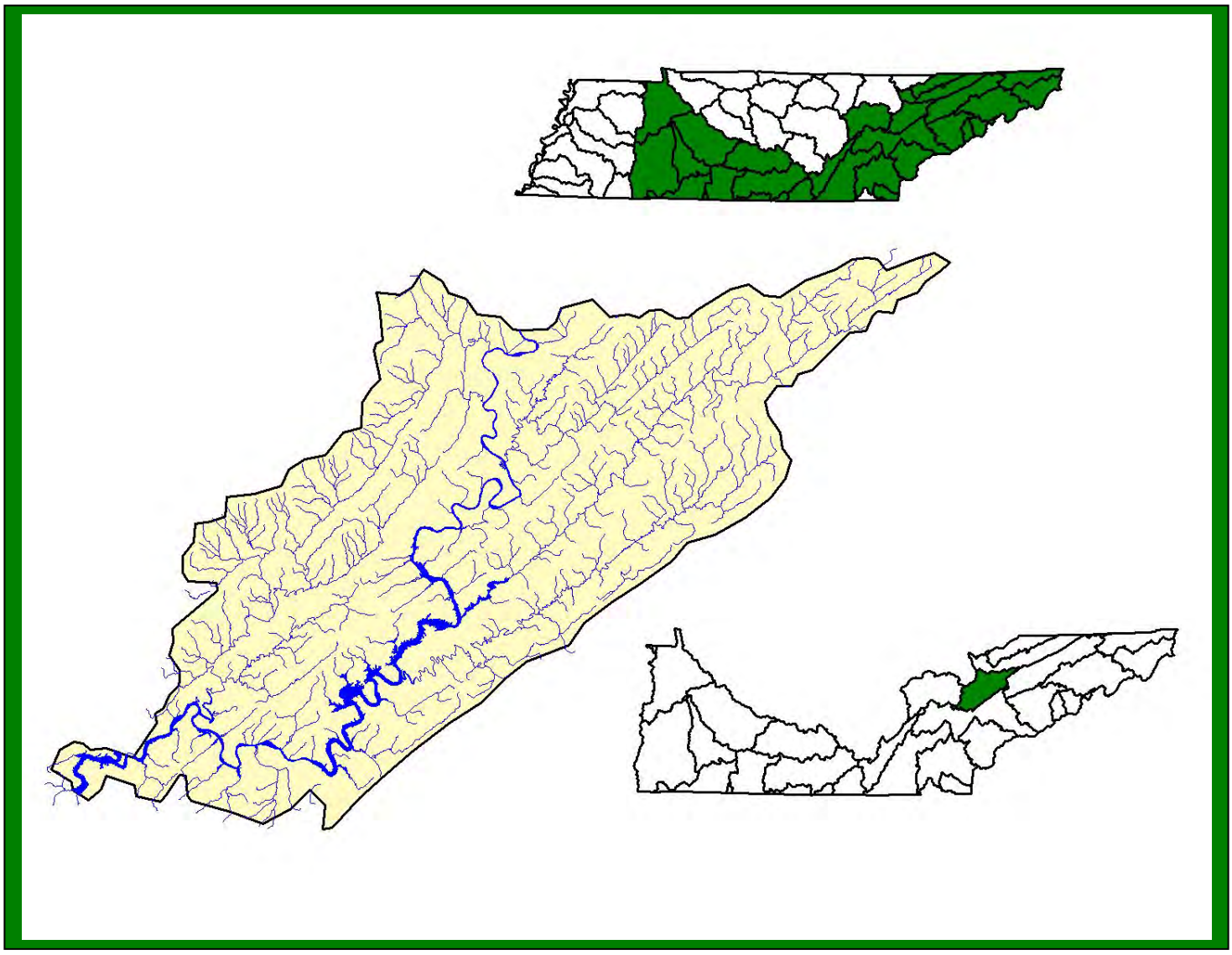
LOWER CLINCH RIVER WATERSHED (06010207) OF THE TENNESSEE RIVER BASIN

WATERSHED WATER QUALITY MANAGEMENT PLAN



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

LOWER CLINCH RIVER WATERSHED
WATER QUALITY MANAGEMENT PLAN

TABLE OF CONTENTS

GLOSSARY

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

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

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

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

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

AFO. Animal Feeding Operation.

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

ARAP. Aquatic Resource Alteration Permit.

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

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

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

Benthic. Bottom dwelling.

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

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

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

CAFO. Concentrated Animal Feeding Operation.

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

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

DO. Dissolved oxygen.

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

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

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

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

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

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

MRLC. Multi-Resolution Land Classification.

MS4. Municipal Separate Storm Sewer System.

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

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

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

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

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

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

SBR. Sequential Batch Reactor.

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

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

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

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

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

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

TMSP. Tennessee Multi-Sector Permit.

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

WAS. Waste Activated Sludge.

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

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

WET. Whole Effluent Toxicity.

WWTP. Waste Water Treatment Plant

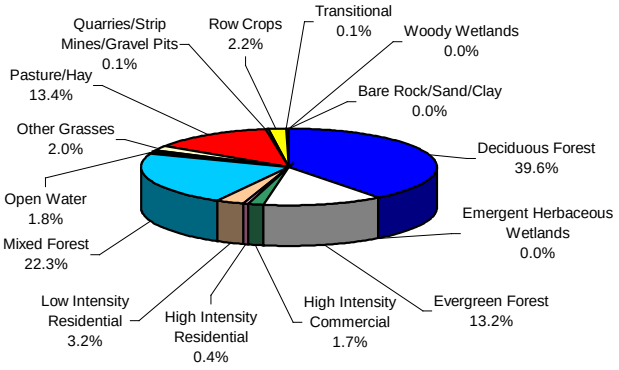
Summary – Lower Clinch River

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

The Watershed Approach recognizes awareness that restoring and maintaining our waters requires crossing traditional barriers (point *vs.* nonpoint sources of pollution) when designing solutions. These solutions increasingly rely on participation by both public and private sectors, where citizens, elected officials, and technical personnel all have opportunities to participate. The Watershed Approach provides the framework for a watershed-based and community-based approach to address water quality problems.

Chapter 1 of the Lower Clinch River Watershed Water Quality Management Plan discusses the Watershed Approach and emphasizes that the Watershed Approach is not a regulatory program or an EPA mandate; rather it is a decision-making process that reflects a common strategy for information collection and analysis as well as a common understanding of the roles, priorities, and responsibilities of all stakeholders within a watershed. Traditional activities like permitting, planning and monitoring are also coordinated in the Watershed Approach.

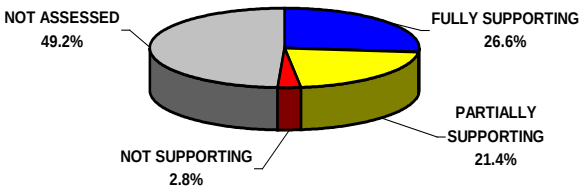
A detailed description of the watershed can be found in Chapter 2. The Lower Clinch River Watershed is approximately 631 square miles and includes parts of eight East Tennessee counties. A part of the Tennessee River drainage basin, the watershed has 802 stream miles and 6,690 lake acres.



Land Use Distribution in the Lower Clinch River Watershed.

Fourteen greenways, four interpretive areas and four wildlife management areas are located in the watershed. Eighty-nine rare plant and animal species have been documented in the watershed, to include seven rare fish species, fourteen rare mussel species, one rare snail species, and two rare reptile species. A portion of the Lower Clinch River has been designated as a State Scenic River.

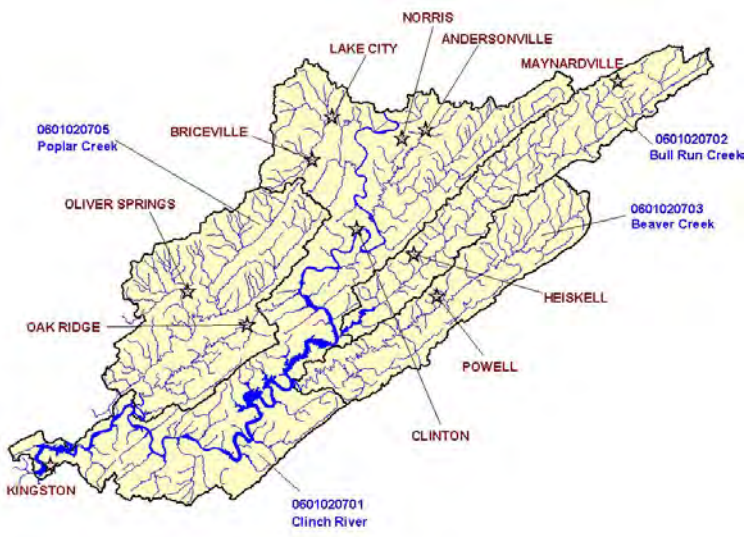
A review of water quality sampling and assessment is presented in Chapter 3. Using the Watershed Approach to Water Quality, 139 sampling events occurred in the Lower Clinch River Watershed in 1999-2000. These were conducted at ambient, ecoregion or watershed monitoring sites. Monitoring results support the conclusion that 26.6% of total stream miles fully support designated uses.



Water Quality Assessment of Streams and Rivers in the Lower Clinch River Watershed. Assessment data are based on the 2002 Water Quality Assessment of 801.9 miles in the watershed.

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

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



The Lower Clinch River Watershed is Composed of Four USGS-Delineated Subwatersheds (10-Digit Subwatersheds).

Point source contributions to the Lower Clinch River Watershed consist of 35 individual NPDES-permitted facilities, 10 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 (18), Tennessee Multi-Sector Permits (53), Mining Permits (24), Ready Mix Concrete Plant Permits (6) and Water Treatment Plant Permits (8). Agricultural operations include cattle, chicken, hog, and sheep farming. Maps illustrating the locations of NPDES and ARAP permit sites are presented in each subwatershed.

Chapter 5 is entitled *Water Quality Partnerships in the Lower Clinch River Watershed* and highlights partnerships between agencies and between agencies and landowners that are essential to success. Programs of federal agencies (Natural Resources Conservation Service, U.S. Fish and Wildlife Service, U.S. Geological Survey, and Tennessee Valley Authority), and state agencies (TDEC Division of Community Assistance, TDEC Division of Water Supply, Tennessee Department of Agriculture and DOE Oversight) are summarized. Local initiatives of active watershed organizations (Clinch River Chapter of Trout Unlimited, Beaver Creek Watershed Association, Beaver Creek Task Force, Coal Creek Watershed Foundation, Hinds Creek Watershed Partnership, Oak Ridge Reservation Local Oversight Committee and Tennessee Citizens for Wilderness Panning) are also described.

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

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

CHAPTER 1

WATERSHED APPROACH TO WATER QUALITY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

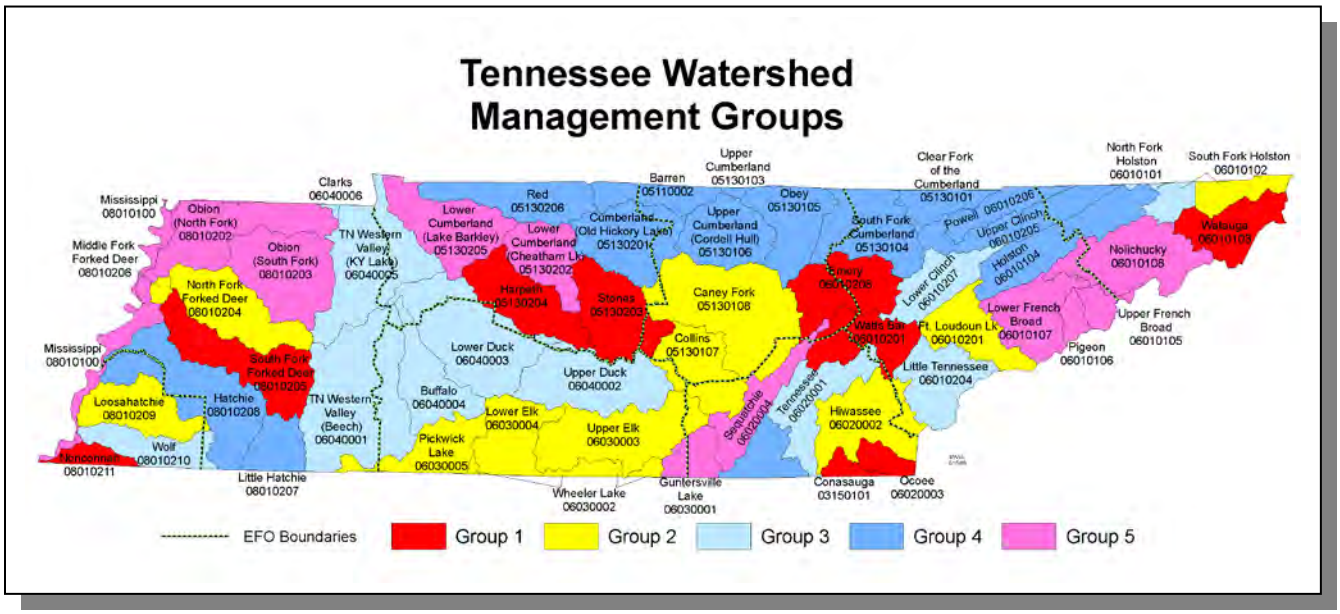


Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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

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

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

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

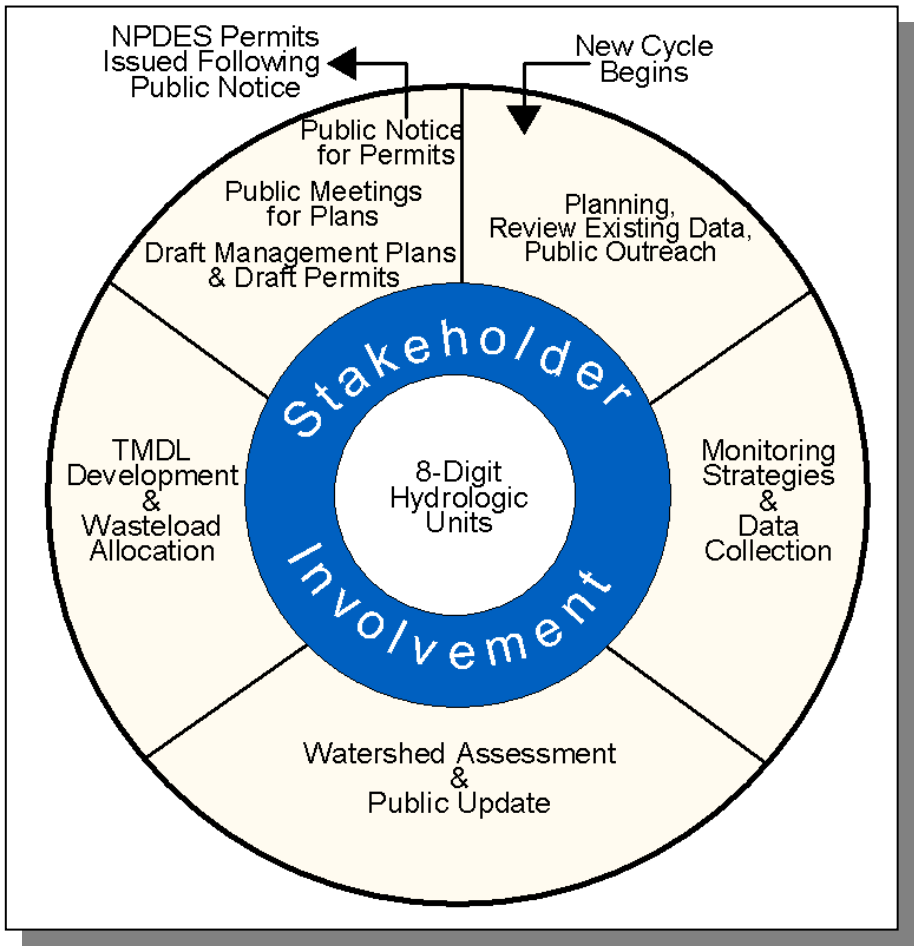


Figure 1-2. The Watershed Approach Cycle.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CHAPTER 2

DESCRIPTION OF THE LOWER CLINCH RIVER WATERSHED

2.1. BACKGROUND. The Clinch River and Watershed are named for one of the first explorers from the Transylvania Land Company to see the river. Dr. Thomas Walker, an explorer and Long Hunter, explored much of the Clinch River Valley in the 1760's. The Upper Clinch River originates in the mountains of Southwestern Virginia; the Lower Clinch River is much calmer, as it originates in the tailwaters of Norris Lake. Oak Ridge National Laboratory is a major facility in the watershed.

This Chapter describes the location and characteristics of the Lower Clinch River Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Lower Clinch River Watershed is located in East Tennessee and includes parts of Anderson, Campbell, Grainger, Knox, Loudon, Morgan, Roane, and Union Counties.

Figure 2-1. General Location of the Lower Clinch River Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Anderson	42.3
Knox	23.8
Roane	18.7
Union	9.1
Loudon	2.7
Morgan	1.8
Campbell	1.3
Grainger	0.2

Table 2-1. The Lower Clinch River Watershed Includes Parts of Eight East Tennessee Counties.

2.2.B. Population Density Centers. Five state highways and two interstates serve the major communities in the Lower Clinch River Watershed.

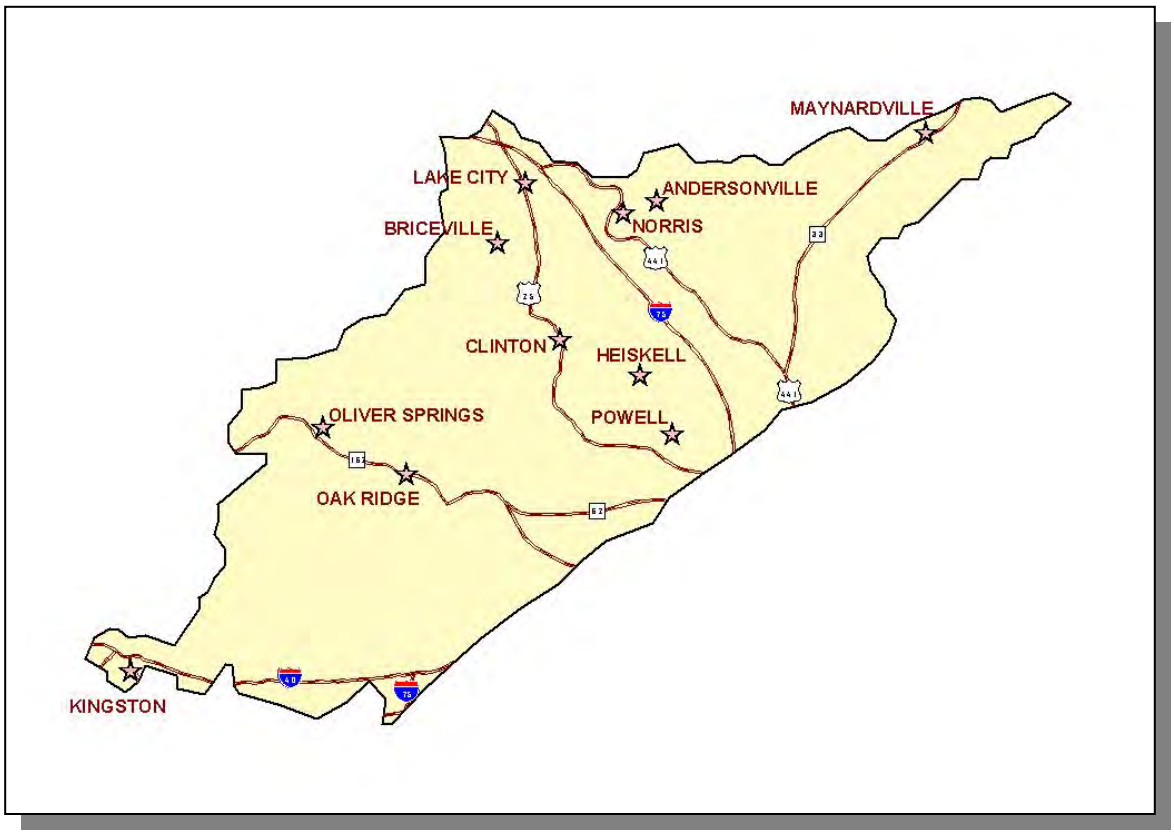


Figure 2-2. Municipalities and Roads in the Lower Clinch River Watershed.

MUNICIPALITY	POPULATION	COUNTY
Oak Ridge	26,788	Anderson
Clinton*	9,755	Anderson
Kingston*	5,398	Roane
Oliver Springs	3,450	Anderson/Roane/Morgan
Lake City	2,086	Anderson
Maynardville*	1,507	Union
Norris	1,231	Anderson

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

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Lower Clinch River Watershed, designated 06010207 by the USGS, drains approximately 631 square miles and empties to the Watts Bar Lake Watershed (06010201).

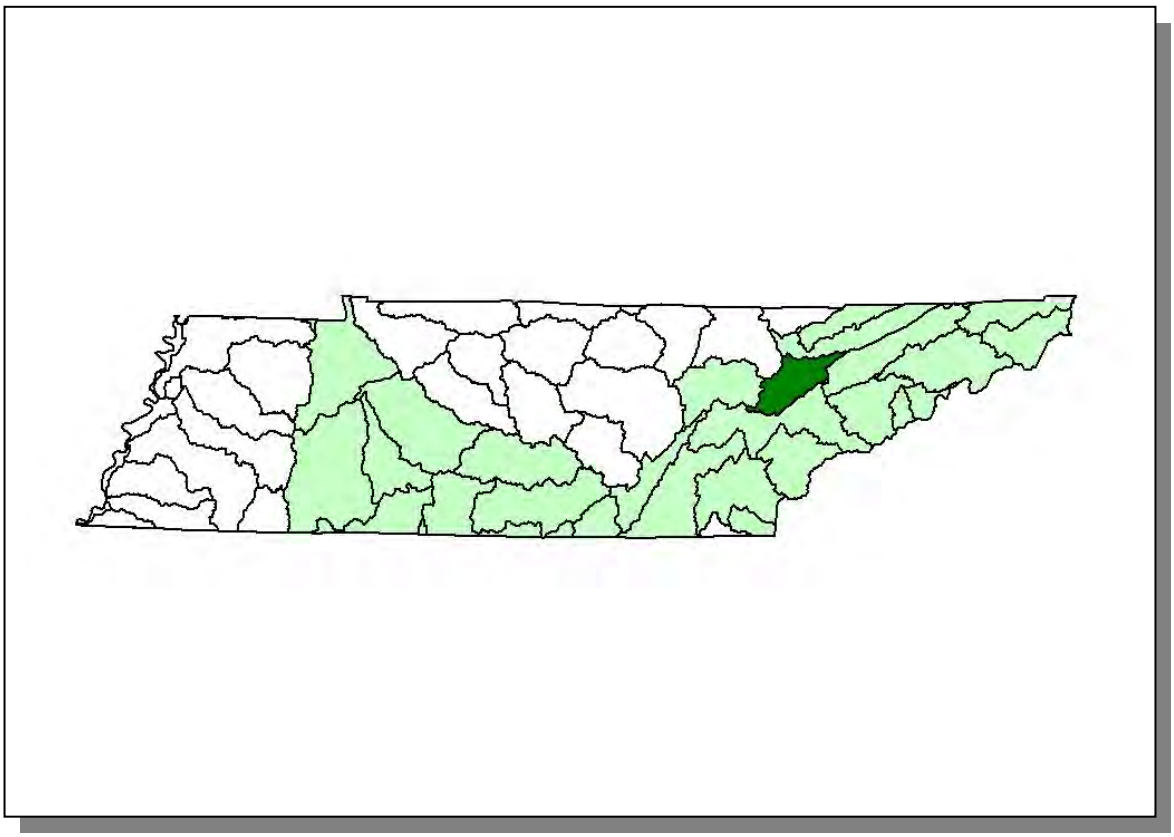


Figure 2-3. The Lower Clinch River Watershed is Part of the Tennessee River Basin.

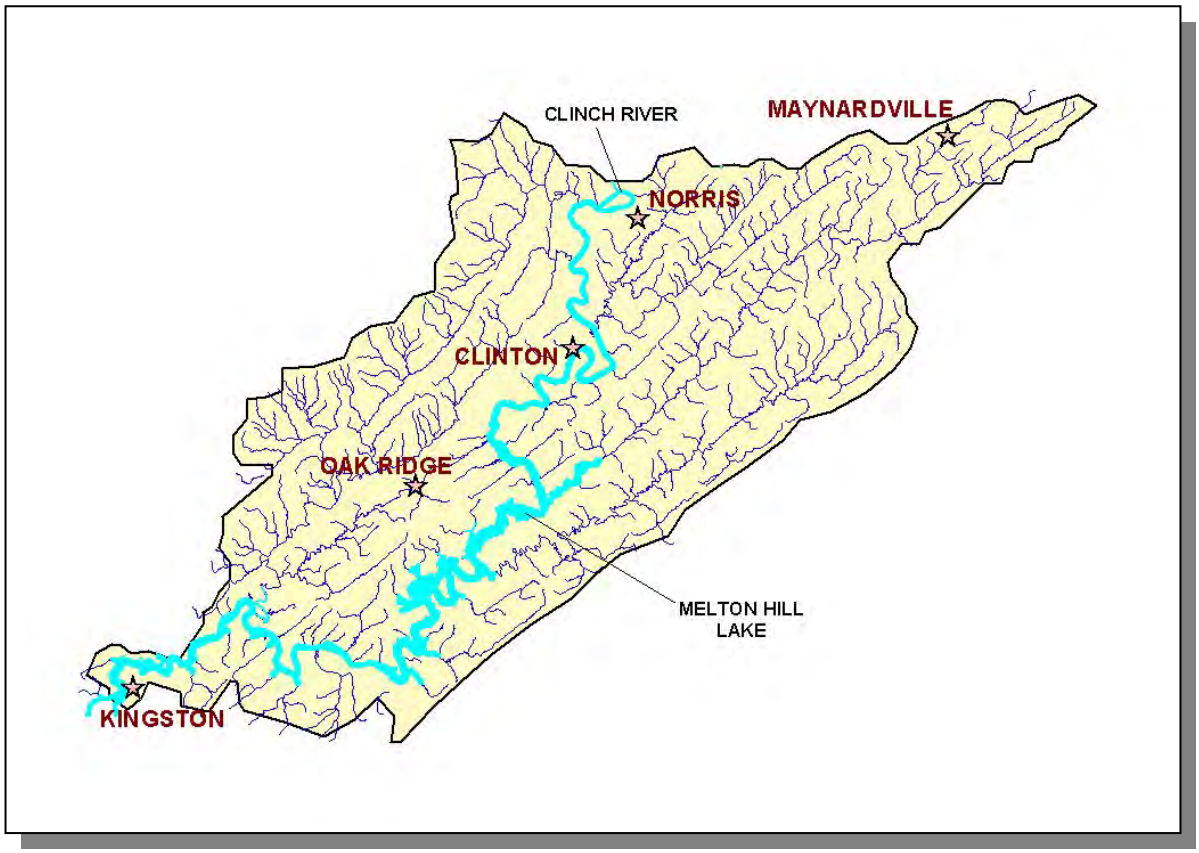


Figure 2-4. Hydrology in the Lower Clinch River Watershed. *There are 802 stream miles and 6,690 lake acres in the Lower Clinch River Watershed as catalogued in the assessment database. Location of the Clinch River and Melton Hill Lake, and the cities of Clinton, Kingston, Maynardsville, Norris, and Oak Ridge are shown for reference.*

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

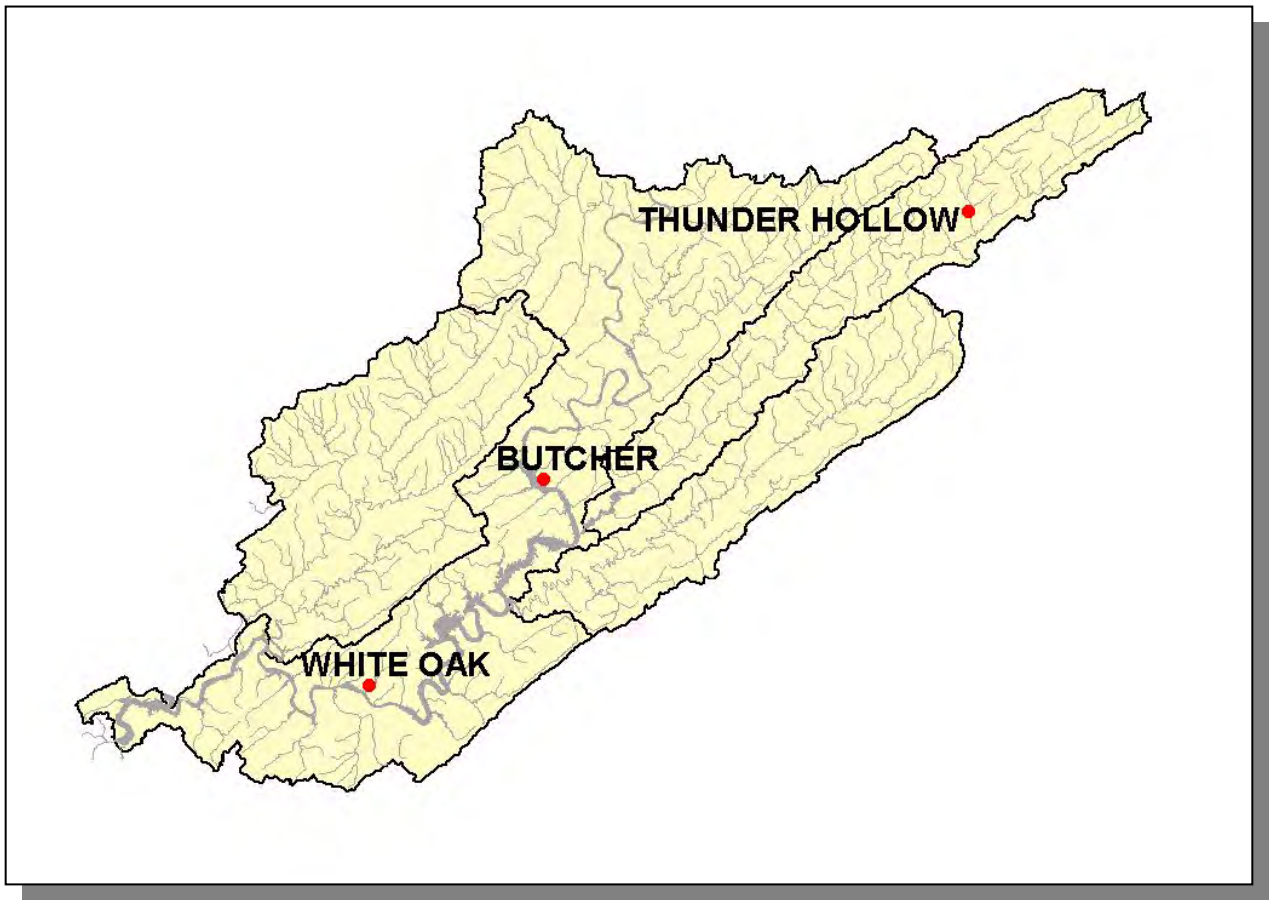


Figure 2-5. Location of Inventoried Dams in the Lower Clinch River Watershed. *More information is provided in Appendix II and on the TDEC homepage at http://gwidc.memphis.edu/website/dws/.*

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

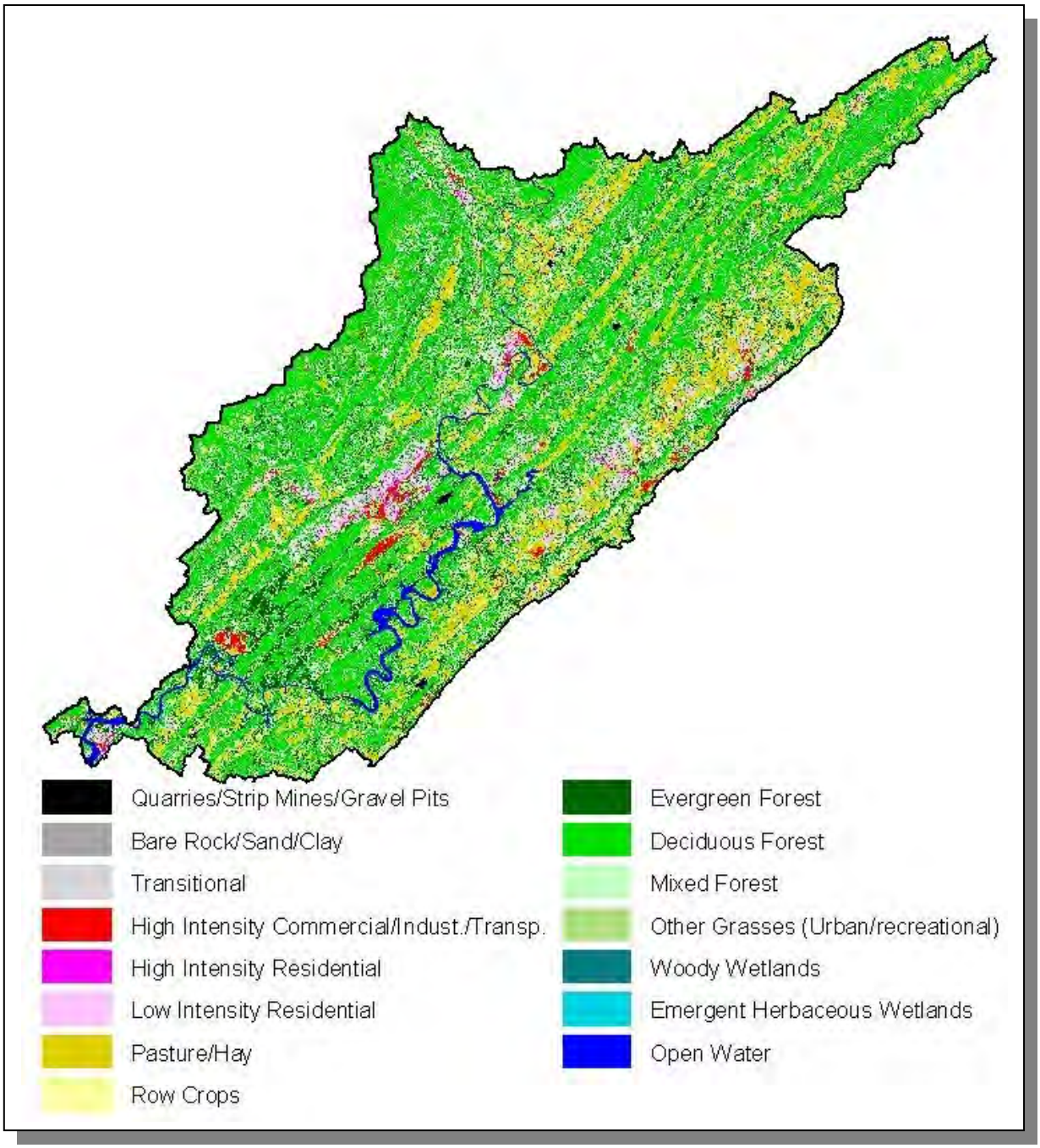


Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery in the Lower Clinch River Watershed.

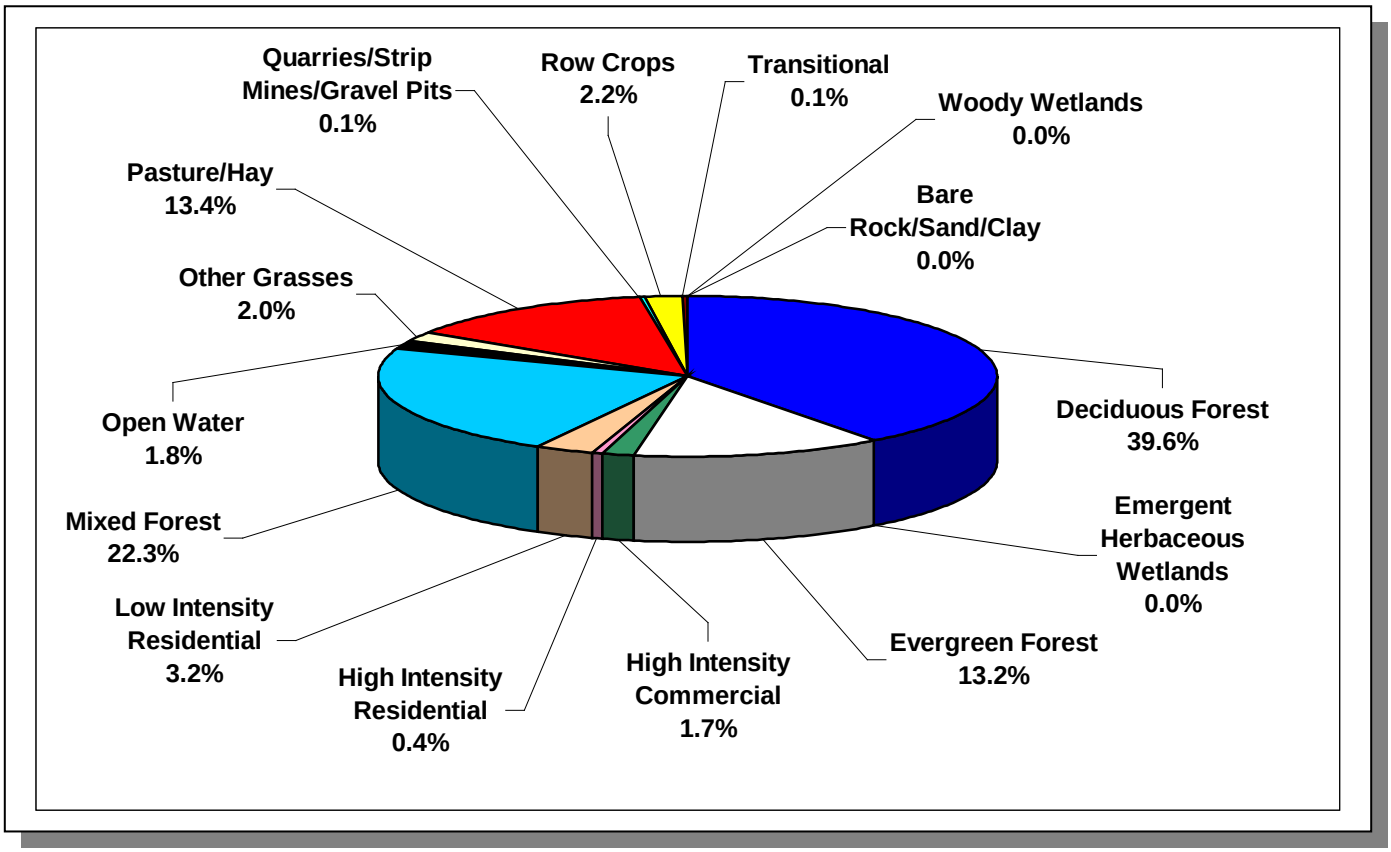


Figure 2-7. Land Use Distribution in the Lower Clinch River Watershed. *More information is provided in Appendix II.*

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

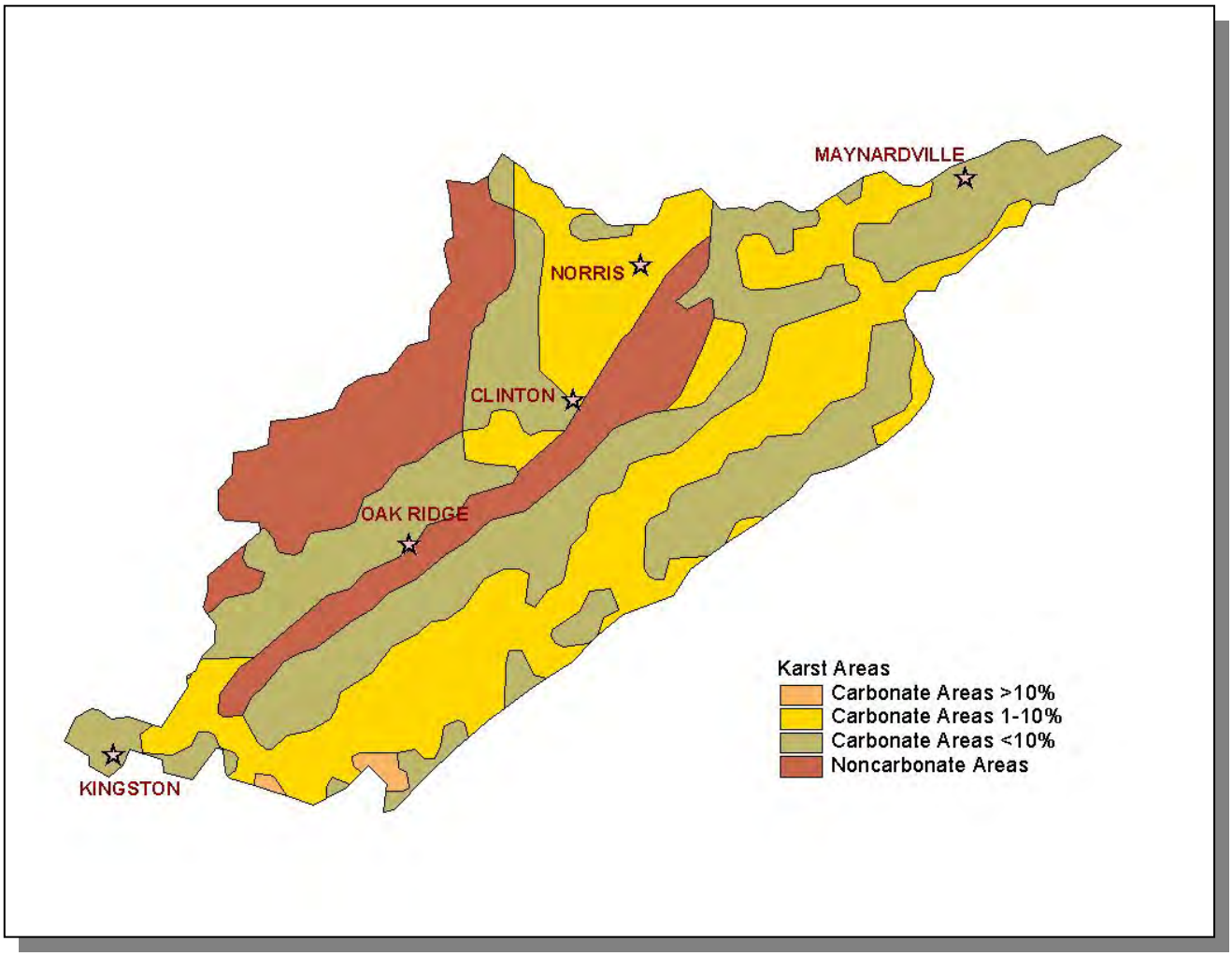


Figure 2-8. Illustration of Karst Areas in Lower Clinch River Watershed. *Locations of Clinton, Kingston, Maynardsville, Norris, and Oak Ridge are shown for reference.*

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

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Lower Clinch River Watershed lies within 3 Level III ecoregions Ridge and Valley, Southwestern Appalachians, and Central Appalachians) and contains 5 Level IV subecoregions:

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

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

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

- **Plateau Escarpment (68c)** is characterized by steep, forested slopes and high velocity, high gradient streams. Local relief is often 1000 feet or more. The geologic strata include Mississippian-age limestone, sandstone, shale, and

siltstone, and Pennsylvanian-age shale, siltstone, sandstone, and conglomerate. Streams have cut down into the limestone, but the gorge talus slopes are composed of colluvium with huge angular, slabby blocks of sandstone. Vegetation community types in the ravines and gorges include mixed oak and chestnut oak on the upper slopes, mesic forests on the middle and lower slopes (beech-tulip poplar, sugar maple-basswood-ash-buckeye), with hemlock along rocky streamsides and river birch along floodplain terraces.

- **Cumberland Mountains (69d)**, in contrast to the sandstone-dominated Cumberland Plateau (68a) to the west and southwest, are more highly dissected, with narrow-crested steep slopes, and younger Pennsylvanian-age shales, sandstones, siltstones, and coal. Narrow, winding valleys separate the mountain ridges, and relief is often 2000 feet. Cross Mountain, west of Lake City, reaches 3534 feet in elevation. Soils are generally well-drained, loamy, and acidic, with low fertility. The natural vegetation is a mixed mesophytic forest, although composition and abundance vary greatly depending on aspect, slope position, and degree of shading from adjacent landmasses. Large tracts of land are owned by lumber and coal companies, and there are many areas of stripmining. Acid mine drainage is primarily limited to first and second order systems. Siltation as surface run-off remains the primary pollutant from past mining, timber harvest and unpaved roads.

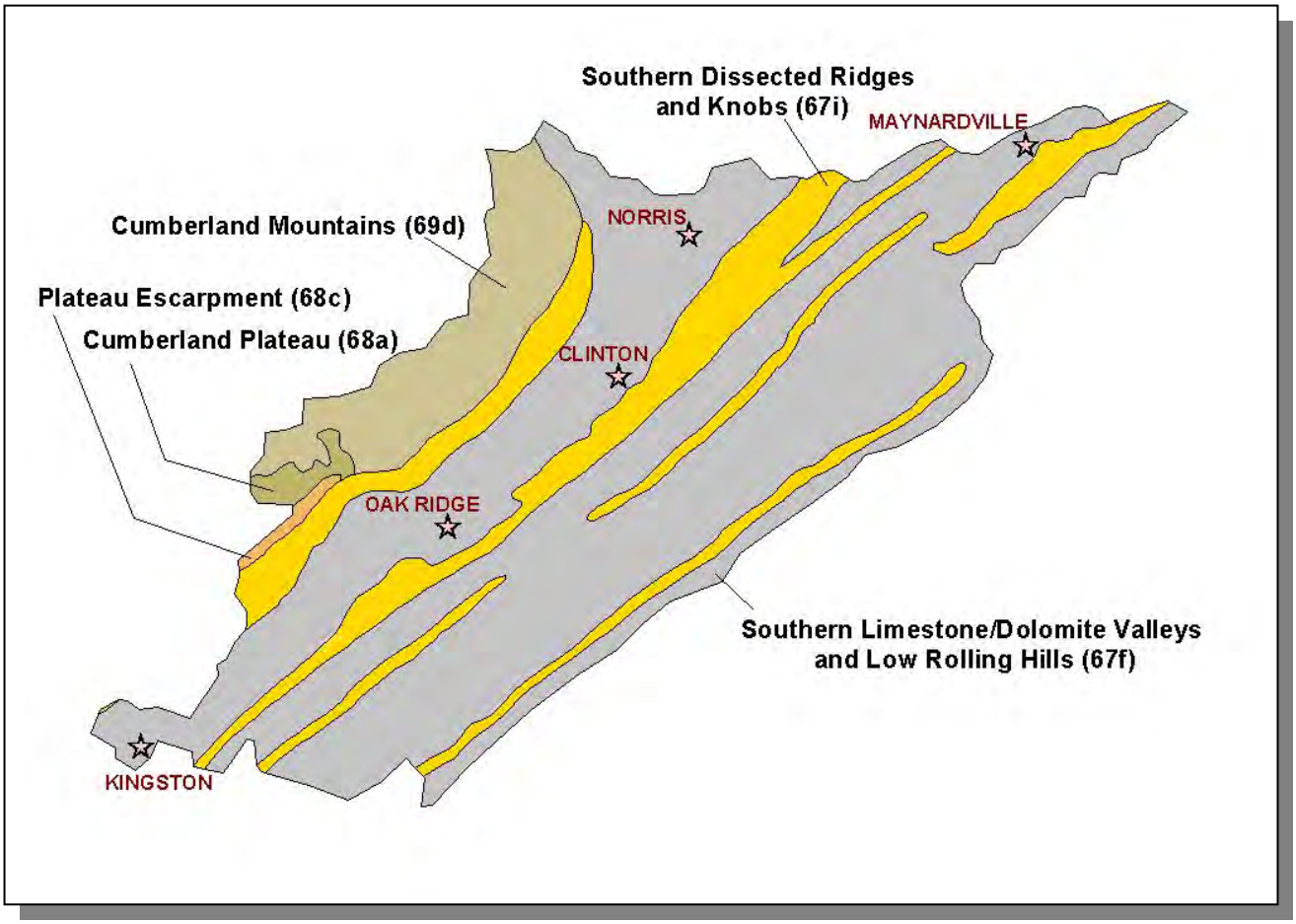


Figure 2-9. Level IV Ecoregions in the Lower Clinch River Watershed. *Locations of Clinton, Kingston, Maynardsville, Norris, and Oak Ridge are shown for reference.*

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

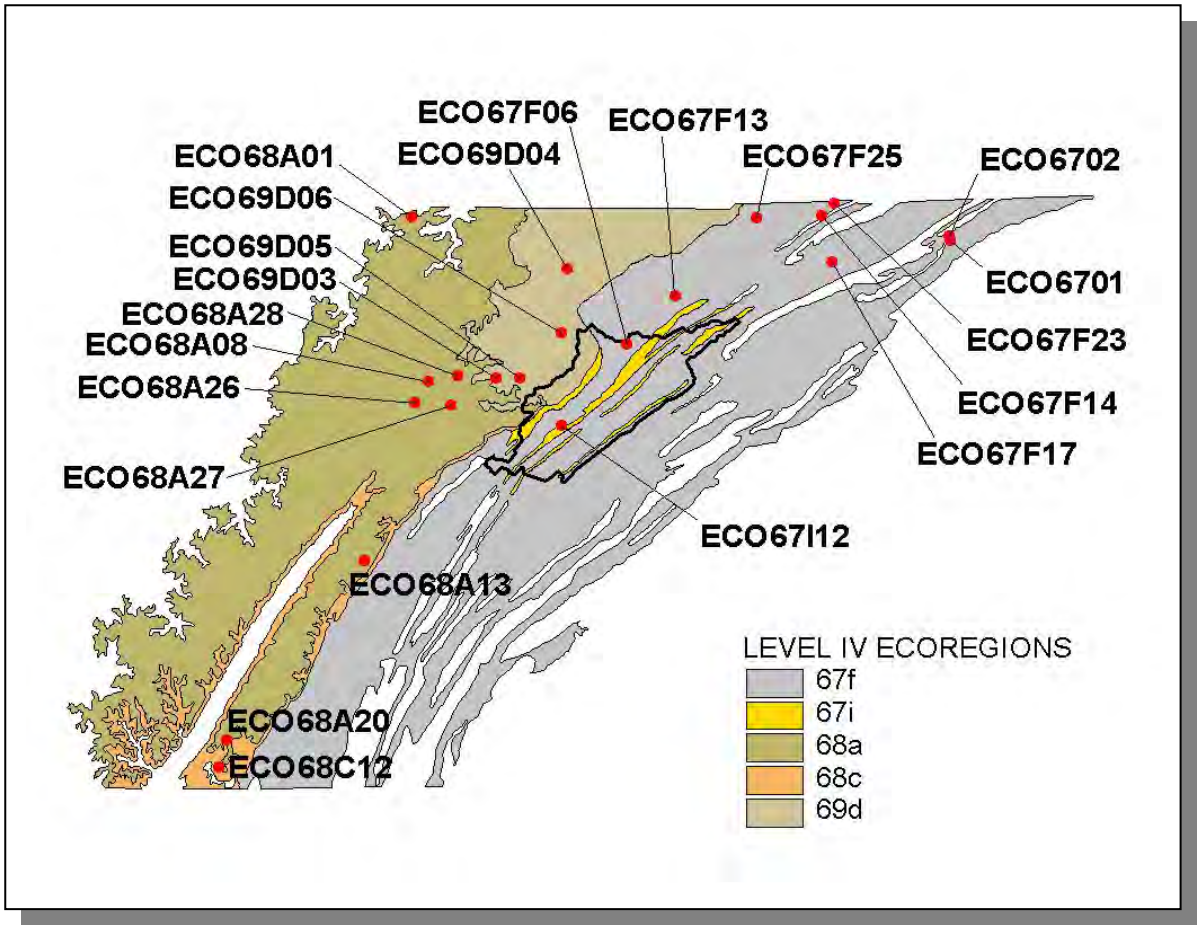


Figure 2-10. Ecoregion Monitoring Sites in Level IV Ecoregions 67f, 67i, 68a, 68c, and 69d in Tennessee. *The Lower Clinch River Watershed boundary is shown for reference. More information is provided in Appendix II.*

2.6. NATURAL RESOURCES.

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

GROUPING	NUMBER OF RARE SPECIES
Insects and Spiders	4
Mussels	14
Snails	1
Amphibians	3
Birds	8
Fish	7
Mammals	7
Reptiles	2
Plants	43
Total	**89**

Table 2-3. There are 89 Known Rare Plant and Animal Species in the Lower Clinch River Watershed.

