC | Nails Creek @ RM 0.0 |
| J | NAILS001.5BT | NAILSCRIS05 | TDEC | Nails Creek @ RM 1.5 |
| K | NAILS003.5BT | NAILSCRIS04 | TDEC | Nails Creek @ RM 3.5 |
| L | NAILS005.0BT | NAILS CRIS03 | TDEC | Nails Creek @ RM 5.0 |
| M | NAILS005.6BT | NAILSCRIS02 | TDEC | Nails Creek @ RM 5.6 |
| N | NAILS006.0BT | NAILSCRIS01 | TDEC | Nails Creek @ RM 6.0 |
| O | WPLPI007.7SV | LPIGEONIS17 | TDEC | West Prong Little Pigeon River @ RM 7.7 |
| P | 03497300 | | USGS | Little River above Townsend |
| Q | 03497450 | | USGS | Little River above Coulter Bridge |
| R | 03498500 | | USGS | Little River above Maryville |
| S | 03498850 | | USGS | Little River near Alcoa |
| T | ECO66E17 | | TDEC | Double Branch @ RM 0.1 |
| U | ECO66G05 | | TDEC | Little River @ RM 50.6 |
| V | CROOKED001.1BT | CROOKED001.1 | TDEC | Crooked Creek @ RM 1.1 |
| W | ELLEJOY000.1BT | ELLEJOY000.1 | TDEC | Ellejoy Creek @ RM 0.1 |
| X | HESSE000.2BT | HESSE000.2 | TDEC | Hesse Creek @ RM 0.2 |
| Y | LITTLE007.6BT | LITTLE007.6 | TDEC | Little River @ RM 7.6 |
| Z | LITTLE009.6BT | LITTLE009.6 | TDEC | Little River @ RM 9.6 |
| # | LITTLE020.3BT | LITTLE020.3 | TDEC | Little River @ RM 20.3 |
| $ | LITTLE027.0BT | LITTLE027.0 | TDEC | Little River @ RM 27.0 |
| α | LITTLE035.6BT | LITTLE035.6 | TDEC | Little River @ RM 35.6 |
| β | NAILS000.7BT | NAILS000.7 | TDEC | Nails Creek @ RM 0.7 |
| γ | PISTOL001.9BT | PISTOL001.9 | TDEC | Pistol Creek @ RM 1.9 |
| δ | REED000.1BT | REED000.1 | TDEC | Reed Creek @ RM 0.1 |
| λ | RODDY000.6BT | RODDY000.6 | TDEC | Roddy Branch @ RM 0.6 |
| π | SHORT000.0BT | SHORT000.0 | TDEC | Short Creek @ RM 0.0 |
| ψ | STOCK003.2KN | STOCK003.2 | TDEC | Stock Creek @ RM 3.2 |
| ■ | TENNE616.0KN | TISSUE53 | TDEC | Tennessee River @ RM 616.0 |
| ▲ | TENNE628.0KN | TISSUE34 | TDEC | Tennessee River @ RM 628.0 |
| ♠ | TENNE629.7KN | TISSUE 54 | TDEC | Tennessee River @ RM 629.7 |
| ♣ | TENNE643.0KN | KXPCB02 | TDEC | Tennessee River @ RM 643.0 |
| ♥ | TENNE651.0 | KXPCB01 | TDEC | Tennessee River @ RM 651.0 |
| ♦ | 475356 | | TVA | Fort Loudoun Lake |
| ♫ | 475603 | | TVA | Fort Loudoun Lake |
| Ω | 475831 | | TVA | Fort Loudoun Lake |
| Δ | 477606 | | TVA | Mouth of First Creek |
| √ | LITTL002.6KN | 001720 | TDEC | Little River |
| ¥ | 003110 | | TDEC | Tennessee River |