In the Lower Clinch River Watershed, there are 7 rare fish species, 15 rare mussel species, and 1 rare snail species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Polyodon spathula	Paddlefish		
Hemitremia flammea	Flame Chub	MC	D
Cyprinella monacha	Spotfin Chub	LT	T
Phoxinus tennesseensis	Tennessee Dace		D
Carpiodes velifer	Highfin Carpsucker		D
Cycleptus elongatus	Blue Sucker	MC	T
Noturus flavipinnis	Yellowfin Madtom	LT, XN	E
Cumberlandia monodonta	Spectaclecase		
Cyprogenia irrorata	Eastern Fanshell Pearly Mussel	LE	E
Dromus dromus	Dromedary Pearly Mussel	LE	E
Fusconaia edgariana	Shiny Pigtoe	LE	E
Fusconia cuneolus	Fine-Rayed Pigtoe	LE	E
Hemistena lata	Cracking Pearly Mussel	LE	E
Lampsilis abrupta	Pink Mucket	LE	E
Lampsilis virescens	Alabama Lamp Mussel	LE	E
Conradilla caelata	Birdwing Pearly Mussel	LE	E
Plethobasus cicatricosus	White Whartyback	LE	E
Plethobasus cooperianus	Orange-Foot Pimpleback	LE	E
Pleurobema plenum	Rough Pigtoe	LE	E
Pleurobema plenum	Pyramis Pigtoe		
Quadrula cylindrica strigulata	Rough Rabbitsfoot Pearly Mussel	LE	E
Io fluvalis	Spiny Riversnail		

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

2.6.B. Wetlands. The Division of Natural Heritage maintains a database of wetland records in Tennessee. These records are a compilation of field data from wetland sites inventoried by various state and federal agencies. Maintaining this database is part of Tennessee's Wetland Strategy, which is described at:

http://www.state.tn.us/environment/nh/wetlands/

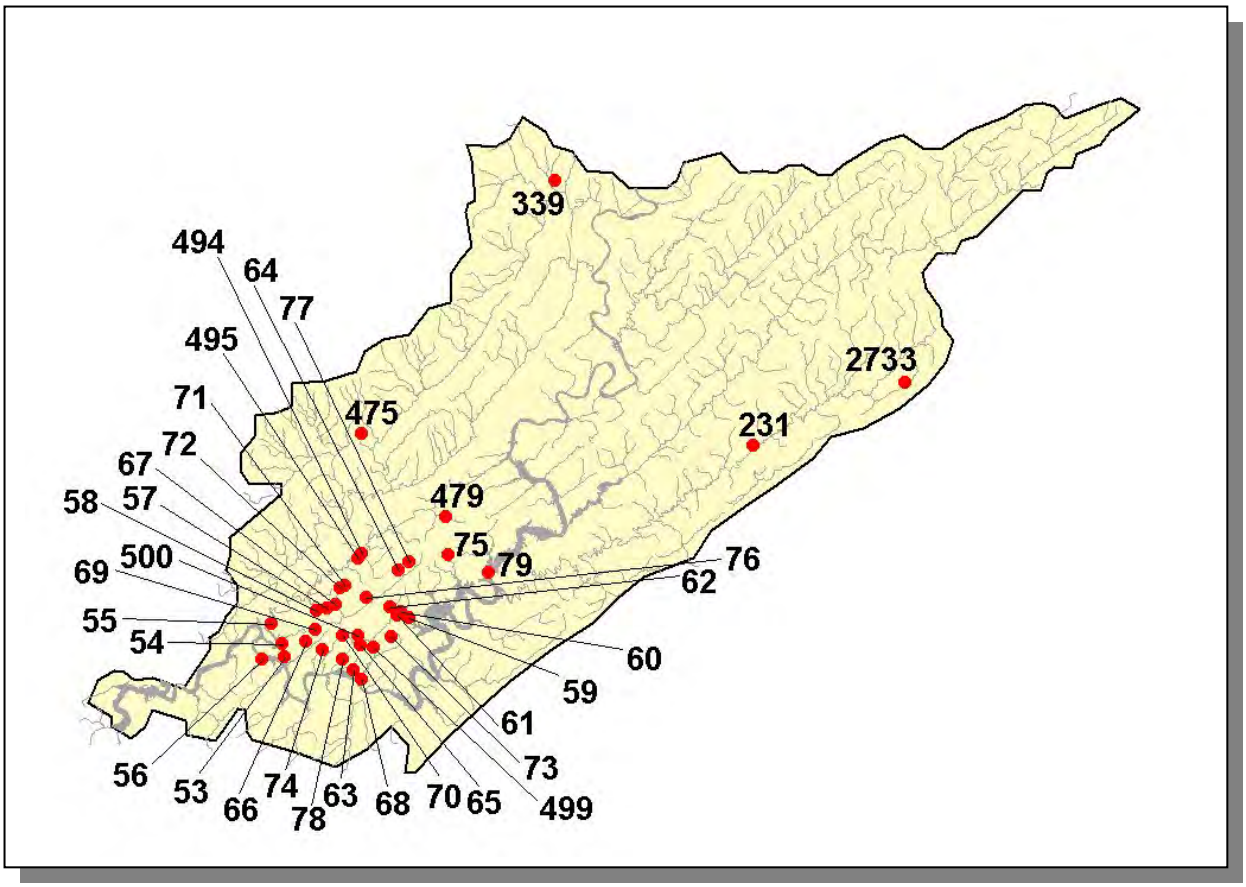


Figure 2-11. Location of Wetland Sites in TDEC Division of Natural Heritage Database in the Lower Clinch River Watershed. This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands*. More information is provided in Appendix II.*

2.7. CULTURAL RESOURCES.

2.7.A. State Scenic River. A portion of the Lower Clinch River has been designated as a State Scenic River. The portion from Melton Hill Dam upstream to Pellissippi Parkway has been designated as a Class III Scenic River. The Tennessee Scenic Rivers Act of 1968, as amended, defines Class III (Partially Developed Areas) as streams affected by the works of man but which still possess actual or potential scenic values. More information about Tennessee's State Scenic River Program may be found at:

http://www.state.tn.us/environment/nh/scenicrivers/

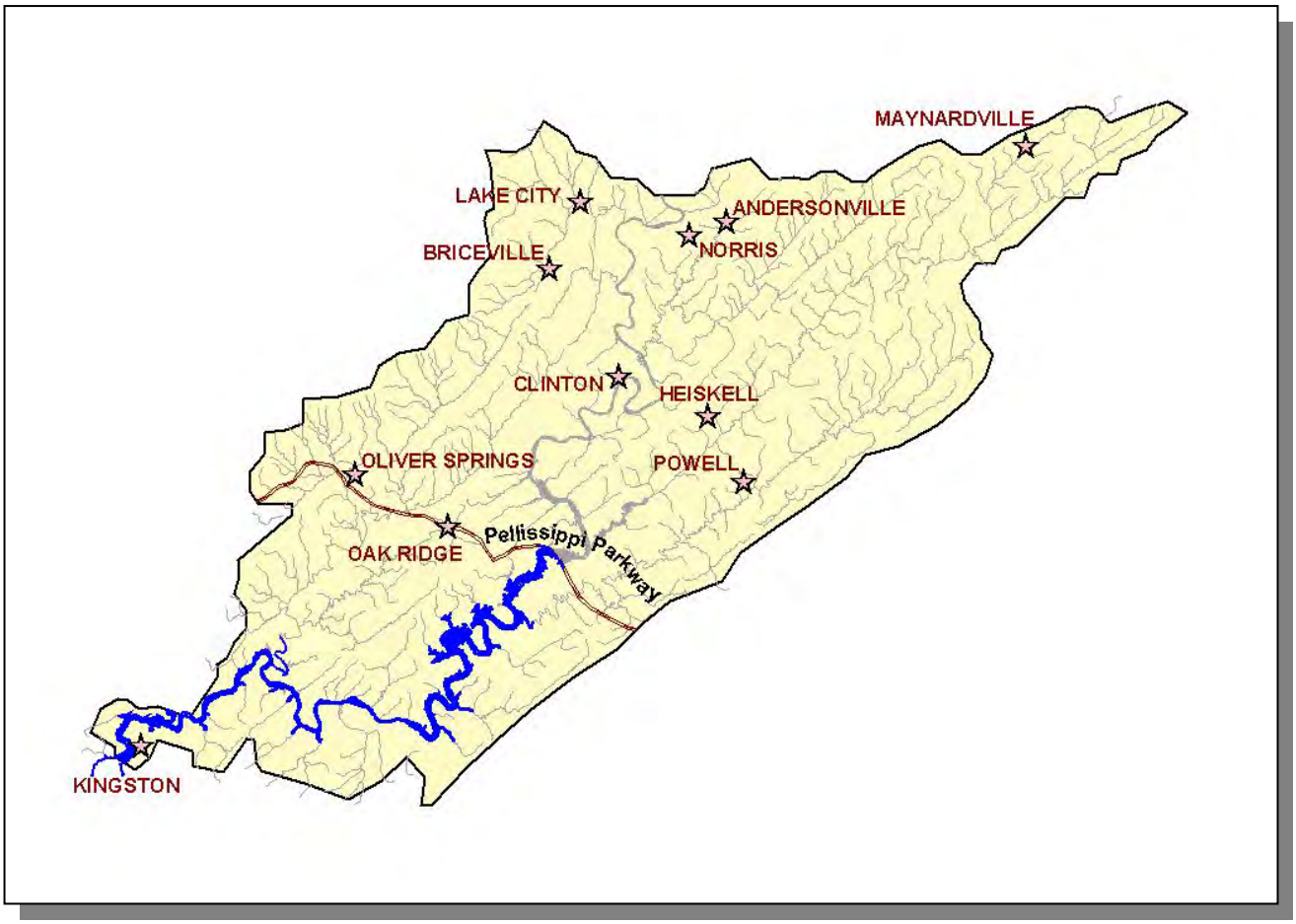


Figure 2-12. A Portion of the Lower Clinch River is Designated as a State Scenic River. *Locations of Andersonville, Briceville, Clinton, Heiskell, Kingston, Lake City, Maynardsville, Norris, Oliver Springs, Oak Ridge, and Powell are shown for reference.*

2.7.B. Nationwide Rivers Inventory. The Nationwide Rivers Inventory, required under the Federal Wild and Scenic Rivers Act of 1968, is a listing of free-flowing rivers that are believed to possess one or more outstanding natural or cultural values. Exceptional scenery, fishing or boating, unusual geologic formations, rare plant and animal life, cultural or historic artifacts that are judged to be of more than local or regional significance are the values that qualify a river segment for listing. The Tennessee Department of Environment and Conservation and the Rivers and Trails Conservation Assistance branch of the National Park Service jointly compile the Nationwide Rivers Inventory from time to time (most recently in 1997). Under a 1980 directive from the President's Council on Environmental Quality, all Federal agencies must seek to avoid or mitigate actions that would have an adverse effect on Nationwide Rivers Inventory segments.

The most recent version of the Nationwide Rivers Inventory lists portions of one stream in the Lower Clinch River Watershed:

> Clinch River, a river with numerous recorded archaeological sites, steep ridges, long, shallow shoal areas and deep pools. The upper reach provides for an excellent pastoral float and provides habitat for the most diverse mussel fauna in the world.

RIVER	SCENIC	RECREATION	GEOLOGIC	FISH	WILDLIFE	HISTORIC	CULTURAL
Clinch River	X	X	X	X	X	X	X

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

Additional information may be found online at:

http://www.nps.gov/ncrc/programs/rtca/nri/index.html

2.7.C. Greenways. The Lower Clinch River Watershed has at least fourteen greenways/trails:

- Big Turtle Trail in Oak Ridge
- Cedar Hill Trail in Oak Ridge
- Emory Valley Trail in Oak Ridge
- Gallaher Bend Greenway in Oak Ridge
- Haw Ridge Trail in Oak Ridge
- Justin P. Wilson Cumberland Trail
- Melton lake Drive Greenway in Oak Ridge
- North Boundary Greenway in Oak Ridge
- North Ridge Trail in Oak Ridge
- Old Bethel Valley Road Greenway in Oak Ridge
- Pine Grove Trail in Oak Ridge
- Wildflower Trail in Oak Ridge
- Worthington Greenway in Oak Ridge

More information about greenways and trails in the watershed may be found at:
http://www2.state.tn.us/tdec/GREENWAYS/tnmap.htm

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

- Big Ridge State Park was one of five demonstration parks developed by the TVA in cooperation with the National Park Service and the Civilian Conservation Corps. The 3,687-acre park is located on Norris Lake. The park is managed by the state of Tennessee.
- Eagle Bend Hatchery is a TWRA warm water hatchery located in Clinton. The site is managed by Tennessee Wildlife Resources Agency.
- Melton Hill Reservation includes the dam, a boathouse, swimming area, camping area, and boat launch ramps on Melton Hill Lake. The site is managed by TVA.
- Norris Dam State Park is located on Norris Lake by Norris Dam. The park is more than 4,000 acres and, in addition to the lake, contains caves, scenic valleys, and a virgin forest. The site is managed by the state of Tennessee.

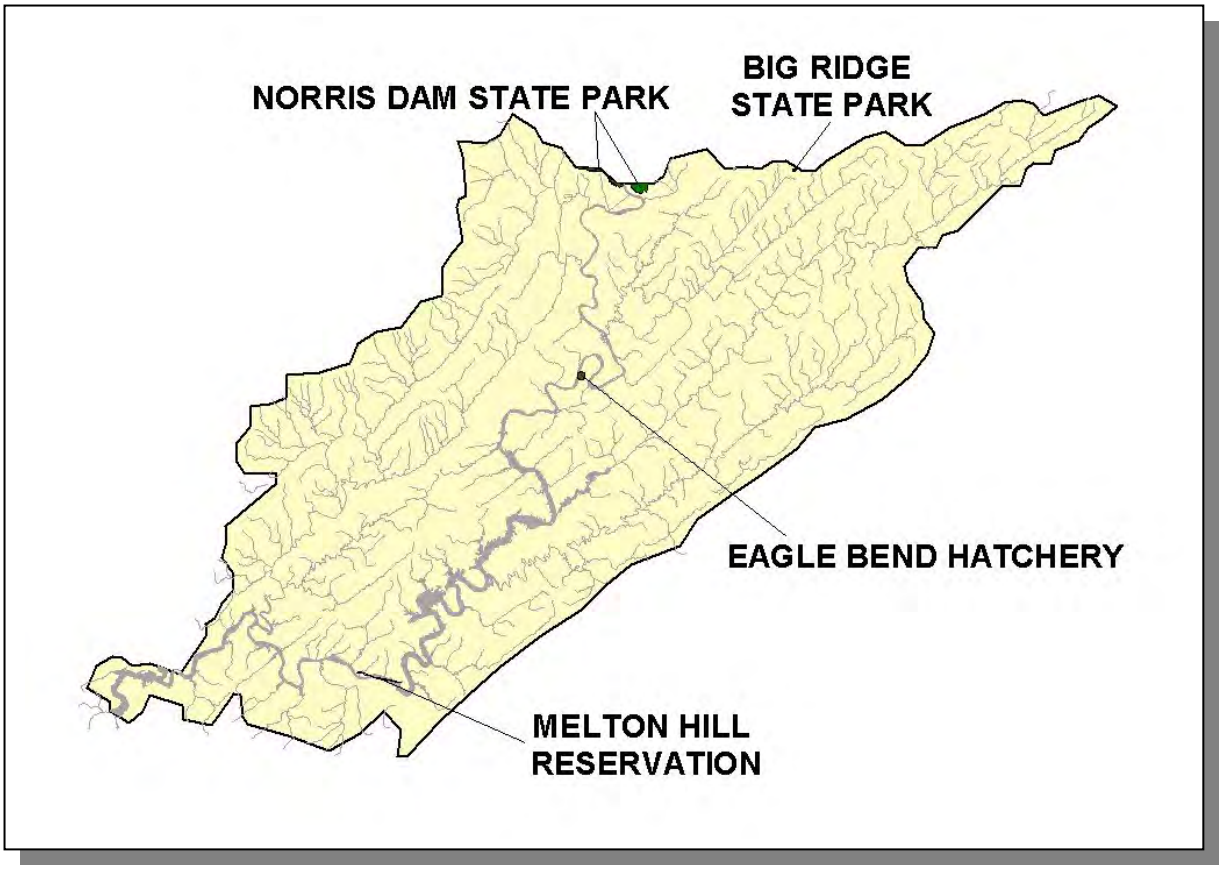


Figure 2-13. Locations of State- and Federally-Managed Lands in the Lower Clinch River Watershed.

2.7.E. Wildlife Management Area. The Tennessee Wildlife Resources Agency manages four wildlife management areas in the Lower Clinch River Watershed.

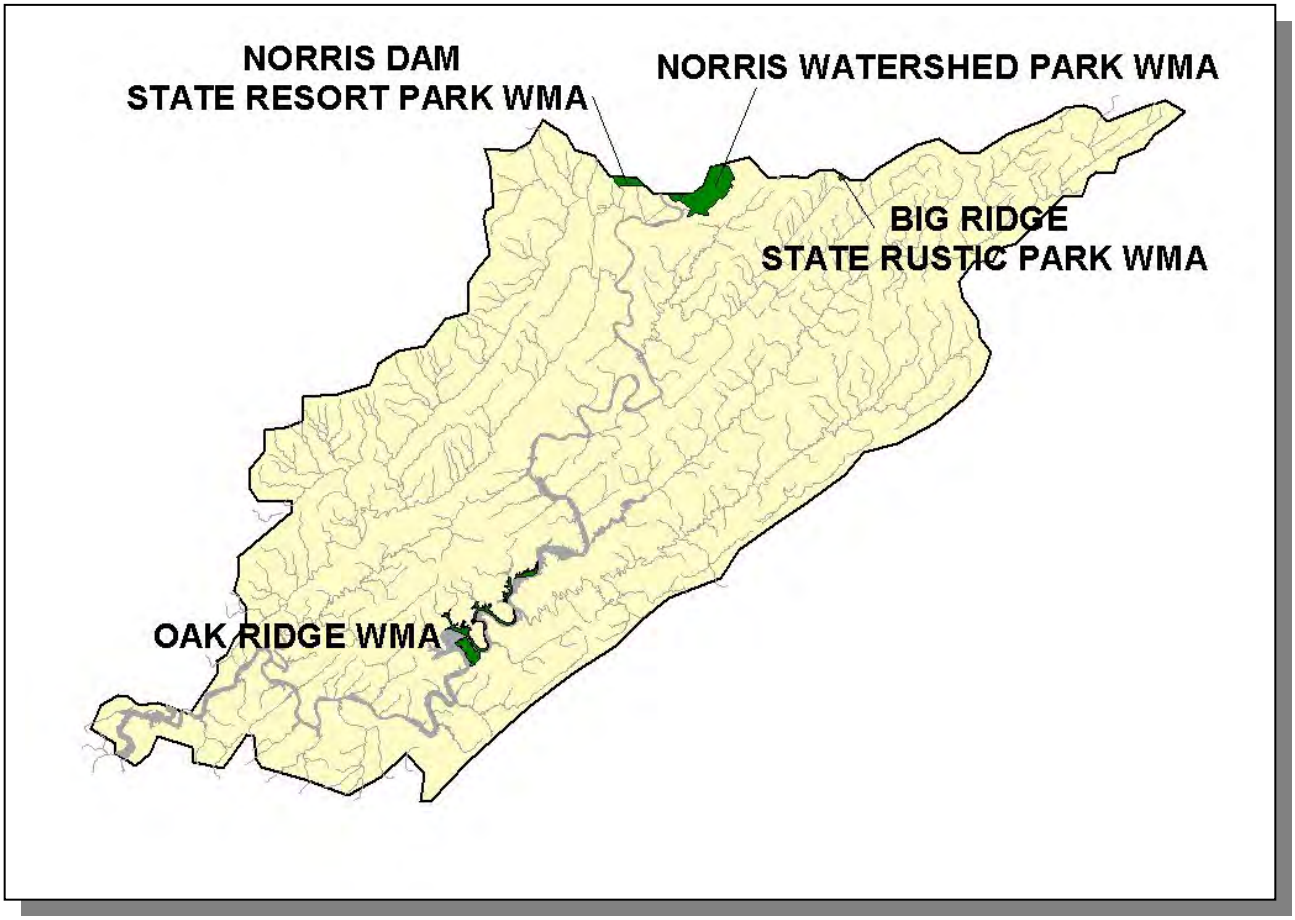


Figure 2-14. TWRA Manages Wildlife Management Areas in the Lower Clinch River Watershed.

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

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

STREAM	NSQ	RB	RF		STREAM	NSQ	RB	RF
Bear Creek	3				East Fork Poplar Creek	4		
Beaver Creek	3	3			Grassy Creek	3		
Buffalo Creek	3		1		Hinds Creek	3		2,4
Bull Run Creek	2		3		North Fork Bull Run Creek	3		4
Clinch River	2,3	2			Poplar Creek	2		
Coal Creek	3		1		Whiteoak Creek	4		

Table 2-6. Stream Scoring from the Tennessee Rivers Assessment Project in the Lower Clinch River Watershed.

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

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

CHAPTER 3

WATER QUALITY ASSESSMENT OF THE LOWER CLINCH RIVER WATERSHED

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

In 1996, Tennessee began the watershed approach to water quality protection. In the Watershed Approach, resources—both human and fiscal—are better used by assessing water quality more intensively on a watershed-by-watershed basis. In this approach, water quality is assessed in year three of the watershed cycle, following one to two years of data collection. More information about the Watershed Approach may be found in Chapter 1 and at http://www.state.tn.us/environment/wpc/watershed/

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

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

Tennessee uses the 305(b) Report to meet four goals (from 2002 305(b) Report):

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

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

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

4. Highlight areas of improved water quality

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

The 303(d) list is a compilation of the waters of Tennessee that fail to support some or all of their classified uses. The 303(d) list does not include streams determined to be fully supporting designated uses as well as streams the Division of Water Pollution Control cannot assess due to lack of water quality information. Also absent are streams where a control strategy is already in the process of being implemented.

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

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

The current 303(d) List is available on the TDEC homepage at:
http://www.state.tn.us/environment/wpc/publications/2004_303dlist.pdf

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

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

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

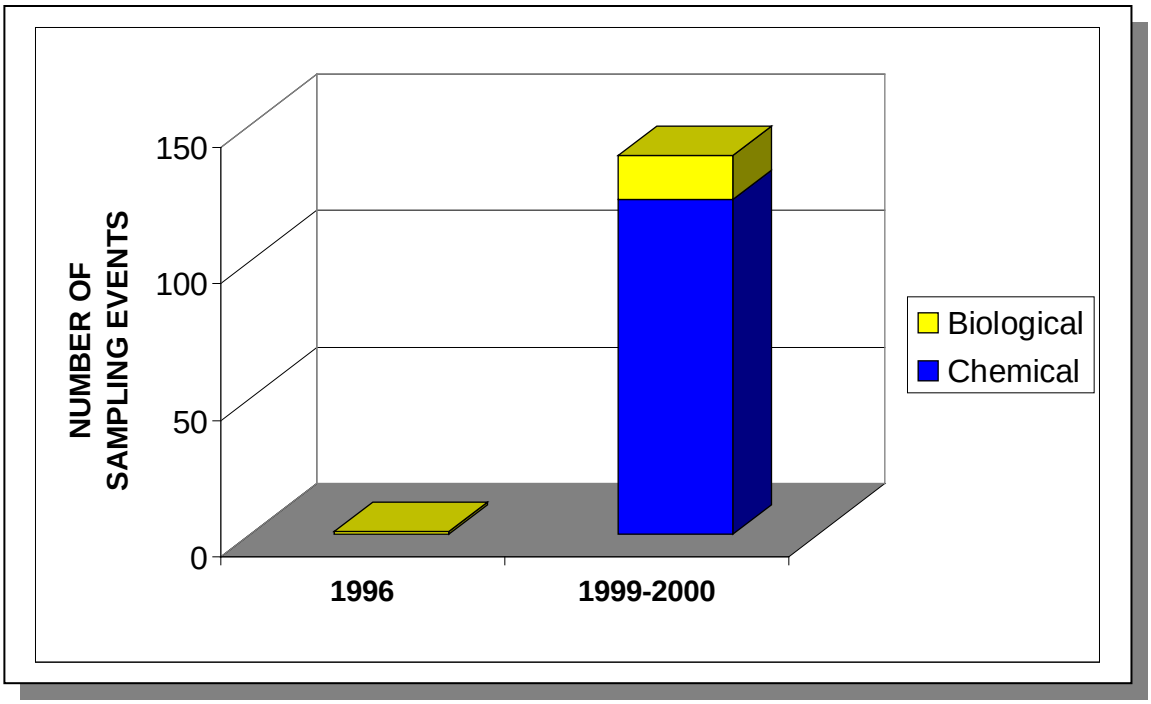


Figure 3-1. Number of Sampling Events Using the Traditional Approach (1996) and Watershed Approach (1999-2000) in the Lower Clinch River Watershed.

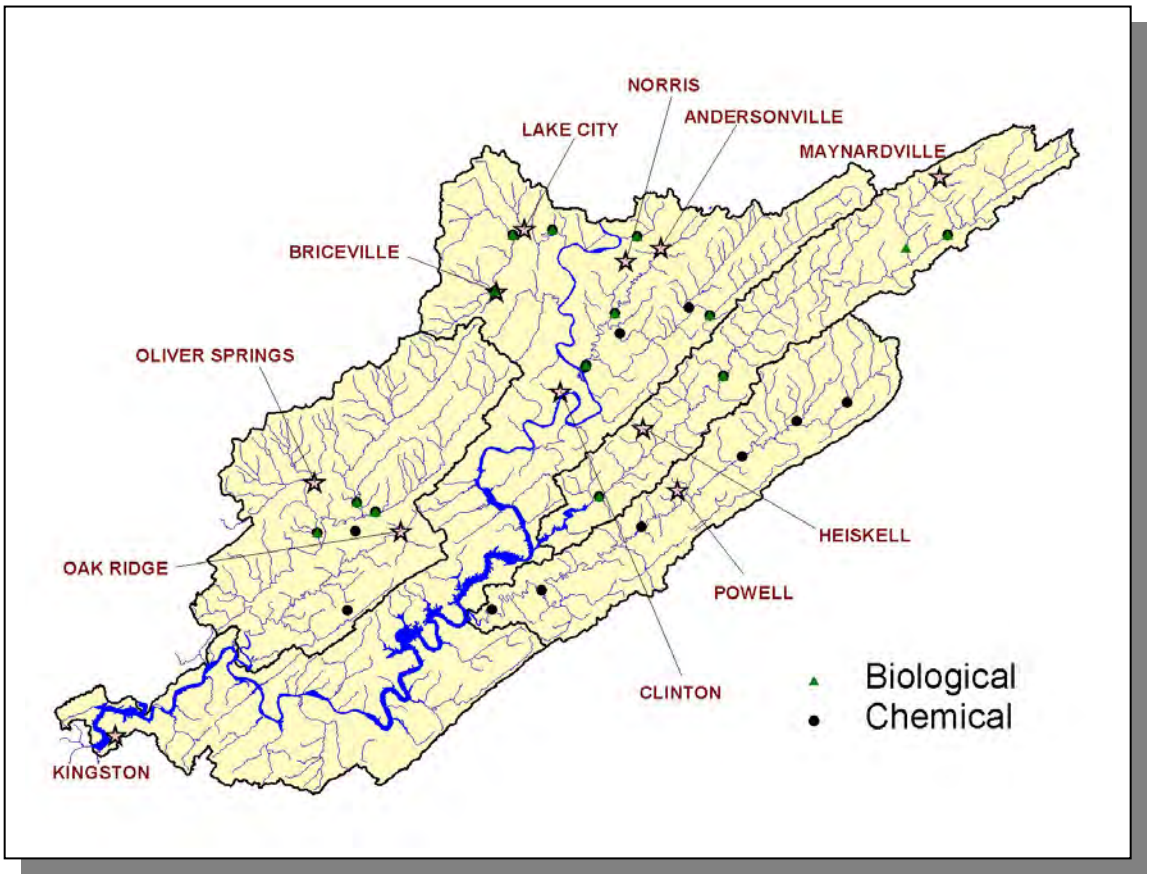


Figure 3-2. Location of Monitoring Sites in the Lower Clinch River Watershed. *Locations of Andersonville, Briceville, Clinton, Heiskell, Kingston, Lake City, Maynardville, Norris, Oak Ridge, Oliver Springs, and Powell are shown for reference.*

	1996	1999-2000
Biological	1	16
Chemical	0	123
Total	**1**	**139**

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

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Field Office-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 Lower Clinch River Watershed are provided in Appendix IV.

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

3.2.B. Ecoregion Sites. Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plants and animals. The delineation phase of the Tennessee Ecoregion Project was completed in 1997 when the ecoregions and subecoregions were mapped and summarized (EPA/600/R-97/022). There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee (see Chapter 2 for more details). The Lower Clinch River Watershed lies within 3 Level III ecoregions (Ridge and Valley, Southwestern Appalachians, and Central Appalachians) and contains 5 subecoregions (Level IV):

- Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)
- Southern Dissected Ridges and Knobs (67i)
- Cumberland Plateau (68a)
- Plateau Escarpment (68c)
- Cumberland Mountains (69d)

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

Ecoregion stations are scheduled to be monitored during the watershed sampling time period.

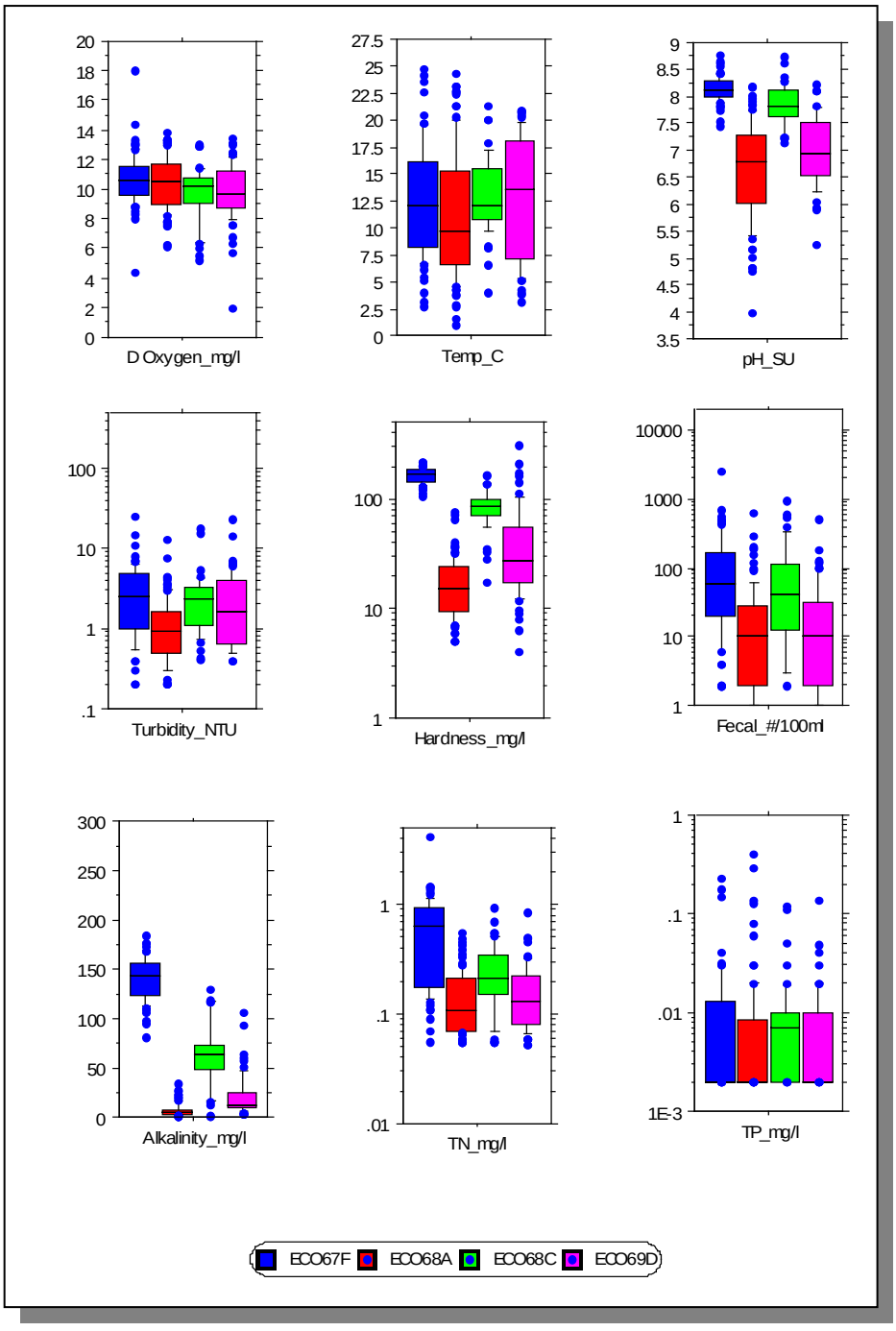


Figure 3-3. Select Chemical Data Collected in Lower Clinch River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. Fecal, fecal coliform bacteria; TN, Total Nitrogen; TP, Total Phosphorus.*

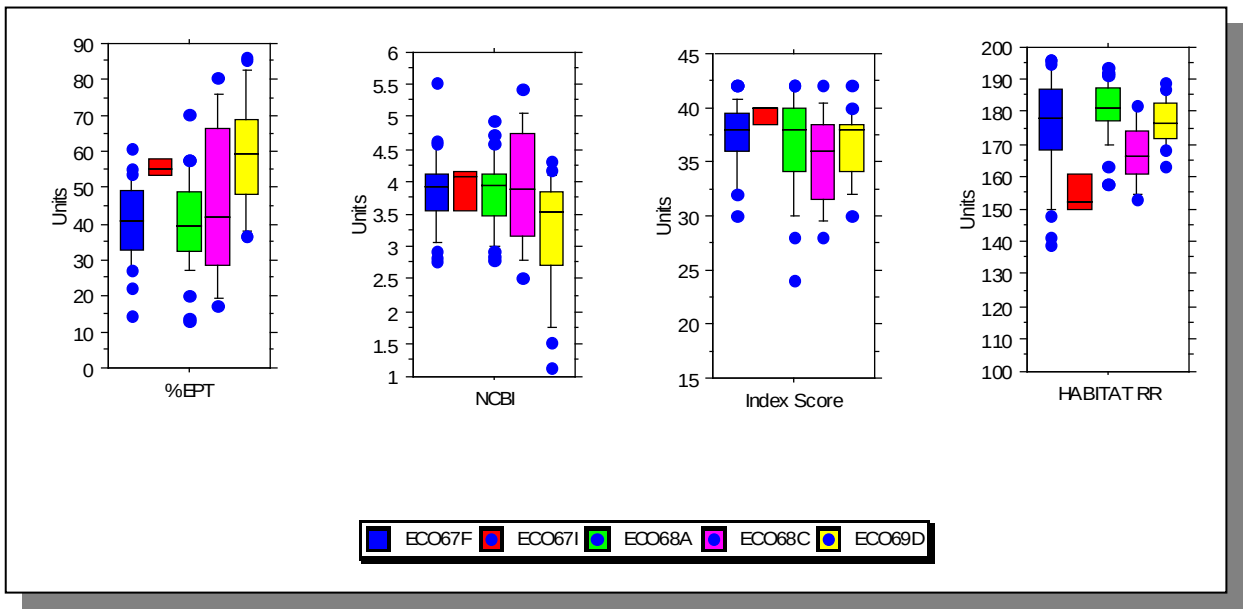


Figure 3-4. Benthic Macroinvertebrate and Habitat Scores for Lower Clinch River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score and Habitat Riffle/Run scoring system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

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

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

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

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

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

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

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

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

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

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

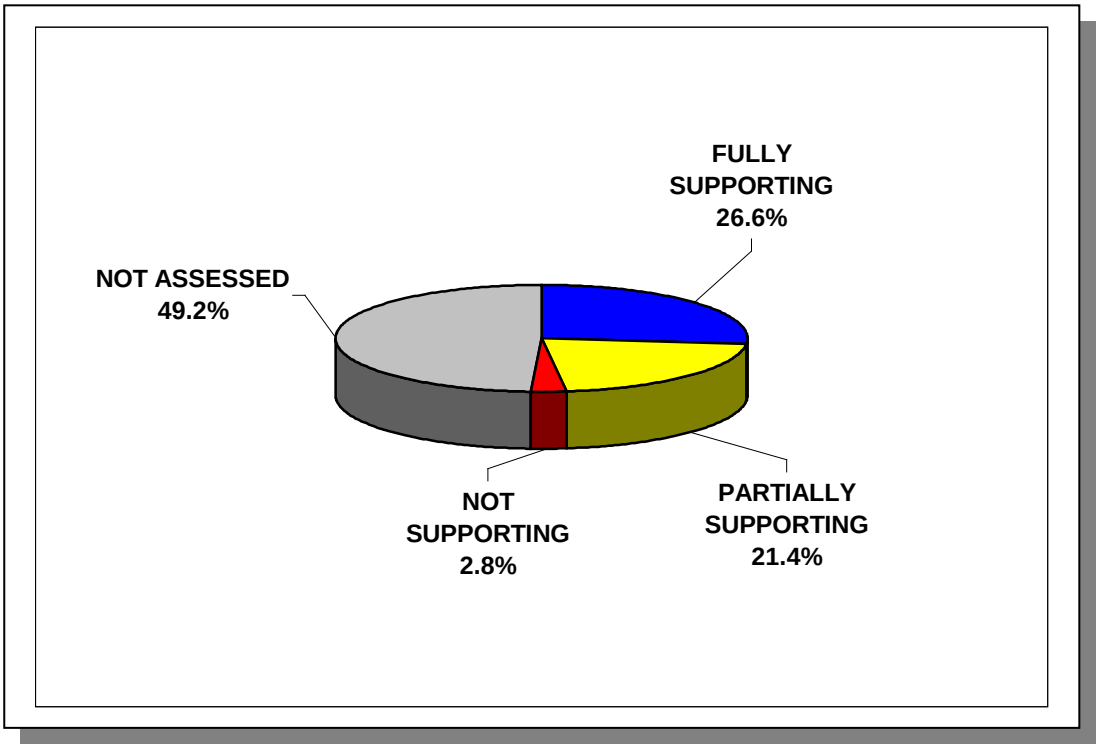


Figure 3-5a. Water Quality Assessment of Streams and Rivers in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment of 801.9 miles in the watershed. More information is provided in Appendix III.*

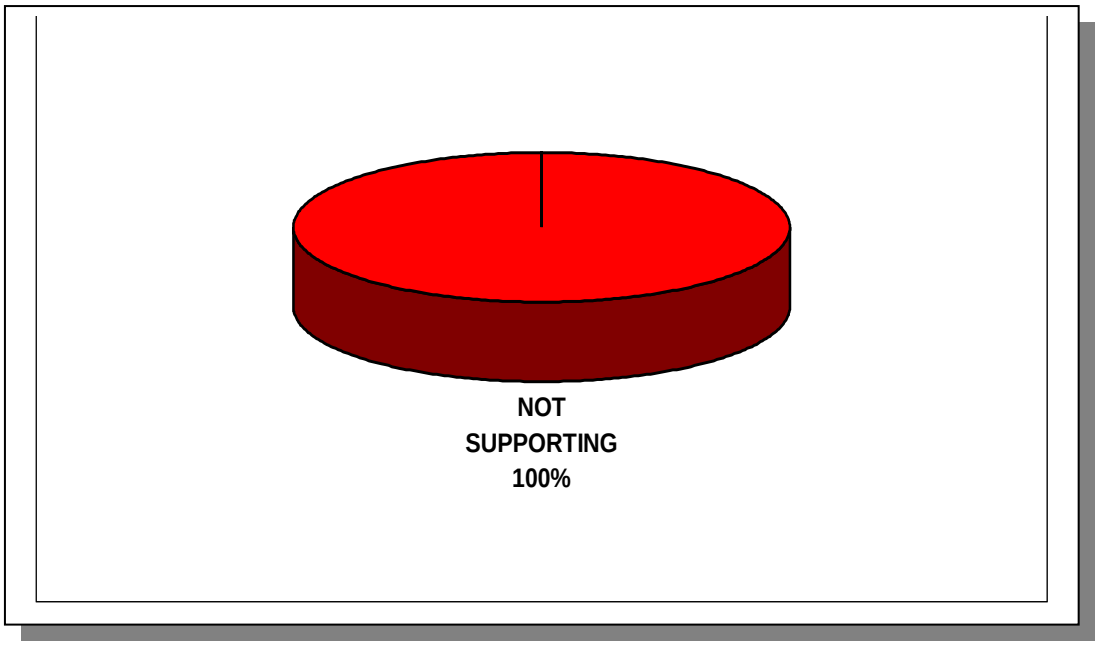


Figure 3-5b. Water Quality Assessment of Lakes in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment of 6,690 lake acres in the watershed. More information is provided in Appendix III.*

3.3.A. Assessment Summary.