***Table A4-4b. Water Quality Monitoring Stations in the Fort Loudoun 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 |
|---|---|---|---|---|---|---|
| TN0022349 | Great Smoky Mtns National Park at Elkmont | 4952 | Sewerage Systems | Minor | Little River @ RM 49.6 | 0601020101 |
| TN0022594 | Tremont Institute | 4952 | Sewerage Systems | Minor | Middle Prong Little River @ RM 2.5 | 0601020101 |
| TN0065081 | Alcoa | 3334 | Primary Production of Aluminum | Major | WWC to Pistol Creek @ RM 7.5, Pistol Creek @ RM 4.7, Unnamed Trib to Pistol Creek, Unnamed Trib to Springfield Branch, Sinkhole | 0601020101 |
| TN0067199 | Alcoa | 3353 | Aluminum Sheet, Plate, and Foil | Major | WWC to Duncan Creek and Russell Branch, Unnamed Trib to Russell Branch @ RM 2.2, Duncan Creek @ RM 0.6 | 0601020101 |
| TN0002216 | Exxon-Mobil | 5171 | Heating Oil-Retail | Minor | Unnamed Trib to Third Creek @ RM 5.3 | 0601020102 |
| TN0002682 | Rohm and Haas | 2821 | Plastic Materials, Synthetic Resins | Minor | East Fork Third Creek @ RM 0.1 | 0601020102 |
| TN0023574 | KUB-4th Creek STP | 4952 | Sewerage Systems | Major | TN River @ RM 640.0 | 0601020102 |
| TN0020079 | Maryville STP | 4952 | Sewerage Systems | Major | TN River @ RM 637.0 | 0601020102 |
| TN0022411 | Citgo Petroleum | 5171 | Heating Oil-Retail | Minor | Little River Embayment @ RM 5.0 | 0601020102 |
| TN0022535 | Trans Montaigne Terminaling | 5171 | Heating Oil-Retail | Minor | TN River @ RM 649.1 | 0601020102 |
| TN0023582 | KUB-Kuwahee STP | 4952 | Sewerage Systems | Major | TN River @ RM 646.2 | 0601020102 |
| TN0023906 | Penninsula Psychiatric Hospital | 4952 | Sewerage Systems | Minor | TN River @ RM 632.0 | 0601020102 |
| TN0027804 | Ameristeel | 3312 | Coke Ovens not With Steel Mills | Minor | East Fork 3rd Creek @ RM 2.3 | 0601020102 |
| TN0055433 | Volunteer Asphalt | 2911 | | Minor | TN River @ RM 651.5 | 0601020102 |
| TN0057525 | Marathon Ashland Petroleum | 5171 | Heating Oil-Retail | Minor | Ditch to Unnamed Trib to 3rd Creek @ RM 5.1 | 0601020102 |
| TN0060402 | Cummins Terminals | 4226 | Fur Storage | Minor | Unnamed Trib to 3rd Creek @ RM 5.3 | 0601020102 |
| TN0060780 | Duncan's Landing | 4952 | Sewerage Systems | Minor | TN River @ RM 635.0 | 0601020102 |
| TN0064190 | B.P. Oil Company | 5541 | | Minor | 1st Creek @ RM 6.2 | 0601020102 |
| TN0064556 | Pilot Travel Centers | 5541 5812 | Gasoline Service Stations, Eating and Drinking Places | Minor | Unnmaed Trib to Turkey Creek @ RM 4.2 | 0601020102 |
| TN0066842 | Conoco, Incorporated | 5171 | Heating Oil-Retail | Minor | 3rd Creek | 0601020102 |

| | | | | | | |
|---|---|---|---|---|---|---|
| TN0067156 | Texaco Bulk Storage Terminal | 5171 | Heating Oil-Retail | Minor | TN River @ RM 648.2 | 0601020102 |
| TN0067181 | Marathon Ashland Petroleum | 5171 | Heating Oil-Retail | Minor | Tennessee River @ RM 648.0 | 0601020102 |
| TN0073130 | Shannon Industries | 3479 | Silverware/Flatware Engraving | Minor | Ditch to 3rd Creek | 0601020102 |
| TN0074705 | Dalen Products | 3089 | Plastic Sausage Casings | Minor | Unnmaed Trib to Turkey Creek @ RM 4.9 | 0601020102 |

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

| FACILITY NUMBER | FACILITY NAME | SIC | SIC NAME | WATERBODY | HUC-10 |
|---|---|---|---|---|---|
| TN0003042 | Vulcan Construction Co. | 1422 | Crushed and Broken Limestone | Duncan Br | 0601020101 |
| TN0065927 | 321 Stone | 1422 | Crushed and Broken Limestone | Gallagher Ck | 0601020102 |
| TN0071862 | Tennessee Marble Co. | 1411 | Dimension Stone | Karst Tribs of Ish Ck | 0601020102 |
| TN0072125 | Tennessee Marble Co. | 1411 | Dimension Stone | Unnamed Trib of Gallagher Ck | 0601020102 |
| TN0072061 | Tennessee Valley Marble Co. | 1411 | Dimension Stone | Unnamed Trib of Gallagher Ck | 0601020102 |
| TN0029467 | Vulcan Construction Co. | 1422 | Crushed and Broken Limestone | Williams Creek | 0601020102 |

***Table A4-6. Active Permitted Mining Sites in the Fort Loudoun Lake Watershed.*** *SIC, Standard Industrial Classification.*

| FACILITY NUMBER | FACILITY NAME | SECTOR | RECEIVING STREAM | AREA* | HUC-10 |
|---|---|---|---|---|---|
| TNR050560 | U.S. Bronze Powders | F | Russell Branch | 6.0 | 0601020101 |
| TNR050800 | Willocks Brothers Company | E | Dunlap Branch | 8.0 | 0601020101 |
| TNR050992 | Waters Motors Inc. #3 | M | Tennessee River | 1.2 | 0601020101 |
| TNR051300 | TN Farmers Cooperative | U, AD, C, P | Fort Loudoun Lake | 4.9 | 0601020101 |
| TNR053134 | STD Auto Alliance Engines | AB | Pistol Branch | 4.5 | 0601020101 |
| TNR053321 | ALCOA recycling Company | N | Laurel Bank Branch | 5.6 | 0601020101 |
| TNR053563 | UPS-Maryville | P | Unnamed Trib to Browns Branch | 1.3 | 0601020101 |
| TNR053718 | Merrimans Septic Tank | E | Pistol Creek | 2.0 | 0601020101 |
| TNR053763 | Alcoa/Maryville/Blount County Landfill | L | WWC to Cotter Creek | 150.0 | 0601020101 |
| TNR053937 | Raun Leasing Company | P | Laurel Branch | 3.1 | 0601020101 |
| TNR053945 | Breed Safety Restraint | AB | Bank Branch | 2.5 | 0601020101 |
| TNR054032 | Robert Shaw Industrial Products | AA, AC | Bank Branch | 5.4 | 0601020101 |
| TNR054069 | ALCOA Inc-West Plant | L | Pistol Creek Unnamed Trib to Tedford Branch | 127.0 | 0601020101 |
| TNR054193 | Akard Commutator of TN | AB, AC | Pistol Creek | 3.3 | 0601020101 |
| TNR054196 | DCS Electronics | AA, AC | Unnamed Trib to Little River | 1.0 | 0601020101 |
| TNR054372 | East TN Wood Products | A | None | 4.0 | 0601020101 |
| TNR054373 | Brown Truss Company | A | Browns Creek | 2.0 | 0601020101 |
| TNR054492 | Koide TN, Incorporated | AA | Little River | 6.4 | 0601020101 |
| TNR054549 | Anderson Truss Company | A | Pistol Creek | 5.0 | 0601020101 |
| TNR055905 | Federal Express-Alcoa | S | Russell Branch | 1.1 | 0601020101 |
| TNR055932 | Midsouth Machine Shop | AB | Unnamed Trib to Russell Branch | 0.5 | 0601020101 |