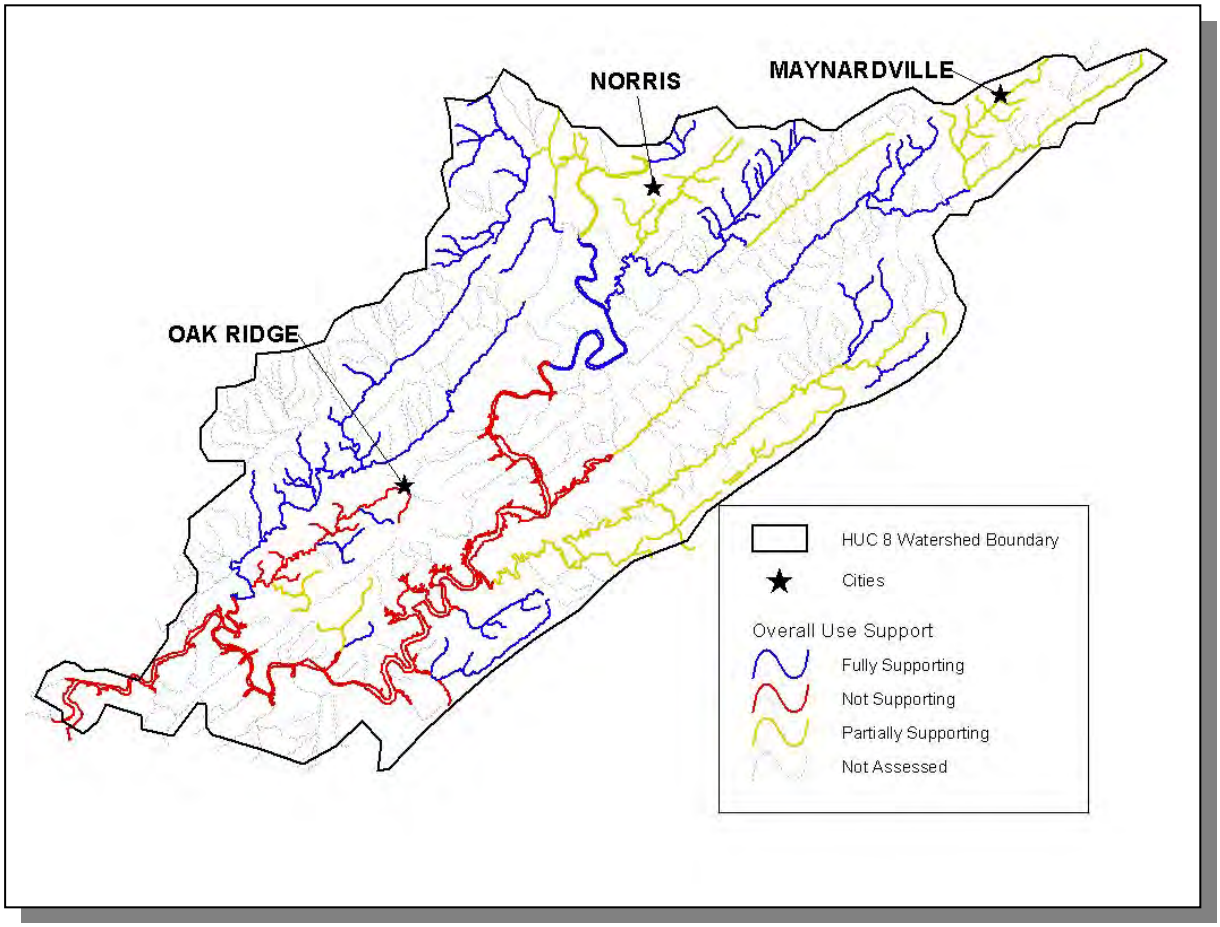


Figure 3-6a. Overall Use Support Attainment in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Maynardville, Norris, and Oak Ridge are shown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

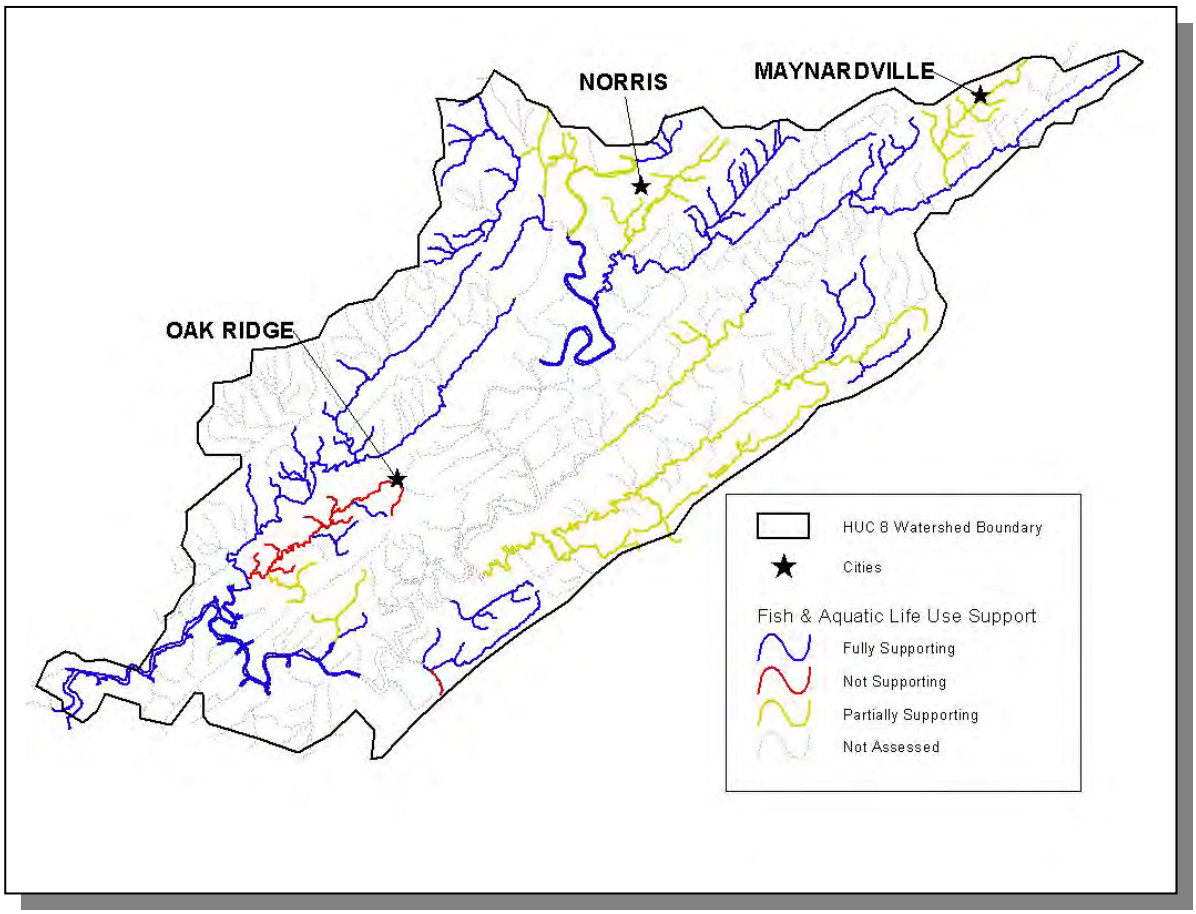


Figure 3-6b. Fish and Aquatic Life Use Support Attainment in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Maynardville, Norris, and Oak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

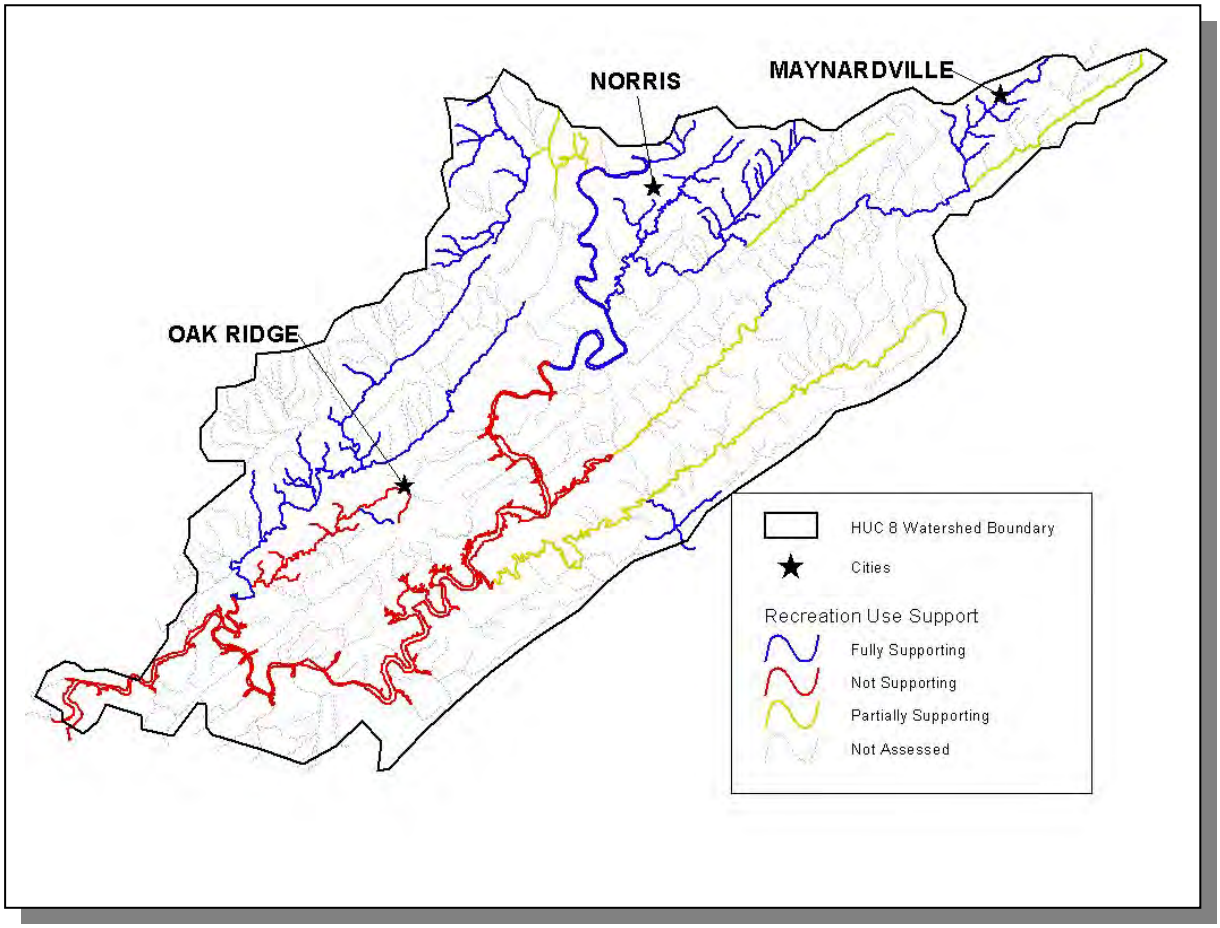


Figure 3-6c. Recreation Use Support Attainment in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Maynardville, Norris, and Oak Ridge are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

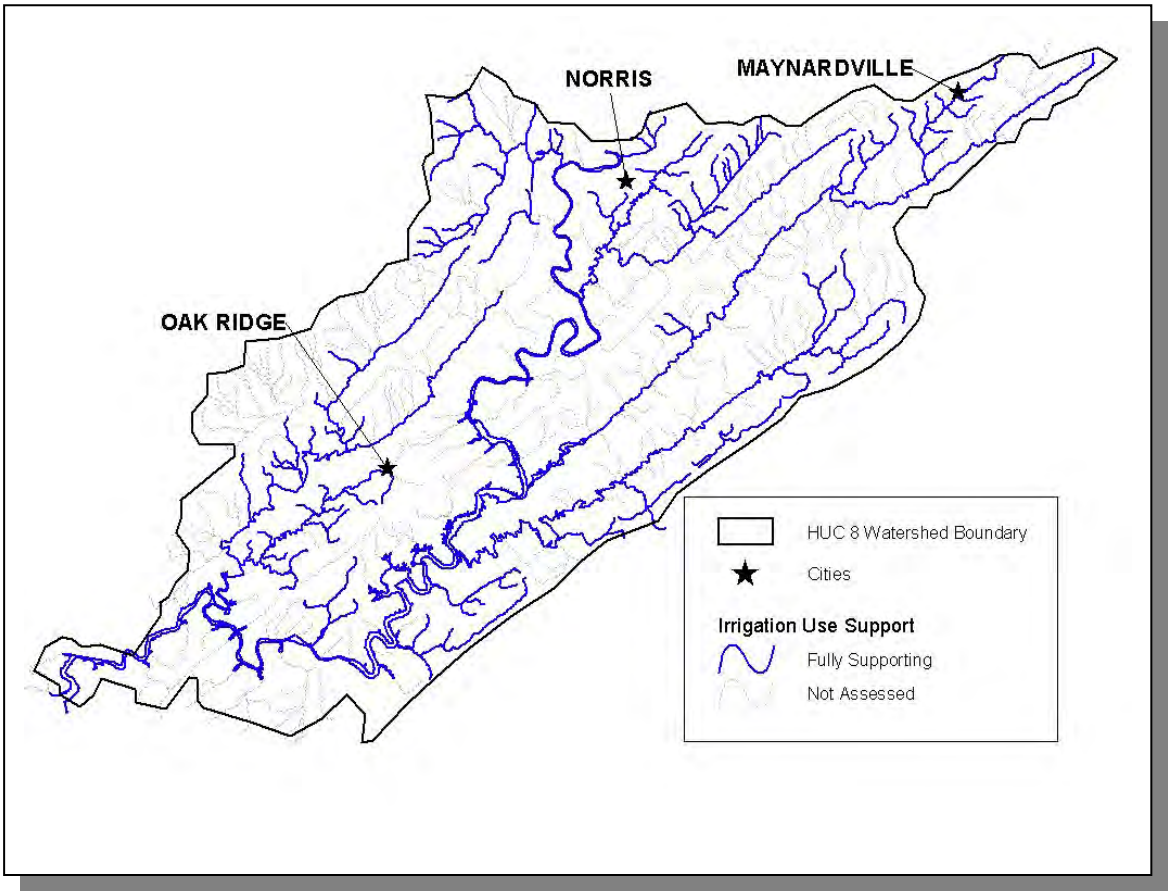


Figure 3-6d. Irrigation Use Support Attainment in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Maynardville, Norris, and Oak Ridge are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

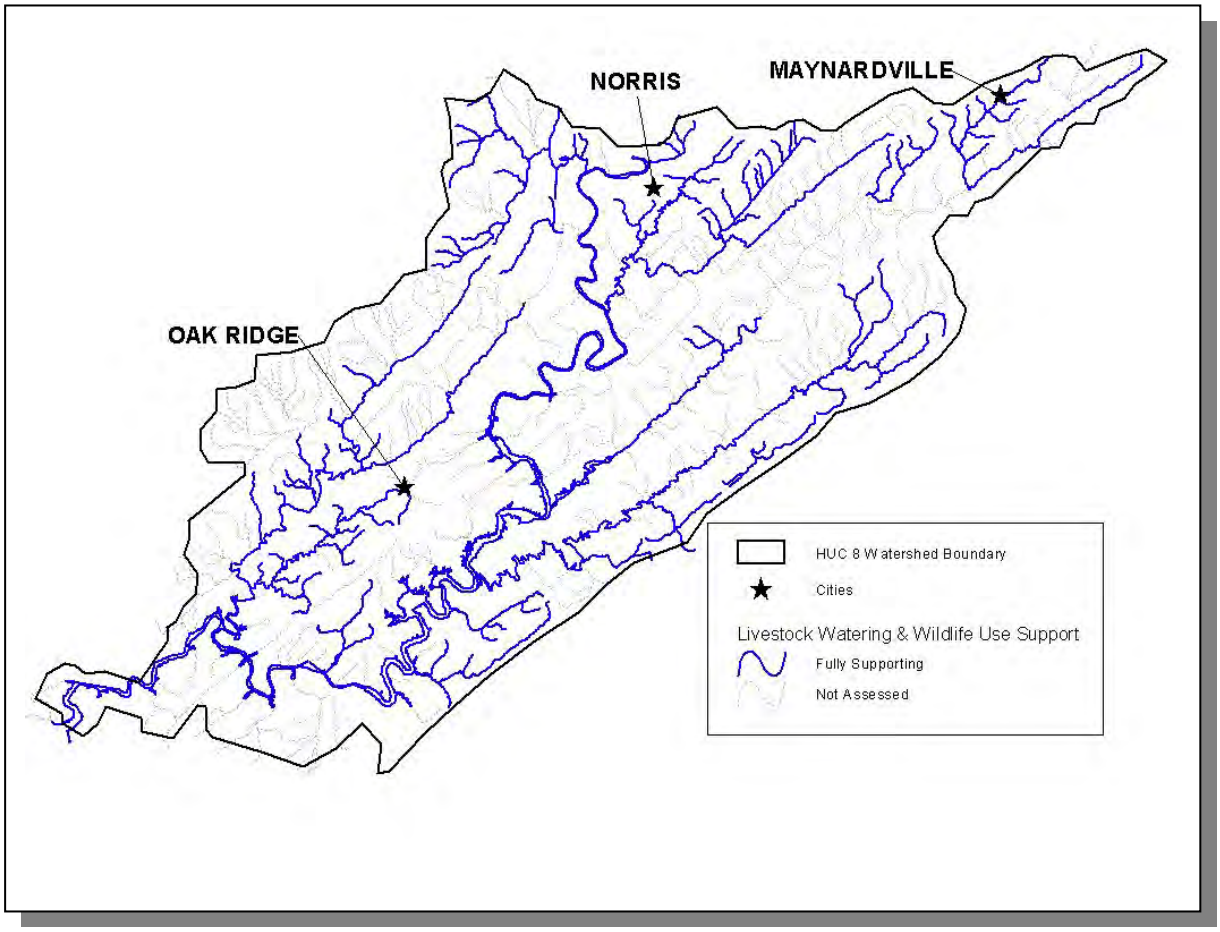


Figure 3-6e. Livestock Watering and Wildlife Use Support Attainment in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Maynardville, Norris,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

3.3.B. Use Impairment Summary.

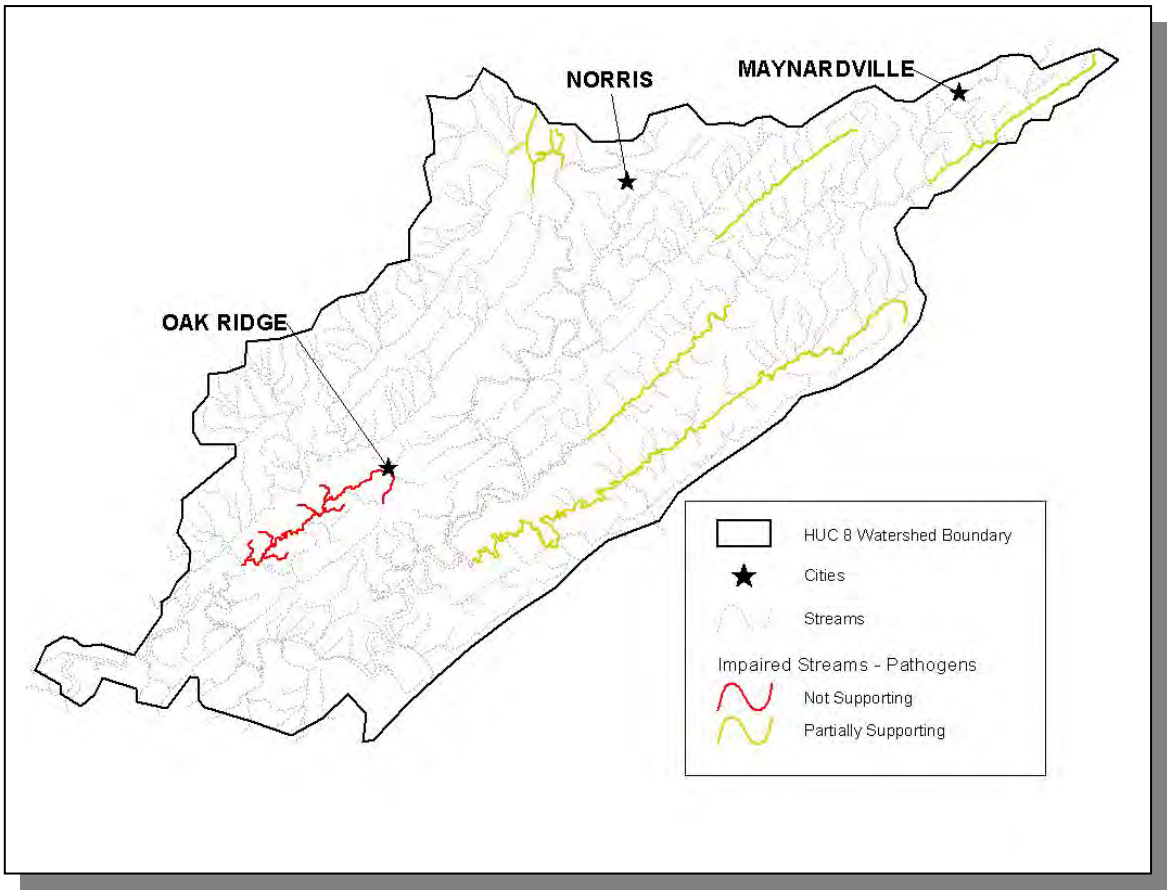


Figure 3-7a. Impaired Streams Due to Pathogens in the Lower Clinch River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Maynardville, Norris, and Oak Ridge are shown for reference. More information is provided in Appendix III.*

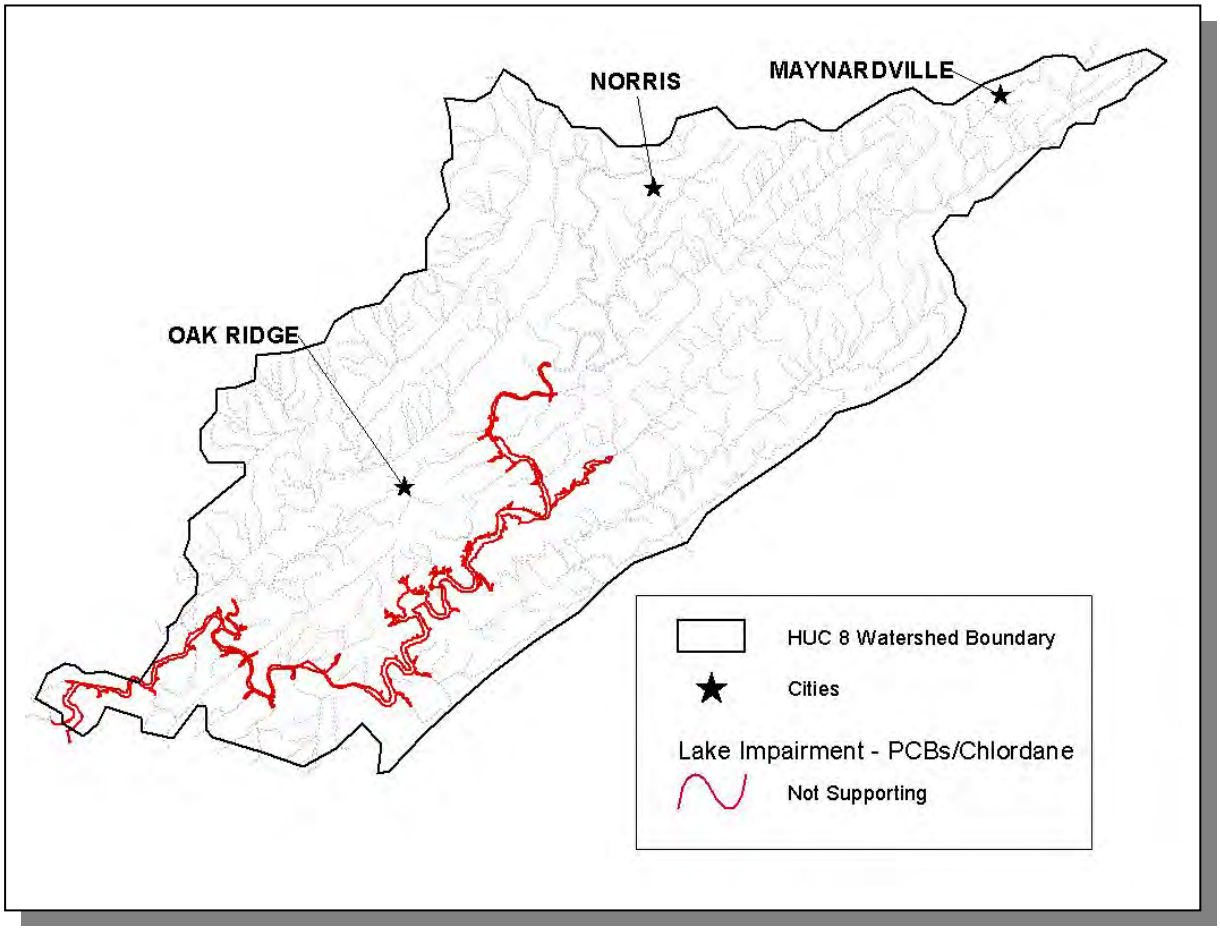


Figure 3-7b. Impaired Lakes Due to Polychlorinated Biphenyls (PCBs) in the Tennessee Portion of the Little Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Maynardville, Norris, and Oak Ridge are shown for reference. More information is provided in Appendix III.*

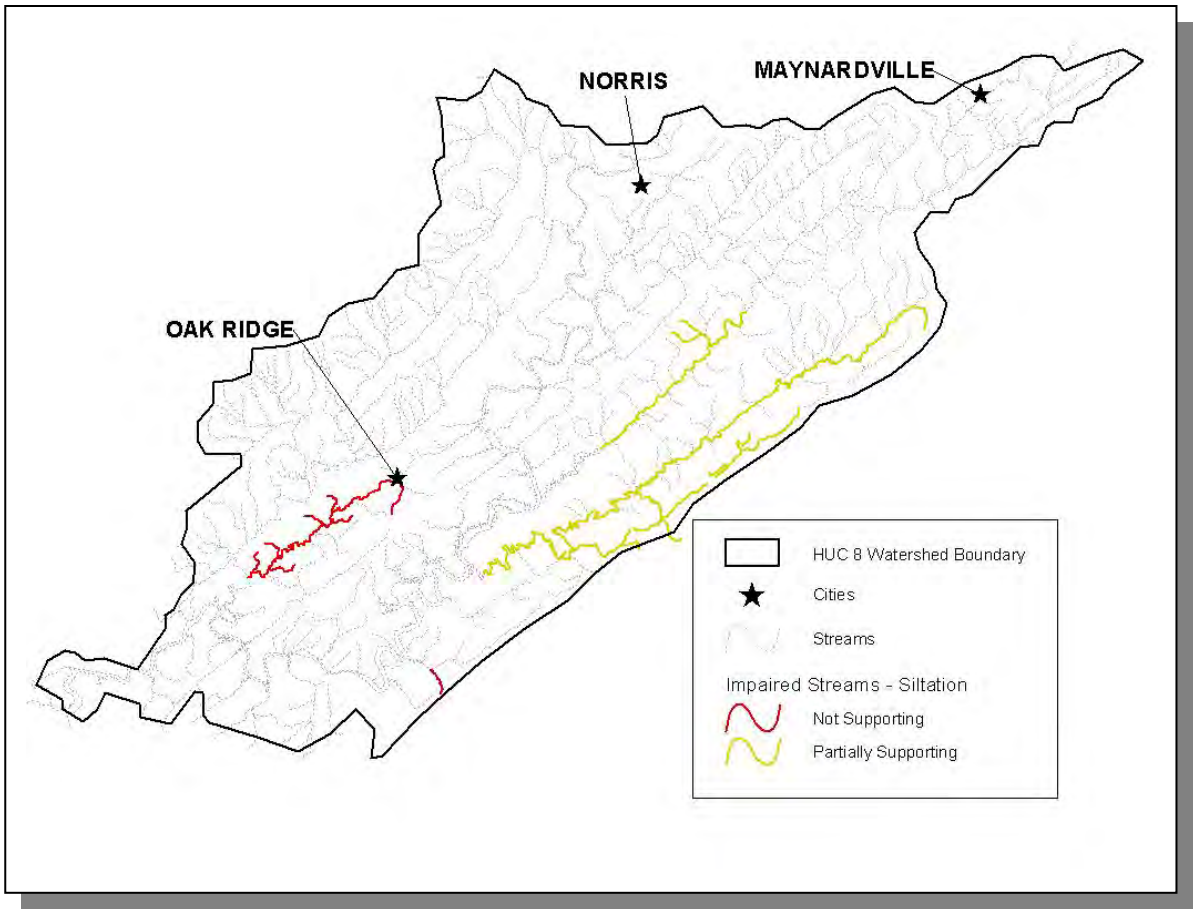


Figure 3-7c. Impaired Streams Due to Siltation in the Tennessee Portion of the Little Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Maynardville, Norris, and Oak Ridge are shown for reference. More information is provided in Appendix III.*

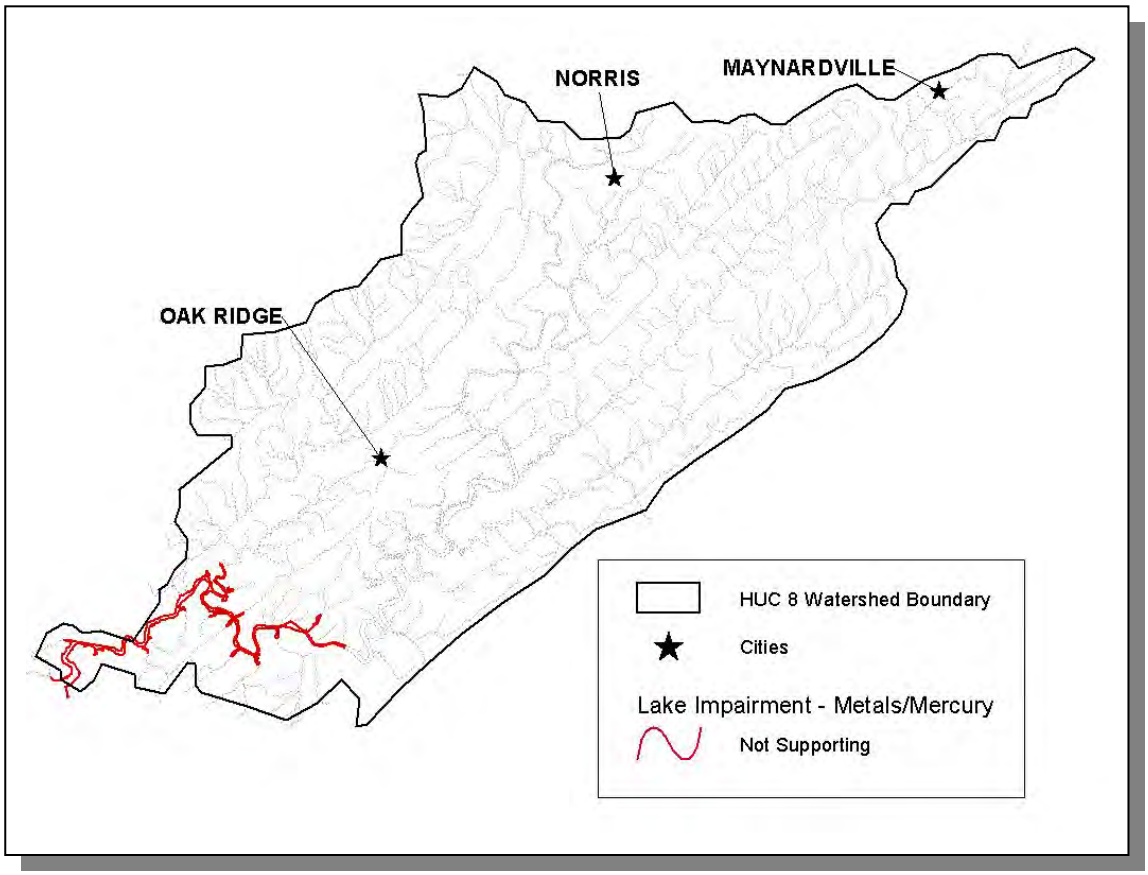


Figure 3-7d. Impaired Lakes Due to Metals/Mercury in the Tennessee Portion of the Little Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Maynardville, Norris, and Oak Ridge are shown for reference. More information is provided in Appendix III.*

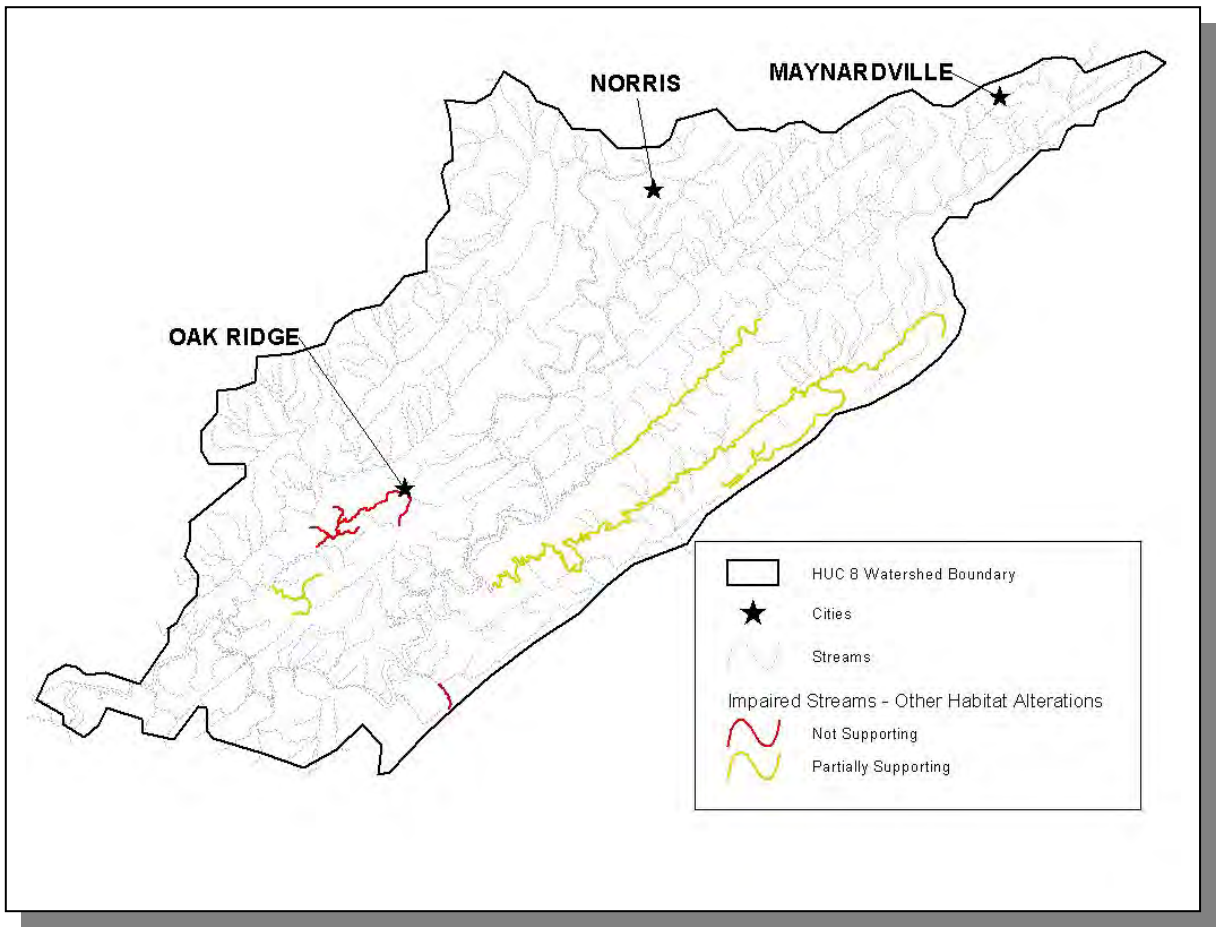


Figure 3-7e. Impaired Streams Due to Habitat Alterations in the Tennessee Portion of the Little Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Maynardville, Norris, and Oak Ridge are shown for reference. More information is provided in Appendix III.*

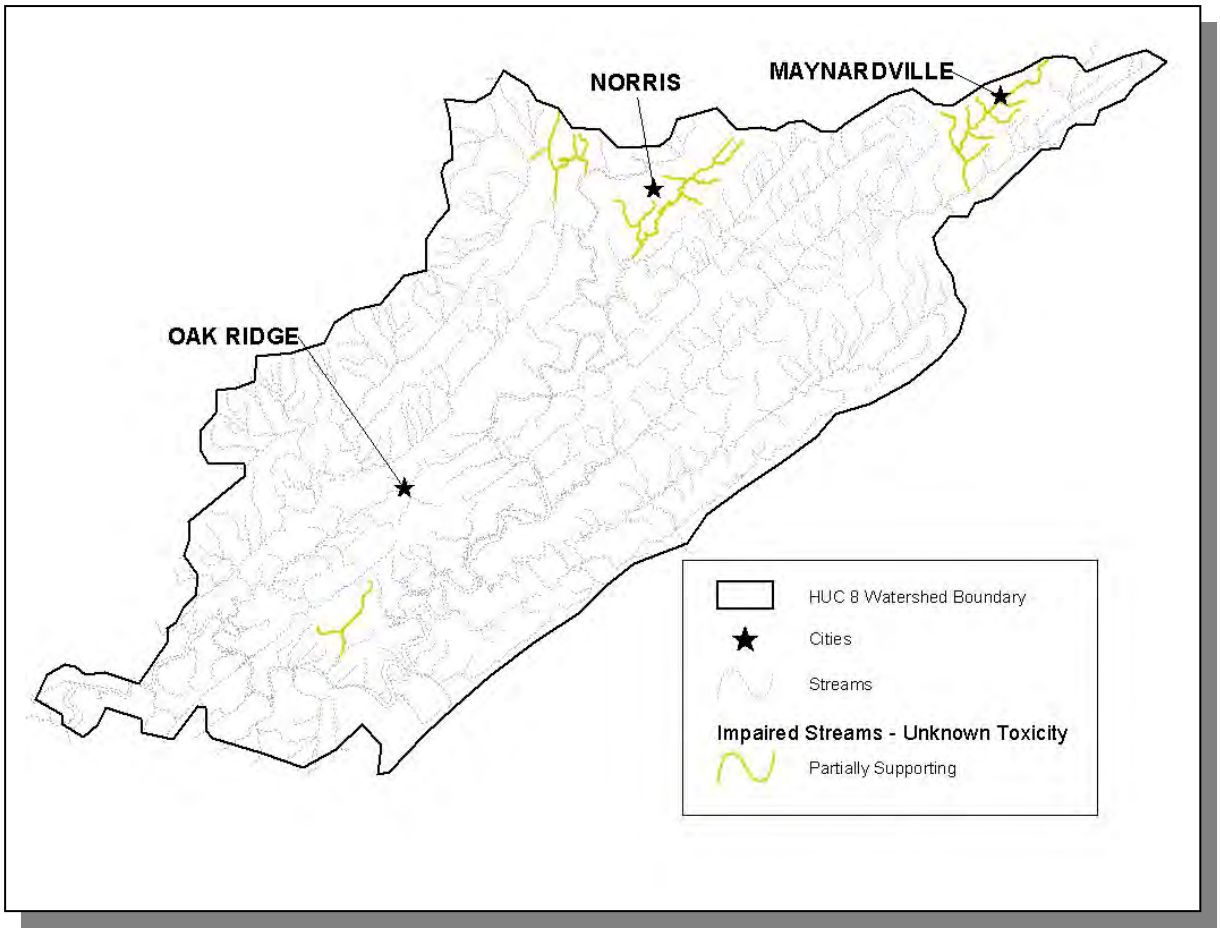


Figure 3-7f. Impaired Streams Due to Unknown Toxicity in the Tennessee Portion of the Little Tennessee River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Maynardville, Norris, and Oak Ridge are shown for reference. More information is provided in Appendix III.*

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

Since the year 2002, the 303(d) list is compiled by using EPA's ADB (Assessment Database) software developed by RTI (Research Triangle Institute). The ADB allows for a more detailed segmentation of waterbodies. While this results in a more accurate description of the status of water quality, it makes it difficult when comparing water quality assessments with and without using this tool. A more meaningful comparison will be between assessments conducted in Year 3 of each succeeding five-year cycle.

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

CHAPTER 4

POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE LOWER CLINCH RIVER WATERSHED

4.1. BACKGROUND. This chapter is organized by HUC-10 subwatershed, and the description of each subwatershed is divided into four parts:

i. General description of the subwatershed
ii. Description of point source contributions
ii.a. Description of facilities discharging to water bodies listed on the 2002 303(d) list
iii. Description of nonpoint source contributions

The Lower Clinch River Watershed (HUC 06010207) has been delineated into four HUC 10-digit subwatersheds.

Information for this chapter was obtained from databases maintained by the Division of Water Pollution Control or provided in the WCS (Watershed Characterization System) data set. The WCS used was version 2.0 (developed by Tetra Tech, Inc for EPA Region 4) released in 2003.

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

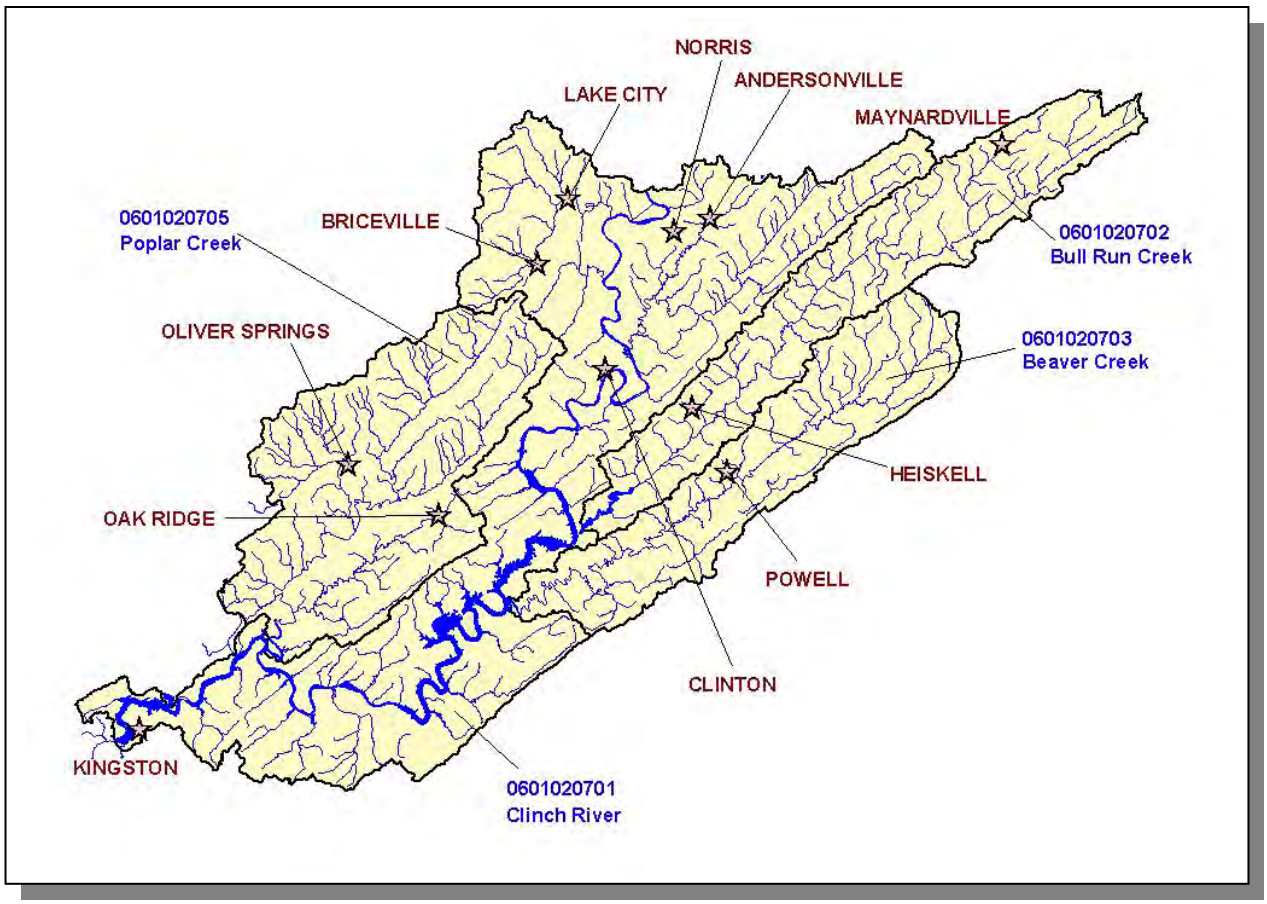


Figure 4-1. The Lower Clinch River Watershed is Composed of Four USGS-Delineated Subwatersheds (10-Digit Subwatersheds). *Locations of Andersonville, Clinton, Heiskell, Kingston, Lake City, Maynardville, Norris, Oak Ridge, Oliver Springs, and Powell are shown for reference.*

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 Lower Clinch River Watershed.

HUC-10	HUC-12
0601020701	060102070101 (Clinch River)
	060102070102 (Hinds Creek)
	060102070103 (Clinch River)
	060102070104 (Clinch River)
	060102070105 (Clinch River)
0601020702	060102070201 (Upper Bull Run Creek)
	060102070202 (Lower Bull Run Creek)
0601020703	060102070301 (Upper Beaver Creek)
	060102070302 (Lower Beaver Creek)
0601020705	060102070501 (Upper Poplar Creek)
	060102070502 (Lower Poplar Creek)
	060102070503 (East Fork Poplar 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. 0601020701 (Clinch River).

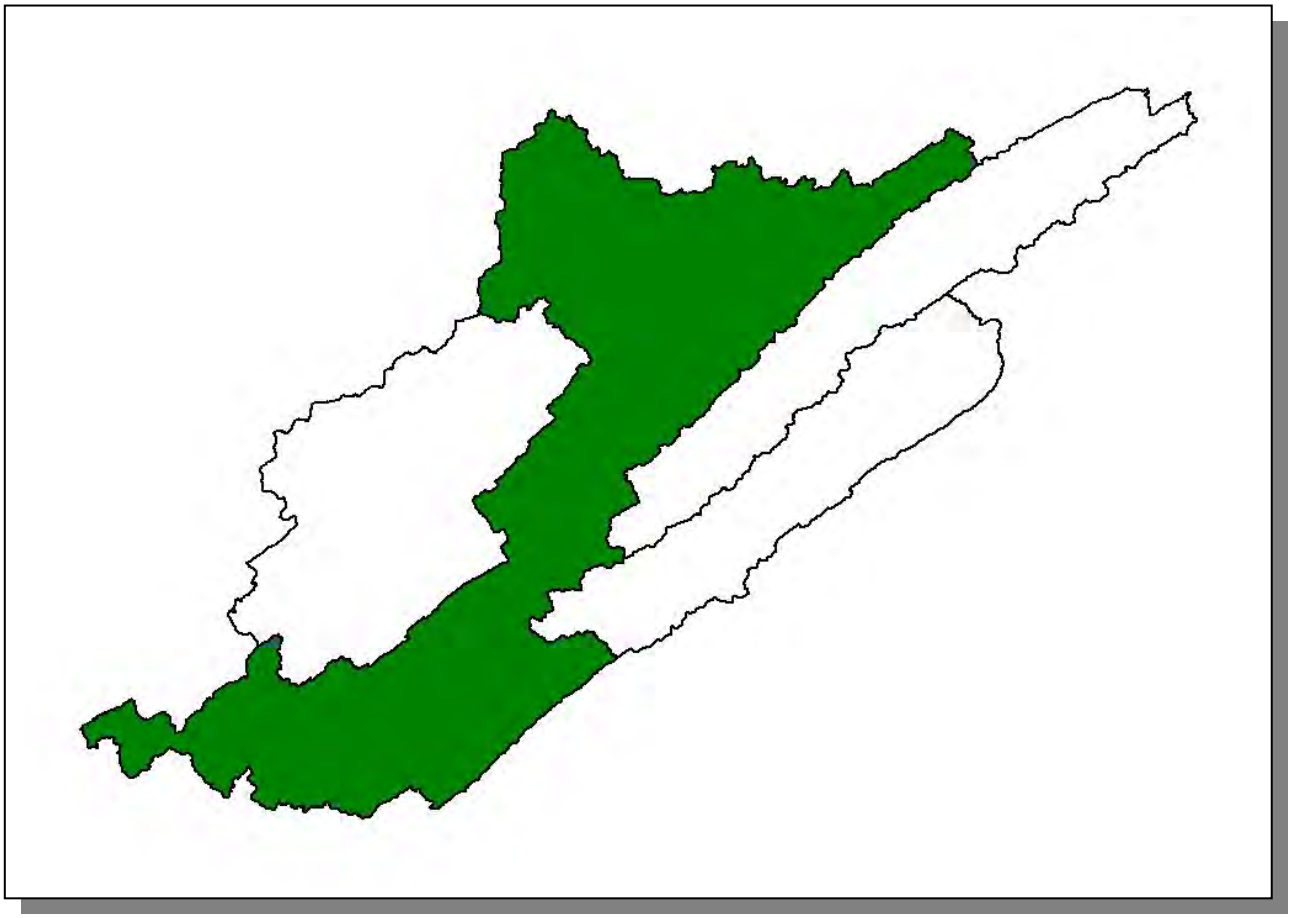


Figure 4-2. Location of Subwatershed 0601020701. *All Lower Clinch River HUC-10 subwatershed boundaries are shown for reference.*

4.2.A.i. General Description.

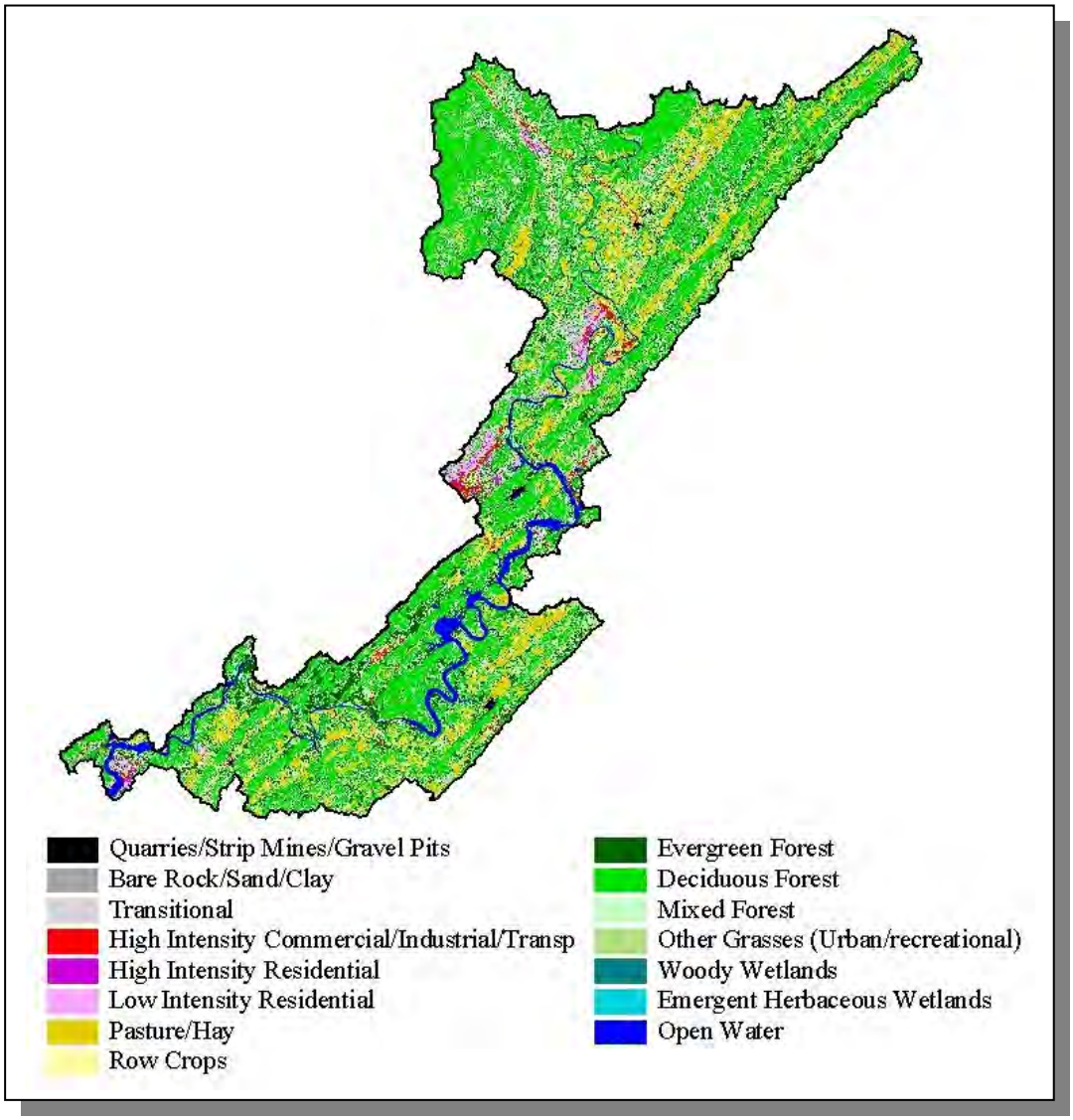


Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0601020701.

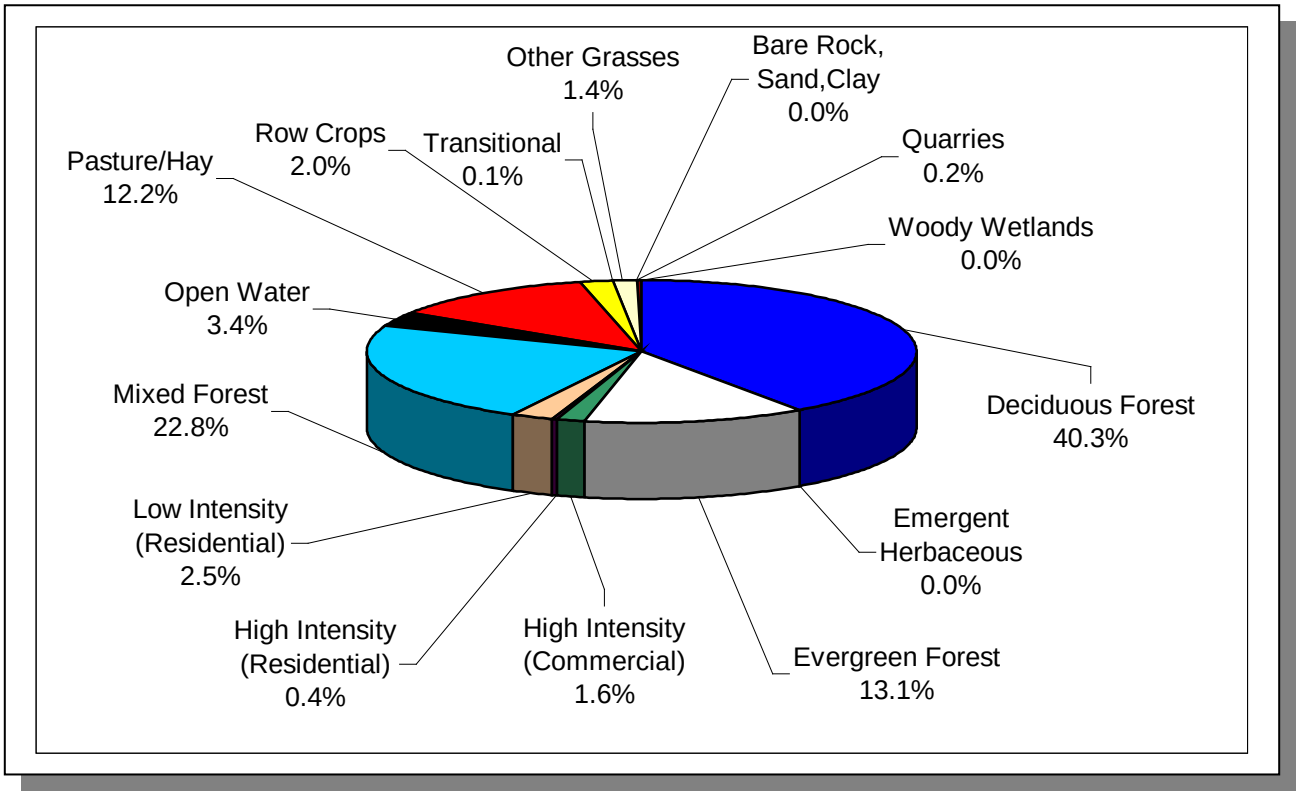


Figure 4-4. Land Use Distribution in Subwatershed 0601020701. *More information is provided in Appendix IV.*

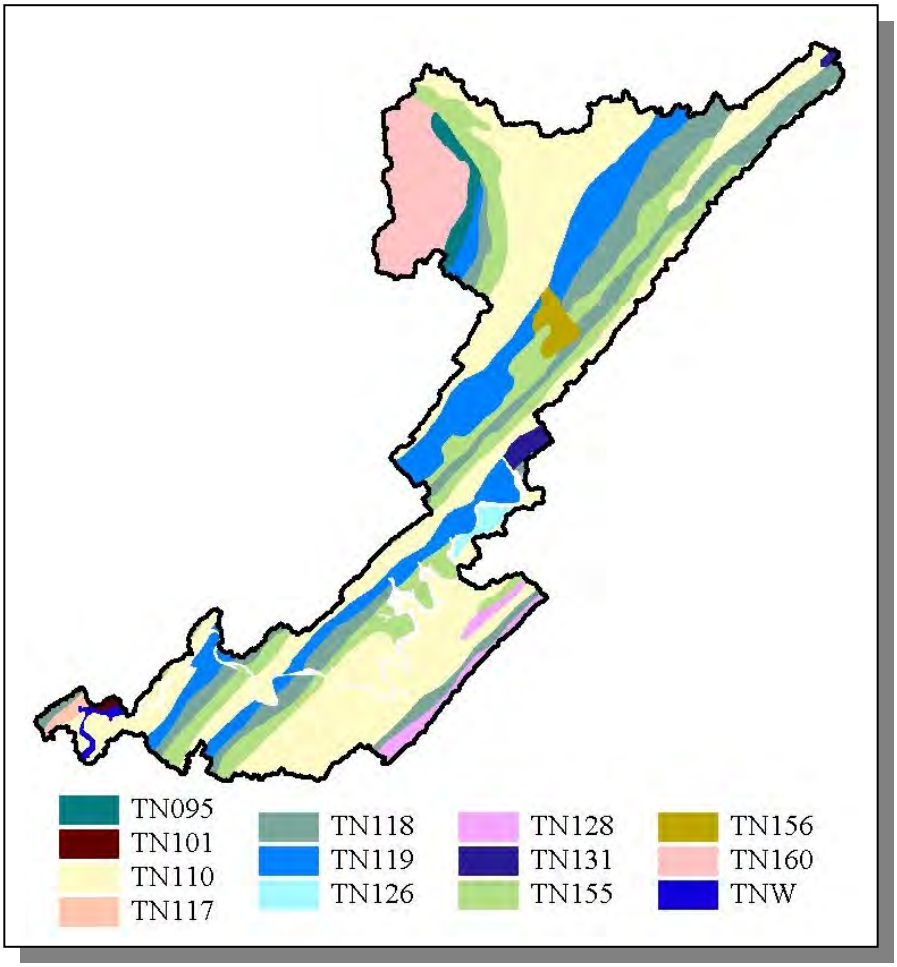


Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020701.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN095	0.00	B	2.35	5.12	Loam	0.31
TN101	0.00	B	1.71	5.39	Loam	0.35
TN110	0.00	B	2.22	4.96	Loam	0.31
TN117	6.00	C	2.06	5.16	Loam	0.37
TN118	0.00	C	6.52	5.12	Loam	0.29
TN119	2.00	C	1.08	5.15	Loam	0.33
TN126	19.00	C	1.30	5.12	Loam	0.33
TN128	0.00	C	1.30	6.53	Clayey Loam	0.26
TN131	0.00	C	1.17	4.95	Silty Loam	0.33
TN155	0.00	C	1.71	5.31	Loam	0.32
TN156	0.00	C	1.41	5.27	Loam	0.33
TN160	0.00	B	2.69	5.36	Loam	0.25

Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020701. *More details are provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Anderson	68,250	71,498	71,330	51.73	35,304	36,984	36,897	4.5
Campbell	35,079	37,878	39,854	1.67	586	632	665	13.5
Knox	335,749	365,900	382,032	4.48	15,029	16,378	17,100	13.8
Loudon	31,255	38,245	39,086	6.87	2,147	2,628	2,685	25.1
Roane	47,227	49,885	51,910	16.71	7,894	8,338	8,676	9.9
Union	13,694	15,956	17,808	5.71	782	912	1,017	30.1
Totals	**531,254**	**579,362**	**602,020**		**61,742**	**65,872**	**67,040**	**8.6**

Table 4-3. Population Estimates in Subwatershed 0601020701.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Clinton	Anderson	8,972	4,006	3,294	700	12
Farragut	Knox	12,804	4,463	3,392	1,064	7
Kingston	Roane	4,552	2,071	1,587	484	0
Lake City	Campbell	2,258	979	930	45	4
Norris	Anderson	1,303	622	505	117	0
Oak Ridge	Roane	27,310	12,694	12,461	212	21
Totals		**57,209**	**24,835**	**22,169**	**2,622**	**44**

Table 4-4. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0601020701.

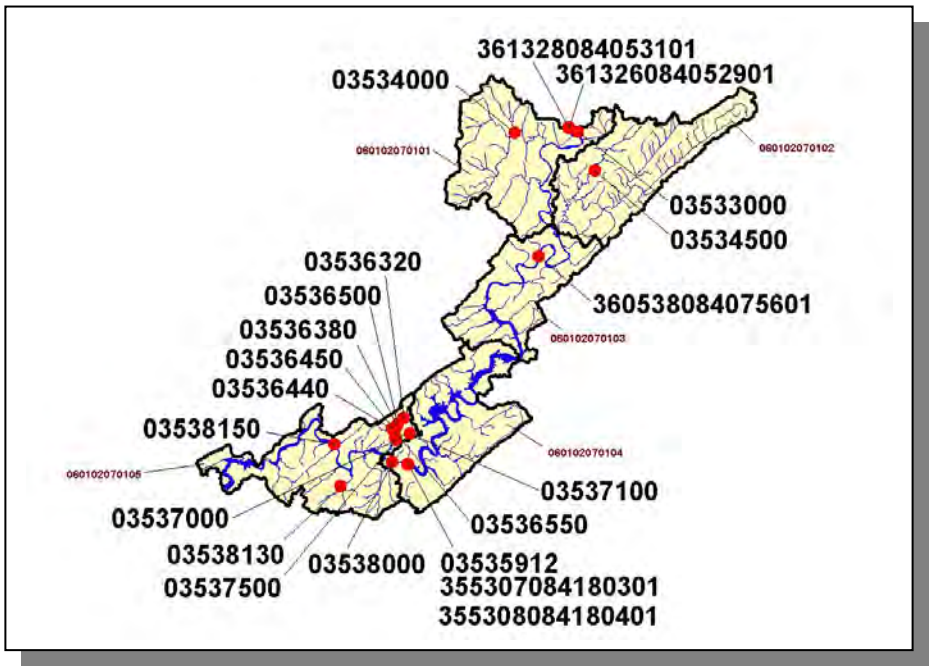


Figure 4-6. Location of Historical Streamflow Data Collection Sites in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070102, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information is provided in Appendix IV.*

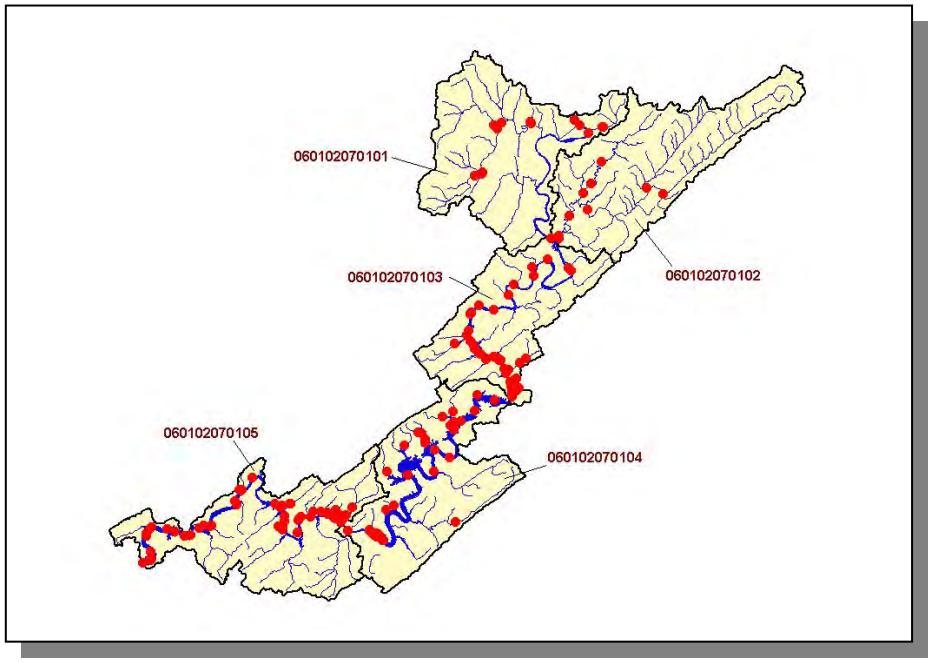


Figure 4-7. Location of STORET Monitoring Sites in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070102, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.A.ii Point Source Contributions.

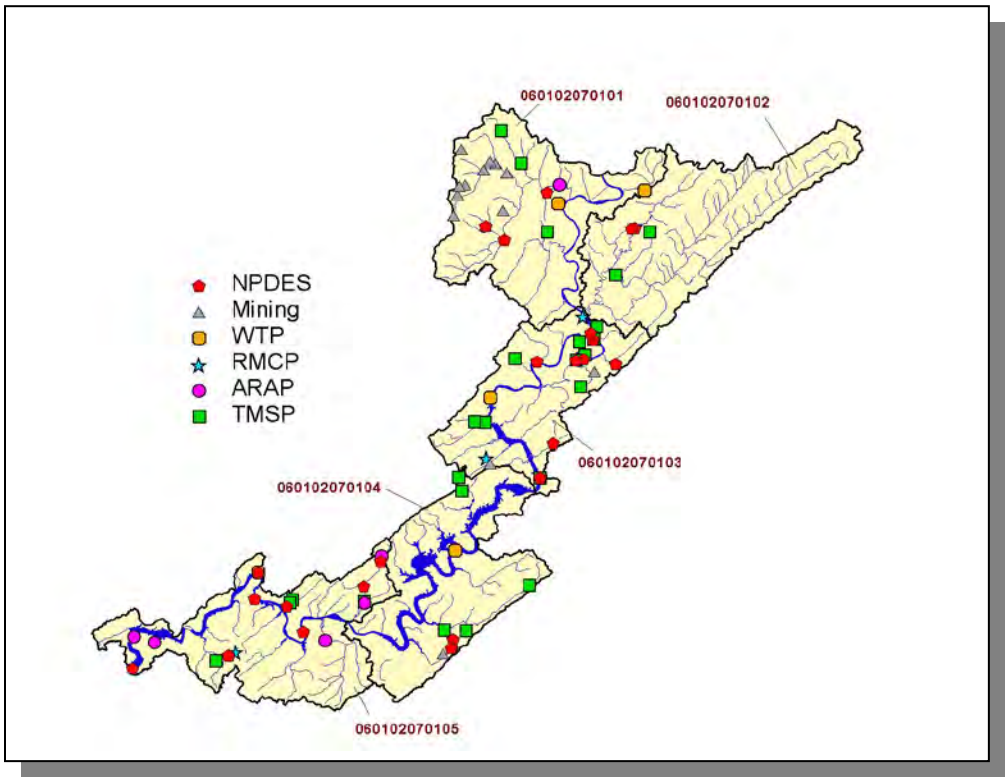


Figure 4-8. Location of Active Point Source Facilities in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

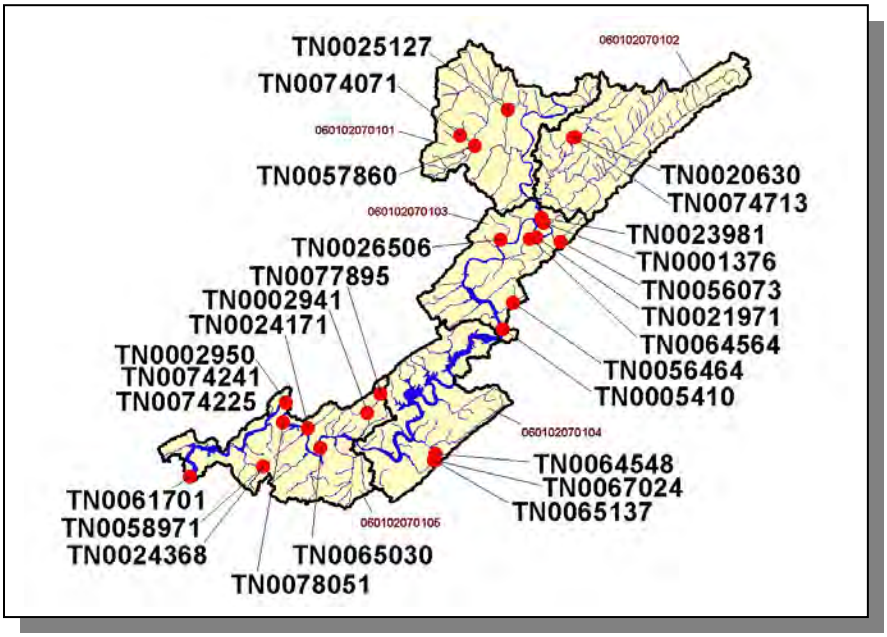


Figure 4-9. Location of NPDES Facilities in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

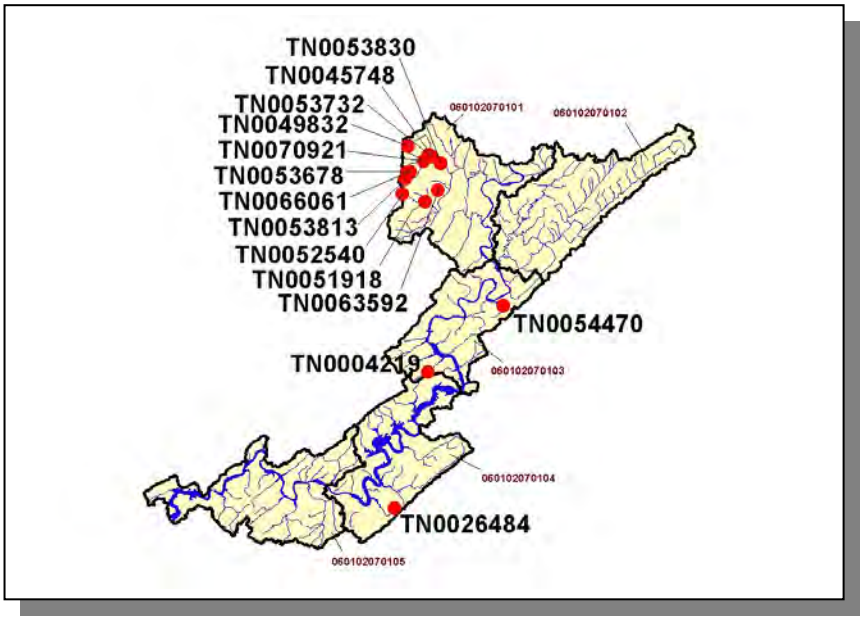


Figure 4-10. Location of Active Mining Facilities in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

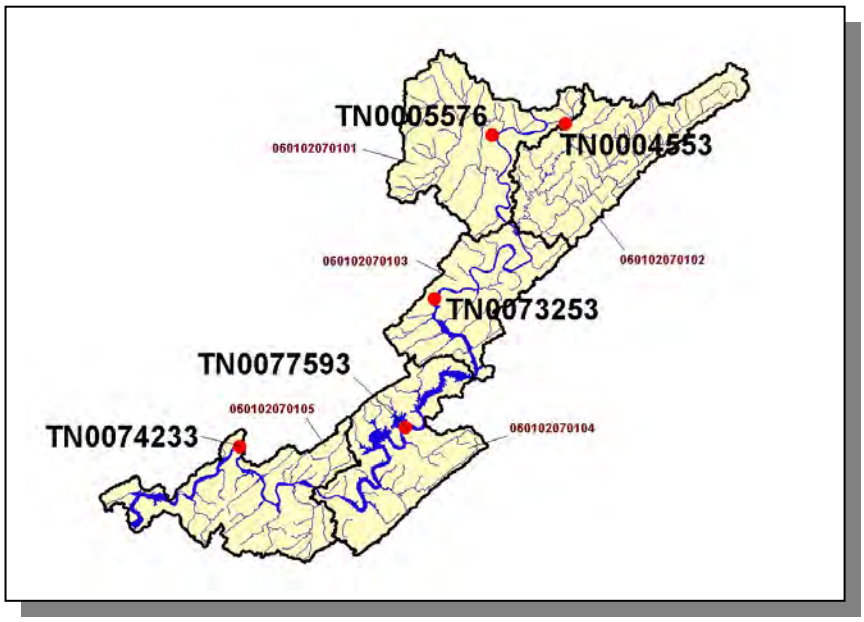


Figure 4-11. Location of Water Treatment Plants in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

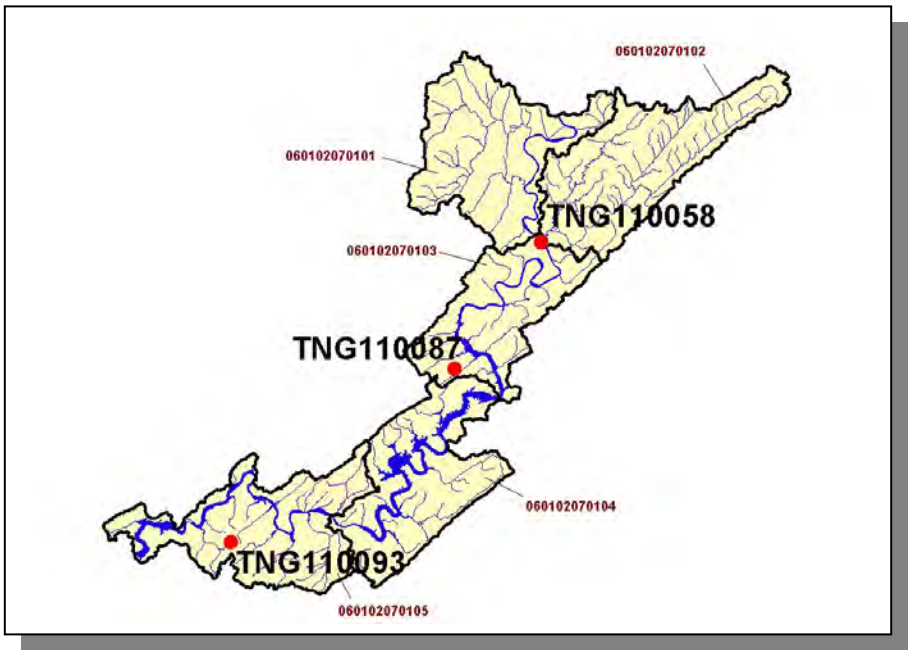


Figure 4-12. Location of Ready Mix Concrete Plants in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

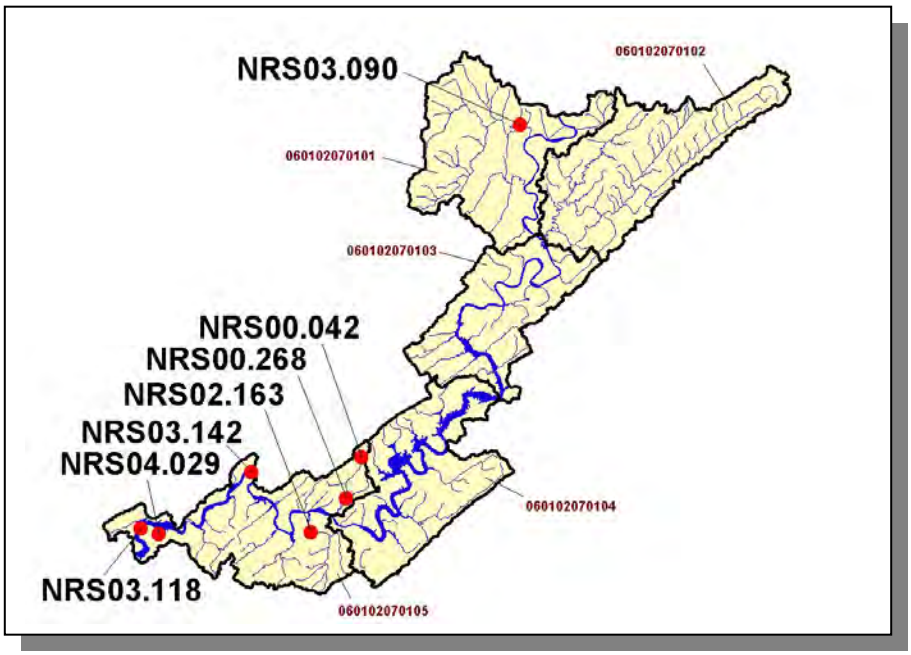


Figure 4-13. Location of ARAP Sites (Individual Permits) in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

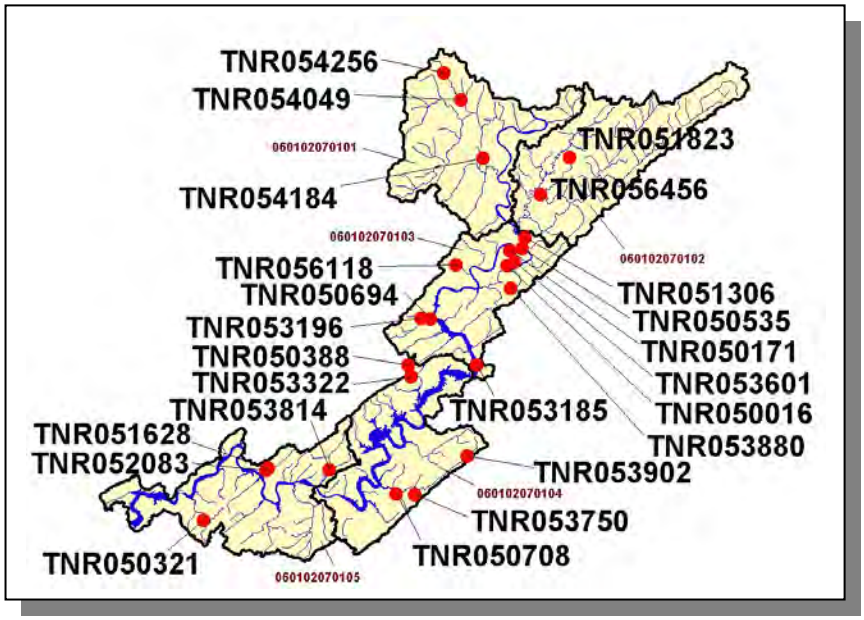


Figure 4-14. Location of TMSP Facilities in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

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

There are five NPDES facilities discharging to water bodies listed on the 2002 303(d) list in Subwatershed 0601020701:

- TN0020630 (Norris STP) discharges to Buffalo Creek @ RM 4.4
- TN0074713 (Intex Enterprises) discharges to Buffalo Creek @ RM 0.3 to Hinds Creek @ RM 5.5
- TN0025127 (Lake City STP) discharges to Coal Creek @ RM 3.3
- TN0065137 (Knoxville Travel Center) discharges to Grable Branch @ RM 0.8
- TN0002941 (USDOE-ORNL) discharges to White Oak Creek, Clinch River, and Melton Branch

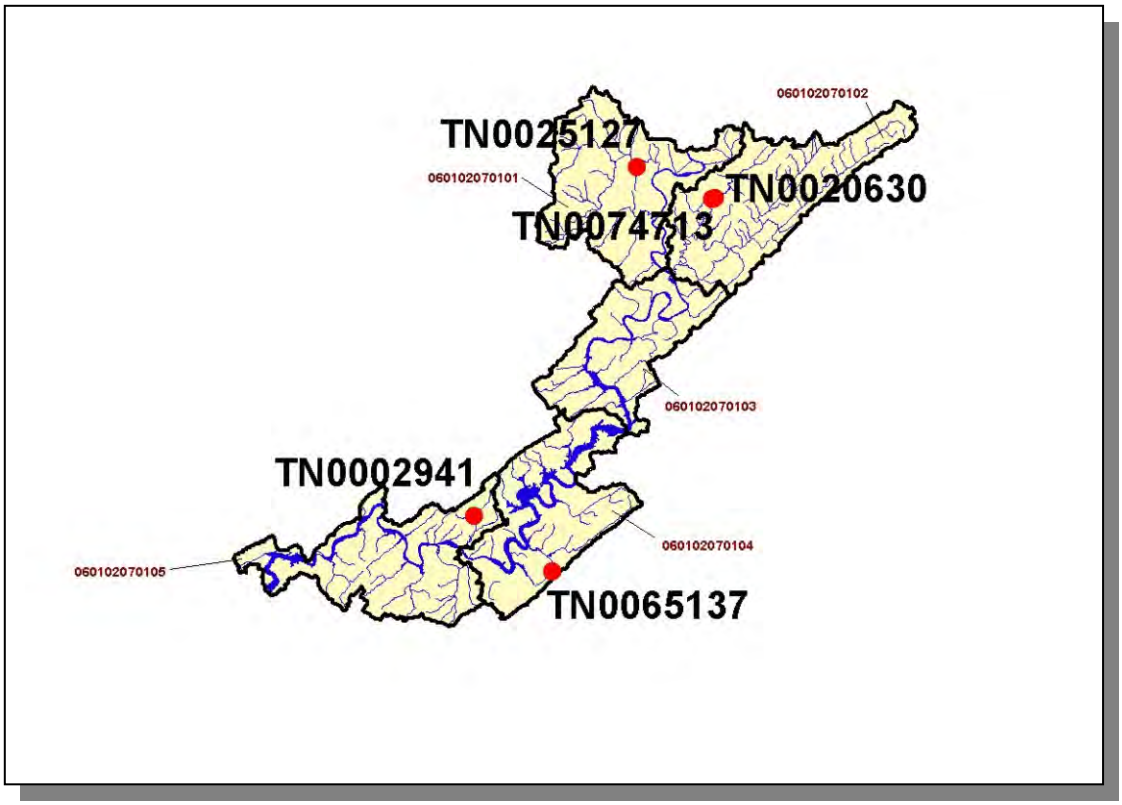


Figure 4-15. Location of NPDES Dischargers to Water Bodies Listed on the 2002 303(d) List in Subwatershed 0601020701. *Subwatershed 060102070101, 060102070021, 060102070103, 060102070104, and 060102070105 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

PERMIT #	1Q10	3Q10	7Q10	3Q20	QDESIGN
TN0020630	0.33	0.33	0.34	0.30	0.2
TN0074713				0	0.324
TN0025127	0.80	0.82	0.87	0.74	0.95
TN0065137					
TN0002941	2.7	2.8	3.1	2.6	

Table 4-5. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020701. *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 #	$CBOD_5$	BENZENE
TN0065137	X	X

Table 4-6. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020701.

PERMIT #	WET	$CBOD_5$	FECAL COLIFORM	*E. COLI*	NH_3	TRC	TSS	SETTLEABLE SOLIDS	CN	DO	pH
TN0020630		X	X	X	X	X	X	X		X	X
TN0074713	X	X			X		X		X		X
TN0025127		X	X	X	X	X	X	X		X	X
TN0065137							X				X
TN0002941	X	X			X		X		X		X

Table 4-7. Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020701. *WET, Whole Effluent Toxicity; $CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); TRC, Total Residual Chlorine; TSS, Total Suspended Solids.*

PERMIT #	Zn	Ag	Ni	Pb	Cu	Cr	Cd
TN0074713	X	X	X	X	X	X	
TN0002941	X	X	X	X	X	X	X

Table 4-8. Metals Monitored for Daily Maximum) Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020701.

PERMIT #	OIL and GREASE	TTO
TN0074713		X
TN0065137	X	
TN0002941	X	X

Table 4-9. Organic Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020701. *TTO, Total Toxic Organics.*

4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens Sold	Hogs	Sheep
7,431	15,720	914	37	<5	93	210

Table 4-10. Summary of Livestock Count Estimates in Subwatershed 0601020701. *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)
Anderson	124.0	124.0	2.6	6.2
Campbell	250.3	250.2	2.6	10.6
Knox	127.5	127.0	2.2	8.2
Loudon	62.3	62.3	1.1	3.5
Roane	153.1	153.1	1.7	5.1
Union	102.5	102.5	0.1	0.0
Total	**819.7**	**819.1**	**10.3**	**33.6**

Table 4-11. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0601020701.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	1.54
Legumes (Pastureland)	0.23
Legumes (Hayland)	1.04
Grass (Hayland)	0.80
Legumes, Grass (Hayland)	2.18
Grass, Forbs, Legumes (Mixed Pasture)	1.30
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	1.95
Soybeans (Row Crops)	15.54
Tobacco (Row Crops)	2.29
Wheat (Close-Grown Cropland)	3.74
Other Vegetable and Truck Crops	11.67
Non-Agricultural Land Use	0.00
Other Land in Farms	0.23
Farmsteads and Ranch Headquarters	0.99

Table 4-12. Annual Estimated Total Soil Loss in Subwatershed 0601020701.

4.2.B. 0601020702 (Bull Run Creek).

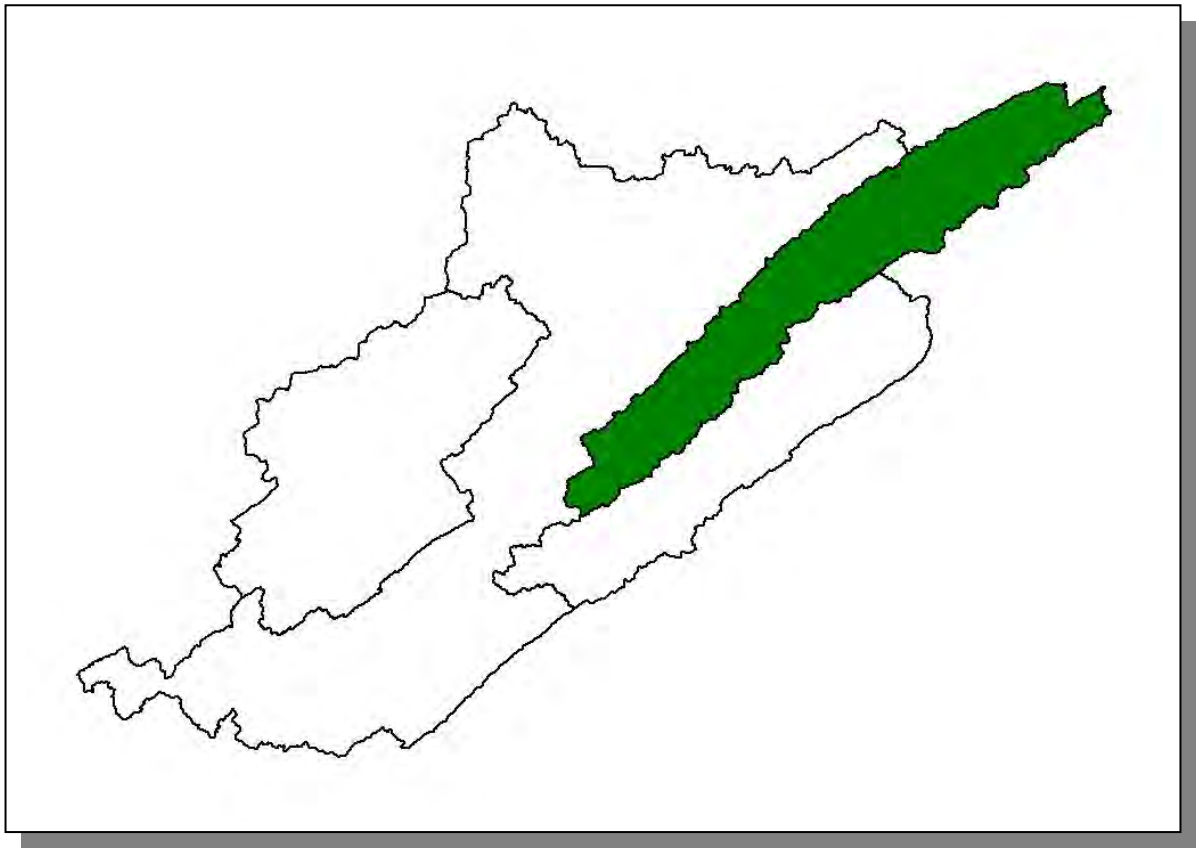


Figure 4-16. Location of Subwatershed 0601020702. *All Lower Clinch River HUC-10 subwatershed boundaries are shown for reference.*

4.2.B.i. General Description.

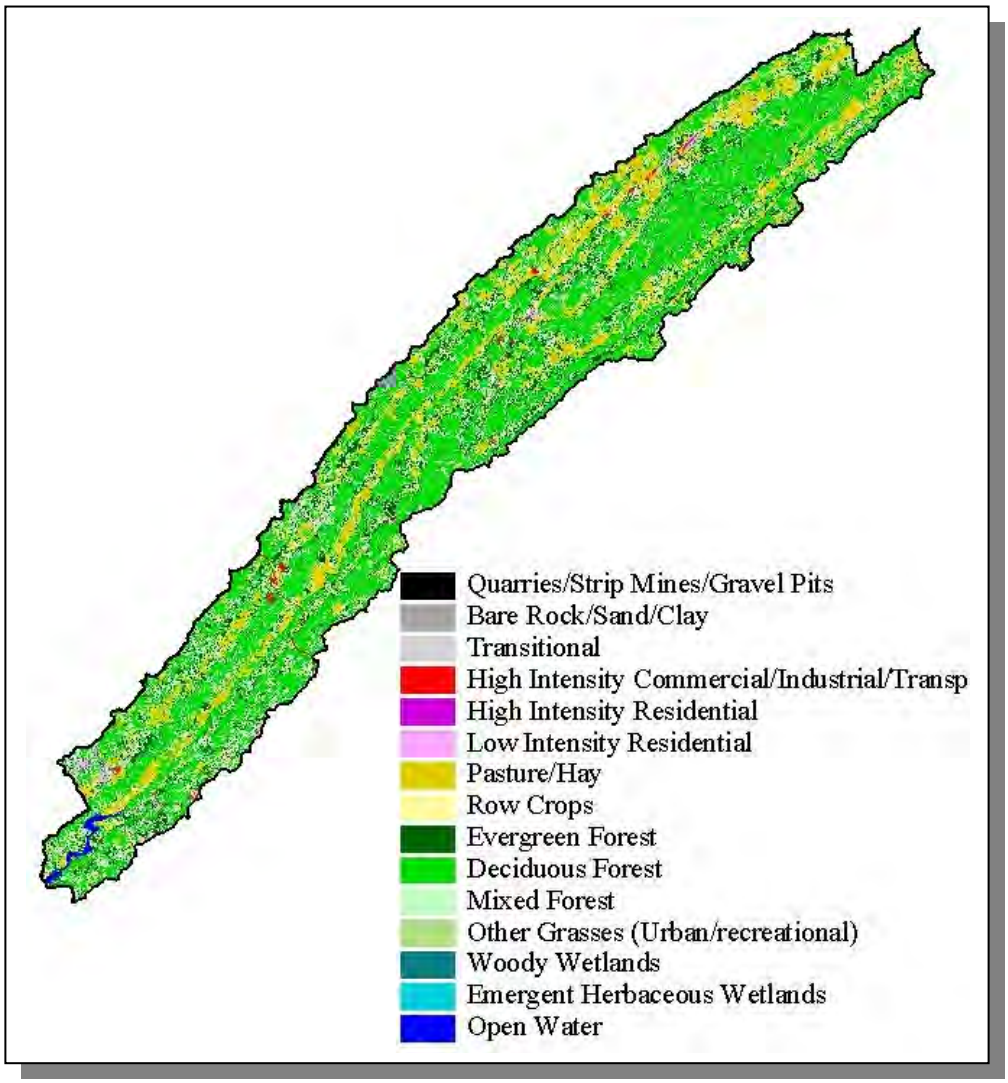


Figure 4-17. Illustration of Land Use Distribution in Subwatershed 0601020702.

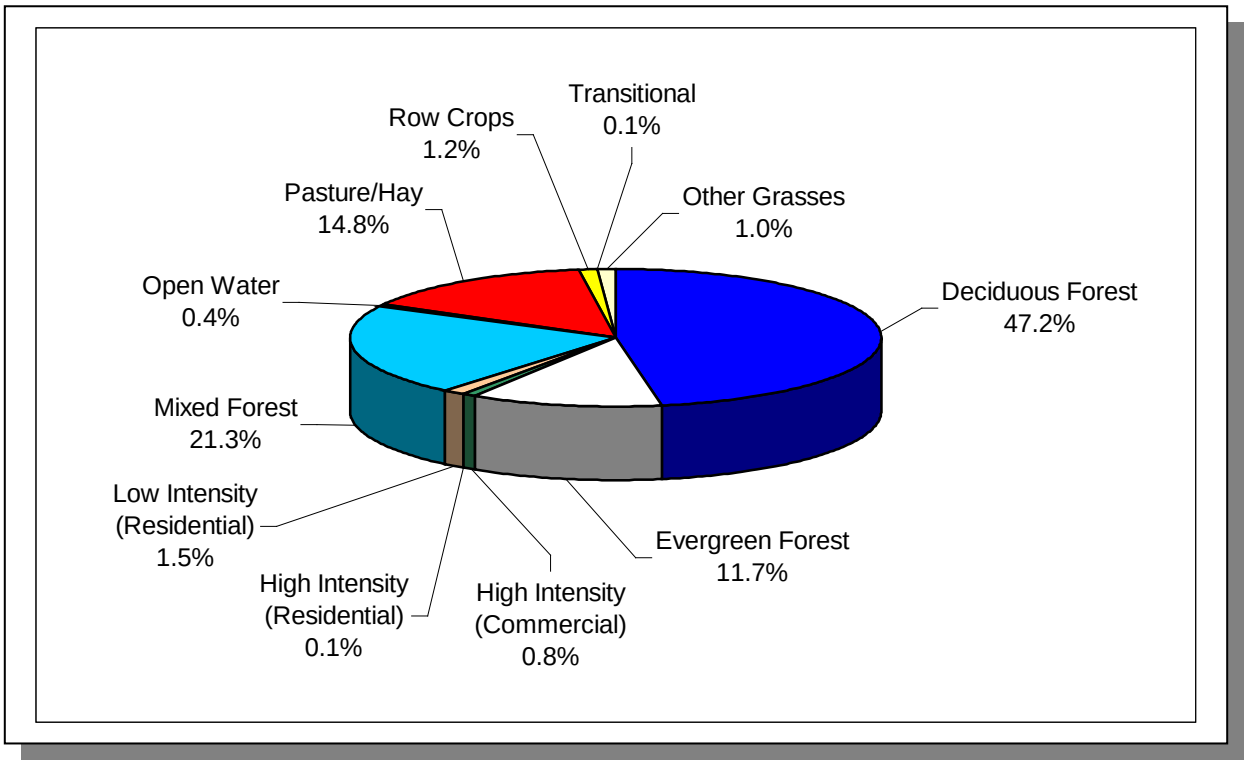


Figure 4-18. Land Use Distribution in Subwatershed 0601020702. *More information is provided in Appendix IV.*

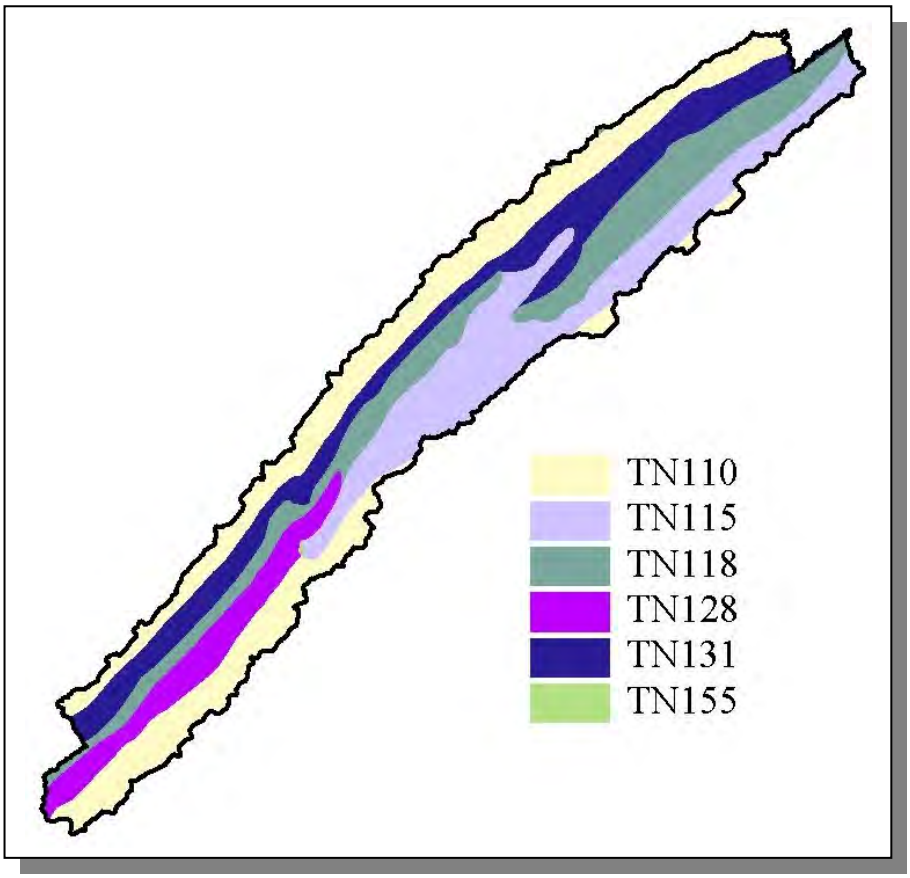


Figure 4-19. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020702.

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
TN115	0.00	C	1.41	5.15	Silty Loam	0.36
TN118	0.00	C	6.52	5.12	Loam	0.29
TN128	0.00	C	1.30	6.53	Clayey Loam	0.26
TN131	0.00	C	1.17	4.95	Silty Loam	0.33
TN155	0.00	C	1.71	5.31	Loam	0.32

Table 4-13. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020702. *More information is provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Anderson	68,250	71,498	71,330	4.10	2,795	2,928	2,921	4.5
Grainger	17,095	19,456	20,659	0.55	94	107	113	20.2
Knox	335,749	365,900	382,032	7.90	26,529	28,912	30,186	13.8
Union	13,694	15,956	17,808	19.63	2,688	3,132	3,496	30.1
Totals	**434,788**	**472,810**	**491,829**		**32,106**	**35,079**	**36,716**	**14.4**

Table 4-14. Population Estimates in Subwatershed 0601020702

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Luttrell	Union	812	303	4	274	25
Maynardville	Union	1,298	544	366	173	5
Plainview	Union	2,165	853	50	789	14
Totals		**4,275**	**1,700**	**420**	**1,236**	**44**

Table 4-15. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0601020702.

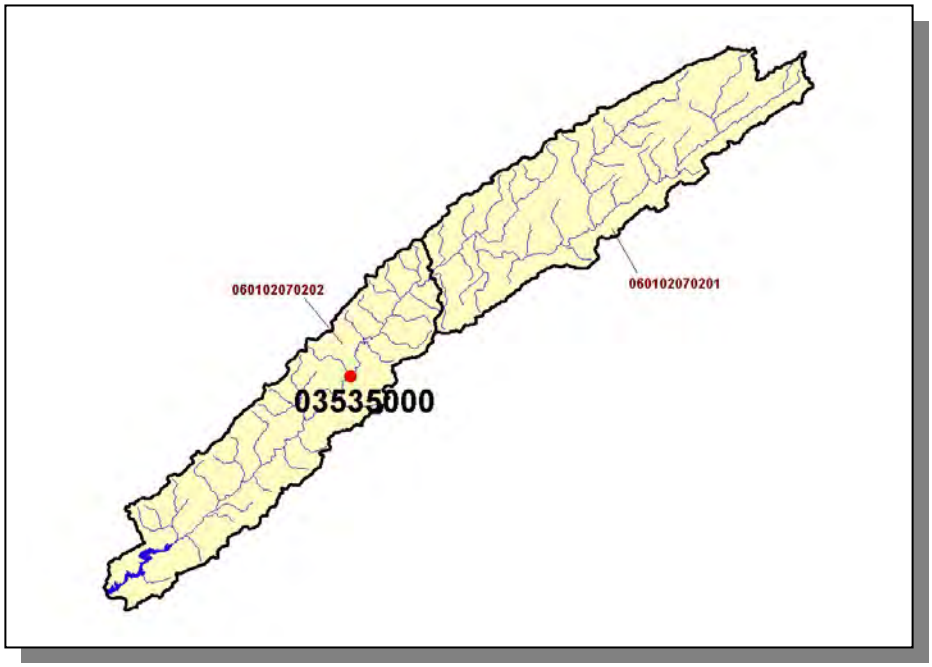


Figure 4-20. Location of Historical Streamflow Data Collection Sites in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information is provided in Appendix IV.*

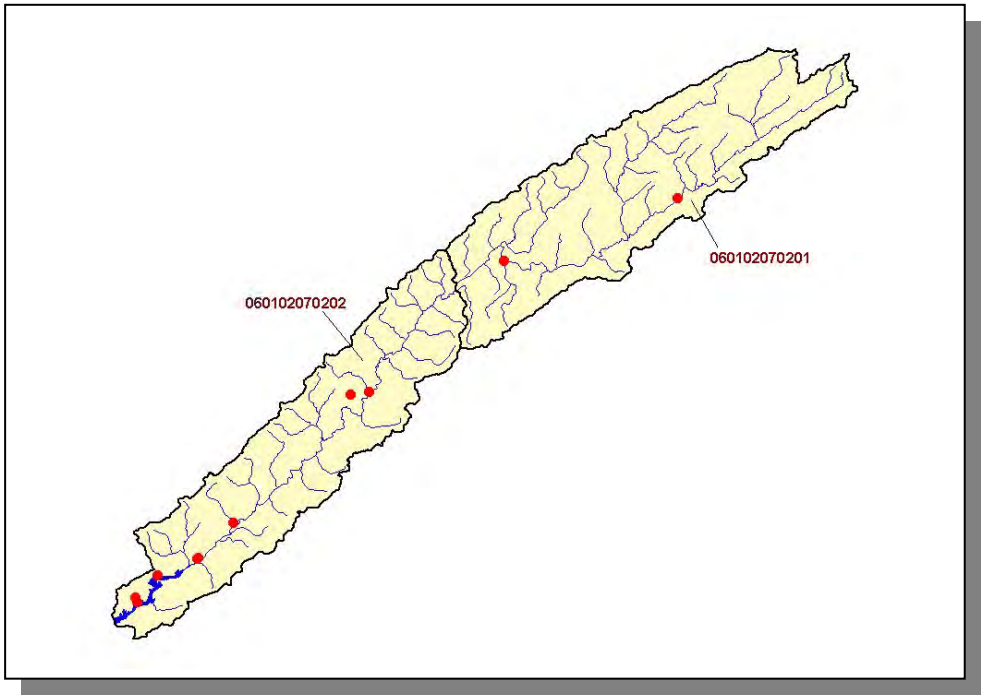


Figure 4-21. Location of STORET Monitoring Sites in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.B.ii. Point Source Contributions.