| | | | | | |
|---|---|---|---|---|---|
| TNR050148 | Moon's Used Parts | M | WWC to Turkey Creek | 4.0 | 0601020102 |
| TNR050376 | W.J.Savage Company | AB | Third Creek | | 0601020102 |
| TNR050407 | Coster Shop-Site Contamination | P | Second Creek | 110.0 | 0601020102 |
| TNR050458 | Performance Pipe | Y | Turkey Creek | 8.3 | 0601020102 |
| TNR050548 | Briggs Industrial | AA | French Broad River | 7.0 | 0601020102 |
| TNR050584 | JBM Incorporated | AA | Fort Loudoun Lake | 4.0 | 0601020102 |
| TNR050585 | Greenway Chemical | C | Whites Creek | 1.0 | 0601020102 |
| TNR050686 | AmeriSteel | F | East Fork Third Creek | 29.0 | 0601020102 |
| TNR050792 | Enterprise Waste Oil Co. | N | Knoxville Stormwater Sewer System | 1.3 | 0601020102 |
| TNR050816 | Pemberton Truck Lines | P | Sheet Run –Off | 2.8 | 0601020102 |
| TNR050828 | Don Payne Trucking | P | Tennessee River | 2.0 | 0601020102 |
| TNR050943 | Johns Story Truck Salvage | M | Ditch to Roseberry Creek | 6.0 | 0601020102 |
| TNR050981 | Kelso Oil Company | AD | Second Creek | 2.0 | 0601020102 |
| TNR050984 | John B. Long Trucking | AB, AC, AD | East Fork Third Creek | 1.3 | 0601020102 |
| TNR051026 | Coster Plant | AD | Unnamed Trib to Second Creek | 5.0 | 0601020102 |
| TNR051073 | Crete Carrier Corporation | P | Unnamed Trib to Turkey Creek | 1.9 | 0601020102 |
| TNR051187 | Rimmer Bros. Truck Parts | M | WWC to Flenniken Branch | 1.0 | 0601020102 |
| TNR051453 | Consolidated Freightways | P | Tennessee River | 4.0 | 0601020102 |
| TNR051461 | Porcelain Products | E | East Fork Third Creek | 2.5 | 0601020102 |
| TNR051494 | PSC Metals, Incorporated | N | Second Creek | 4.2 | 0601020102 |
| TNR051706 | Knox Recycled Fiber Co. | N | Third Creek | 1.2 | 0601020102 |
| TNR051820 | General Shale Products | E, P | Tennessee River Williams Creek | 36.8 | 0601020102 |
| TNR052051 | Overnite Transportation Co. | P, L | Sinking Creek | 23.0 | 0601020102 |
| TNR052103 | Roadway Express, Inc. | P | | 7.1 | 0601020102 |
| TNR053042 | Tamko Roofing Products | B | Second Creek | 9.7 | 0601020102 |
| TNR053054 | PSC Metals, Incorporated | N | Second Creek | 6.5 | 0601020102 |
| TNR053145 | Fulton Bellows | AA | Third Creek | 4.0 | 0601020102 |
| TNR053192 | Simerly Vaults, Inc. | Y | 1st UD of Knox County | 2.2 | 0601020102 |
| TNR053194 | Earthgrains baking Co. | U | Tennessee River | 1.7 | 0601020102 |
| TNR053198 | BFI Recycling | N | Loves Creek | 1.5 | 0601020102 |
| TNR053241 | Knoxville Yard | P | Tennessee River | 3.0 | 0601020102 |
| TNR053252 | Downtown Island Airport | S | Fort Loudoun Lake | 5.0 | 0601020102 |
| TNR053253 | McGhee-Tyson Airport | S | Unnamed Trib to Russell Br Unnamed Trib to Lackey Ck | 125.0 | 0601020102 |
| TNR053265 | Beverly Steel, Incorporated | AA | None | 5.8 | 0601020102 |
| TNR053380 | Tennessee Asphalt Co. | D | Goose Creek | 3.0 | 0601020102 |
| TNR053418 | Kuwahee WWTP | T | Fort Loudoun Lake | 27.0 | 0601020102 |
| TNR053419 | Fourth Creek WWTP | T | Tennessee River | 2.0 | 0601020102 |
| TNR053426 | Federal Express | S | Turkey Creek | 1.2 | 0601020102 |
| TNR053450 | Tom's Foods, Incorporated | U | Ten Mile Creek | 7.2 | 0601020102 |
| TNR053566 | Highway Transport, Inc. | P | Unnamed Trib to 4th Creek | 6.3 | 0601020102 |
| TNR053598 | Kenan Transport, Inc. | P | Third Creek | 9.9 | 0601020102 |

| | | | | | |
|---|---|---|---|---|---|
| TNR053603 | White Lilly Foods Company | U | Knoxville Municipal Stormwater Sewer | 3.0 | 0601020102 |
| TNR053652 | Norfolk Southern Railway | P | Holston River | 2.0 | 0601020102 |
| TNR053655 | System 81 Express, Inc. | P | Turkey Creek Tennessee River | 6.0 | 0601020102 |
| TNR053914 | Tire Distribution Systems | P | Fourth Creek | 3.6 | 0601020102 |
| TNR054011 | Process Rail Services | AB | French Broad River | 1.3 | 0601020102 |
| TNR054044 | Hines Fine Soils, LLC | E | Unnamed Trib to Goose Creek | 13.5 | 0601020102 |
| TNR054081 | Lambert Excavation & Soils | E | Goose Creek | 10.8 | 0601020102 |
| TNR054111 | Shamrock Organics | A | Third Creek | 7.0 | 0601020102 |
| TNR054194 | Processed Foods Corp. | U | Unnamed Trib to 3rd Creek | 3.8 | 0601020102 |
| TNR054290 | Silver Furniture Company | W | First Creek | 10.4 | 0601020102 |
| TNR054308 | Pallet Express | A | Straight Fork | 2.0 | 0601020102 |
| TNR054310 | Quality Machine & Welding | AA | | 2.4 | 0601020102 |
| TNR054336 | Microwave Materials | AB | Turkey Creek | 0.1 | 0601020102 |
| TNR054374 | Perma-Chink Systems | C | | 0.5 | 0601020102 |
| TNR054417 | Stonecraft, Incorporated | J, E | Turkey Creek | 0.2 | 0601020102 |
| TNR054550 | Environmental Systems | AC | Second Creek | 8.3 | 0601020102 |
| TNR054574 | Dyno Nobel, Incorporated | C | Unnamed Pond | 10.0 | 0601020102 |
| TNR054582 | Signal Mtn Cement Co. | E | Tennessee River | 4.5 | 0601020102 |
| TNR055031 | Knoxville Cast Stone | E | East Fork Creek | 11.0 | 0601020102 |
| TNR055919 | Zetek Power Coropration | AC | Flat Fork | 8.8 | 0601020102 |

***Table A4-7. Active Permitted TMSP Facilities in the Fort Loudoun Lake Watershed.*** *Area, acres of property associated with industrial activity; WWC, Wet Weather Conveyance. 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 |
|---|---|---|---|---|
| 98.108 | Blount | Boat Ramp | Little River | 0601020101 |
| 98.558 | Knox | Bridge Culvert | Third Creek | 0601020101 |
| 99.073 | Knox | Building Construction | Tennessee River | 0601020101 |
| 99.343 | Blount | Stream relocation | Brown Creek | 0601020101 |
| 98.311 | Knox | Fill-in Slough | Tennessee River | 0601020102 |
| 98.362 | Knox | Debris removal | Unnamed Trib to 1st Creek | 0601020102 |
| 98.526 | Knox | Channelization | 4th Creek | 0601020102 |
| 98.645 | Blount | Impoundment | Unnamed Trib to Taylor Creek | 0601020102 |
| 99.100 | Knox | Stream relocation | Unnamed Trib to Little Turkey Cr | 0601020102 |
| 99.311 | Knox | Stream Relocation | Unnamed Trib to Turkey Creek | 0601020102 |
| 99.383 | Knox | Road Construction | Ten Mile Creek | 0601020102 |
| 99.467 | Knox | Rip-Rap | Holder Branch | 0601020102 |
| 99.530 | Knox | Wetland Fill (0.23 Acre) | Ten Mile Creek | 0601020102 |
| 99.531 | Knox | Box Culvert Extension | Ten Mile Creek | 0601020102 |
| 00.056 | Knox | Concrete Retaining Wall | 1st Creek | 0601020102 |
| 00.132 | Knox | Bridge Construction | 3rd Creek | 0601020102 |
| 00.001 | Knox | Retaining Wall | 3rd Creek | 0601020102 |

***Table A4-9. Individual ARAP Permits Issued January 1994 Through June 2000 in Fort Loudoun Lake Watershed.***

# APPENDIX V

| CONSERVATION PRACTICE | UNITS | AMOUNT |
|---|---|---|
| Alley Cropping | Acres | 0 |
| Contour Buffer Strips | Acres | 5 |
| Crosswind Trap Strips | Acres | 0 |
| Field Borders | Feet | 13,000 |
| Filter Strips | Acres | 2 |
| Grassed Waterways | Acres | 0 |
| Riparian Forest Buffers | Acres | 7 |
| Streambank and Shoreline Protection | Feet | 19,650 |
| Windbreaks and Shelterbelts | Feet | 0 |
| Hedgerow Plantings | Feet | 0 |
| Herbaceous Wind Barriers | Feet | 0 |
| Total Conservation Buffers | Acres | 29 |