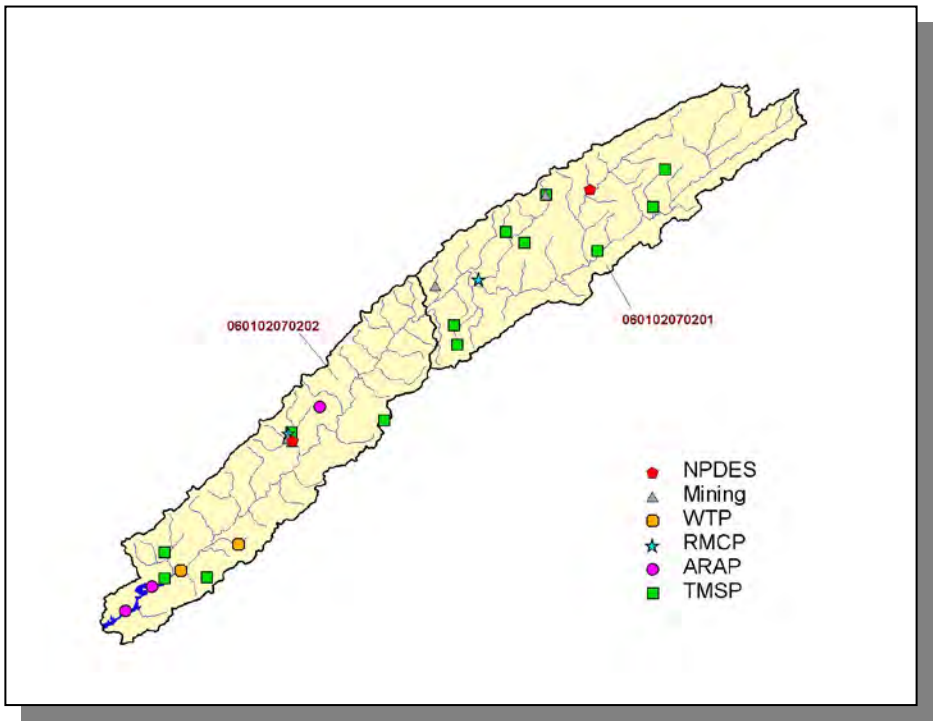


Figure 4-22. Location of Active Point Source Facilities in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

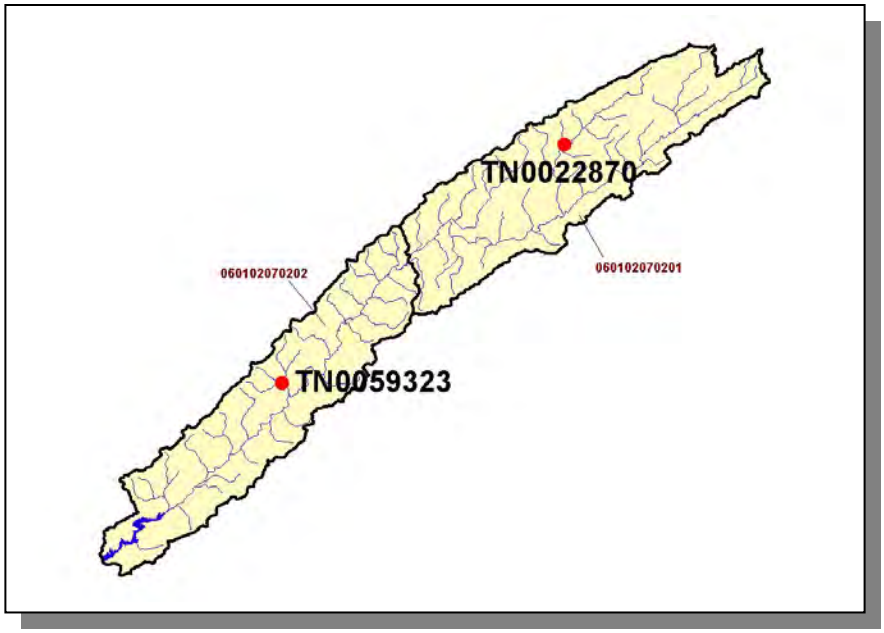


Figure 4-23. Location of NPDES Facilities in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

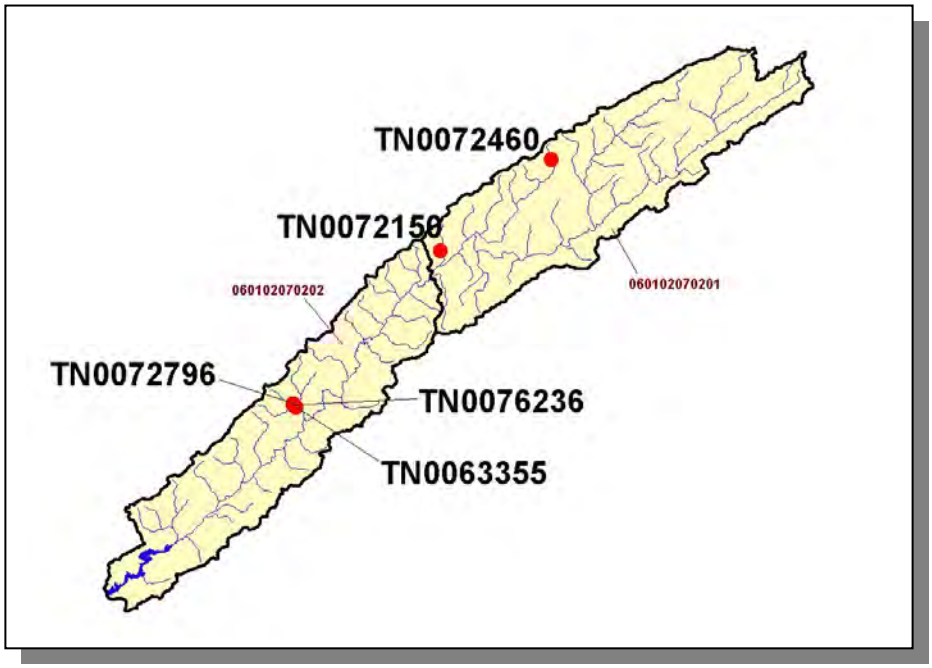


Figure 4-24. Location of Active Mining Facilities in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

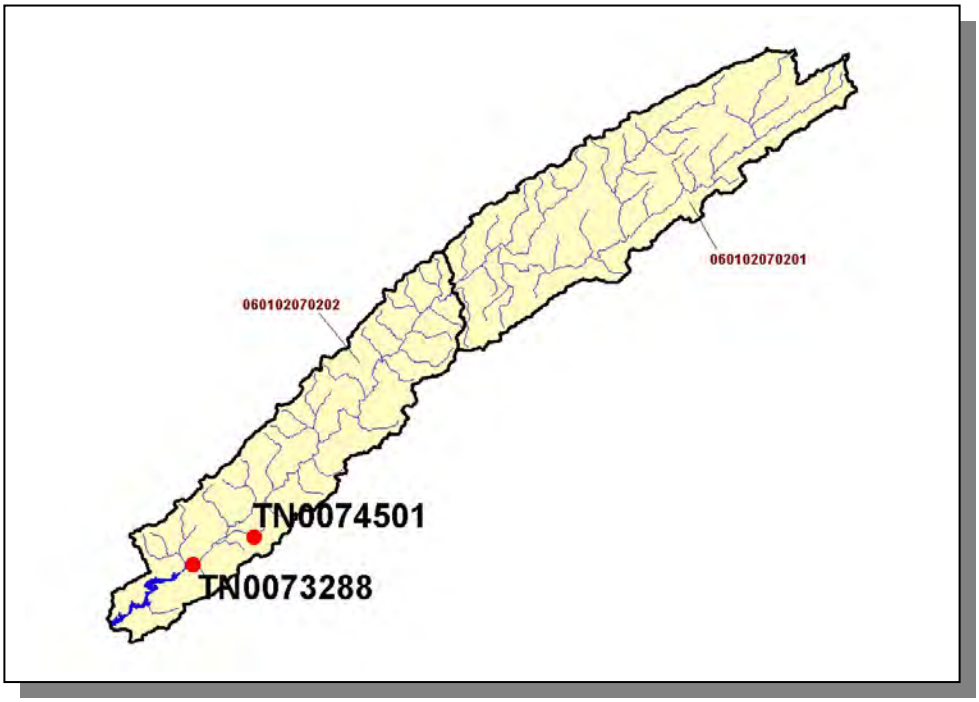


Figure 4-25. Location of Water Treatment Plants in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

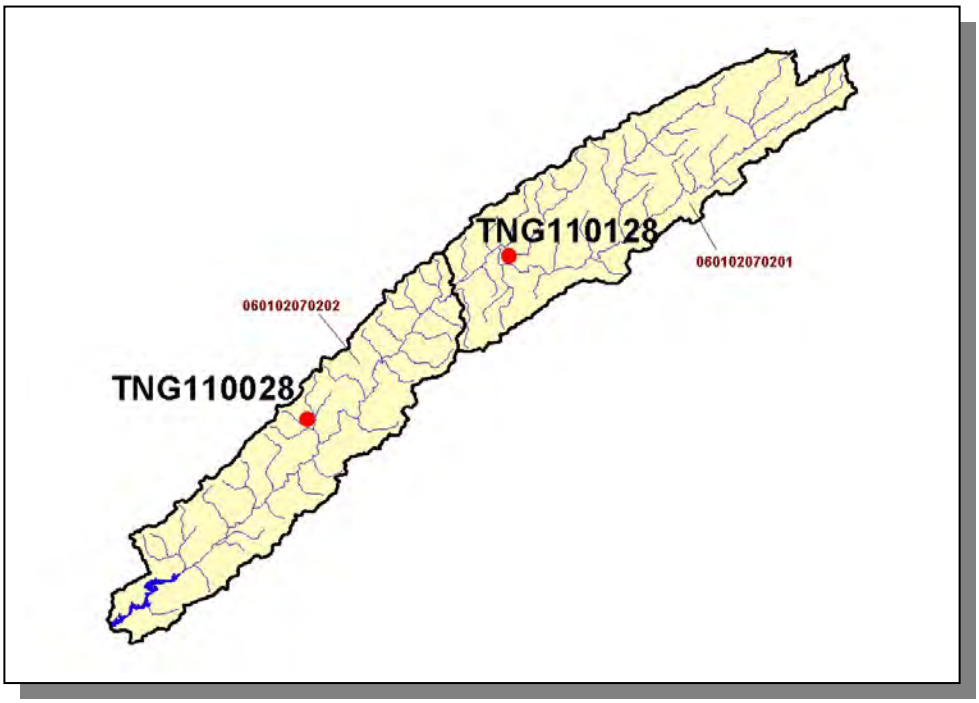


Figure 4-26. Location of Ready Mix Concrete Plants in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

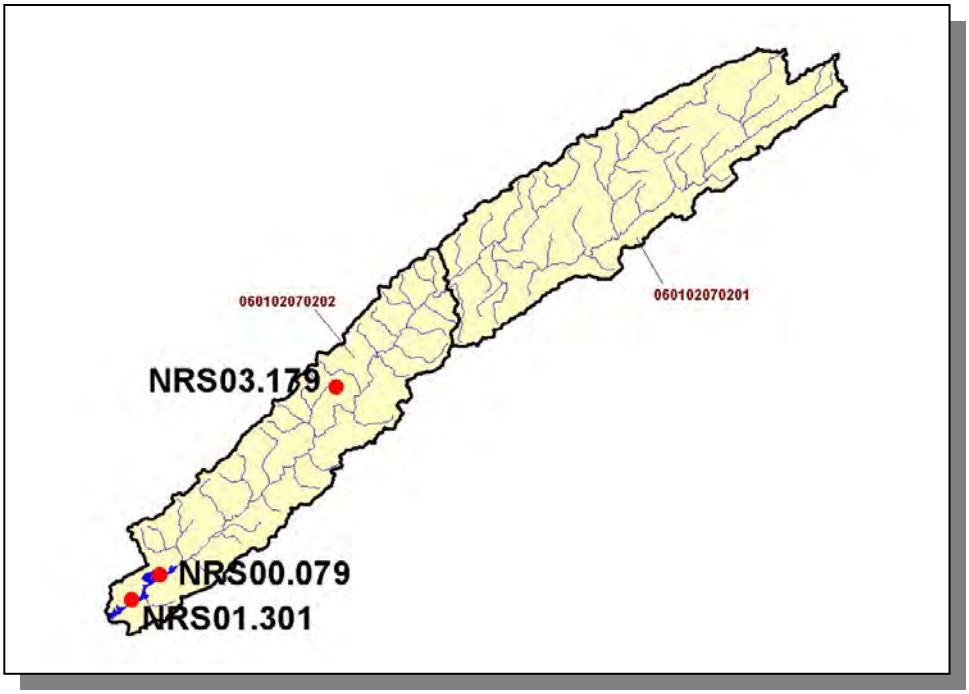


Figure 4-27. Location of ARAP Sites (Individual Permits) in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

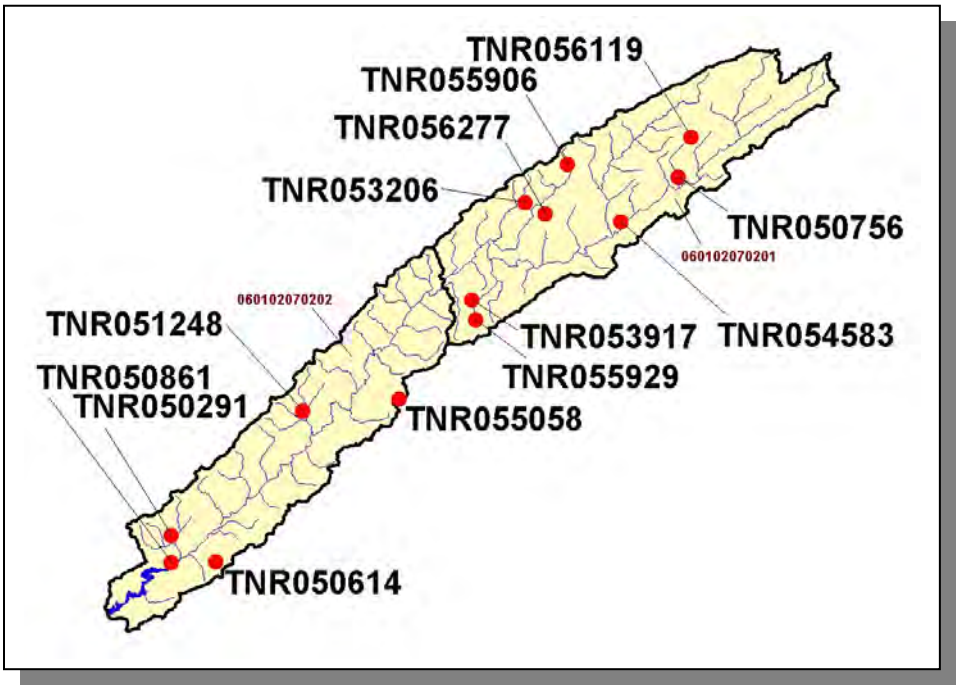


Figure 4-28. Location of TMSP Facilities in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

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

There are two NPDES facilities discharging to water bodies listed on the 2002 303(d) list in Subwatershed 0601020702:

- TN0022870 (Maynardville STP) discharges to North Fork Bull Run Creek @ RM 3.1
- TN0059323 (Hallsdale-Powell Raccoon Valley STP) discharges to Bull Run Creek @ RM 12.6

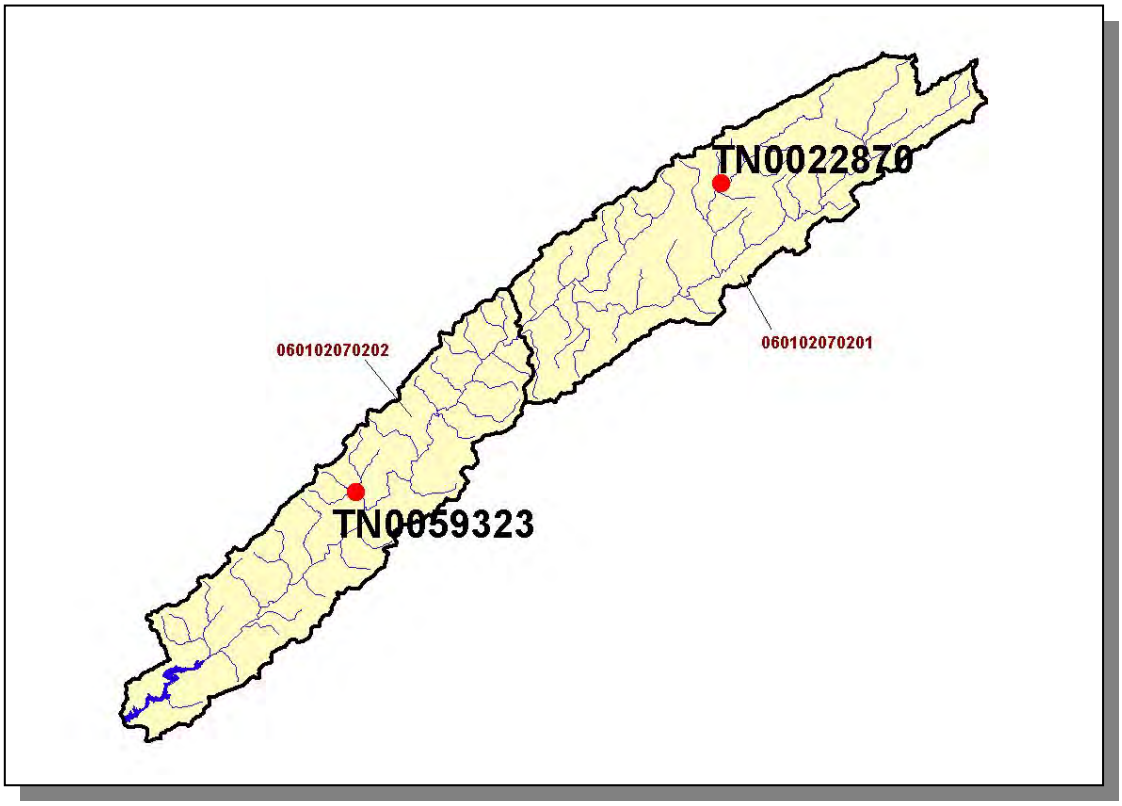


Figure 4-29. Location of NPDES Dischargers to Water Bodies Listed on the 2002 303(d) List in Subwatershed 0601020702. *Subwatershed 060102070201 and 060102070202 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

PERMIT #	1Q10	3Q10	7Q10	3Q20	QDESIGN
TN0022870	0.50	0.52	0.56	0.47	0.6
TN0059323	4.76	4.90	5.29	4.50	0.3

Table 4-16. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020702. *Data are in million gallons per day (MGD). Data were obtained from the USGS publication Flow Duration and Low Flows of Tennessee Streams Through 1992 or from permit files.*

PERMIT #	$CBOD_5$	FECAL COLIFORM	*E. COLI*	NH_3	TRC	TSS	SETTLEABLE SOLIDS	DO	pH
TN0022870	X	X	X	X	X	X	X	X	X
TN0059323	X	X	X	X	X	X	X	X	X

Table 4-17. Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020702. *$CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); TRC, Total Residual Chlorine; TSS, Total Suspended Solids.*

4.2.B.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens Sold	Hogs	Sheep
2,981	5,807	115	12	<5	83	76

Table 4-18. Summary of Livestock Count Estimates in Subwatershed 0601020702. *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)
Anderson	124.0	124.0	2.6	6.2
Grainger	102.6	102.6	0.3	1.8
Knox	127.5	127.0	2.2	8.2
Union	102.5	102.5	0.1	0.0
Total	**456.6**	**456.1**	**5.2**	**16.2**

Table 4-19. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0601020702.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.77
Legumes (Hayland)	1.07
Grass (Hayland)	1.02
Legumes, Grass (Hayland)	1.02
Grass, Forbs, Legumes (Mixed Pasture)	1.18
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	1.28
Soybeans (Row Crops)	15.54
Tobacco (Row Crops)	2.22
Wheat (Close-Grown Cropland)	4.44
Other Vegetable and Truck Crops	12.06
Non-Agricultural Land Use	0.00
Other Land in Farms	0.23
Farmsteads and Ranch Headquarters	0.32

Table 4-20. Annual Estimated Total Soil Loss in Subwatershed 0601020702.

4.2.C. 0601020703 (Beaver Creek).

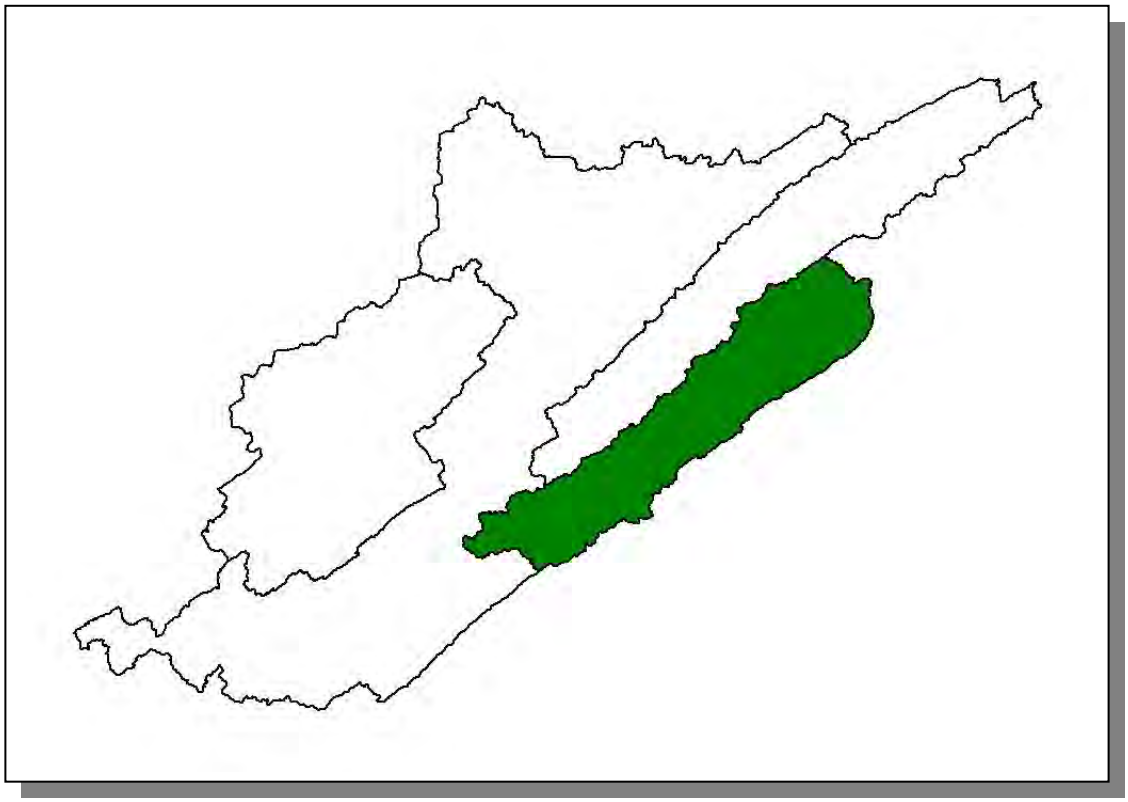


Figure 4-30. Location of Subwatershed 0601020703. *All Lower Clinch River HUC-10 subwatershed boundaries are shown for reference.*

4.2.C.i. General Description.

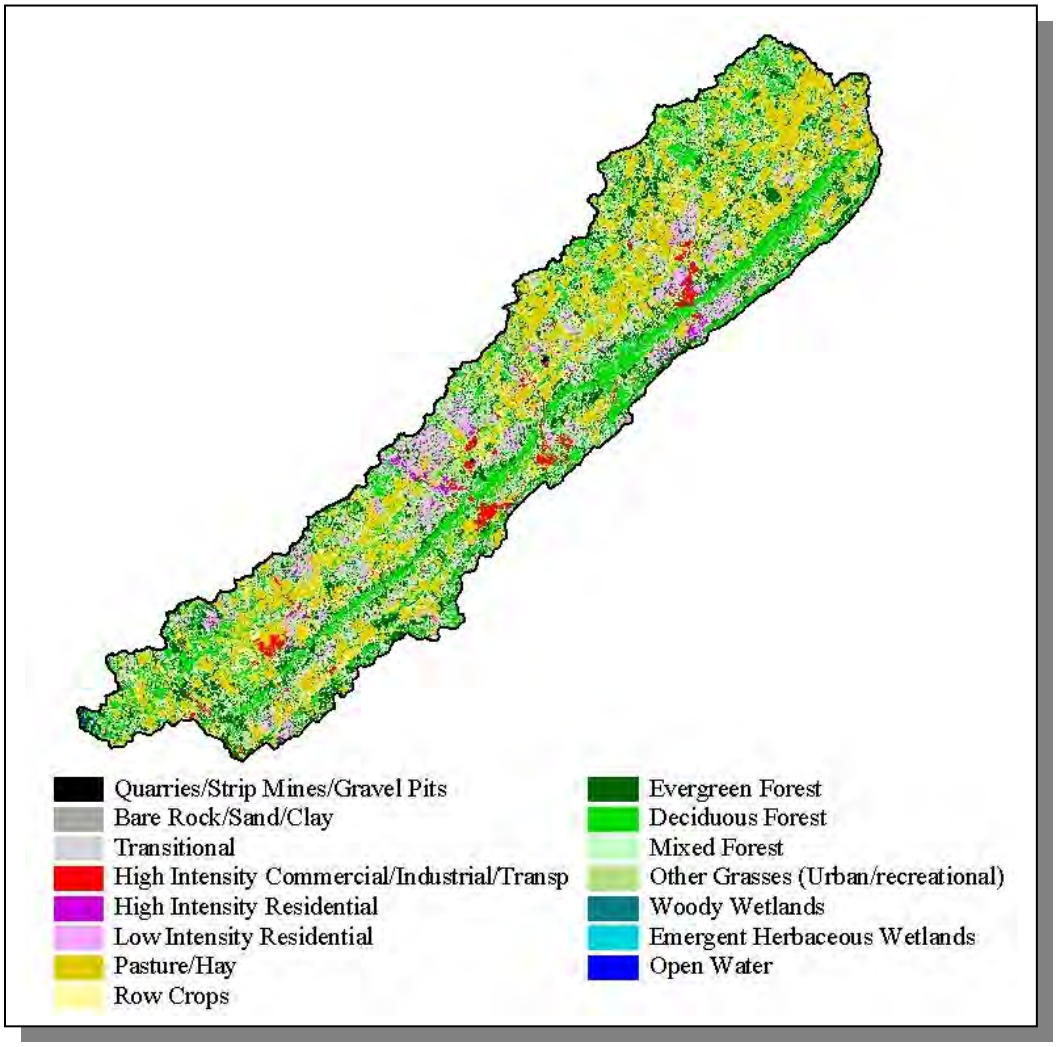


Figure 4-31. Illustration of Land Use Distribution in Subwatershed 0601020703.

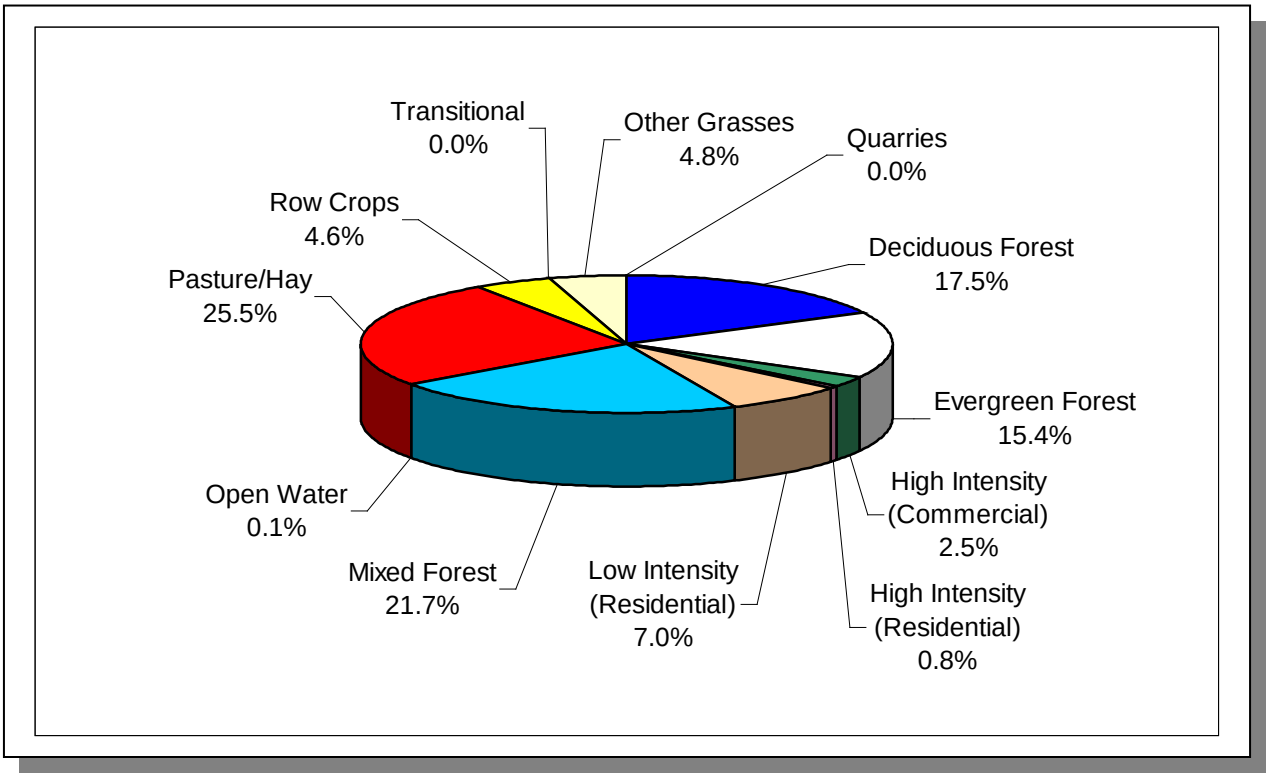


Figure 4-32. Land Use Distribution in Subwatershed 0601020703. *More information is provided in Appendix IV.*

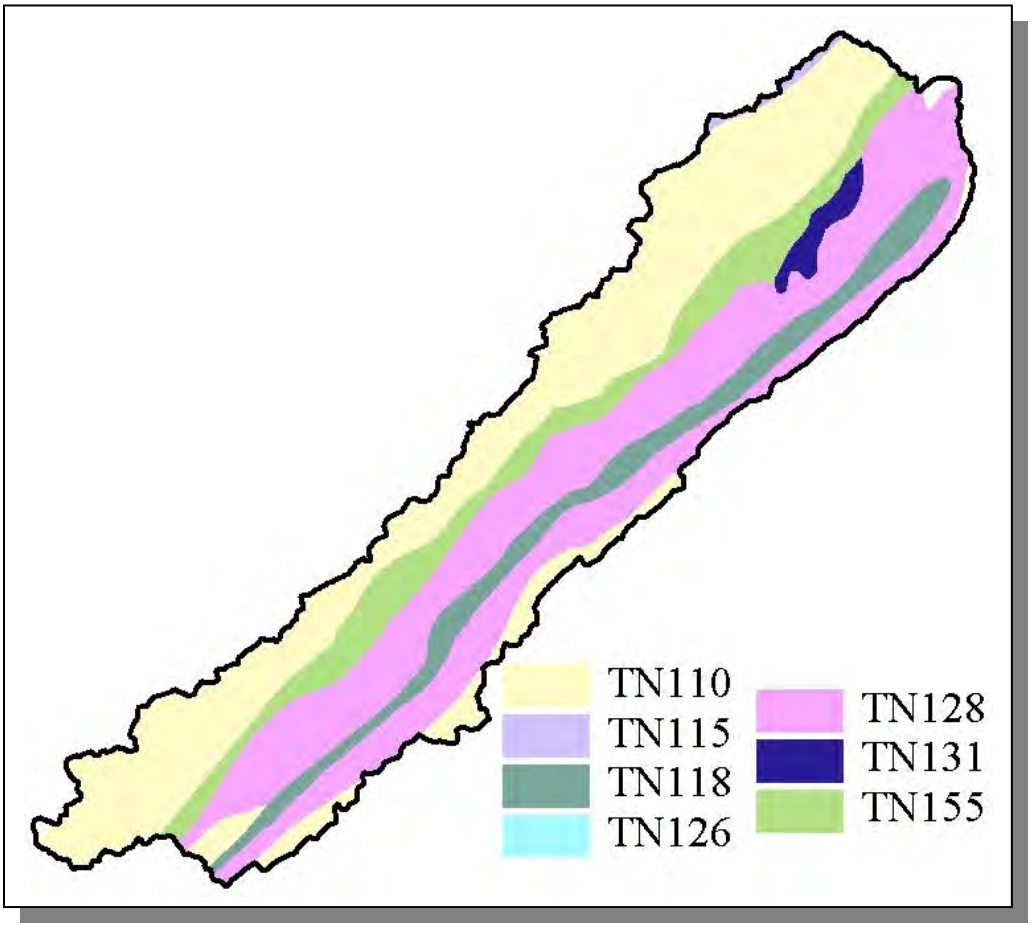


Figure 4-33. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020703.

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
TN115	0.00	C	1.41	5.15	Silty Loam	0.36
TN118	0.00	C	6.52	5.12	Loam	0.29
TN126	19.00	C	1.30	5.12	Loam	0.33
TN128	0.00	C	1.30	6.53	Clayey Loam	0.26
TN131	0.00	C	1.17	4.95	Silty Loam	0.33
TN155	0.00	C	1.71	5.31	Loam	0.32

Table 4-21. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020703. *More information is provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Anderson	68,250	71,498	71,330	0.08	56	59	59	5.4
Knox	335,749	365,900	382,032	17.11	57,457	62,617	65,378	13.8
Totals	**403,999**	**437,398**	**453,362**		**57,513**	**62,678**	**65,437**	**13.8**

Table 4-22. Population Estimates in Subwatershed 0601020703.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Knoxville	Knox	165,121	76,453	74,884	1,521	48

Table 4-23. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0601020703.

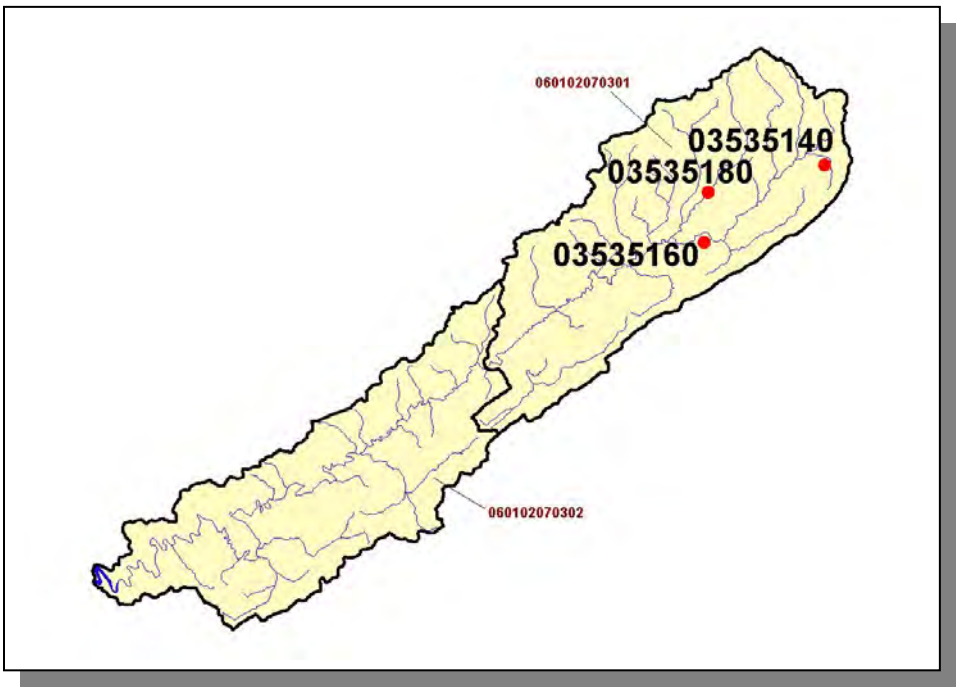


Figure 4-34. Location of Historical Streamflow Data Collection Sites in Subwatershed 0601020703. *Subwatershed 060102070301 and 060102070302 boundaries are shown for reference. More information is provided in Appendix IV.*

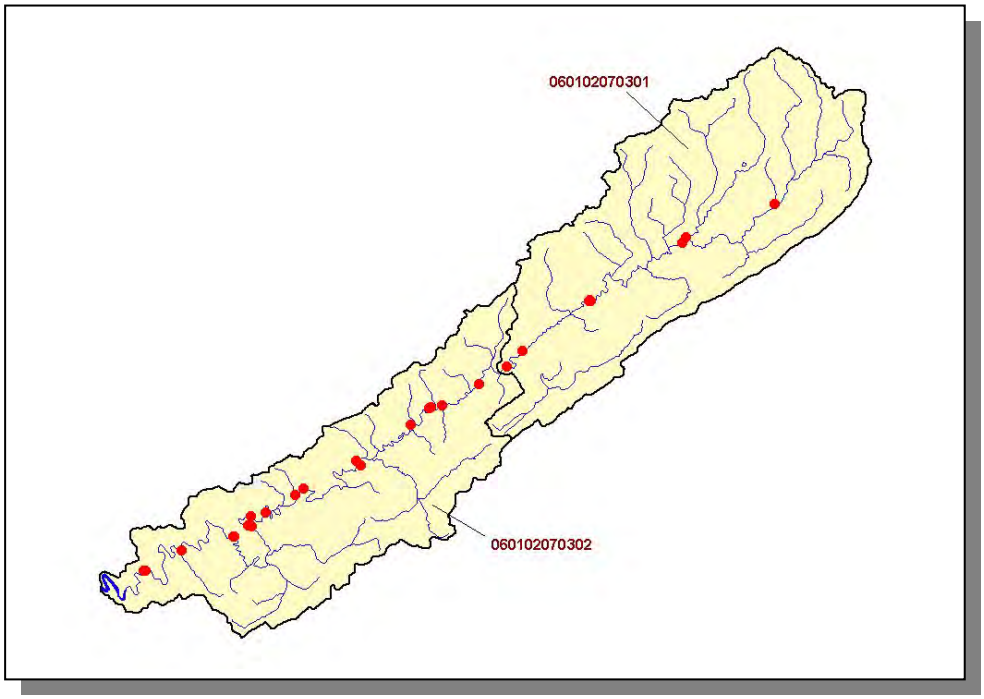


Figure 4-35. Location of STORET Monitoring Sites in Subwatershed 0601020703. *Subwatershed 060102070301 and 060102070302 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.C.ii. Point Source Contributions.

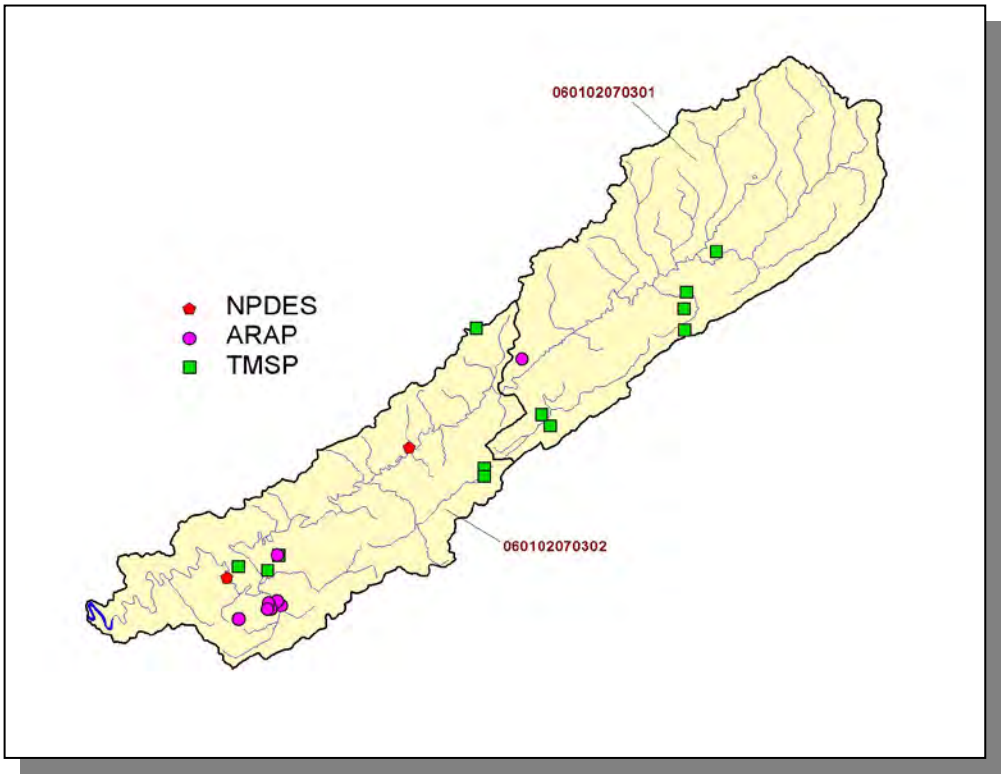


Figure 4-36. Location of Active Point Source Facilities in Subwatershed 0601020703. *Subwatershed 060102070301 and 060102070302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

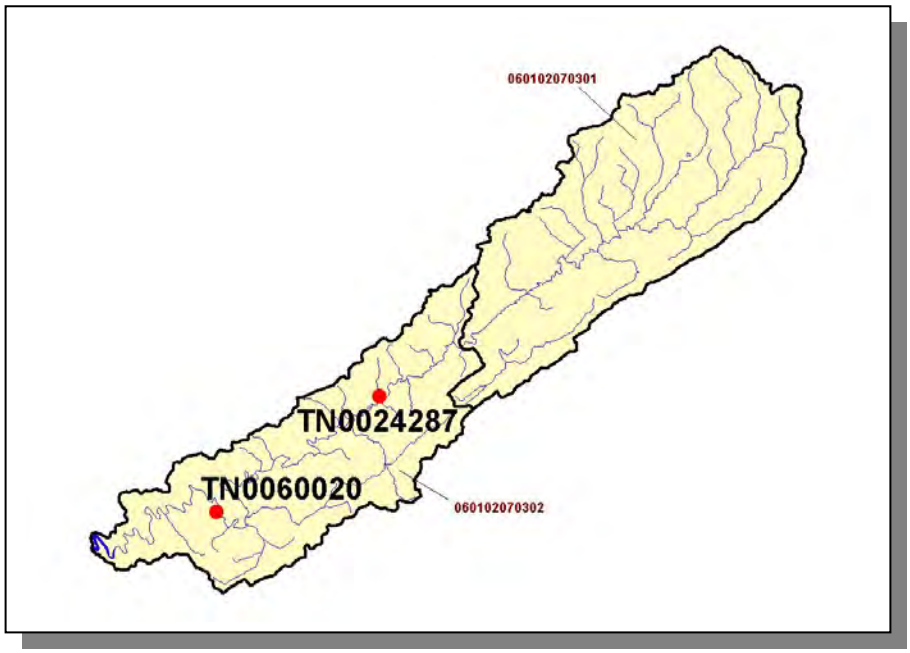


Figure 4-37. Location of NPDES Facilities in Subwatershed 0601020703. *Subwatershed 060102070301 and 060102070302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

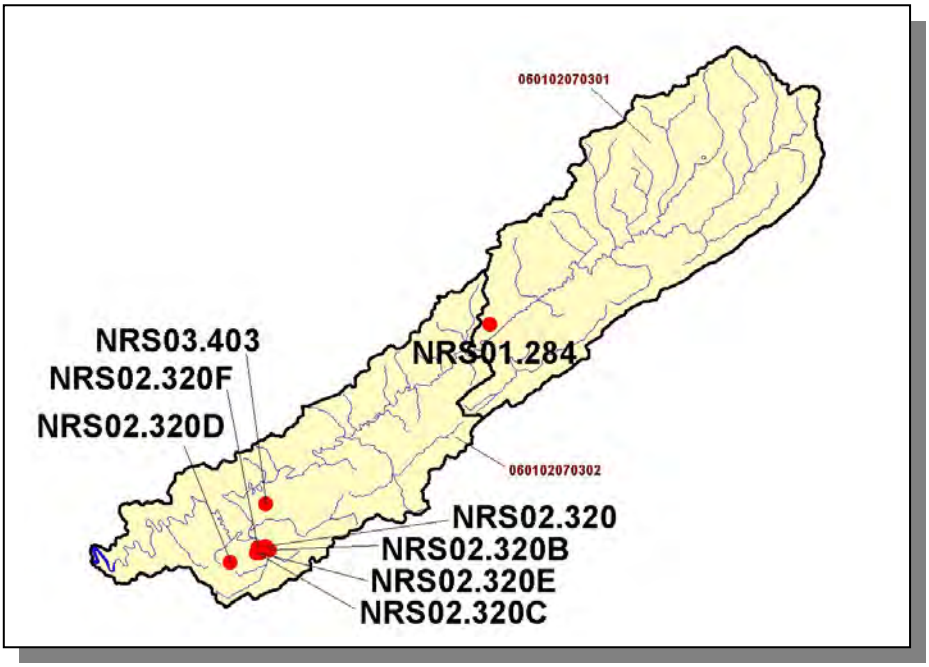


Figure 4-38. Location of ARAP Sites (Individual Permits) in Subwatershed 0601020703. *Subwatershed 060102070301 and 060102070302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

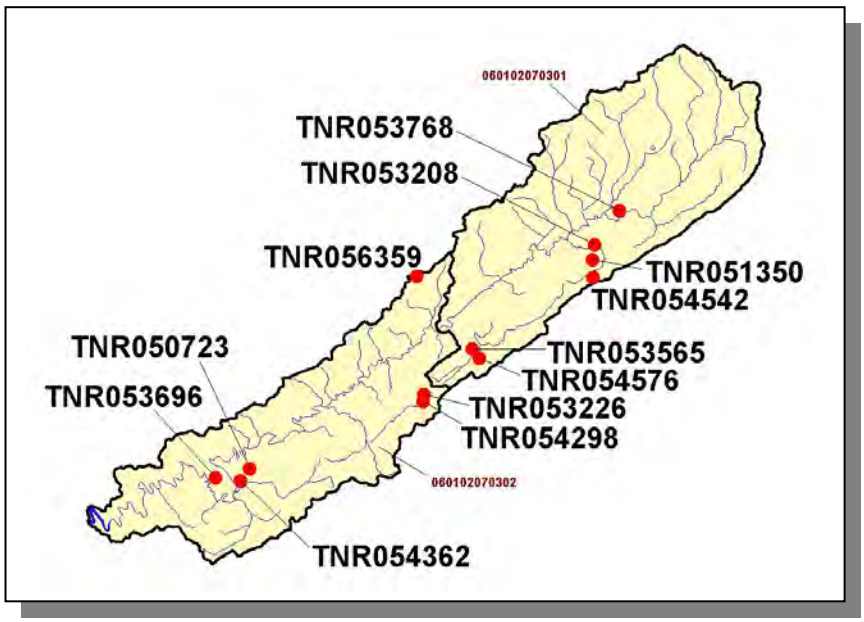


Figure 4-39. Location of TMSP Facilities in Subwatershed 0601020703. *Subwatershed 060102070301 and 060102070302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

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

There are two NPDES facilities discharging to water bodies listed on the 2002 303(d) list in Subwatershed 0601020703:

- TN0024287 (Hallsdale-Powell Utility District STP) discharges to Beaver Creek @ RM 23.5
- TN0060020 (West Knox Utility District-Karns Beaver Creek STP) discharges to Beaver Creek @ RM 10.7

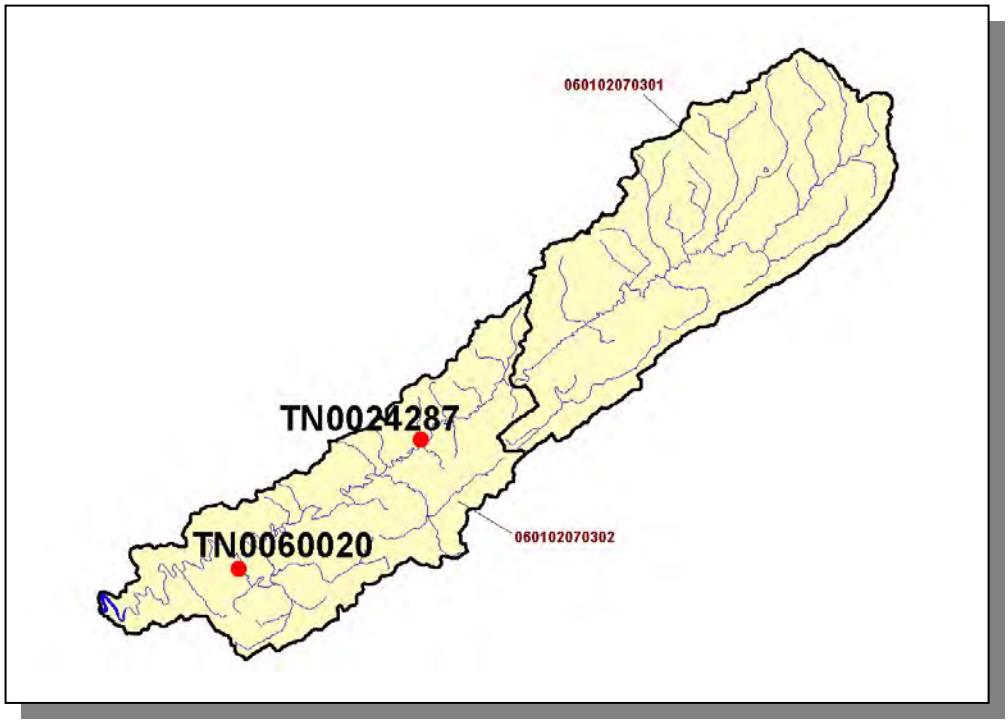


Figure 4-40. Location of NPDES Dischargers to Water Bodies Listed on the 2002 303(d) List in Subwatershed 0601020703. *Subwatershed 060102070301 and 060102070302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

PERMIT #	1Q10	3Q10	7Q10	3Q20	QDESIGN
TN0024287	3.9	4.0	4.3	3.7	9.0
TN0060020	6.0	6.2	6.7	5.7	4.0

Table 4-24. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020703. *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	TOTAL N	TOTAL P
TN0024287	X		
TN0060020	X	X	X

Table 4-25. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020703. *TSS, Total Suspended Solids.*

PERMIT #	WET	$CBOD_5$	FECAL COLIFORM	*E. COLI*	Pb	Hg	NH_3	SETTLEABLE SOLIDS	TRC	DO	pH
TN0024287			X	X		X		X	X	X	X
TN0060020	X	X	X	X	X		X	X	X	X	X

Table 4-26. Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020703. *WET, Whole Effluent Toxicity; $CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); TRC, Total Residual Chlorine; TSS, Total Suspended Solids.*

4.2.C.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens Sold	Hogs	Sheep
2,931	5,820	202	8	<5	201	153

Table 4-27. Summary of Livestock Count Estimates in Subwatershed 0601020703. *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)
Anderson	124.0	124.0	2.6	6.2
Knox	127.5	127.0	2.2	8.2
Totals	**251.5**	**251.0**	**4.8**	**14.4**

Table 4-28. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0601020703.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.90
Legumes (Hayland)	1.07
Grass (Hayland)	0.12
Legumes, Grass (Hayland)	0.25
Grass, Forbs, Legumes (Mixed Pasture)	0.47
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	1.10
Soybeans (Row Crops)	15.54
Tobacco (Row Crops)	1.62
Wheat (Close-Grown Cropland)	4.44
Other Vegetable and Truck Crops	12.06
Non-Agricultural Land Use	0.00
Other Land in Farms	0.23
Farmsteads and Ranch Headquarters	0.18

Table 4-29. Annual Estimated Total Soil Loss in Subwatershed 0601020703.

4.2.D. 0601020705 (Poplar Creek).

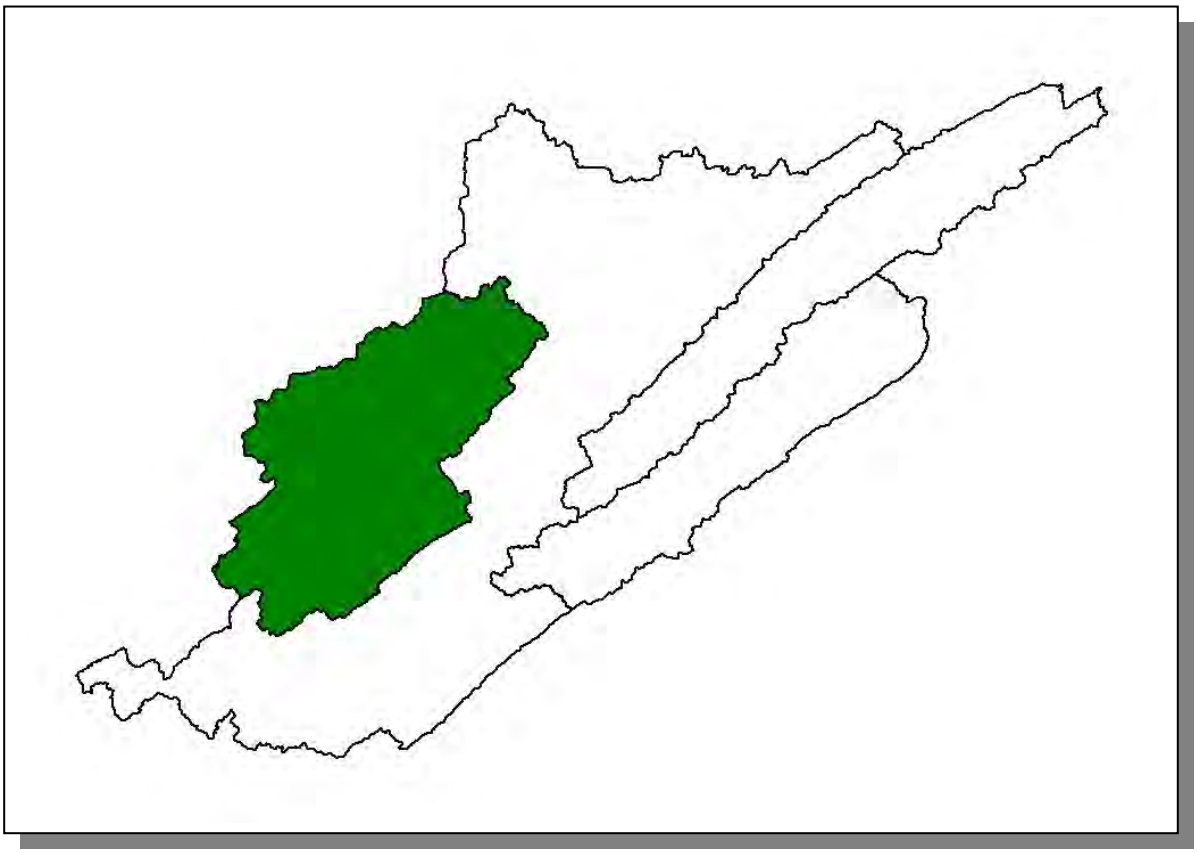


Figure 4-41. Location of Subwatershed 0601020705. *All Lower Clinch River HUC-10 subwatershed boundaries are shown for reference.*

4.2.D.i. General Description.