***Table A5-1a. Conservation Buffers Conservation Practices in Partnership with NRCS in the Fort Loudoun Lake Watershed.*** *Data are from Performance & Results Measurement System (PRMS) for October 1, 2001 through September 30, 2002 reporting period. Data represent practices in both the Group 1 and Group 2 portions of the watershed.*

| PARAMETER | TOTAL |
|---|---|
| Erosion Reduction Applied (Acres) | 1,340 |
| Highly Erodible Land With Erosion Control Practices (Acres) | 1,102 |
| Estimated Annual Soil Saved By Erosion Control Measures (Tons/Year) | 19,191 |
| Total Estimated Soil Saved (Tons/Year) | 19,191 |

***Table A5-1b. Erosion Control Conservation Practices in Partnership with NRCS in the Fort Loudoun lake Watershed.*** *Data are from Performance & Results Measurement System (PRMS) for October 1, 2001 through September 30, 2002 reporting period. Data represent practices in both the Group 1 and Group 2 portions of the watershed.*

| PARAMETER | TOTAL |
|---|---|
| Acres of AFO Nutrient Management Applied | 470 |
| Acres of Non-AFO Nutrient Management Applied | 1,283 |
| Total Acres Applied | 1,753 |

***Table A5-1c. Nutrient Management Conservation Practices in Partnership with NRCS in the Fort Loudoun Lake Watershed.*** *Data are from Performance & Results Measurement System (PRMS) for October 1, 2001 through September 30, 2002 reporting period. Data represent practices in both the Group 1 and Group 2 portions of the watershed.*

| PARAMETER | TOTAL |
|---|---|
| Acres of Pest Management Systems Applied | 2,690 |

***Table A5-1d. Pest Management Conservation Practices in Partnership with NRCS in the Fort Loudoun Lake Watershed.*** *Data are from Performance & Results Measurement System (PRMS) for October 1, 2001 through September 30, 2002 reporting period. Data represent practices in both the Group 1 and Group 2 portions of the watershed.*

| CONSERVATION PRACTICE | ACRES |
|---|---|
| Acres Prepared for Revegetation of Forestland | 14 |
| Acres Improved Through Forest Stand Improvement | 6,445 |
| Acres of Tree and Shrub Establishment | 1,099 |

***Table A5-1e. Tree and Shrub Conservation Practices in Partnership with NRCS in the Fort Loudoun Lake Watershed.*** *Data are from Performance & Results Measurement System (PRMS) for October 1, 2001 through September 30, 2002 reporting period. Data represent practices in both the Group 1 and Group 2 portions of the watershed.*

| CONSERVATION PRACTICE | ACRES |
|---|---|
| Acres of Upland Habitat Management | 1,596 |
| Acres of Wetland Habitat Management | 0 |
| Total Acres Wildlife Habitat Management | 1,596 |

***Table A5-1f. Wildlife Habitat Management Conservation Practices in Partnership with NRCS in the Fort Loudoun Lake Watershed.*** *Data are from Performance & Results Measurement System (PRMS) for October 1, 2001 through September 30, 2002 reporting period. Data represent practices in both the Group 1 and Group 2 portions of the watershed.*

| COMMUNITY | PROJECT DESCRIPTION | AWARD DATE | AWARD AMOUNT |
|---|---|---|---|
| Alcoa | Wastewater Collection | 04/29/96 | $1,275,000 |

***Table A5-2. Communities in the Fort Loudoun Lake Watershed Receiving SRF Grants or Loans.***

| NRCS CODE | PRACTICE | NUMBER OF BMPs |
|---|---|---|
| | Septic System | 1 |
| 312 | Waste Management System | 8 |
| 313 | Waste Storage System | 1 |
| 327 | Conservation Cover | 1 |
| 342 | Critical Area Treatment | 12 |
| 378 | Pond | 7 |
| 382 | Fencing | 11 |
| 449 | Irrigation Water Management | 1 |
| 472 | Use Excluson | 2 |
| 484 | Mulching | 1 |
| 512 | Pasture/Hayland Planting | 105 |
| 516 | Pipeline | 21 |
| 528 | Proper Grazing | 1 |
| 558 | Roof Runoff Management | 3 |
| 560 | Access Lane | 1 |
| 561 | Heavy Use Area | 54 |
| 576 | Stream Crossing | 6 |
| 580 | Streambank/Shoreline Protection | 1 |
| 584 | Streambank Stabilization | 3 |
| 590 | Nutrient Management | 1 |
| 614 | Trough or Tank | 24 |
| 614b | Alternate Water Source | 2 |
| 633 | Waste Utilization | 3 |
| 638 | WSC Basin | 1 |

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