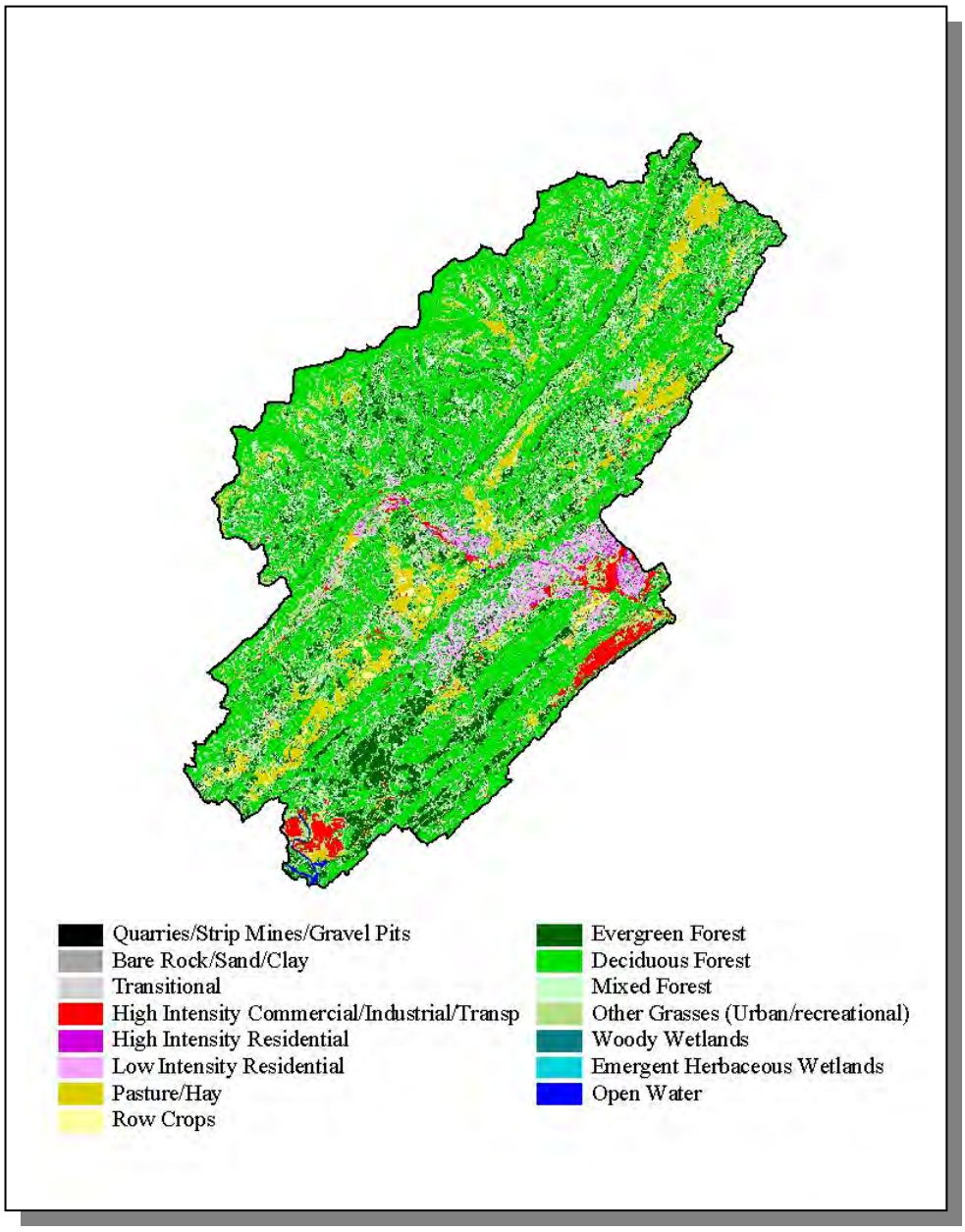


Figure 4-42. Illustration of Land Use Distribution in Subwatershed 0601020705.

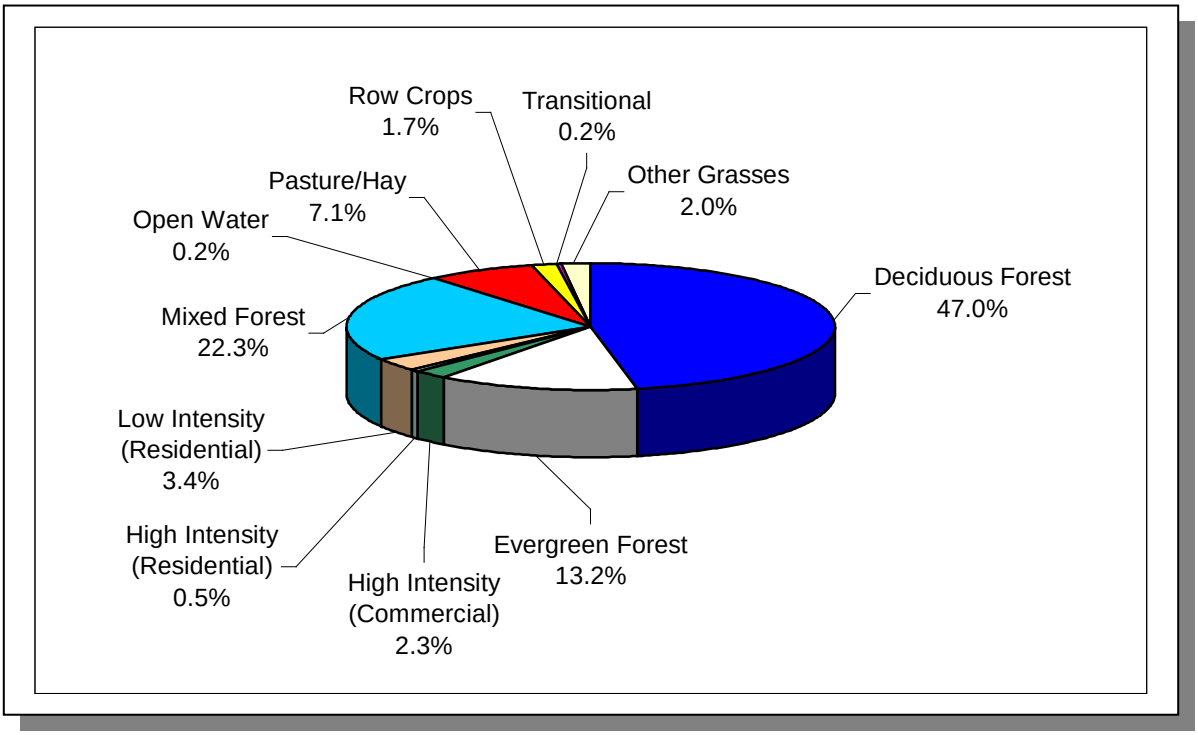


Figure 4-43. Land Use Distribution in Subwatershed 0601020705. *More information is provided in Appendix IV.*

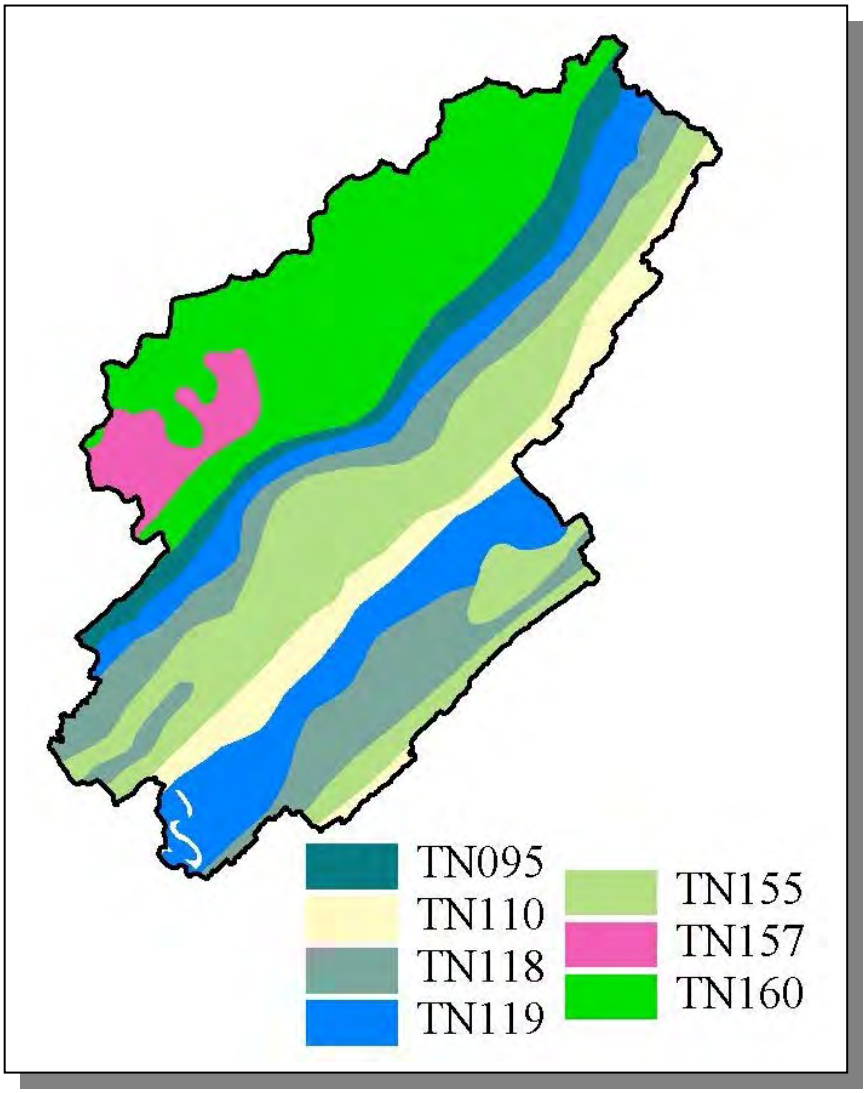


Figure 4-44. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020705.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN095	0.00	B	2.35	5.12	Loam	0.31
TN110	0.00	B	2.22	4.96	Loam	0.31
TN118	0.00	C	6.52	5.12	Loam	0.29
TN119	2.00	C	1.08	5.15	Loam	0.33
TN155	0.00	C	1.71	5.31	Loam	0.32
TN157	0.00	B	2.38	4.62	Loam	0.28
TN160	0.00	B	2.69	5.36	Loam	0.25

Table 4-30. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0601020705. *More information is provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Anderson	68,250	71,498	71,330	22.47	15,334	16,063	16,026	4.5
Morgan	17,300	18,521	19,757	2.28	394	422	450	14.2
Roane	47,227	49,885	51,910	11.97	5,653	5,972	6,214	9.9
Totals	**132,777**	139,904	**142,997**		**21,381**	**22,457**	**22,690**	**6.1**

Table 4-31. Population Estimates in Subwatershed 0601020705

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Oak Ridge	Roane	27,310	12,694	12,461	212	21
Oliver Springs	Roane	3,275	1,306	1,165	141	0
Totals		**30,585**	**14,000**	**13,626**	**353**	**21**

Table 4-32. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0601020705.

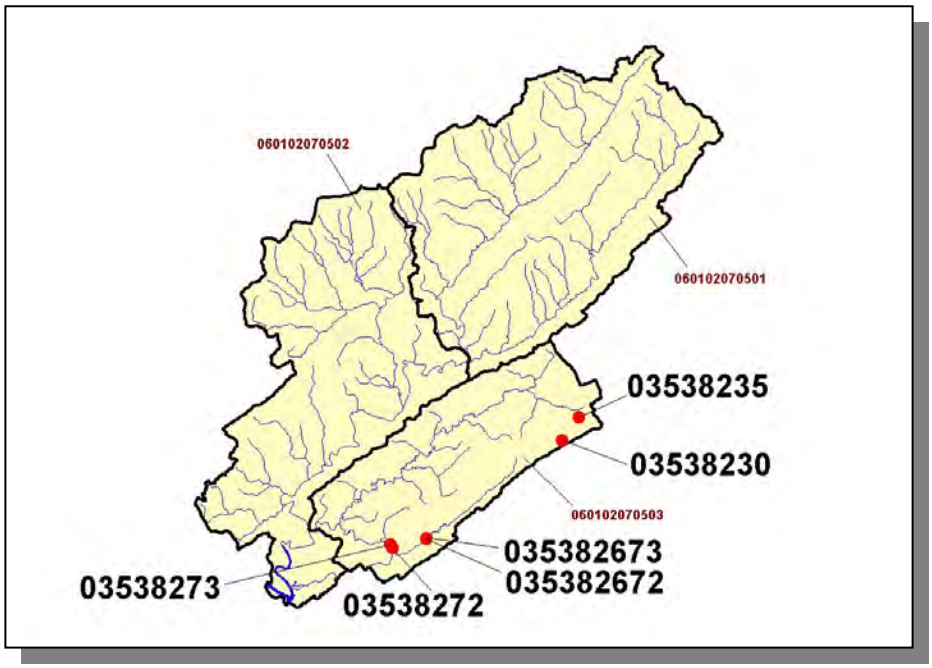


Figure 4-45. Location of Historical Streamflow Data Collection Sites in Subwatershed 0601020705. *Subwatershed 060102070501, 0604000402, 060102070502 and 060102070503 boundaries are shown for reference. More information is provided in Appendix IV.*

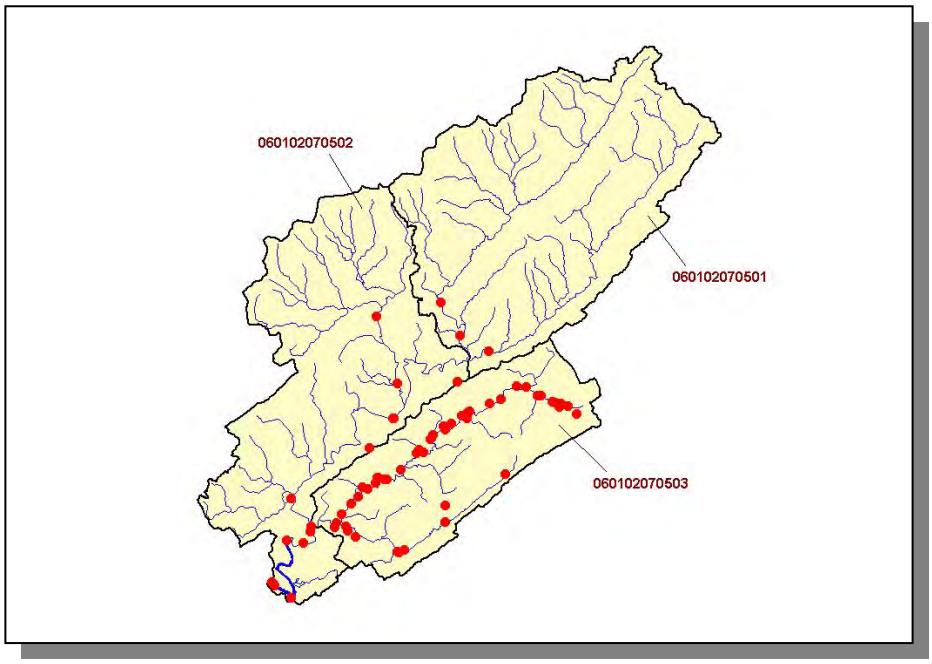


Figure 4-46. Location of STORET Monitoring Sites in Subwatershed 0601020705. *Subwatershed 060102070501, 0604000402, 060102070502 and 060102070503 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.D.ii. Point Source Contributions.

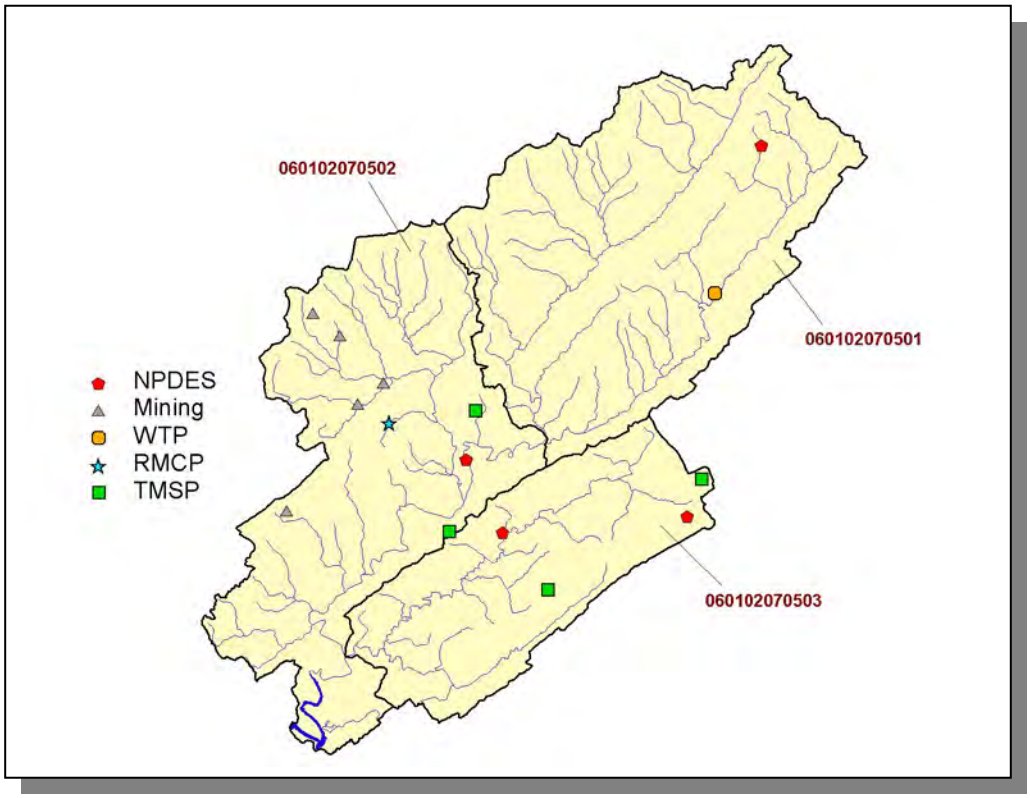


Figure 4-47. Location of Active Point Source Facilities in Subwatershed 0601020705. *Subwatershed 060102070501, 060102070502, and 060102070503 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

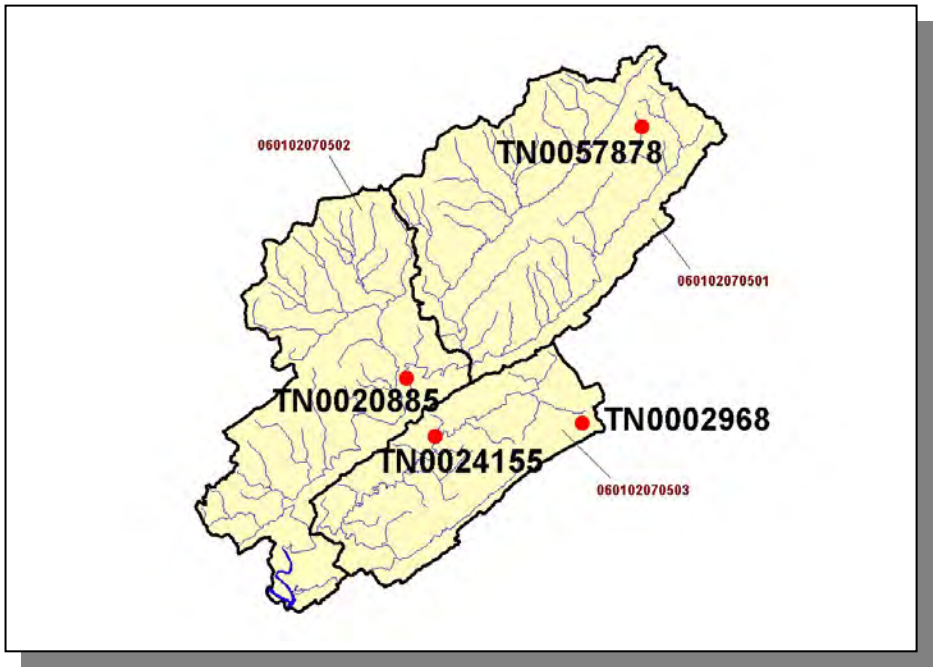


Figure 4-48. Location of NPDES Facilities in Subwatershed 0601020705. *Subwatershed 060102070501, 060102070502, and 060102070503 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

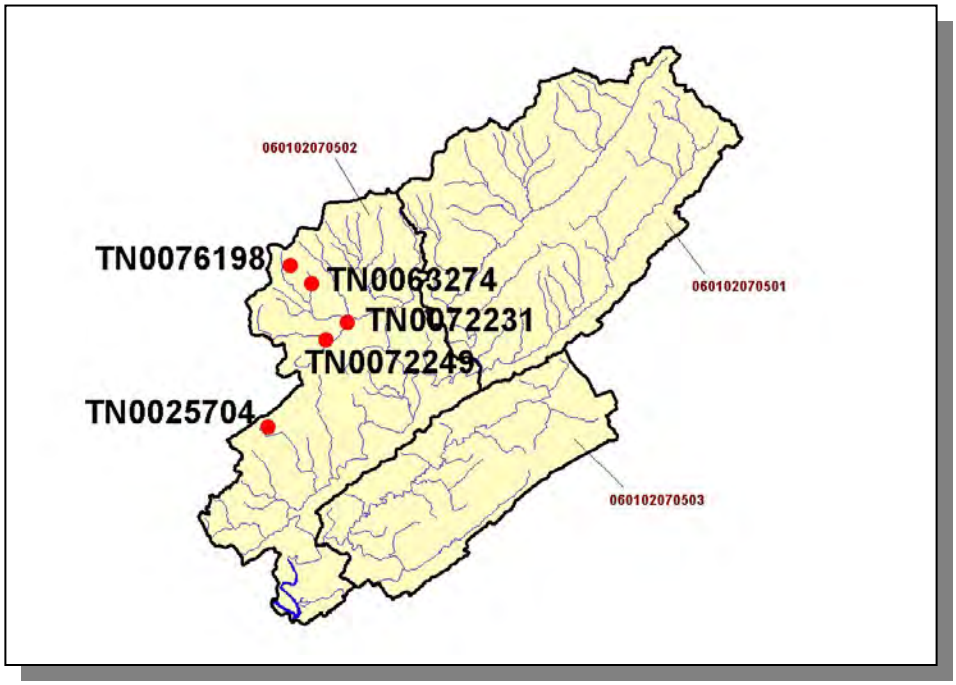


Figure 4-49. Location of Active Mining Facilities in Subwatershed 0601020705. *Subwatershed 060102070501, 060102070502, and 060102070503 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

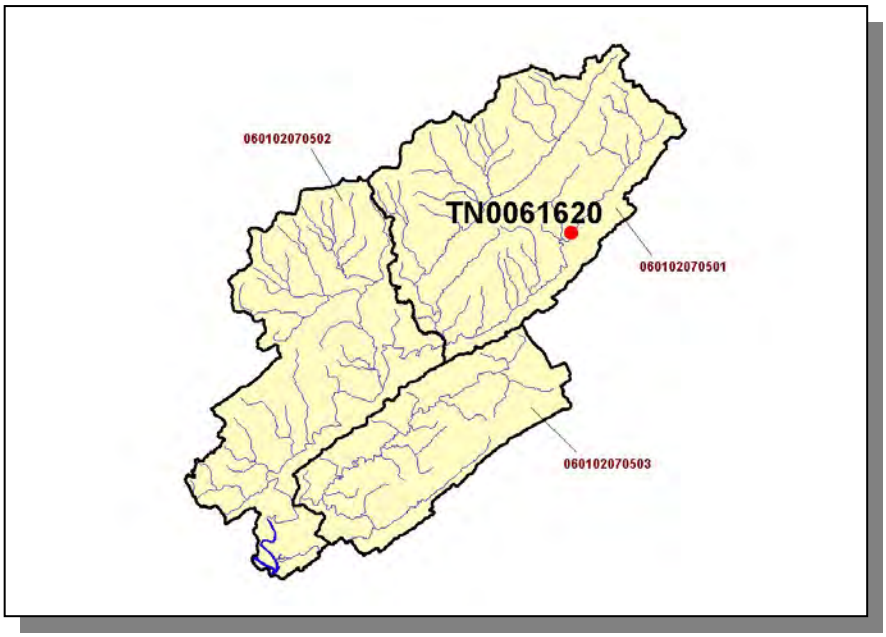


Figure 4-50. Location of Water Treatment Plants in Subwatershed 0601020705. *Subwatershed 060102070501, 060102070502, and 060102070503 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

Figure 4-51. Location of Ready Mix Concrete Plants in Subwatershed 0601020705. *Subwatershed 060102070501, 060102070502, and 060102070503 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

Figure 4-52. Location of TMSP Facilities in Subwatershed 0601020705. *Subwatershed 060102070501, 060102070502, and 060102070503 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

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

There is one NPDES facility discharging to water bodies listed on the 2002 303(d) list in Subwatershed 0601020705:

- TN0024155 (Oak Ridge STP) discharges to East Fork Poplar Creek @ RM 8.3

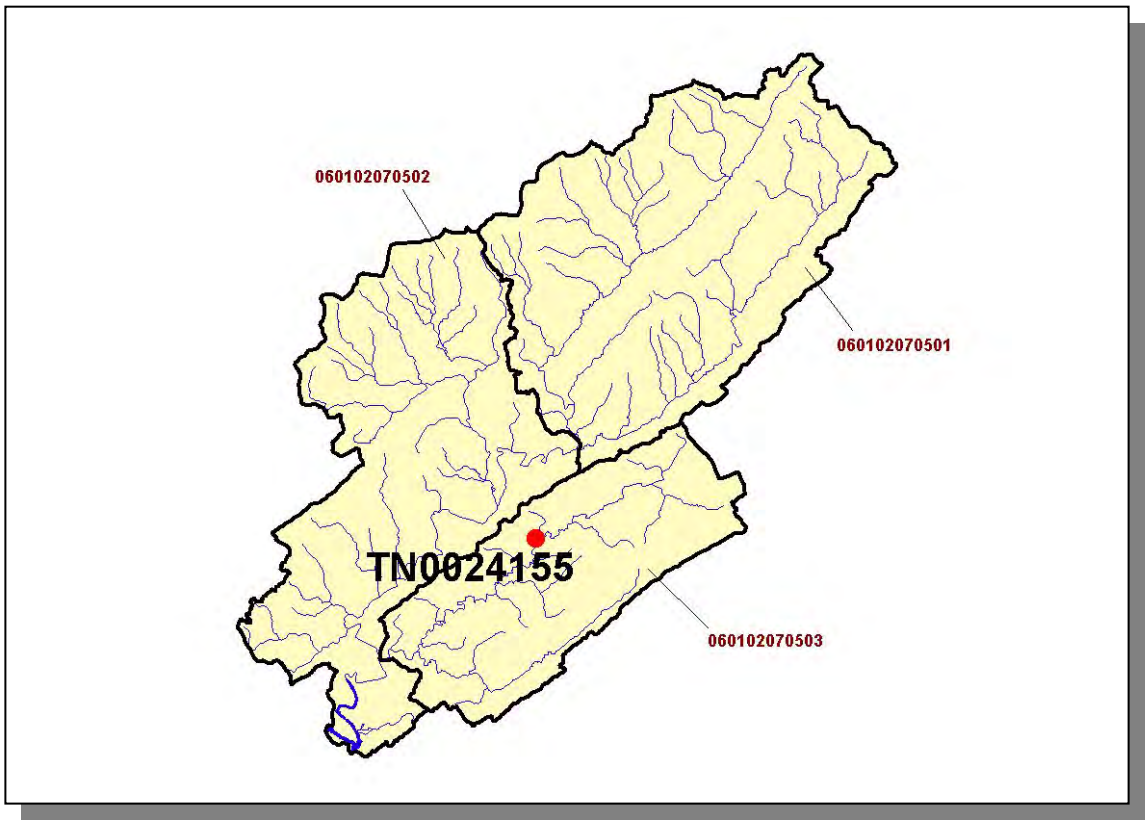


Figure 4-53. Location of NPDES Dischargers to Water Bodies Listed on the 2002 303(d) List in Subwatershed 0601020705. *Subwatershed 060102070501, 060102070502, and 060102070503 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

PERMIT #	1Q10	3Q10	7Q10	3Q20	QDESIGN
TN0024155	14.4	15.8	16.5	15.1	5.87

Table 4-33. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020705. *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 #	WET	$CBOD_5$	FECAL COLIFORM	NH_3	*E. COLI*	TSS	SETTLEABLE SOLIDS	CN	DO	pH
TN0024155	X	X	X	X	X	X	X	X	X	X

Table 4-34. Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0601020705. *WET, Whole Effluent Toxicity; $CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); TSS, Total Suspended Solids.*

4.2.D.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Milk Cow	Cattle	Chickens (Layers)	Chickens (Broilers Sold)	Hogs	Sheep
1,954	142	3,924	10	74,854	24	47

Table 4-35. Summary of Livestock Count Estimates in Subwatershed 0601020705. *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)
Anderson	124.0	124.0	2.6	6.2
Morgan	287.8	276.2	3.5	10.9
Roane	153.1	153.1	1.7	5.1
Totals	**564.9**	**553.3**	**7.8**	**22.2**

Table 4-36. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0601020705.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	1.68
Legumes (Pastureland)	0.23
Legumes (Hayland)	1.07
Grass (Hayland)	0.75
Legumes, Grass (Hayland)	2.01
Grass, Forbs, Legumes (Mixed Pasture)	1.13
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	7.18
Tobacco (Row Crops)	1.62
Other Vegetable and Truck Crops	12.06
Non-Agricultural Land Use	0.00
Other Land in Farms	0.23
Farmsteads and Ranch Headquarters	1.16

Table 4-37. Annual Estimated Soil Loss in Subwatershed 0601020705.

CHAPTER 5

WATER QUALITY PARTNERSHIPS IN THE LOWER CLINCH RIVER WATERSHED

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

- Partnerships between agencies
- Partnerships between agencies and landowners

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

5.2. FEDERAL PARTNERSHIPS.

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

Performance Results System (PRS) is a Web-based database application providing USDA Natural Resources Conservation Service, conservation partners, and the public fast and easy access to accomplishments and progress toward strategies and performance. The PRS may be viewed at http://prms.nrcs.usda.gov/prs. From the opening menu, select "Reports" in the top tool bar. Next, select "2004 Reports" if it's active, and "2003 PRMS Reports" if it's not. Pick the conservation treatment of interest on the page that comes up and reset the date to 2004 Reports if it is not set there. Pick the conservation practice of interest. In the location drop box of the page that comes up, select "Tennessee" and click on the "Refresh" button. In the "By" drop box that comes up, select "Hydrologic Unit" and click on the "Refresh" button. The report of interest can now be viewed.

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

CONSERVATION PRACTICE	TOTAL	
	FEET	ACRES
Pest Management		17

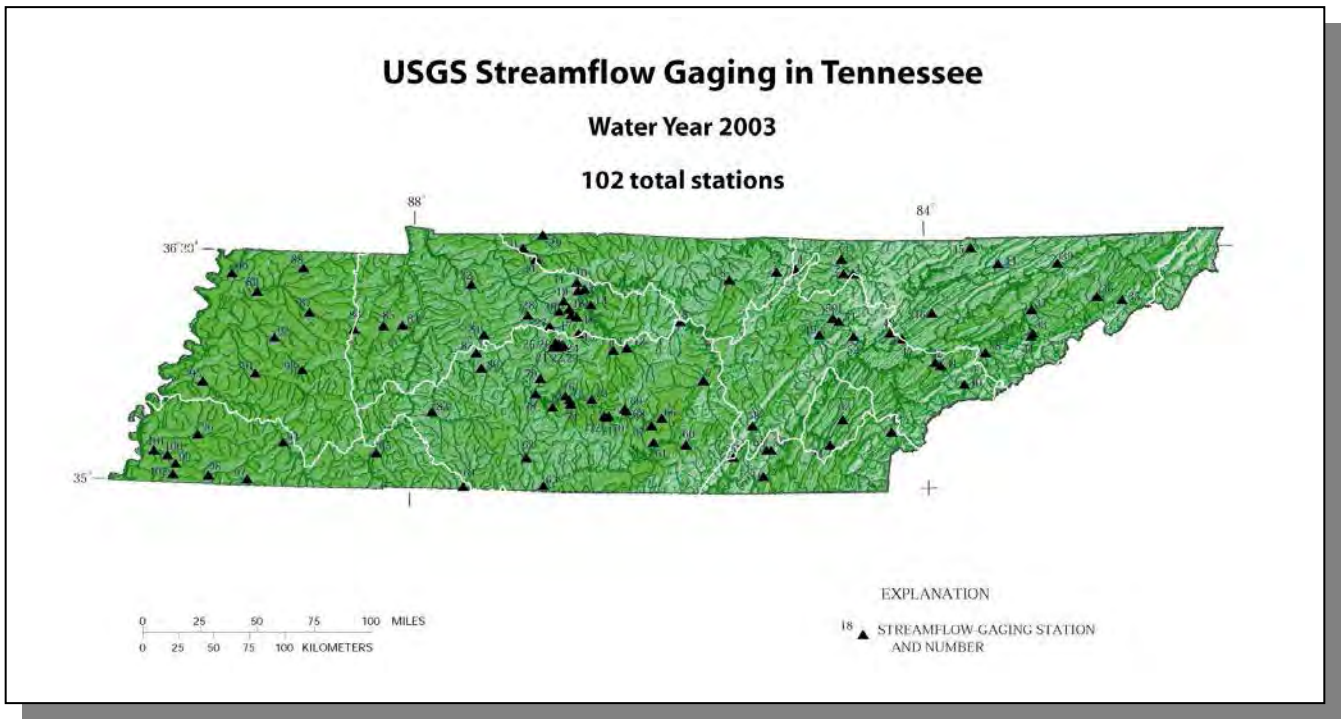
Table 5-1. Landowner Conservation Practices in Partnership with NRCS in the Lower Clinch River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. More information is provided in Appendix V.*

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

The USGS collects hydrologic data to document current conditions and provide a basis for understanding hydrologic systems and solving hydrologic problems. In Tennessee, the USGS records streamflow continuously at more than 102 gaging stations equipped with recorders and makes instantaneous measurements of streamflow at many other locations. Ground-water levels are monitored Statewide, and the physical, chemical, and biologic characteristics of surface and ground waters are analyzed. USGS activities also include the annual compilation of water-use records and collection of data for National

baseline and water-quality networks. National programs conducted by the USGS include the National Atmospheric Deposition Program (http://bqs.usgs.gov/acidrain/), National Stream Quality Accounting Network (http://water.usgs.gov/nasqan/), and the National Water-Quality Assessment Program (http://water.usgs.gov/nawqa/). For specific information on the Upper and Lower Tennessee NAWQA studies, please visit http://tn.water.usgs.gov/lten/tenn.html

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



5.2.C. U.S. Fish and Wildlife Service. The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. Sustaining our nation's fish and wildlife resources is a task that can be accomplished only through the combined efforts of governments, businesses, and private citizens. The U.S. Fish and Wildlife Service (Service) works with State and Federal agencies and Tribal governments, helps corporate and private landowners conserve habitat, and cooperates with other nations to

halt illegal wildlife trade. The Service also administers a Federal Aid program that distributes funds annually to States for fish and wildlife restoration, boating access, hunter education, and related projects across America. The funds come from Federal excise taxes on fishing, hunting, and boating equipment.

Endangered Species Program

Through the Endangered Species Program, the Service consults with other federal agencies concerning their program activities and their effects on endangered and threatened species. Other Service activities under the Endangered Species Program include the listing of rare species under the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.) and the recovery of listed species. Once listed, a species is afforded the full range of protections available under the ESA, including prohibitions on killing, harming or otherwise taking a species. In some instances, species listing can be avoided by the development of Candidate Conservation Agreements, which may remove threats facing the candidate species, and funding efforts such as the Private Stewardship Grant Program. The Federally endangered gray bat (*Myotis grisescens*) occurs in this reach of the Clinch River watershed. For a complete listing of endangered and threatened species in Tennessee, please visit the Service's website at http://www.fws.gov/cookeville/.

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

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

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

Partners for Fish and Wildlife Program

The U.S. Fish and Wildlife Service established the Partners for Fish and Wildlife Program to restore historic habitat types that benefit native fishes and wildlife. The program adheres to the concept that restoring or enhancing habitats such as wetlands or

other unique habitat types will substantially benefit federal trust species on private lands by providing food and cover or other essential needs. Federal trust species include threatened and endangered species, as well as migratory birds (e.g. waterfowl, wading birds, shorebirds, neotropical migratory songbirds).

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

The Service is actively involved with the TNC and private landowners in the upper reaches of the Clinch River watershed to protect riparian habitats for a number of Federally listed mussel and fish species. Specific projects have included the installation of livestock exclusion fencing and alternate water supply sources.

HOW TO PARTICIPATE

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

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

5.2.D. Tennessee Valley Authority (TVA). Tennessee Valley Authority's goals for the 21st century are to generate prosperity for the Tennessee Valley by promoting economic development, supplying low-cost, reliable power, and supporting a thriving river system. TVA is committed to the sustainable development of the region and is engaged in a wide range of watershed protection activities. TVA has 7 multidisciplinary Watershed Teams 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 Lower Clinch River watershed.

Reservoir Monitoring

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

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

TVA monitors ecological conditions at 69 sites on 31 reservoirs. The Lower Clinch watershed contains Melton Hill Reservoir and a portion of the Watts Bar Reservoir, referred to as the Clinch River arm. Melton Hill is sampled at the forebay (CRM 24.0), mid-reservoir (CRM 45.0), and inflow (CRM 59-66) stations. The Clinch River arm of Watts Bar is sampled at the inflow station (CRM 19).

TVA monitored Melton Hill Reservoir annually from 1991 to 1994 to establish baseline data on the reservoir's ecological health under a range of weather and flow conditions. Melton Hill is now evaluated every other year.

The following chart present Reservoir Ecological Health scores for each year for which data were comparable.

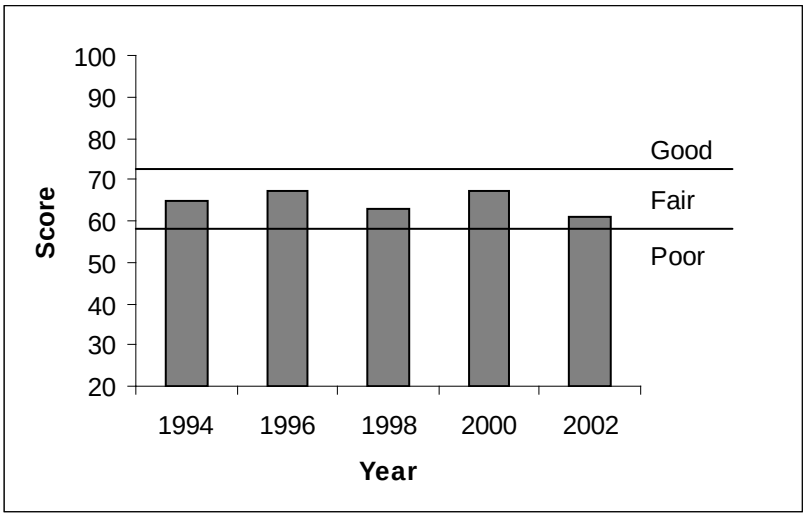


Figure 5-1. Melton Hill Reservoir Ecological Health Ratings (1994-2002)

Melton Hill Reservoir rated fair in 2002, with an overall ecological health score similar to previous years. However, significant changes have been observed for several indicators in recent years—probably the result of dry weather conditions and low reservoir flows. Drought conditions that began in the summer 1998 and continued into 2002 produced near record low flows in the Tennessee Valley. The effects of these low flow years are reflected in the mix of fair and poor ratings for dissolved oxygen and chlorophyll, which always rated good prior to 1996. Flows were below average for Melton Hill in 2002, but apparently sufficient to prevent oxygen depletion in the lower water column. Notably, chlorophyll continued to show an increase in 2002 with the highest summer average to date. TVA will continue to monitor this trend. Monitoring was conducted on Melton Hill Reservoir in 2004, however results are not yet available.

TVA has monitored Watts Bar Reservoir, including an inflow station on Clinch River arm (CRM 19) since 1991. The fish and benthic macroinvertebrate community are sampled at this station. In 2002, the fish community rated fair and benthos rated poor, similar to previous years. The fair rating for the fish community was due to low catch rates, high composition of tolerant individuals, and fair fish diversity. Benthos rated poor due to low overall density and the lack of intolerant organisms. Dissolved oxygen, chlorophyll, and sediment contaminants were not monitored at this site. Information regarding the overall health of Watts Bar Reservoir as shown by TVA's ecological indicators is available from the TVA Internet site (http://www.tva.gov).

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

More information about Reservoir Ecological Health Monitoring in the Lower Clinch River watershed can be obtained by contacting Tyler Baker at (423)-876-6733 or tfbaker@tva.gov or by visiting TVA's Internet site (http://www.tva.gov).

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

TVA monitored five sites on or around Melton Hill Reservoir for *E. coli* in 2004. Bacteriological water sampling is conducted between Memorial Day and Labor Day when people are most likely to be recreating. Resource Stewardship conducts ten tests within a 30-day period at each site to establish a geometric mean for the indicator bacteria. The 2004 sampling locations were:

Site Name	***Location***
Melton Hill Dam Beach	Clinch RM 23.5
Clark Center (Carbide) Park Beach	McCoy Branch M 0.2, Clinch RM 37.4R
Solway Bridge Park Boat Ramp	Clinch River M 43.9R
Oak Ridge Municipal Park	Clinch RM 50.3
Gibbs Ferry Park Boat Ramp	Clinch RM 53.2

Samples collected at Melton Hill Dam beach were within the state of Tennessee's guidelines for water contact. Three sites had at least one sample with elevated bacteria levels: Clark Center (Carbide) Park beach, Solway Bridge Park boat ramp, and Gibbs Ferry Park boat ramp. One site, Oak Ridge Municipal Park, had an elevated geometric mean and exceeded the single sample maximum at least one time when compared to the state of Tennessee's guidelines for water contact. All of these sites reported the presence of waterfowl (Canada geese), either continuously or intermittently, which likely influenced the increased bacteriological concentrations. Data from this sampling effort is shared in a timely manner with TDEC's Division of Water Pollution Control.

TVA monitored 21 sites on or around Watts Bar Reservoir for *E. coli* in 2004. The Kingston City Park Beach is the only site sampled within the Lower Clinch watershed. Monitoring results for this site were within the state of Tennessee's guidelines for water contact.

Fish Flesh Toxic Contaminants. State agencies are responsible for advising the public of health risks from eating contaminated fish. TVA assists the states by collecting and analyzing fish from TVA reservoirs. TVA collected channel catfish and largemouth bass from the reservoir for tissue analysis in the autumn of 2003. Catfish were analyzed for an array of contaminants (including pesticides and PCBs). Largemouth bass were analyzed for mercury. The results have been provided to state agencies in Tennessee.

More information on bacteriological and fish tissue monitoring on Melton Hill Reservoir or Watts Bar Reservoir can be obtained by contacting Rebecca Hallman at (423)-876-6736 or rlhallman@tva.gov by visiting TVA's Internet site (http://www.tva.gov).

Stream Bioassessment

Condition of water resources in Lower Clinch River 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 Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies) 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).

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

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.

Sample Site Selection. EPT and IBI assessments are conducted at the same sites. Site selection is governed primarily by study objectives, stream physical features, and stream access. TVA's objective is to characterize the quality of water resources within a watershed (11-digit hydrologic unit). Sites are typically located in the lower end of sub-watersheds and at intervals on the mainstem to integrate the effects of land use. A total of 29 sites are sampled in the Lower Clinch drainage. These sites are typically sampled every five years to keep a current picture of watershed condition.

Tailwater Health

In addition to stream and river assessments, TVA conducts assessments in selected tailwater areas to evaluate the success of minimum flow and dissolved oxygen augmentations as part of TVA's Reservoir Release Improvement program. These evaluations are based on the same three stream components used in stream assessments – IBI, EPT, and habitat assessment. As part of the Reservoir Release

Improvement (RRI) program, TVA uses autoventing turbines to improve the quality of water released from Norris Dam. This innovative technology efficiently introduces air flow into low-pressure zones just below the turbines to create many small air bubbles. A re-regulating weir is also used below Norris to provide additional aeration and to maintain a minimum flow of water downstream between periods of hydroelectric generation. This process helps to prevent riverbed dry-out and provides additional habitat for fish and other aquatic life.

The RRI program has improved the dissolved oxygen concentrations and minimum flow levels in Norris tailwaters. However tailwater temperatures remain unnaturally cold and mostly unsuitable for native fish communities. Since 1993, TVA's tailwater monitoring data has consistently shown poor ratings for fish and benthos. Monitoring has been conducted yearly since 2002 at three Clinch River tailwater locations (CRM 77, CRM 70.5, and CRM 66.7). Non-native cold water sport fish, such as rainbow trout and brown trout, have been introduced and thrive in Norris tailwater.

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 is 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.

Beaver Creek Watershed Association was organized in 2003 to protect and enhance the natural and human environment of the Beaver Creek watershed through the mobilization of public support, build public awareness and promote Best Management Practices (BMPs). TVA has assisted them in producing a quarterly newsletter, developing an exhibit that can be moved around the watershed, producing information/educational signage for a Halls Greenway wetland and publishing an educational brochure about wetlands. Future plans include sampling sediment from construction sites, implementing a recognition program for contractor's who have installed stormwater management BMPs on their construction sites, building membership and participating in other water improvement projects. For more information, go to http://www.bvrcrk.org.

Bullrun Creek Watershed Association was organized in 2004 by concerned citizens of the community to protect, enhance and preserve the natural environment of the Bullrun Creek watershed. TVA helped them produce a brochure about their organization. Meetings are currently being held once a month. They hope to become involved in community education, trash cleanups and water monitoring and would like to produce a

portable exhibit about the watershed. For more information, e-mail inquires to bullruncreek@frontiernet.net.

Tennessee Citizens for Wilderness Planning (TCWP) is dedicated to achieving and perpetuating protection of natural lands and waters. TCWP has worked with TVA for the past 5 years in removing evasive exotic plant species from the Worthington Cemetery Ecological Study Area on Melton Hill Reservoir. Once the non-natives are removed, native plants are planted in their place. For more information, visit http://tcwp.org/.

Coal Creek Watershed Foundation is a non-profit organization organized in 2000 with a mission to improve the quality of life in the Coal Creek watershed. They are working as volunteers with government agencies and other partners to effect change by combining the intellectual resources of engineers/scientists in East Tennessee with the common sense of the residents from the Coal Creek watershed. TVA assists them with education activities and streambank restoration and stabilization projects. Visit http://www.coalcreekaml.com for more information.

Coalition Support: 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 Watts Bar-Clinch Watershed Team participates in several inter-agency partnerships in this area.

Water Quality Forum (WQF), established in 1990, is a cooperative network of agencies, nonprofit organizations and citizens working to improve the health of the waterways in East Tennessee in accordance with the goals of the Clean Water Act. TVA was one of the 9 founding members. The Forum has initiated or participates in the following projects and activities: Adopt-a-Watershed; Kids-in-the-Creek; Adopt-a-Stream; River Rescue; WaterFest; Environmental Stewardship Program; Sediment and Erosion Control BMP workshops; and Clean, and Protect and Restore Day. For more information, visit http:www.waterqualityforum.org.

Beaver Creek Task Force formed in 1999 to coordinate improvement efforts in the Beaver Creek Watershed, a rapidly urbanizing watershed located in Knox County. The Task Force has developed an inventory of the watershed's natural and cultural resources, sponsored a public meeting to inform Beaver Creek residents about resource conditions and obtain public input into future watershed improvement activities, assisted a group of watershed residents in forming the Beaver Creek Watershed Association, and created a native plant arboretum along a section of the greenway. A proposal requesting approximately $500,000 to stabilize stream banks, restore or enhance riparian buffers and wetlands, install agricultural BMPs, create in-stream habitat, manage storm water, and remove debris dams along a five mile section of Beaver Creek has been approved by the Tennessee Stream Mitigation Program Selection Committee. The Task Force has begun development of a long-range plan for the watershed.

Bullrun Creek Restoration Initiative is an inter-agency partnership formed to address water quality problems in the Bullrun Creek watershed flowing through Grainer, Union, Knox, and Anderson counties. Partners have assessed water resource conditions, identified pollution sources, developed an Integrated Pollution Source Identification system to plan and manage water quality improvement projects, sponsored stakeholder meetings to hear the concerns of watershed residents and gage support for the restoration initiative, developed a watershed video, fact sheet, internet site, and newsletters to educate stakeholders and keep them informed about the initiative, and sponsored annual farm tours to demonstrate and promote conservation practices. In 2002 a calendar was produced that featured farm practices that can make your farm water friendly. They also were instrumental in helping a group of citizens form the Bullrun Creek Watershed Association. Using TVA funds and some from Quail Unlimited, the Initiative purchased a no-till drill for use in the watershed to implement pasture improvement projects; the Knox County Soil Conservation District has agreed to store the equipment, maintain it and manage its use. Over 15,000 feet of streambank in the watershed has benefited from BMPs or will soon benefit.

Hinds Creek Partnership is focused on improving water quality and community awareness of water quality issues. Recent streambank restoration projects have stabilized approximately 450 feet of streambank, fenced off 1000 feet of stream and planted 3 riparian acres with native seedlings. TVA and TDEC have implemented a water quality monitoring project. A farm tour to highlight agricultural BMPs is planned for 2005.

Outreach

TVA supports several programs to educate and engage Lower Clinch River watershed stakeholders in water quality improvement and protection activities.

National Clean Boating Campaign. The National Clean Boating Campaign is a partnership program that highlights the importance of clean water so boating will continue to be fun and safe for future generations. The program demonstrates how boaters can be good stewards of their water environment through best boating and marina practices. TVA sponsors this program on all of it's reservoirs including Melton Hill and Watts Bar.

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 WQF 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. Knox County served as the pilot area for TGRI. TVA also assisted Knox County partners in convening a Site Planning Roundtable, a diverse committee that included representatives of county, city and state government agencies, environmentalists, lawyers, bankers, developers, builders and homeowners. The Roundtable reached consensus on recommended changes to development rules and processes. Funding for development of TGRI was obtained through a 319(h) grant.

Kids-in-the-Creek. This annual event is done in conjunction with Adopt-A-Watershed, a program implemented in Knox County middle and high schools to encourage students to investigate and improve the health of their school's watershed. In order to help students understand the importance of our creeks and streams we let them spend a day in a nearby creek collecting fish and bugs and learning about nonpoint source pollution, where it comes from and how it can impact the water.

Protection and Restoration Activities

The partners in this area are involved in numerous activities that are designed to protect and restore the targeted watersheds. For example, public meetings are organized and held to gain input from landowners about their concerns and to share information; newsletters and brochures are produced to present the issues and outline possible solutions; articles are printed in local newspapers, web sites are developed and tire dumps are cleaned up; and windshield surveys are made to become familiar with the watershed and identify sensitive areas.

Promote Best Management Practices. TVA provides funding and technical expertise to assist with instillation of BMPs that will reduce non-point pollution. TVA also works with partners to promote use of BMPs. Recent studies have shown that poorly managed pasture land is a major contributor to poor water quality. Efforts are now being targeted to pasture improvement BMPs. Cost share funds are available though several state and federal programs.

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 nonpoint source 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.

Clean, Protect and Restore (CPR) is an annual effort lead by Community Action Committee AmeriCorps Water Quality Team in conjunction with its WQF 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 (includes Beaver Creek and part of Bullrun Creek watersheds).

Adopt-A-Stream is a program whose goal is to increase public sensitivity to awareness of the importance of the miles of creeks, streams and rivers in Knox County and to restore health to those waterways damaged by people or nature.

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 2004, TVA partnered with the Beaver Creek Task Force and Halls High School to deliver riparian seedlings to creek-side property owners in the watershed. Packages of 30 native riparian plant seedlings were distributed to riparian property owners in the watershed. Seedlings were also distributed to landowners in Bullrun Creek watershed through our partners with the Soil Conservation Districts. 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 (http://www.tva.com/river/landandshore/index.htm).

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 specialists to help plan and implement watershed restoration efforts. IPSI is based on interpretation of color infrared photography. In 2003, IPSI systems were completed for Bullrun Creek watershed. This project was made possible by funding from The TVA. IPSI is being used to identify water quality impacts and target improvement efforts and is being considered for the Beaver Creek watershed for 2005.

Further information on TVA's Watershed Assistance activities in the Lower Clinch River watershed can be obtained by writing the Watts Bar-Clinch Watershed Team at: Tennessee Valley Authority, 2007 Grubb Road Lenoir City, TN 37771 or calling (865)-988-2440.

5.3. STATE PARTNERSHIPS.

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

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

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

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

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

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

assessments were mandated and funded by Congress. Source water protection will be left up to the individual states and local governments without additional authority from Congress for that progression.

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

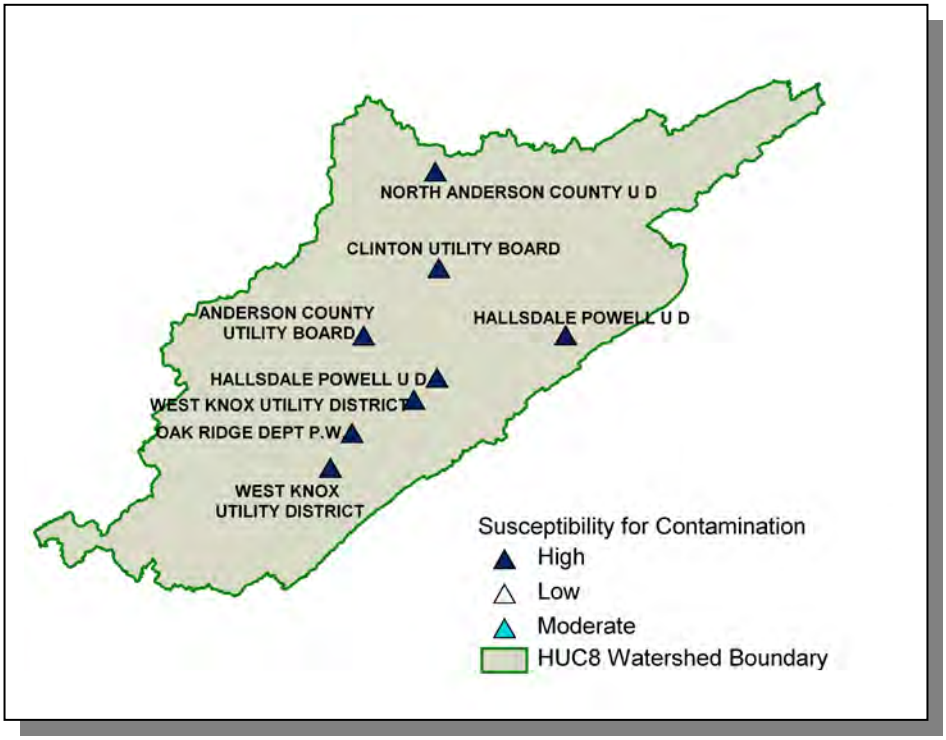


Figure 5-2. Susceptibility for Contamination in the Lower Clinch River Watershed.

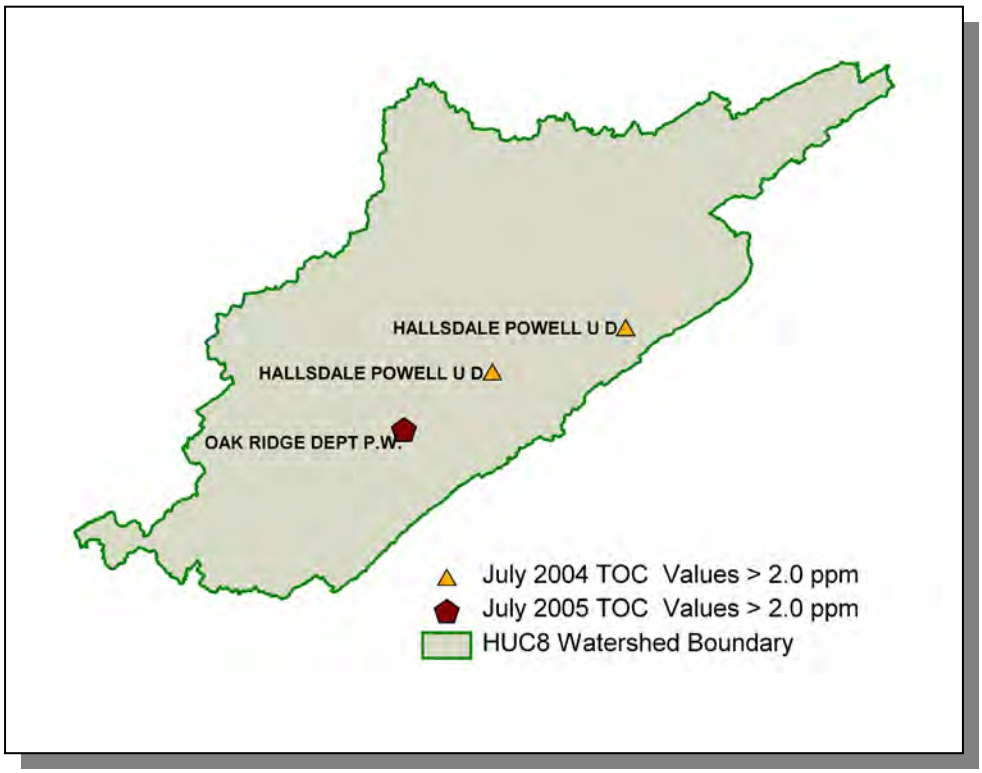


Figure 5-3. July 2004 and 2005 Raw Water Total Organic Carbon (TOC) Analysis in the Lower Clinch River Watershed.

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

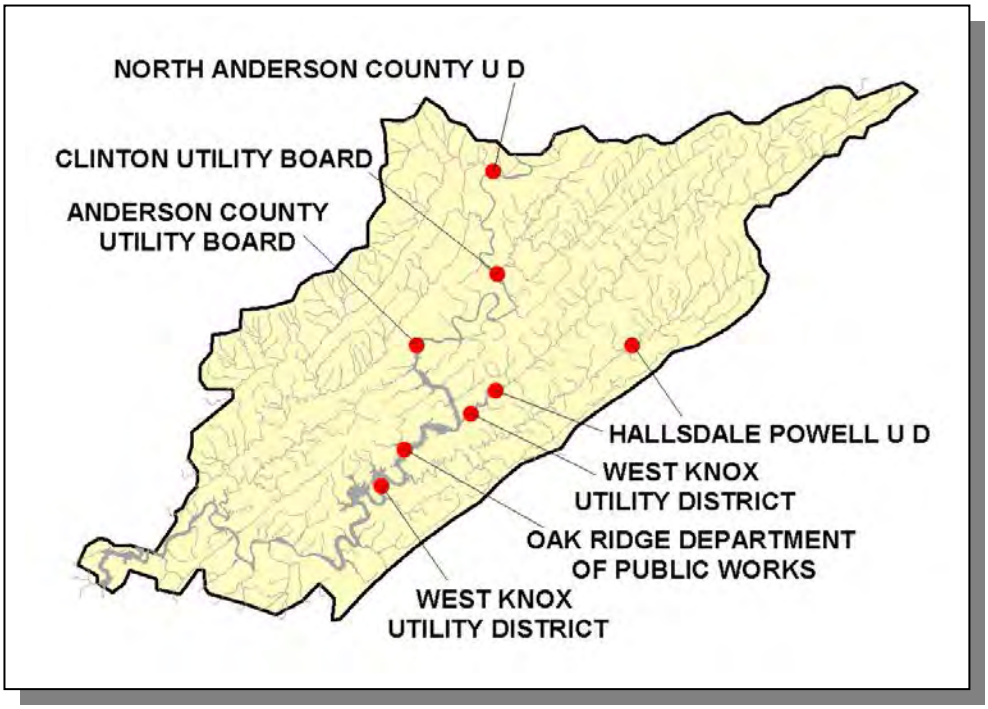


Figure 5-4. Locations of Community and Non-Community Public Water Supply Intakes in the Lower Clinch River Watershed.

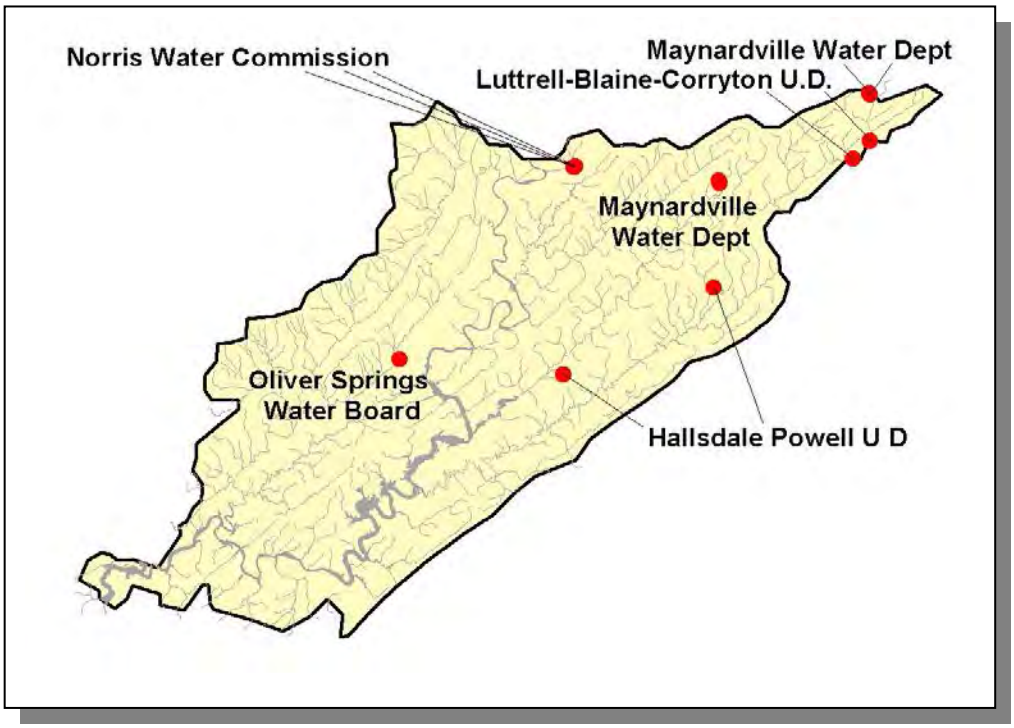


Figure 5-5. Locations of Community and Public Groundwater Supply Intakes in the Lower Clinch River Watershed.

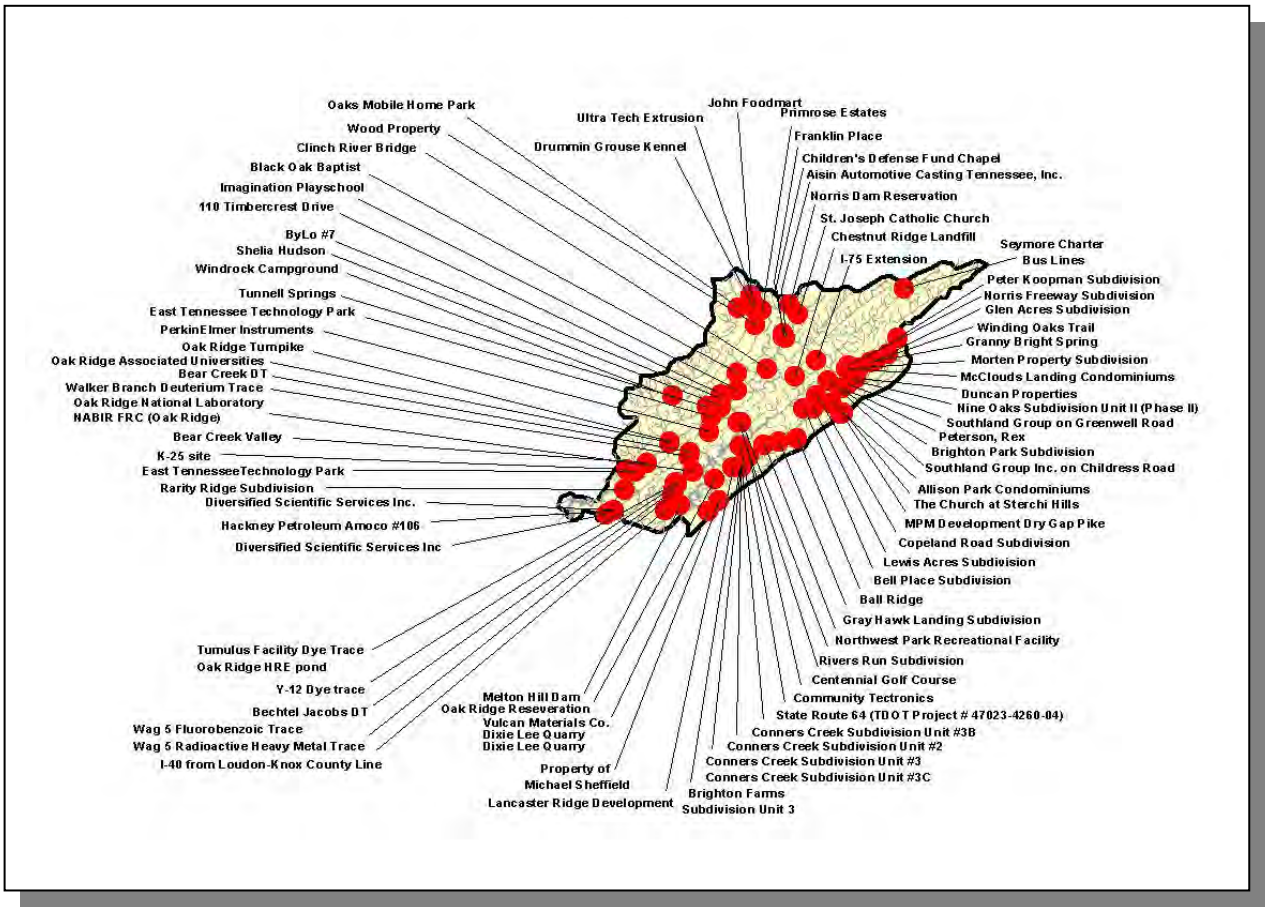


Figure 5-6. Locations of UIC (Underground Injection Control) Sites in the Lower Clinch River Watershed. *Injection wells include stormwater sinkholes modified for drainage, commercial/industrial septic tanks, and large capacity septic tanks.*

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

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

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

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

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

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

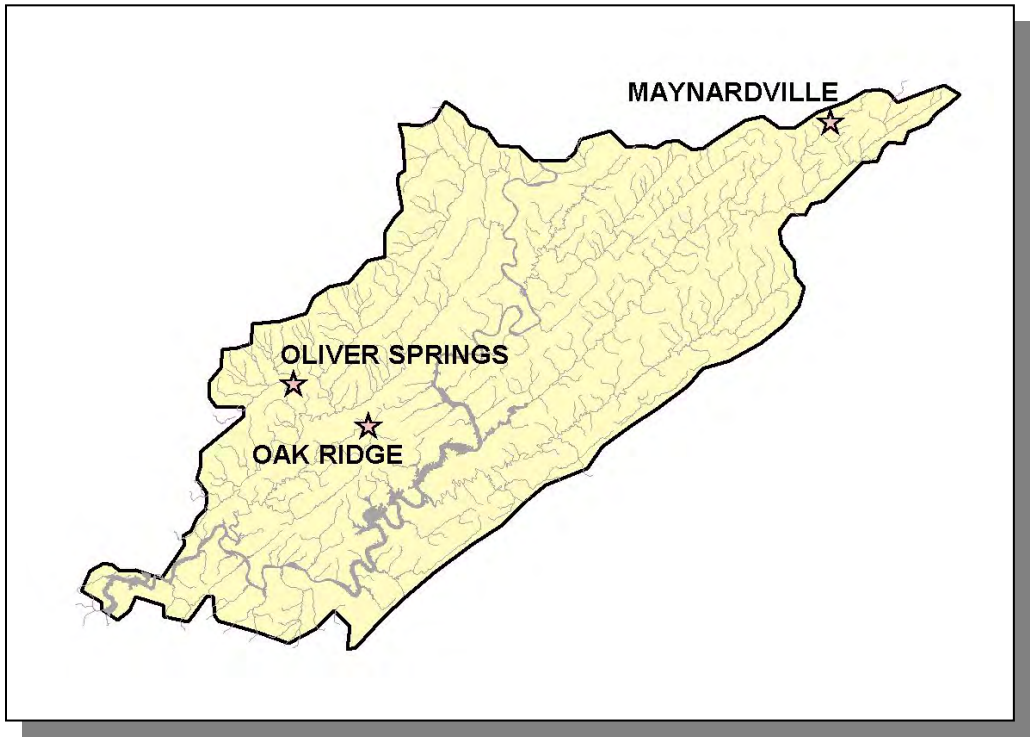


Figure 5-7. Location of Communities Receiving SRF Loans or Grants in the Lower Clinch River Watershed. *More information is provided in Appendix V.*

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

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

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

- Monitoring Projects. Up to 20% of the available grant funds are used to assist the water quality monitoring efforts in Tennessee streams, both in the state's 5-year watershed monitoring program, and also in performing before-and-after BMP installation, so that water quality improvements can be verified. Some monitoring in the Lower Clinch River Watershed was funded under an agreement with the Tennessee Department of Agriculture, Nonpoint Source Program (U.S. Environmental Protection Agency Assistance Agreements C9994674-00-0, C9994674-01-0, and C9994674-02-0).

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

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

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

Since January of 1999, the Department of Agriculture and the Department of Environment and Conservation have had a Memorandum of Agreement whereby complaints received by TDEC concerning agriculture or silviculture projects would be forwarded to TDA for investigation and possible correction. Should TDA be unable to obtain correction, they would assist TDEC in the enforcement against the violator. More information forestry BMPs is available at:
http://tennessee.gov/agriculture/forestry/BMPs.pdf, and the complaint form is available at: http://tennessee.gov/environment/wpc/logform.php.

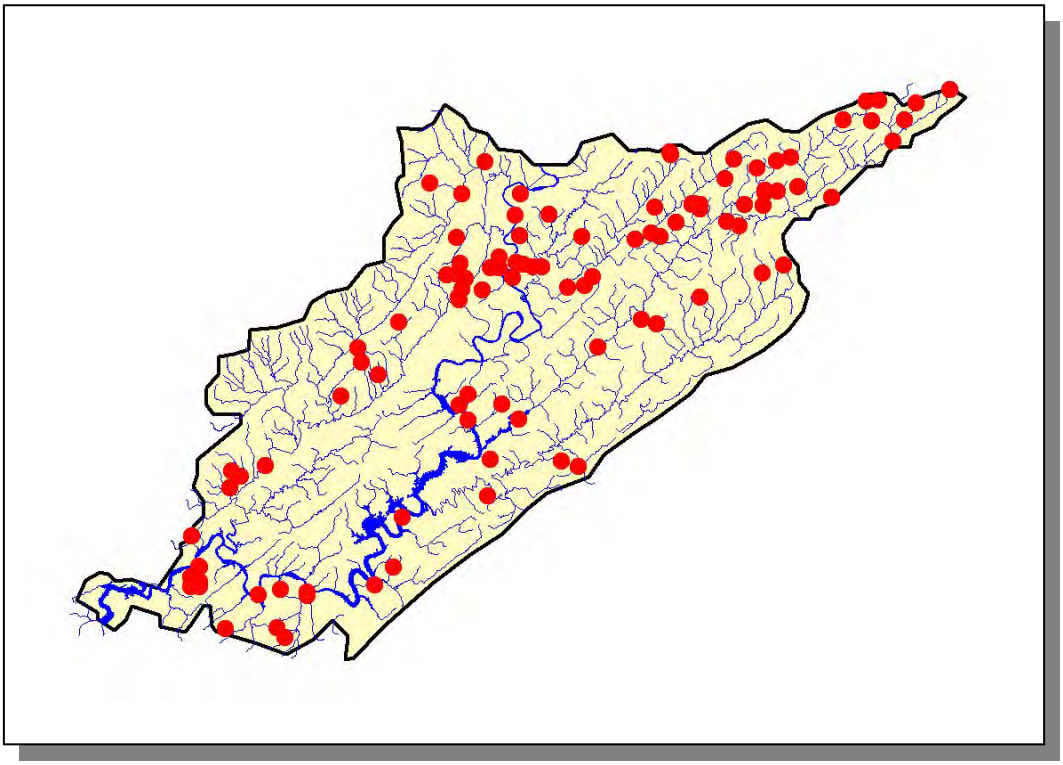


Figure 5-8. Location of BMPs installed from 1999 through 2003 in the Lower Clinch River Watershed with Financial Assistance from the Tennessee Department of Agriculture's Nonpoint Source and Agricultural Resources Conservation Fund Grant Programs. *More information is provided in Appendix V.*

5.3.D. DOE-Oversight. The Tennessee Department of Environment and Conservation, DOE Oversight Division under terms of the Tennessee Oversight Agreement, conducts environmental monitoring on the Clinch River. Chemical and radiological emissions in the water, biota, and sediment on the Oak Ridge Reservation and surrounding environs are emphasized. The goal is to assure that DOE Oak Ridge Operations have no adverse impact to public health, safety, or the environment. Results from this monitoring and the findings of the quality and effectiveness of the DOE's environmental programs are reported in an annual status report. Annual environmental monitoring report is also provided each spring that details the technical results of these studies may be found at: http://www.state.tn.us/environment/doeo/active.php

5.4. LOCAL INITIATIVES.

5.4.A. Clinch River Chapter of Trout Unlimited. Trout Unlimited is a national natural resources conservation organization. Its mission is to conserve, protect and restore cold water (trout and salmon) habitats. The Clinch River tailwater extends about 13-miles from Norris Dam to the Highway 61 Bridge at Clinton. The river supports an excellent trout fishery featuring rainbow and trophy brown trout; it is one of the finest trout fisheries in the East.

The Clinch River Chapter has over around 100 members, most of whom live in and around the Anderson County communities of Oak Ridge, Clinton and Norris. The mission of the Chapter is to conserve and protect the Clinch River tailwater.

The Chapter was established in 1994 and has worked on numerous projects to enhance the fishery. The following are some of the projects the Chapter has initiated:

- Taking the lead in establishing the Coal Creek Watershed Foundation.
- Sponsoring annual shoreline and road cleanups; and conducting annual river cleanups that to date have removed over 5,000 tires and a large amount of other debris from the river channel and tributaries.
- Establishing a mile-long demonstration bank stabilization project to prevent shoreline erosion and improve fish and wildlife habitat.
- Establishing a biological monitoring program with partners TVA and TWRA.

For its efforts in these and other projects, the Chapter was awarded Trout Unlimited's second highest conservation award in 2001, the Silver Trout Award. In 2004, Chapter member Carol Moore was awarded Trout Unlimited's Volunteer Conservationist of the Year Award.

The Clinch River Chapter supports the watershed approach to protecting our streams and is working hard to support the Coal Creek Watershed Foundation. The Chapter looks forward to the day when the quality of life for residents of the Coal Creek watershed will be significantly improved; and when the large volumes of sediment that flow from Coal Creek into the Clinch tailwater during major rain events are mitigated through erosion control projects.

More information about Clinch River Chapter of Trout Unlimited activities may be found at http://www.crctu.com/

5.4.B. Beaver Creek Watershed Association. The Beaver Creek Watershed Association was formed in March 2003 and currently consists of about 200 members. It is chartered in Tennessee as a non-profit corporation and operates as a 501(c)(3) organization under IRS regulations. The organization's members are spread throughout the northern

sections of Knox County, including the communities of Gibbs, Halls, Powell, Karns, and Hardin Valley/Solway.

In recent years many residents of the watershed have expressed growing concerns about issues such as suburban sprawl, flooding, pollution of Beaver Creek, destruction of farms and forests, absence of dedicated greenspace, and highway construction. Not only do residents wish to see problems alleviated, but they want to see positive things accomplished. Our local officials and elected representatives are responsible for certain matters, but citizens must take a lead role in bringing about positive actions. That's what BCWA is all about.

Briefly put, our mission is to protect and enhance the natural and human environment of the Beaver Creek Watershed. We want to spearhead our communities' efforts to manage how they grow. If we want to have livable communities that reflect residents' desires for pleasant surroundings, less congestion, more greenspace and wildlife refuges, a cleaned-up Beaver Creek, and greater appreciation and preservation of community values and identities, then we need residents in the watershed to join together to accomplish these objectives.

BCWA has a number of projects underway. We are rehabilitating a marsh adjoining the new Halls library and working with the school board to reclaim a suburban brownfield and turn it into an outdoor classroom for a high school. The Tennessee Valley Authority has provided us with funds to develop signage and education brochures for the marsh. Hallsdale-Powell Utility District has provided BCWA with funds and an engineering consultant to accomplish these projects as well. BCWA members have worked with the local Adopt-a-Watershed and Adopt-a-Stream programs in portions of the watershed. A project is underway with the World Wildlife Fund to measure sediment runoff from construction projects to establish some idea of the amount of burden being experienced by Beaver Creek and its tributaries. BCWA has contributed limited funds to two local schools for projects and distributes information brochures and newspaper supplements to local residents. With TVA support, the Association distributes periodic newsletters about the BCWA and watershed issues to two thousand residents who live on Beaver Creek. The Association also hopes to initiate a land trust that can hold title to conservation easements in the Beaver Creek Watershed.

More information about the Beaver Creek Watershed Association is available by mail at: P.O. Box 652/Powell, TN 37849, and at the Beaver Creek Watershed Association web site: http://www.bvrcrk.org

5.4.C. Beaver Creek Task Force. The Beaver Creek Watershed is the southernmost watershed in the Lower Clinch Basin. It's 86 square miles lies entirely within the northern portion of Knox County. The 44 miles of main stem plus seven main tributaries wind through five different communities before emptying into the Clinch River. Beaver Creek is a rapidly urbanizing watershed and the creek is 303(d) listed by the State of Tennessee. The primary impacts to Beaver Creek include sediment, nutrients, and pathogens from agricultural and urban runoff; nutrients and pathogens from municipal point sources; and habitat alteration due primarily to land development.

Formed in 1998 the Beaver Creek Task Force's (BCTF) mission is to bring together public and private institutions to implement a program to protect and enhance the natural and human environments of the Beaver Creek Watershed. Members of the Task force come from local, state, and federal agencies with participation of the local utility districts and the Beaver Creek Watershed Association. A partial listing includes: AMEC, Beaver Creek Watershed Association, Hallsdale Powell Utility Company, Knox County Engineering and Public Works Stormwater Management Division, Knox County Parks and Recreation, Knox County Soil Conservation District, Knox Land and Water Conservancy, Knoxville/Knox County Metropolitan Planning Commission, Knoxville/Knox County Utilities Board Geographic Information System, Tennessee Valley Authority, Tennessee Department of Environment and Conservation, USDA National Resources Conservation District, and the University of Tennessee Water Resources Research Center.

Initially, the BCTF conducted an assessment of the Beaver Creek Watershed to inventory resources and to identify problem areas. After a round of public meetings the data was assembled into a report and published in 2003. This study will help Knox County plan more effectively for flood control, water quality, and the allocation of land for open space, recreation, and trails. During the assessment process a FEMA flood study was conducted on the creek. The results of this flood study were used by Knox County to adopt a new Stormwater Ordinance that expanded the no build/no fill zone in the Beaver Creek floodplain. The assessment report is also being used as an educational/outreach tool by the task force and has been distributed to local and state leaders.

Also in 2003, the BCTF assisted in the formation of the Beaver Creek Watershed Association and is partnering with them on a number of educational and restoration projects. At the same time the Task Force obtained a grant from the Tennessee Valley Authority that was used to hire a Watershed Coordinator for Knox County to primarily focus on the Beaver Creek Watershed.

In addition, BCTF partners have published a 16 page tabloid on Beaver Creek that was distributed to stakeholders as inserts in local newspapers; partnered with the University of Tennessee Water Resource Research Center to get the Adopt-A-Watershed Program into six watershed high schools and middle schools; and partnered with the Hallsdale Powell Utility District with its traveling environmental education program for elementary schools in the watershed.

In addition to these ongoing efforts the BCTF has turned its recent focus to preparing a comprehensive Watershed Restoration Plan, assisting TDEC in its data collection for the TMDL for Beaver Creek, and looking for restoration opportunities in the watershed. In the summer of 2004 the BCTF presented a proposal to the Tennessee Stream Mitigation Program to restore a five-mile reach of Beaver Creek. The $500,000 project was accepted and is now in its beginning stages.

Through its current and future efforts the Beaver Creek Task Force envisions the Beaver Creek Watershed as a desirable place to live, with its beautiful vistas and open spaces protected, its waters wadeable and fishable, and its floodplain returned to its natural function of storing waters during high flows. It envisions vibrant communities that are distinct in history and culture yet united by the valley corridor. Communities will have

access to Beaver Creek and its tributaries to recreate and reflect so that they may be better able to appreciate its ecology and be inspired to preserve and protect it through their own actions.

Web Site: http://www.waterqualityforum.org

Contact Information for the Beaver Creek Task Force Executive Committee

Chris Granju Knox County Department of Engineering And Public Works Stormwater Management chris.granju@knoxcounty.org	865-215-5840
Karen Nolt Knox County Department of parks and Recreation Karen.nolt@knoxcounty.org	865-215-6610
Tom McDonough Tennessee Valley Authority tamcdono@tva.org	865-988-2483
Tim Gangaware University of Tennessee Water Resources Research Center gangwrrc@utk.edu	865-974-4777
Roy Arthur Knox County Department of Engineering and PW Watershed Coordinator rarthurroy@aol.com	865-755-9053

5.4.D. Coal Creek Watershed Foundation. The dream of the Coal Creek Watershed Foundation, Inc. (CCWF) was born in February 2000 during a drive along Coal Creek. The original goal of CCWF simply was to make Coal Creek and its tributaries suitable trout-spawning habitat. In order to improve the water quality, acid mine drainage from the abandoned coalmine lands in the Coal Creek watershed needs to be abated. There is rich coal mining history in this area that can be seen at http://www.coalcreekaml.com/Legacy.htm. The intention of CCWF was to perform a simple community service project using the group's engineering skills, thereby performing the work required to apply for a grant from the Office of Surface Mining (OSM) to reclaim abandoned mine land.

However, acid mine drainage is not the only problem in the Coal Creek watershed. Meetings with various groups, government agencies, and local residents revealed that while improving water quality would be welcome, every group had a goal of its own. The residents are primarily concerned with the quality of life for their children—better schools, adequate dental and health care, opportunities for jobs, safety from flooding, and education. Many parents have heard their children say they will leave the Coal

Creek watershed because "there is nothing here for me." As the groups joined together, the CCWF's goal broadened to "improving the quality of life in the Coal Creek watershed."

Since February 2000, CCWF has been building the human infrastructure needed to accomplish their mission. Volunteers and agencies have jumped on board. At the first public event in Coal Creek, citizens posted protest signs. Now, they write songs about the volunteers and the ladies cook for them on work days. The accomplishments of CCWF are too vast to describe in full detail here; however they can be found at http://www.coalcreekaml.com.

Coal Creek Water Quality. OSM has monitored the water quality of Coal Creek and the results have shown the water quality is not as bad as once thought. Mother Nature has helped with the recovery from the coal mining that was done before the strict regulations went into effect in 1977. Sampling results can be seen at:

http://www.coalcreekaml.com/OSMsamplingthruAugust2003.pdf.

For information on abandoned mine land reclamation lessons, visit:

http://www.coalcreekaml.com/MineReclamationLessons.htm.

We have learned that the main problem in Coal Creek is sediment. Coal Creek flows into the Clinch River. If you are driving north on Interstate 75 and look over the side of the bridge that travels over the Clinch River, you can see where Coal Creek flows into the Clinch. Especially after a rain, it looks like a plume of chocolate milk is entering the river out of Coal Creek. To test this theory, storm samplers were installed throughout the Coal Creek Watershed. Sampling results are showing the sediment as predicted. We plan to take another sampling when there is a large rain event after a drought period to compare to the results that have been collected. This is an on-going process.

For more information on the Coal Creek Watershed, contact Carol Moore at (865)-584-0344 or clmoore@geoe.com. Visit the web page at http://www.coalcreekaml.com.

5.4.E. Hinds Creek Watershed Partnership. The Hinds Creek Watershed Partnership is comprised of local, state, and federal partners working to protect and improve water quality throughout the watershed. While areas of Hinds Creek watershed are being developed, much of the watershed remains in agriculture. The partnership has focused much of its efforts working with local landowners to develop comprehensive farm management plans and implement agricultural best management practices (BMPs) that can benefit the landowner and improve water quality. Many practices, such as pasture renovation, cattle exclusion fencing, and alternative watering systems, can be funded through conservation programs administered by local Soil Conservation Districts and Natural Resource and Conservation Services. The Partnership is also involved in a cooperative water quality monitoring project with TDEC and is working to perform comprehensive watershed assessments. Gathering information regarding the health of the watershed will help prioritize areas of work, as well as help obtain funding for watershed improvements. Future plans include a community meeting to provide

stakeholders an opportunity to voice concerns and learn about Hinds Creek watershed and a demonstrational agricultural BMP farm tour.

For more information about the Hinds Creek Watershed Partnership, please contact Tiffany Foster at tlfoster@tva.gov.

5.4.F. Oak Ridge Reservation Local Oversight Committee. The Oak Ridge Reservation (ORR) Local Oversight Committee (LOC) is a non-profit, regional organization representing the interests of local governments and their citizens with respect to U.S. Department of Energy's (DOE) environmental decisions on the ORR. The LOC was formed in 1991 when the state of Tennessee signed an oversight agreement with DOE to independently monitor ORR environmental restoration and waste management activities. Its purpose is to allow local government and citizen input into decisions by the DOE on environmental and other activities that affect local jurisdictions. Information can be found at the website http://www.local-oversight.org or call toll-free (888)-770-3073.

The initial major concern was the discharge of radioactive and hazardous contaminants from the ORR into the Clinch River. The primary sources were the Bethel Valley and Melton Valley waste storage and disposal sites that drained into the White Oak Creek embayment and the Y-12 and K-25 plants that contributed contamination to Poplar Creek. Studies of the water, biota, and sediments of Watts Bar Reservoir documented that PCBs were the most problematic contaminant, but cesium-137 also persists in buried sediments and mercury in some fish. The studies resulted in issuance of a fish advisory due to PCBs in certain gamefish from Watts Bar Reservoir, which had a serious impact on the tourism industry of downstream counties. Of other significant contaminants, ongoing releases from the ORR include tritium and strontium-90, however these are soluble and pass through the lake system.

Over the years, the LOC and its Citizens' Advisory Panel (CAP) have undertaken projects and outreach related to downstream contamination from the ORR. The Watts Bar Reservoir Fish Advisory study was a special project of the CAP in conjunction with state and federal agencies to address concerns of the counties on Watts Bar Reservoir regarding the effects of PCB contamination on fishing and other recreational activities. Publication of the brochure resulted from a multi-organizational effort to address the fears of residents and tourists regarding the warning signs posted around Watts Bar Reservoir. The organizations that worked to create and review the brochure were Agency for Toxic Substances and Disease Registry (ATSDR), LOC and CAP, Tennessee Department of Environment and Conservation, Tennessee Wildlife Resources Agency, and Tennessee Department of Health.

The CAP reviewed the protocols and assisted with advertising, outreach, and educating potential participants in a study conducted by ATSDR in the late 1990s. Blood samples were taken from 116 fishermen who regularly ate their catches; the serum was tested for PCBs and mercury. PCBs levels were elevated in five people and nondetectable in 46. Regarding mercury, one person had a high mercury level and 89 had no detectable mercury. The remaining samples indicated contamination levels similar to those found in the general population and lower than expected for such fish consumers.

The Chairman of the CAP produced a study titled "Signs of Stewardship" which investigated the fate of warning signs posted on Lower East Fork Poplar Creek. The

CAP also provided independent oversight of DOE's drinking water sampling effort at East Tennessee Technology Park (the former K-25 site).

The LOC continues to provide outreach on its downstream activities, including presentations to groups concerned with watershed issues, such as the Tellico Village Homeowners Association. It also sponsors the annual "State of East Fork Poplar Creek Address" a presentation that details the improvements in the health of this contaminated tributary stream.

5.4.G. Tennessee Citizens for Wilderness Planning. TCWP is dedicated to achieving and perpetuating protection of natural lands and waters by means of public ownership, legislation, or cooperation of the private sector. While the group's first focus is on the Cumberland and Appalachian regions of east Tennessee, its efforts may extend to the rest of the state and the nation. TCWP's strength lies in researching information pertinent to an issue, informing and educating its membership and the public, interacting with groups having similar objectives, and working through the legislative, administrative, and judicial branches of government on the federal, state, and local levels. TCWP publishes a bi-monthly newsletter that has been called one of the most informative conservation newsletters in the country.

TCWP's activities contribute to protection of the Lower Clinch Watershed, as the group engages in current, local issues and ongoing projects. TCWP is a steward with TVA of the Worthington Cemetery/Cedar Barren on the Clinch River in Oak Ridge. With Advocates for the Oak Ridge Reservation (AFORR) and Tennessee Wildlife Resources Agency (TWRA), TCWP sponsors public hikes on areas such as the Three Bends of the Oak Ridge Reservation to help raise public appreciation for these sensitive, undeveloped areas that contribute to Lower Clinch water quality protection. With AFORR, TCWP is an advocate for natural resource protection in proposed actions on the Oak Ridge Reservation. TCWP has hosted public meetings for discussions regarding proposed TVA actions, such as the Watts Bar Land Plan.

In November 2002, TCWP raised funds and purchased from Bowater nearly 50 acres of land abutting TVA's White's Creek Small Wild Area. This land is an essential buffer for the SWA, since the entire Bowater tract was placed on the market. The new acreage is being donated to TVA. TCWP maintains a trail on the SWA and plans an additional trail on the new land.

For more information, visit the TCWP web site at http://tcwp.org/ or contact Jimmy Groton, TCWP Vice-President and Chair of Water Issues Committee, (865)-483-5799.

CHAPTER 6

RESTORATION PRIORITIES IN THE LOWER CLINCH RIVER WATERSHED

6.1. BACKGROUND.

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

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

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

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

6.2.A. Year 1 Public Meeting. The first Lower Clinch River Watershed public meeting was held November 10, 1998 at the DOE Oversight Building in Oak Ridge. 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

- Contributions from agricultural nonpoint source pollution
- Development too close to rivers
- Lack of effective erosion controls
- Loss of farmland to development
- Lack of TDEC personnel to perform inspections, follow-ups, and monitoring
- Industrial growth without analysis of effects on watershed
- Burdon if impacts of the 303(d) List falls solely on regulated community while others (*i.e.*, agriculture) also contribute to the problem
- Contaminated sediment from East Fork Poplar Creek

6.2.B. Year 3 Public Meeting. The second Lower Clinch River Watershed public meeting was held April 17, 2001 at the DOE Oversight Building in Oak Ridge. 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 Lower Clinch River Watershed public meeting was held November 7, 2005 at Powell High School. The meeting featured eleven educational components:

- Overview of draft Watershed Water Quality Management Plan slide show

- Benthic macroinvertebrate samples and interpretation
- SmartBoard™ with interactive GIS maps
- "How We Monitor Streams" self-guided slide show
- "Why We Do Biological Sampling" self-guided slide show
- TVA display
- Powell High School display
- Beaver Creek Watershed Association display
- Trout Unlimited display
- Coal Creek Watershed Foundation display
- Local presentations about Beaver Creek, Bullrun Creek, Hinds Creek, and Coal Creek citizen groups

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

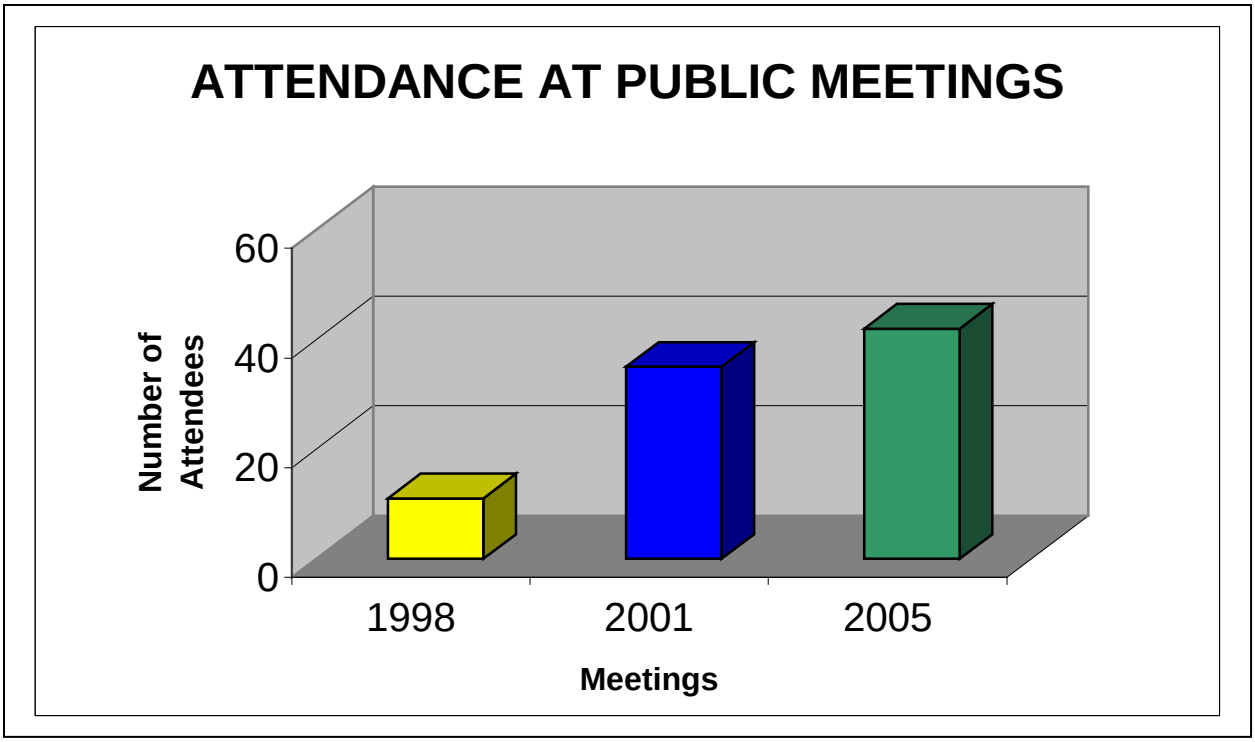


Figure 6-1. Attendance at Public Meetings in the Lower Clinch River Watershed. *Attendance numbers do not include TDEC personnel.*

Figure 6-2. High School Students Explain the Principles of Nonpoint Source Pollution Control to Citizens at the Lower Clinch River Watershed Public Meeting.

Figure 6-3. Watershed Meetings are a Good Opportunity for Local Citizen-Based Watershed Groups to Share What They are Doing to Promote Clean Water.

Figure 6-4. Environmental Specialist Jonathon Burr helps Citizens Learn About the Relationship Between Aquatic Insects and Water Quality at the Lower Clinch River Watershed Public Meeting.

6.3. APPROACHES USED.

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

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

Approved TMDLs:

Lower Clinch River Watershed in Anderson, Campbell, Grainger, Knox, Loudon, Morgan, Roane, and Union Counties. TMDL for pathogens in the Lower Clinch River Watershed. Approved November 29, 2005.
http://www.state.tn.us/environment/wpc/tmdl/approvedtmdl/LowDuckRF2.pdf

TMDLs are prioritized for development based on many factors.

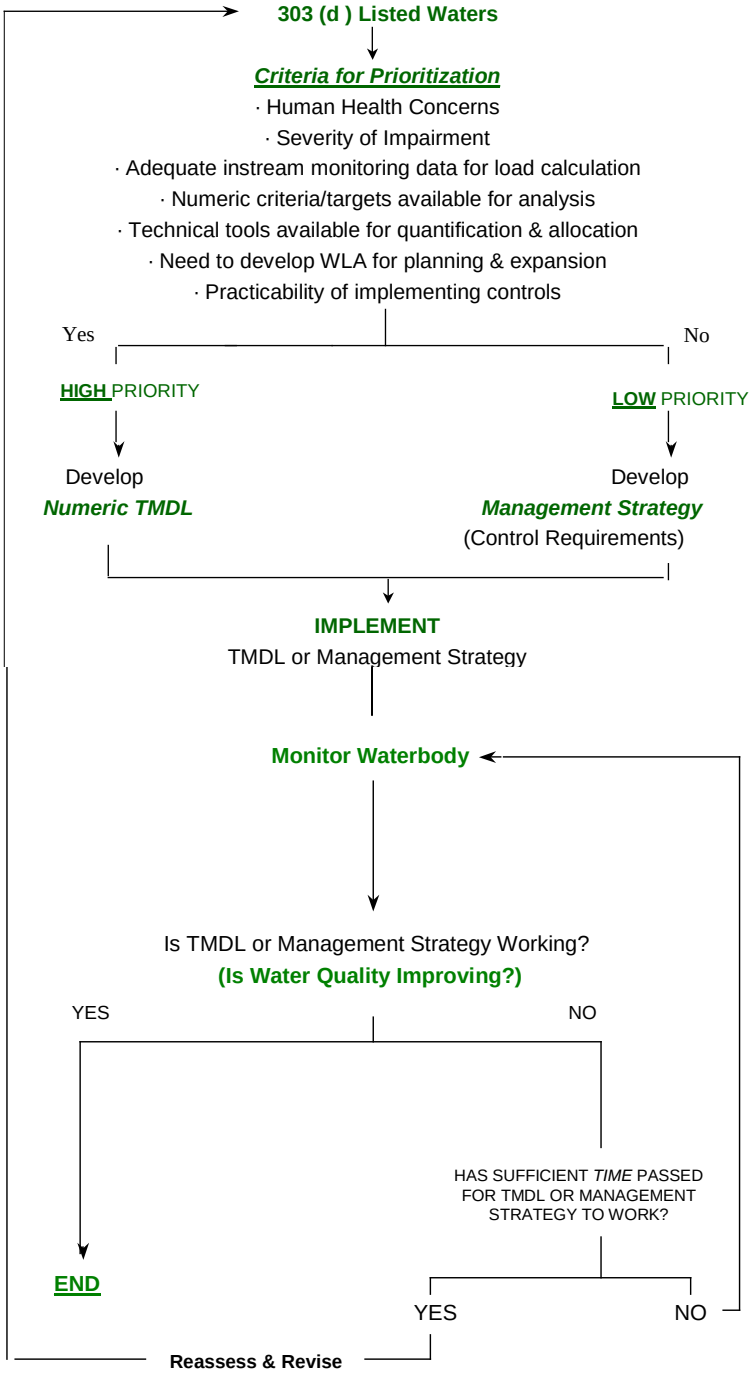


Figure 6.5. Prioritization Scheme for TMDL Development.

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

There are several state and federal regulations that address some of the contaminants impacting waters in the Lower Clinch River Watershed. Most of these are limited to only point sources: a pipe or ditch. Often, controls of point sources are not sufficient to protect waters, so other measures are necessary. Some measures include efforts by landowners and volunteer groups and the possible implementation of new regulations. Many agencies, such as the Tennessee Department of Agriculture (TDA) and the Natural Resources Conservation Service (NRCS), offer financial assistance to landowners for corrective actions (like Best Management Practices) that may be sufficient for recovery of impacted streams. Many nonpoint problems will require an active civic involvement at the local level geared towards establishment of improved zoning guidelines, building codes, streamside buffer zones and greenways, and general landowner education.

The following text describes types of impairments, possible causes, and suggested improvement measures. Restoration efforts should not be limited to only those streams and measures suggested below.

6.3.B.i. Sedimentation.

6.3.B.i.a. From Construction Sites. Construction activities have historically been considered “nonpoint sources.” In the late 1980’s, EPA designated them as being subject to NPDES regulation if more than 5 acres were being disturbed. In the spring of 2003, that threshold became 1 acre. The general permit issued for such construction sites establishes conditions for maintenance of the sites to minimize pollution from storm water runoff, including requirements for installation and inspection of erosion controls. Also, the general permit imposes more stringent inspection and self-monitoring requirements on sites in the watershed of streams that are already impaired due to sedimentation. Examples in the Lower Clinch River Watershed are Back Creek and Muddy Creek. 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 that drain into high quality waters. The Clinch River upstream of Melton Hill Reservoir and Clear Creek in Norris are examples of high quality streams in the Lower Clinch River Watershed.

6.3.B.i.b. From Channel and/or Bank Erosion. Many streams within the Lower Clinch River Watershed suffer from varying degrees of streambank erosion. When steam channels are altered, or large tracts of land are cleared, storm water runoff, will cause banks to become unstable and highly erodable. Heavy livestock traffic can also severely disturb banks. Destabilized banks contribute to sediment load and to the loss of beneficial riparian vegetation to the stream. Some inappropriate agricultural practices have impacted the hydrology and morphology of stream channels in this watershed.

Several agencies such as the NRCS and TDA, as well as watershed citizen groups, are working to stabilize portions of stream banks using bioengineering and other techniques. Many of the affected streams, like Hinds Creek and Bullrun Creek, could benefit from these types of projects. Other methods or controls that might be necessary to address common problems are:

Voluntary activities

- Re-establish bank vegetation (example: Buffalo Creek).
- Establish off-channel watering areas for livestock by moving watering troughs and feeders back from stream banks (examples: Bullrun Creek and Buffalo Creek).
- Limit cattle access to streams and bank vegetation (examples: Bullrun Creek and Hinds Creek).

Additional strategies

- Increase efforts in the Master Logger program to recognize impaired streams and require more effective management practices.
- Better community planning for the impacts of development on small streams, especially development in growing areas (examples: Hinds Creek and North Fork Bullrun Creek).
- Limit livestock access to streams and bank vegetation (example: Buffalo Creek).
- Require post-construction run-off rates to be no greater than pre-construction rates in order to avoid in-channel erosion (example: Beaver Creek).
- Implement additional restrictions on logging in streamside management zones.
- Limit clearing of stream and ditch banks (example: Indian Creek). *Note: Permits may be required for any work along streams.*
- Limit road and utilities crossings of streams.
- Restrict the use of off-highway vehicles on stream banks and in stream channels.

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

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

Since the Dust Bowl era, the agriculture community has strived to protect the soil from wind and soil erosion. Agencies such as the Natural resources Conservation Service (NRCS), the University of Tennessee Agricultural Extension Service, and the Tennessee Department of Agriculture have worked to identify better ways of farming, to educate the farmers, and to install the methods that address the sources of some of the impacts due to agriculture. Cost sharing is available for many of these measures.

Many sediment problems traceable to agricultural practices also involve riparian loss due to close row cropping or pasture clearing for grazing. Agriculturally impacted streams that could benefit from the establishment of riparian buffer zones include Bullrun Creek, Buffalo Creek, and Hinds Creek.

6.3.B.ii. Pathogen Contamination.

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

Currently, only five stream systems in the Lower Clinch River Watershed are known to have excessive pathogen contamination. They are Beaver Creek, Bullrun Creek, Hinds Creek, East Fork Poplar Creek, and Coal Creek.

Other measures that may be necessary to control pathogens are:

Voluntary activities

- Off-channel watering of livestock (examples: Bullrun Creek and Hinds Creek).
- Limit livestock access to streams (examples: Bullrun Creek and Hinds Creek).
- Improve and educate on the proper management of animal waste from feeding operations.

Enforcement strategies

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

Additional strategies

- Develop intensive planning in areas where sewer is not available and treatment by subsurface disposal is not an option due to poor soils, floodplains, or high water tables.
- Develop and enforce leash laws and controls on pet fecal material.
- Greater efforts by sewer utilities to identify leaking lines or overflowing manholes (example: Beaver 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, from fertilized lawns and croplands, and faulty sewage disposal processes. Nutrients are often transported with sediment, so many of the measures designed to reduce sediment runoff will also aid in preventing organic enrichment of streams and lakes.

Other sources of nutrients can be addressed by:

Voluntary activities

- Educate homeowners and lawn care companies in the proper application of fertilizers.
- Encourage landowners, developers, and builders to leave stream buffer zones. Streamside vegetation can filter out many nutrients and other pollutants before they reach the stream. These riparian buffers are also vital along livestock pastures. Examples of streams that could benefit are Beaver Creek and its tributaries.
- Use grassed drainage ways that can remove fertilizer before it enters streams.
- Use native plants for landscaping since they don't require as much fertilizer and water.

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

- Maintain shade over a stream. Cooler water can hold more oxygen and retard the growth of algae. As a general rule, all stream channels suffer from some canopy removal. An intact riparian zone also acts as a buffer to filter out nutrient loads before they enter the water.
- Discourage impoundments. Ponds and lakes do not aerate water. *Note: Permits may be required for any work on a stream, including impoundments.*

Regulatory strategies.

- Strengthen enforcement of regulations governing on-site wastewater treatment (examples: Coal Creek and Buffalo Creek).
- Impose more stringent permit limits for nutrients discharged from sewage treatment plants.
- Timely and appropriate enforcement for noncomplying sewage treatment plants, large and small, and their collection system.
- Identify Concentrated Animal Feeding Operations not currently permitted.

6.3.B.iv. Toxins and Other Materials.

Although some toxic substances are discharged directly into waters of the state from a point source, much of these materials are washed in during rainfalls from an upland location, or via improper waste disposal that contaminates groundwater. In the Lower Clinch River Watershed, storm water runoff from industrial facilities or urban areas is a significant issue. More stringent inspection and regulation of permitted industrial facilities, and local strormawter quality initiatives and regulations, could help reduce the amount of contaminated runoff reaching state waters. Examples of streams that could benefit from these measures include Beaver Creek and East Fork Poplar Creek.

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

Some of these problems can be addressed by:

Voluntary activities

- Provide public education.
- Paint warnings on storm drains that connect to a stream. (This would benefit Beaver Creek and Coal Creek).
- Sponsor community clean-up days.
- Landscape public areas.
- Encourage public surveillance of their streams and reporting of dumping activities to their local authorities.

Enforcement strategies

- Prohibit illicit discharges to storm drains.
- Strengthen litter law enforcement at the local level.

6.3.B.v. Habitat Alteration.

The alteration of the habitat within a stream can have severe consequences. Whether it is the removal of the vegetation providing a root system network for holding soil particles together, the release of sediment, which increases the bed load and covers benthic life and fish eggs, the removal of gravel bars, “cleaning out” creeks with heavy equipment,

or the impounding of the water in ponds and lakes, many alterations impair the use of the stream for designated uses. Habitat alteration also includes the draining or filling of wetlands.

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

Voluntary activities

- Sponsor litter pickup days to remove litter that might enter streams.
- Organize stream cleanups removing trash, limbs and debris before they cause blockage.
- Avoid use of heavy equipment to "clean out" streams (Indian Creek).
- Plant native vegetation along streams to stabilize banks and provide habitat (examples: Beaver Creek and Knob Fork).
- Encourage developers to avoid extensive use of 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.

6.3.B.vi. Acid Mine Runoff.

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

Streams that would benefit from remediation projects include some upper tributaries of Coal Creek and Poplar Creek.

APPENDIX II

ID	NAME	HAZARD
017001	Butcher	L
737003	White Oak	F
877001	Thunder Hollow	S

Table A2-1. Inventoried Dams in the Lower Clinch River Watershed. *Hazard Codes: F, Federal; High; (S), Significant; (L), Low. TDEC only regulates dams indicated by a numeric hazard score.*

LAND COVER/LAND USE	ACRES	% OF WATERSHED
Open Water	7,175	1.77
Other Grasses	7,911	1.95
Pasture/Hay	54,435	13.42
Row Crops	8,739	2.15
Woody Wetlands	37	0.01
Emergent Herbaceous Wetlands	6	0.00
Deciduous Forest	160,678	39.62
Mixed Forest	90,389	22.29
Evergreen Forest	53,596	13.22
High Intensity: Commercial/Industrial	7,083	1.74
High Intensity: Residential	1,637	0.40
Low Intensity: Residential	12,929	3.19
Quarries/Strip Mines/Gravel Pits	378	0.09
Bare Rock/Sand/Clay	1	0.00
Transitional	559	0.14
Total	**405,553**	**100.00**

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

ECOREGION	REFERENCE STREAM	WATERSHED (HUC)	
Ridge and Valley (67)	Big Creek (6701)	Holston River	06010104
Ridge and Valley (67)	Fisher Creek (6702)	Holston River	06010104
Southern Limestone/Dolomite Valleys and Low Rolling Hills (67f)	Clear Creek (67F06)	Lower Clinch River	06010207
	White Creek (67F13)	Upper Clinch River	06010205
	Powell River (67F14)	Powell River	06010206
	Big War Creek (67F17)	Upper Clinch River	06010205
	Martin Creek (67F23)	Powell River	06010206
	Powell River (67F25)	Powell River	06010206
Southern Dissected Ridges and Knobs (67i)	Mill Branch (67I12)	Lower Clinch River	06010207
Cumberland Plateau (68a)	Rock Creek (68A01)	South Fork Cumberland	05130104
	Clear Creek (68A08)	Emory River	06010208
	Piney Creek (68A13)	Fort Loudoun/Watts Bar	06010201
	Mullins Creek (68A20)	Lower Tennessee	06020001
	Daddys Creek (68A26)	Emory River	06010208
	Island Creek (68A27)	Emory River	06010208
	Rock Creek (68A28)	Emory River	06010208
Plateau Escarpment (68c)	Ellis Gap Branch (68C12)	Lower Tennessee	06020001
Cumberland Mountains (69d)	Stinking Creek (69D04)	Clear Fork Cumberland	05130101
	Flat Fork (69D03)	Emory River	06010208
	New River (69D05)	South Fork Cumberland	05130104
	Round Rock Creek (69D06)	South Fork Cumberland	05130104

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

CODE	NAME	AGENCY	AGENCY ID
53	TDEC/DNH ORR K-25 Filtration Plant Wetland (NA33)	TDEC/DNH	S.USTNHP 288
54	TDEC/DNH ORR NW Pine Ridge Fringeless Orchid Site	TDEC/DNH	S.USTNHP 284
55	TDEC/DNH ORR Lower Poplar Creek Rookery (NA30)	TDEC/DNH	S.USTNHP 376
56	TDEC/DNH ORR Roberts Branch Wetlands Complex (RA2)	TDEC/DNH	S.USTNHP 370
57	TDEC/DNH ORR Rein Orchid Swamp Site (NA4)	TDEC/DNH	S.USTNHP 259
58	TDEC/DNH ORR Bear Creek Wetlands Site (RA4)	TDEC/DNH	S.USTNHP 300
59	TCED/DNH ORR Bearden Creek Gorge and Wetlands (NA3)	TDEC/DNH	S.USTNHP 458
60	TDEC/DNH ORR Bethel Valley Small Head Rush Wetland Site	TDEC/DNH	S.USTNHP 460
61	TDEC/DNH ORR Chestnut Ridge Barren and Wetland Site	TDEC/DNH	S.USTNHP 457
62	TDEC/DNH ORR Chestnut Ridge Springs Area Site (RA21)	TDEC/DNH	S.USTNHP 367
63	TDEC/DNH ORR Clinch Floodplain Swamp Site (RA16)	TDEC/DNH	S.USTNHP 362
64	TDEC/DNH ORR Esat Bear Creek Reain Orchid Wetland Site	TDEC/DNH	S.USTNHP 283
65	TDEC/DNH ORR Environmental Science. Division Lily Site	TDEC/DNH	S.USTNHP 286
66	TDEC/DNH ORR Fringeless Orchid Wetlands Site (NA27)	TDEC/DNH	S.USTNHP 282
67	TDEC/DNH ORR Hembree Marsh (NA24) Site	TDEC/DNH	S.USTNHP 279
68	TDEC/DNH ORR Sweetflag Marsh Site (RA19)	TDEC/DNH	S.USTNHP 365
69	TDEC/DNH ORR Study Area-E Site	TDEC/DNH	S.USTNHP 471
70	TDEC/DNH ORR Study Area-D Site	TDEC/DNH	S.USTNHP 470
71	TDEC/DNH ORR Study Area-C Site	TDEC/DNH	S.USTNHP 469
72	TDEC/DNH ORR Study Area-B Site	TDEC/DNH	S.USTNHP 468
73	TDEC/DNH ORR Melton Hill Valley Lily Area Site (NA26)	TDEC/DNH	S.USTNHP 281
74	TDEC/DNH ORR New Zion Boggy Site (NA42)	TDEC/DNH	S.USTNHP 366
75	TDEC/DNH ORR LD Ash Disposal Site	TDEC/DNH	S.USTNHP 373
76	TDEC/DNH ORR Oine Ridge Wetlands Site	TDEC/DNH	S.USTNHP 268
77	TDEC/DNH ORR Quillwort Temporary Pond Site (RA5)	TDEC/DNH	S.USTNHP 301
78	TDEC/DNH ORR Raccoon Creek Goldenseal Area (NA26)	TDEC/DNH	S.USTNHP 261
79	TDEC/DNH ORR Small Pond Site (RA26)	TDEC/DNH	S.USTNHP 372
231	USACOE-Nashville Client Site	USACOE-Nashville	
339	TDOT SR 9 Mitigation Site	TDOT	
475	TDEC/WPC Trib to Poplar Creek Permit/Mitigation Site	TDEC/WPC	
479	TDEC/WPC East Fork Poplar Creek WPC Permit Site	TDEC/WPC	
494	TDEC/WPC Gum Hollow Branch Permit Site	TDEC/WPC	
495	TDEC/WPC Gum Hollow Branch Mitigation Site	TDEC/WPC	
499	TDEC/WPC Melton Branch Permit Site	TDEC/WPC	
500	TDEC/WPC Melton Branch Weir Mitigation Site	TDEC/WPC	
2733	USACOE Clinch River 39.5 L Site	USACOE-Nashville	960047747

Table A2-4. Wetland Sites in Lower Clinch River Watershed in TDEC Database. *TDEC, Tennessee Department of Environment and Conservation; USACOE-Nashville, United States Army Corps of Engineers-Nashville District; WPC, Water Pollution Control; TDOT, Tennessee Department of Transportation; 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)
Beech Grove Fork	TN06010207029_0200	11.4
Brushy Fork	TN06010207020_1200	13.0
Bullrun Creek	TN06010207014_2000	15.6
Byrams Creek	TN06010207016_0200	22.4
Cane Creek	TN06010207270_0100	6.2
Clear Creek	TN06010207019_0100	6.0
Clinch River	TN06010207019_1000	14.1
Coal Creek	TN06010207029_2000	15.0
Conner Creek	TN06010207455_1000	8.3
Cox Creek	TN06010207011_0400	4.5
Gum Hollow Branch	TN06010207026_0400	3.9
Hickory Creek	TN06010207004_1000	10.7
Hinds Creek	TN06010207016_1000	6.7
Hinds Creek	TN06010207016_2000	7.1
Lammie Branch	TN06010207011_0310	5.5
Melton Branch	TN06010207247_0100	2.0
Mill Branch	TN06010207026_0300	2.0
Poplar Creek	TN06010207020_1000	28.7
Poplar Creek	TN06010207020_2000	12.5
Raccoon Creek	TN06010207014_0200	11.8
Willow Fork	TN06010207011_0300	5.9

Table A3-1a. Streams Fully Supporting Designated Uses in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Bear Creek	TN06010207026_0600	5.5
Beaver Creek	TN06010207011_1000	22.5
Beaver Creek	TN06010207011_2000	13.7
Beaver Creek	TN06010207011_3000	7.5
Buffalo Creek	TN06010207016_0100	19.9
Bullrun Creek	TN06010207014_1000	11.8
Bullrun Creek	TN06010207014_3000	11.4
Clinch River	TN06010207019_2000	7.4
Coal Creek	TN06010207029_1000	10.9
Foster Branch	TN06010207014_0110	1.2
Grassy Creek	TN06010207011_0700	8.2
Hinds Creek	TN06010207016_3000	8.9
Hines Branch	TN06010207011_0500	3.2
Knob Fork	TN06010207011_0600	8.1
Meadow Creek	TN06010207011_0800	5.0

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
North Fork Bullrun Creek	TN06010207014_0300	19.0
Whiteoak Creek	TN06010207247_1000	5.3
Williams Branch	TN06010207014_0100	2.4

Table A3-1b. Streams Partially Supporting Designated Uses in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
East Fork Poplar Creek	TN06010207026_1000	9.7
East Fork Poplar Creek	TN06010207026_2000	11.3
Grable Branch	TN06010207004_0100	1.3

Table A3-1c. Streams Not Supporting Designated Uses in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Allen Creek	TN06010207011_0100	4.9
Andy Branch	TN06010207016_0300	3.5
Bear Creek	TN06010207026_0610	5.4
Blue Spring Creek	TN06010207020_1100	3.9
Browns Creek	TN06010207020_0700	9.4
Brushy Creek	TN06010207016_0400	4.4
Caney Creek	TN06010207028_1000	7.4
Cow Creek	TN06010207020_0500	6.5
Davidson Creek	TN06010207020_0100	6.4
Doe Creek	TN06010207270_1000	5.6
Geise Creek	TN06010207020_0421	6.2
Harness Creek	TN06010207020_0800	6.9
Indian Creek	TN06010207020_0450	13.5
Little Cow Creek	TN06010207020_0430	3.5
Massingill Spring Branch	TN06010207020_0300	4.4
McCoy Branch	TN06010207256_1000	3.0
Melton Hill Reservoir Tribs	TN06010207006T_1000	36.9
Middle Creek	TN06010207020_0420	12.9
Misc tribs to Beaver Creek	TN06010207011_0999	24.4
Misc tribs to Bullrun Creek	TN06010207014_0999	29.3
Misc tribs to Clinch River	TN06010207019_0999	15.8
Misc tribs to Hinds Creek	TN06010207016_0999	5.1
Misc tribs to Hinds Creek	TN06010207016_2999	10.7
Misc. tribs to Beaver Creek	TN06010207011_0998	8.3
Misc. tribs to Brushy Creek	TN06010207020_1299	25.4
Misc. tribs to Bullrun Creek	TN06010207014_0998	40.4
Misc. tribs to Hinds Creek	TN06010207016_3999	15.9
Oxier Creek	TN06010207020_0200	4.8

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Paw Paw Creek	TN06010207036_1000	15.2
Pinhook Branch	TN06010207026_0500	5.0
Plum Creek	TN06010207011_0900	5.3
Right Fork Coal Creek	TN06010207029_0300	7.6
Scarboro Creek	TN06010207259_1000	2.6
Schoolhouse Creek	TN06010207020_0900	2.0
Slatestone Creek	TN06010207029_0100	5.6
Stoney Flat Creek	TN06010207020_0600	7.2
Unnamed trib to East Fork Poplar Creek	TN06010207026_0100	2.9
Unnamed trib to East Fork Poplar Creek	TN06010207026_0200	1.6
Unnamed trib to Indian Creek	TN06010207020_0410	2.0
Unnamed trib to Melton Hill	TN06010207258_1000	2.4
Unnamed trib to Williams Creek	TN06010207014_0120	3.5
Woods Gap Branch	TN06010207014_0400	6.7

Table A3-1d. Streams Not Assessed in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (ACRES)
Clinch River Arm Watts Bar Reservoir	TN06010201001_0100	1,000
Melton Hill Reservoir	TN06010207006_1000	5,690

Table A3-1e. Lakes Not Supporting Designated Uses in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Bear Creek	TN06010207026_0600	5.5	Partial
Beaver Creek	TN06010207011_1000	22.5	Partial
Beaver Creek	TN06010207011_2000	13.7	Partial
Beaver Creek	TN06010207011_3000	7.5	Partial
Bullrun Creek	TN06010207014_1000	11.8	Partial
East Fork Poplar Creek	TN06010207026_2000	11.3	Not supporting
Grable Branch	TN06010207004_0100	1.3	Not supporting
Hines Branch	TN06010207011_0500	3.2	Partial
Knob Fork	TN06010207011_0600	8.1	Partial

Table A3-2a. Stream Impairment Due to Other Habitat Alterations in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Beaver Creek	TN06010207011_1000	22.5	Partial
Beaver Creek	TN06010207011_2000	13.7	Partial
Beaver Creek	TN06010207011_3000	7.5	Partial
Bullrun Creek	TN06010207014_1000	11.8	Partial
Bullrun Creek	TN06010207014_3000	11.4	Partial
Coal Creek	TN06010207029_1000	10.9	Partial
East Fork Poplar Creek	TN06010207026_1000	9.7	Not supporting
East Fork Poplar Creek	TN06010207026_2000	11.3	Not supporting
Hinds Creek	TN06010207016_3000	8.9	Partial

Table A3-2b. Stream Impairment Due to Pathogens in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Beaver Creek	TN06010207011_1000	22.5	Partial
Beaver Creek	TN06010207011_2000	13.7	Partial
Beaver Creek	TN06010207011_3000	7.5	Partial
Bullrun Creek	TN06010207014_1000	11.8	Partial
East Fork Poplar Creek	TN06010207026_1000	9.7	Not supporting
East Fork Poplar Creek	TN06010207026_2000	11.3	Not supporting
Foster Branch	TN06010207014_0110	1.2	Partial
Grable Branch	TN06010207004_0100	1.3	Not supporting
Grassy Creek	TN06010207011_0700	8.2	Partial
Knob Fork	TN06010207011_0600	8.1	Partial
Meadow Creek	TN06010207011_0800	5.0	Partial
Williams Branch	TN06010207014_0100	2.4	Partial

Table A3-2c. Stream Impairment Due to Siltation in the Lower Clinch River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Buffalo Creek	TN06010207016_0100	19.9	Partial
Coal Creek	TN06010207029_1000	10.9	Partial
North Fork Bullrun Creek	TN06010207014_0300	19.0	Partial
Whiteoak Creek	TN06010207247_1000	5.3	Partial

Table A3-2d. Stream Impairment Due to Unknown Toxicity in the Lower Clinch River Watershed.

APPENDIX IV

LAND USE/LAND COVER	AREAS IN HUC-10 SUBWATERSHEDS (ACRES)			
	01	02	03	05
Bare Rock/Sand/Clay	1			
Deciduous Forest	78,456	31,453	10,071	40,699
Emergent Herbaceous Wetlands	6		8,900	
Evergreen Forest	25,462	7,782	1,417	11,453
High Intensity: Commercial/Industrial/Transportation	3,116	521		2,029
High Intensity: Residential	732	69	439	397
Low Intensity: Residential	4,930	989	4,050	2,961
Mixed Forest	44,369	14,170	12,530	19,320
Open Water	6,685	265	59	166
Other Grasses: Urban/Recreational	2,812	646	2,763	1,690
Pasture/Hay	23,741	9,871	14,664	6,159
Row Crops	3,799	800	2,677	1,462
Transitional	275	52	22	209
Woody Wetlands	37			
Quarries/Strip Mines	357		20	
Total	**194,778**	**66,619**	**57,612**	**86,545**

Table A4-1. Land Use Distribution in Lower Clinch River Watershed by HUC-10. *Data are from 1992 Multi-Resolution Land Characterization (MRLC) derived by applying a generalized Anderson Level II system to mosaics of Landsat thematic mapper images collected every five years.*

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

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

STATION	HUC-10	AGENCY	STREAM NAME	AREA (SQ MILES)	LOW FLOW (CFS)		
					1Q10	7Q10	3Q20
03533000	0601020701	USGS	Clinch River	2,913	263	290	226
03534000	0601020701	USGS	Coal Creek	24.5	0.80	0.87	0.74
03534500	0601020701	USGS	Buffalo Creek	9.92	0.32	0.34	0.30
03535912	0601020701	USGS	Clinch River	3,343	0	14.2	0
03536320	0601020701	USGS	Whiteoak Creek	1.31			
03536380	0601020701	USGS	Whiteoak Creek	2.10			
03536440	0601020701	USGS	Northwest Tributary	0.67			
03536450	0601020701	USGS	First Creek	0.33			
03536500	0601020701	USGS	Whiteoak Creek	2.08			
03536550	0601020701	USGS	White Oak Creek	3.28			
03537000	0601020701	USGS	Whiteoak Creek	3.62	2.7	3.1	2.6
03537100	0601020701	USGS	Melton Hill Branch	0.52			
03537500	0601020701	USGS	Melton Branch	1.48	-	-	-
03538000	0601020701	USGS	Whiteoak Creek	6.01	-	-	0
03538130	0601020701	USGS	Caney Creek	5.55	0.55	0.60	0.50
03538150	0601020701	USGS	Clinch River	3,385	149	194	137
355307084180301	0601020701	TVA	Clinch River				
355308084180401	0601020701	TVA	Clinch River				
360538084075601	0601020701	TVA	Clinch River				
361326084052901	0601020701	TVA	Clinch River				
361328084053101	0601020701	TVA	Clinch River				
03535000	0601020702	USGS	Bullrun Creek	68.5	19.0	24.0	15.4
03535140	0601020703	USGS	South Fork Beaver Creek				
03535160	0601020703	USGS	Beaver Creek				
03535180	0601020703	USGS	Willow Fork				
03538200	0601020705	USGS	Poplar Creek	55.9	3.6	3.9	3.4
03538225	0601020705	USGS	Poplar Creek	82.5	3.85	4.78	3.97
03538230	0601020705	USGS	East Fork Poplar Creek				
03538235	0601020705	USGS	East Fork Poplar Creek	1.69			
03538250	0601020705	USGS	East Fork Poplar Creek	19.5	14.4	16.5	15.1
03538270	0601020705	USGS	Bear Creek	4.26	0.18	0.20	0.17
03538272	0601020705	USGS	Bear Creek	0.14			
03538273	0601020705	USGS	Bear Creek	5.0			
03538275	0601020705	USGS	Bear Creek	7.15	0.2	0.4	0.2
035382672	0601020705	USGS	Bear Creek	0.3			
035382673	0601020705	USGS	Bear Creek	3.2			
035977607	0601020705	USGS					
0356653019	0601020705	USGS					

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

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TDEC	7			0601020701
TDEC	CLINC052.6AN	2	Clinch River @ RM 52.6	0601020701
TDEC	13		Bearden Creek	0601020701
TDEC	BGROV000.1AN	BEECH000.1AN	Beech Grove Fork @ RM 0.1	0601020701
TDEC	BUFFA000.7AN		Buffalo Creek @ RM 0.7	0601020701
TDEC	6		Bull Run Steam Plant	0601020701
TDEC	25		Clear Creek	0601020701
TDEC			Clinch River	0601020701
TDEC	CLINC041.5AN	000670	Clinch River @ RM 41.5	0601020701
TDEC	CLINC005.5KN	000690	Clinch River @ RM 5.5	0601020701
TDEC	CLINC010.0RO	000680	Clinch River @ RM 10.0	0601020701
TDEC	CLINC066.3AN	CLINCH066.3	Clinch River @ RM 66.3	0601020701
TDEC	COAL001.2AN		Coal Creek @ RM 1.2	0601020701
TDEC	COAL010.6AN		Coal Creek @ RM 10.6	0601020701
TDEC	COAL005.4AN	000705	Coal Creek @ RM 5.4	0601020701
TDEC	CLINC078.7AN	1CRM78.7	Clinch River @ RM 78.7	0601020701
TDEC	12		East Fork Walker Branch	0601020701
TDEC	23		Ernie's Creek	0601020701
TDEC	GRASS000.0DM	GRASSYCREEKIS01	Grassy Creek @ RM 0.0	0601020701
TDEC	CLINC017.9RO	4CRM17.9	Grubb Islands	0601020701
TDEC	HINDS000.7AN		Hinds Creek @ RM 0.7	0601020701
TDEC	HINDS012.6AN		Hinds Creek @ RM 12.6	0601020701
TDEC	HINDS014.1AN		Hinds Creek @ RM 14.1	0601020701
TDEC	HINDS006.8AN	HCK20.6	Hinds Creek @ RM 6.8	0601020701
TDEC	19		Ish Creek	0601020701
TDEC	9		Kerr Hollow Branch	0601020701
TDEC	10		McCoy Branch	0601020701
TDEC	18		Raccoon Creek	0601020701
TDEC	8		Scarboro Creek	0601020701
TDEC	14		Unnamed Tributary	0601020701
TDEC	15		Unnamed Tributary	0601020701
TDEC	16		Unnamed Tributary	0601020701
TDEC	17		Unnamed Tributary	0601020701
TDEC	21		Unnamed Tributary	0601020701
TDEC	22		Unnamed Tributary	0601020701
TDEC	11		Western Branch	0601020701
TVA	475759		Beech Grove Fork @ RM 0.24	0601020701
TVA	475154		Buffalo Creek @ RM 1.78	0601020701
TVA	475404		Buffalo Creek @ RM 4.51	0601020701
TVA	477322		Bullrun Creek @ RM 0.3	0601020701
TVA	477674		Bullrun Creek @ RM 0.5	0601020701
TVA	475323		Clinch River @ RM 0.1	0601020701
TVA	476646		Clinch River @ RM 0.5	0601020701
TVA	477222		Clinch River @ RM 0.65	0601020701

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	477222		Clinch River @ RM 0.65	0601020701
TVA	476187		Clinch River @ RM 1.0	0601020701
TVA	476612		Clinch River @ RM 1.0	0601020701
TVA	475784		Clinch River @ RM 10.0	0601020701
TVA			Clinch River @ RM 11.0	0601020701
TVA	476032		Clinch River @ RM 14.4	0601020701
TVA	476518		Clinch River @ RM 15.0	0601020701
TVA	476031		Clinch River @ RM 15.4	0601020701
TVA	476577		Clinch River @ RM 15.6	0601020701
TVA	476613		Clinch River @ RM 15.9	0601020701
TVA	475777		Clinch River @ RM 17.9	0601020701
TVA	476581		Clinch River @ RM 18.3	0601020701
TVA	476030		Clinch River @ RM 19.0	0601020701
TVA	476081		Clinch River @ RM 2.1	0601020701
TVA	476188		Clinch River @ RM 2.5	0601020701
TVA	476082		Clinch River @ RM 2.6	0601020701
TVA	477065		Clinch River @ RM 20.0	0601020701
TVA			Clinch River @ RM 20.1	0601020701
TVA			Clinch River @ RM 20.5	0601020701
TVA			Clinch River @ RM 20.6	0601020701
TVA	477340		Clinch River @ RM 21.0	0601020701
TVA	475327		Clinch River @ RM 21.7	0601020701
TVA	476609		Clinch River @ RM 23.0	0601020701
TVA	475115		Clinch River @ RM 23.10	0601020701
TVA	476631		Clinch River @ RM 23.3	0601020701
TVA	475639		Clinch River @ RM 23.4	0601020701
TVA	477167		Clinch River @ RM 23.5	0601020701
TVA	476505		Clinch River @ RM 23.7	0601020701
TVA	476556		Clinch River @ RM 24.0	0601020701
TVA	477064		Clinch River @ RM 24.0	0601020701
TVA	475324		Clinch River @ RM 3.5	0601020701
TVA	475638		Clinch River @ RM 31.8	0601020701
TVA	476632		Clinch River @ RM 38.0	0601020701
TVA	477063		Clinch River @ RM 39.0	0601020701
TVA	476189		Clinch River @ RM 4.0	0601020701
TVA	475780		Clinch River @ RM 4.6	0601020701
TVA	475637		Clinch River @ RM 41.1	0601020701
TVA	475910		Clinch River @ RM 43.0	0601020701
TVA	476633		Clinch River @ RM 44.0	0601020701
TVA	476194		Clinch River @ RM 45.0	0601020701
TVA	476345		Clinch River @ RM 46.2	0601020701
TVA	476346		Clinch River @ RM 46.4	0601020701
TVA	476070		Clinch River @ RM 46.6	0601020701
TVA	476347		Clinch River @ RM 46.8	0601020701

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	475636		Clinch River @ RM 47.0	0601020701
TVA	476195		Clinch River @ RM 47.6	0601020701
TVA	476072		Clinch River @ RM 47.7	0601020701
TVA	476091		Clinch River @ RM 48.0	0601020701
TVA	475843		Clinch River @ RM 48.6	0601020701
TVA	476073		Clinch River @ RM 48.7	0601020701
TVA	475635		Clinch River @ RM 49.0	0601020701
TVA	476074		Clinch River @ RM 49.5	0601020701
TVA	477224		Clinch River @ RM 49.5	0601020701
TVA	476196		Clinch River @ RM 49.9	0601020701
TVA	475325		Clinch River @ RM 5.0	0601020701
TVA	476190		Clinch River @ RM 5.7	0601020701
TVA	476634		Clinch River @ RM 50.0	0601020701
TVA	477165		Clinch River @ RM 50.32	0601020701
TVA	475634		Clinch River @ RM 50.5	0601020701
TVA	476197		Clinch River @ RM 50.8	0601020701
TVA	476198		Clinch River @ RM 51.2	0601020701
TVA	475633		Clinch River @ RM 51.5	0601020701
TVA	476348		Clinch River @ RM 52.5	0601020701
TVA	477225		Clinch River @ RM 53.2	0601020701
TVA	475632		Clinch River @ RM 54.0	0601020701
TVA	475631		Clinch River @ RM 56.0	0601020701
TVA	475630		Clinch River @ RM 57.0	0601020701
TVA	476349		Clinch River @ RM 58.6	0601020701
TVA	475844		Clinch River @ RM 58.8	0601020701
TVA			Clinch River @ RM 6.0	0601020701
TVA	476557		Clinch River @ RM 6.8	0601020701
TVA	475065		Clinch River @ RM 60.0	0601020701
TVA	475064		Clinch River @ RM 64.0	0601020701
TVA	475629		Clinch River @ RM 64.2	0601020701
TVA	475845		Clinch River @ RM 66.3	0601020701
TVA	477582		Clinch River @ RM 77.9	0601020701
TVA	475326		Clinch River @ RM 9.0	0601020701
TVA			Clinch River @ RM 9.7	0601020701
TVA	475157		Coal Creek @ RM 1.22	0601020701
TVA	475156		Coal Creek @ RM 4.94	0601020701
TVA	475757		Coal Creek @ RM 8.45	0601020701
TVA	475758		Coal Creek @ RM 8.95	0601020701
TVA	475153		Hinds Creek @ RM 0.75	0601020701
TVA	475391		Hinds Creek @ RM 3.56	0601020701
TVA	475403		Hinds Creek @ RM 6.73	0601020701
TVA	477166		McCoy Branch @ RM 0.4	0601020701
TVA			McCoy Branch Embayment	0601020701
TVA	476628		Patterson Creek at RM 0.01	0601020701

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA			Scarboro Creek Embayment	0601020701
TVA	477331		Unnamed Tributary @ RM 0.15	0601020701
TVA	477332		Unnamed Tributary @ RM 0.38	0601020701
TVA	475775		Whiteoak Creek @ RM 0.05	0601020701
TVA	476592		Whiteoak Creek @ RM 0.18	0601020701
TVA			Whiteoak Creek @ RM 0.2	0601020701
TVA	476591		Whiteoak Creek @ RM 0.38	0601020701
TVA	476516		Whiteoak Creek @ RM 0.4	0601020701
TVA	476626		Whiteoak Creek @ RM 0.45	0601020701
TVA			Whiteoak Creek @ RM 0.6	0601020701
TVA	476627		Whiteoak Creek @ RM 1.2	0601020701
TVA	476590		Whiteoak Creek @ RM 51.0	0601020701
TVA	476589		Whiteoak Creek @ RM 55.0	0601020701
TVA	477333		Worthington Branch @ RM 0.4	0601020701
TVA	477324		Worthington Branch @ RM 1.2	0601020701
TVA	477325		Worthington Branch @ RM 1.65	0601020701
TVA	477673		Worthington Branch @ RM 1.65	0601020701
USEPA			Clinch River	0601020701
USEPA	190002		Clinch River	0601020701
USEPA	470106		Clinch River	0601020701
USEPA	472208		Clinch River	0601020701
TDEC	BULLR005.2KN		Bull Run Creek @ RM 5.2	0601020702
TDEC	BULLR016.2KN		Bullrun Creek @ RM 16.2	0601020702
TDEC	BULLR034.1UN		Bullrun Creek @ RM 34.1	0601020702
TVA	477313		Bull Run Creek @ RM 1.8	0601020702
TVA	477314		Bull Run Creek @ RM 3.5	0601020702
TVA	477315		Bull Run Creek @ RM 7.3	0601020702
TVA	477323		Bullrun Creek @ RM 1.9	0601020702
TVA	476049		Bullrun Creek @ RM 16.3	0601020702
TVA	475232		Bullrun Creek @ RM 25.86	0601020702
TVA	475152		Bullrun Creek @ RM 5.25	0601020702
TDEC	BEAVE031.9KN	000140	Beaver Creek @ RM 31.9	0601020703
TDEC	BEAVE025.3KN	000150	Clinch River @ RM 25.3	0601020703
TDEC	BEAVE024.7KN	000160	Clinch River @ RM 24.7	0601020703
TVA	477310		Beaver Creek @ RM 13.9	0601020703
TVA	477309		Beaver Creek @ RM 10.13	0601020703
TVA	475261		Beaver Creek @ RM 13.89	0601020703
TVA	475278		Beaver Creek @ RM 14.75	0601020703
TVA	475277		Beaver Creek @ RM 15.34	0601020703
TVA	475720		Beaver Creek @ RM 16.8	0601020703
TVA	475721		Beaver Creek @ RM 17.1	0601020703
TVA	475279		Beaver Creek @ RM 20.88	0601020703
TVA	475719		Beaver Creek @ RM 21.15	0601020703
TVA	475357		Beaver Creek @ RM 24.60	0601020703

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	475376		Beaver Creek @ RM 26.69	0601020703
TVA	475718		Beaver Creek @ RM 29.10	0601020703
TVA	477311		Beaver Creek @ RM 29.3	0601020703
TVA	477307		Beaver Creek @ RM 3.4	0601020703
TVA	477312		Beaver Creek @ RM 31.8	0601020703
TVA	475390		Beaver Creek @ RM 31.92	0601020703
TVA	475089		Beaver Creek @ RM 36.92	0601020703
TVA	477308		Beaver Creek @ RM 6.9	0601020703
TDEC	BEAVE012.5KN		Beaver Creek @ RM 12.5	0601020705
TDEC	BEAVE023.6KN		Beaver Creek @ RM 23.6	0601020705
TDEC	BRUSH001.0AN		Brushy Creek @ RM 1.0	0601020705
TDEC	INDIA001.5RO		Indian Creek @ RM 1.5	0601020705
TDEC	POPLA000.1RO	002175	Poplar Creek @ RM 0.1	0601020705
TDEC	POPLA019.8AN		Poplar Creek @ RM 19.8	0601020705
TVA			Bear Creek @ RM 0.4	0601020705
TVA	476515		Bear Creek @ RM 0.55	0601020705
TVA			Bear Creek @ RM 1.2	0601020705
TVA	476514		Bear Creek @ RM 2.8	0601020705
TVA	476617		Bear Creek @ RM 2.9	0601020705
TVA			Bear Creek @ RM 3.1	0601020705
TVA	476618		Bear Creek @ RM 5.0	0601020705
TVA	476513		Bear Creek @ RM 7.4	0601020705
TVA			Bear Creek. @ RM 2.75	0601020705
TVA	476608		East Fork Poplar Creek @ RM 0.03	0601020705
TVA	476572		East Fork Poplar Creek @ RM 0.23	0601020705
TVA	476571		East Fork Poplar Creek @ RM 1.2	0601020705
TVA	476605		East Fork Poplar Creek @ RM 1.35	0601020705
TVA	476620		East Fork Poplar Creek @ RM 1.7	0601020705
TVA	476508		East Fork Poplar Creek @ RM 10.0	0601020705
TVA	476597		East Fork Poplar Creek @ RM 10.05	0601020705
TVA	476606		East Fork Poplar Creek @ RM 10.9	0601020705
TVA	476563		East Fork Poplar Creek @ RM 11.3	0601020705
TVA	476596		East Fork Poplar Creek @ RM 12.06	0601020705
TVA	476561		East Fork Poplar Creek @ RM 12.39	0601020705
TVA	476560		East Fork Poplar Creek @ RM 12.89	0601020705
TVA	476595		East Fork Poplar Creek @ RM 13.0	0601020705
TVA	476621		East Fork Poplar Creek @ RM 13.5	0601020705
TVA	476593		East Fork Poplar Creek @ RM 13.55	0601020705
TVA	476588		East Fork Poplar Creek @ RM 13.66	0601020705
TVA	476573		East Fork Poplar Creek @ RM 13.71	0601020705
TVA	476546		East Fork Poplar Creek @ RM 13.74	0601020705
TVA			East Fork Poplar Creek @ RM 13.8	0601020705
TVA	476594		East Fork Poplar Creek @ RM 14.02	0601020705
TVA	476507		East Fork Poplar Creek @ RM 14.36	0601020705

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TVA	476570		East Fork Poplar Creek @ RM 2.36	0601020705
TVA			East Fork Poplar Creek @ RM 2.85	0601020705
TVA	476604		East Fork Poplar Creek @ RM 2.85	0601020705
TVA	476510		East Fork Poplar Creek @ RM 3.3	0601020705
TVA	476569		East Fork Poplar Creek @ RM 3.5	0601020705
TVA			East Fork Poplar Creek @ RM 4.0	0601020705
TVA	476568		East Fork Poplar Creek @ RM 4.5	0601020705
TVA	476603		East Fork Poplar Creek @ RM 4.52	0601020705
TVA	475125		East Fork Poplar Creek @ RM 4.77	0601020705
TVA	476602		East Fork Poplar Creek @ RM 4.92	0601020705
TVA	476567		East Fork Poplar Creek @ RM 5.74	0601020705
TVA	476566		East Fork Poplar Creek @ RM 6.72	0601020705
TVA	476509		East Fork Poplar Creek @ RM 6.89	0601020705
TVA	476601		East Fork Poplar Creek @ RM 7.05	0601020705
TVA	476565		East Fork Poplar Creek @ RM 7.95	0601020705
TVA			East Fork Poplar Creek @ RM 8.0	0601020705
TVA	476600		East Fork Poplar Creek @ RM 8.12	0601020705
TVA	476599		East Fork Poplar Creek @ RM 8.7	0601020705
TVA			East Fork Poplar Creek @ RM 8.8	0601020705
TVA	476564		East Fork Poplar Creek @ RM 9.21	0601020705
TVA	476598		East Fork Poplar Creek @ RM 9.74	0601020705
TVA	475158		Indian Creek @ RM 3.36	0601020705
TVA	476512		Mill Branch @ RM 0.20	0601020705
TVA	475776		Poplar Creek @ RM 0.1	0601020705
TVA	476614		Poplar Creek @ RM 0.2	0601020705
TVA	476578		Poplar Creek @ RM 1.0	0601020705
TVA	477617		Poplar Creek @ RM 1.0	0601020705
TVA	476616		Poplar Creek @ RM 13.0	0601020705
TVA	475124		Poplar Creek @ RM 13.77	0601020705
TVA	476558		Poplar Creek @ RM 13.8	0601020705
TVA	475123		Poplar Creek @ RM 21.62	0601020705
TVA	476579		Poplar Creek @ RM 3.8	0601020705
TVA	476615		Poplar Creek @ RM 5.3	0601020705
TVA	476580		Poplar Creek @ RM 6.8	0601020705

Table A4-4. STORET Water Quality Monitoring Stations in the Lower Clinch River Watershed*. RM, River Mile; TDEC, Tennessee Department of Environment and Conservation; TVA, Tennessee Valley Authority; USEPA, United States Environmental Protection Agency.*

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	MADI	WATERBODY	HUC-10
TN0020630	Norris STP	4952	Sewerage System	Minor	Buffalo Creek @ RM 4.4	0601020701
TN0074713	Intex Enterprises	3479	Coating, Engraving, and Allied Service	Major	Buffalo Creek @ RM 0.3 to Hinds Creek @ RM 5.5	0601020701
TN0056073	Travel Centers of America-Concord	5541	Gas Service Station	Minor	Turkey Creek @ RM 4.9	0601020701
TN0001376	Modive Manufacturing	3443	Fabricated Plate Work	Minor	Clinch River @ RM 64.5 (Outfall 002) and Clinch River @ RM 64.6 (Outfall 003)	0601020701
TN0023981	Rexnord Corporation	3562	Ball and Roller Boring	Minor	Clinch River @ RM 64.8	0601020701
TN0021971	Carlisle Tire	3011	Tire and Inner Tube	Minor	UT to Clinch River @ RM 62.7	0601020701
TN0064564	Eagle Bend Manufacturing	3465	Auto Stamping	Minor	Clinch River @ RM 6.5	0601020701
TN0056464	Clinton Utility Board-Pine Meadows Mobile STP	4952	Sewerage System	Minor	UT @ mile 0.5 to Washington Branch @ RM 1.5	0601020701
TN0025127	Lake City STP	4952	Sewerage System	Minor	Coal Creek @ RM 3.3	0601020701
TN0005410	TVA Bull Run Fossil Plant	4911	Electric Service	Major	Clinch River @ RM 48.0	0601020701
TN0026506	Clinton STP #1	4952	Sewerage System	Major	Clinch River @ RM 56.9	0601020701
TN0057860	Briceville Elementary School	4952	Sewerage System	Minor	Coal Creek @ RM 8.6	0601020701
TN0074071	North Anderson County Utility District-Airshaft Hollow	4952	Sewerage System	Minor	Slatestone Creek @ RM 1.5	0601020701
TN0064548	Flying J Travel Plaza #5034	5541	Gas Service Station	Minor	Grable Branch @ RM 0.6 to Hickory Creek @ RM 1.7	0601020701
TN0067024	Petro Stopping Center	5541	Gas Service Station	Minor	Grable Branch	0601020701
TN0065137	Knoxville Travel Center	5541	Gas Service Station	Minor	Grable Branch @ RM 0.8	0601020701
TN0077895	ORNL-Spellation Neutron Source Facility	8733	Noncommercial Research	Minor	White Oak Creek @ RM 4.2	0601020701
TN0002941	USDOE-ORNL	9711	National Security	Major	White Oak Creek, Clinch River, Melton Branch	0601020701
TN0065030	Soaring Eagle Campground and RV	4952	Sewerage System	Minor	Clinch River (Watts Bar Reservoir) @ RM 17.5	0601020701
TN0024171	Oak Ridge-Clinch River Industrial Park STP	4952	Sewerage System	Minor	Clinch River @ RM 14.5	0601020701
TN0002950	East Tennessee Technology Park-USDOE	2819	Inorganic Chemicals	Minor	Poplar Creek @ RM 1.9, Clinch River, Mitchell Branch	0601020701
TN0074225	East Tennessee Technology Park-Central Neutralization Facility	4953	Refuse System	Major	Clinch River @ RM 12.0	0601020701
TN0074241	East Tennessee Technology Park WWTP	4952	Sewerage System	Minor	Poplar Creek @ RM 1.9	0601020701

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	MADI	WATERBODY	HUC-10
TN0078051	City of Oak Ridge-Rarity Ridge WWTP	4952	Sewerage System	Minor	Clinch River @ RM 12.85	0601020701
TN0024368	Family Inns of America	4952	Sewerage System	Minor	UT to Young Creek @ RM 2.7	0601020701
TN0058971	Days Inn Kingston	4952	Sewerage System	Minor	UT @ RM 0.1 to Young Creek @ RM 2.7	0601020701
TN0061701	Kingston STP	4952	Sewerage System	Major	Clinch River @ RM 0.28	0601020701
TN0022870	Maynardville STP	4952	Sewerage System	Minor	North Fork Bull Run Creek @ RM 3.1	0601020702
TN0059323	Hallsdale-Powell Raccoon Valley STP	4952	Sewerage System	Minor	Bull Run Creek @ RM 12.6	0601020702
TN0024287	Hallsdale-Powell Utility District STP	4952	Sewerage System	Major	Beaver Creek @ RM 23.5	0601020703
TN0060020	West Knox Utility District-Karns Beaver Creek STP	4952	Sewerage System	Major	Beaver Creek @ RM 10.7	0601020703
TN0057878	Dutch Valley Elementary School	4952	Sewerage System	Minor	UT @ RM 2.2 to Brushy Fork Creek @ RM 11.1	0601020705
TN0002968	USDOE-OR Y12 Plant	9611	Admin of General Economic Programs	Major	East Fork Poplar Creek, McCoy Branch, Bear Creek	0601020705
TN0024155	Oak Ridge STP	4952	Sewerage System	Major	East Fork Poplar Creek @ RM 8.3	0601020705
TN0020885	Oliver Springs STP	4952	Sewerage System	Minor	Poplar Creek @ RM 15.4	0601020705

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

FACILITY NUMBER	PERMITEE	SIC	SIC NAME	WATERBODY	HUC-10
TN0045748	Beech Grove Processing Co. (Beech Grove Processing Plant #1)	1221	Preparation Plants, Bituminous Coal or Lignite	Beech Grove Fork	0601020701
TN0053732	Beech Grove Processing Co. (Beech Grove Refuse Area #2)	1221	Preparation Plants, Bituminous Coal or Lignite	Beech Grove Fork	0601020701
TN0053830	Beech Grove Processing Co. (Beech Grove Refuse Area #3)	1221	Preparation Plants, Bituminous Coal or Lignite	Beech Grove Fork	0601020701
TN0054470	General Shale Products (Mine #15-Wolf Valley)	1459	Shale (Common) Quarrying-not for Manufacturing	Little Dismal Creek	0601020701
TN0051918	Premium Coal Co. (Tipple and Preparation Plant)	1221	Preparation Plants, Bituminous Coal or Lignite	Slatestone Creek	0601020701
TN0063592	Premium Coal Co. (Refuse Area #2)	1221	Bituminous Coal Refuse Area	Slatestone Creek	0601020701
TN0004219	The Rogers Group (Oak Ridge Quarry)	1422	Limestone-Crushed and Broken	Union Valley Creek	0601020701
TN0052540	S&H Mining, Inc. (Deep Mine #7)	1221	Coal Mining Bituminous, Underground	Slatestone Creek	0601020701
TN0049832	The Tennessee Coal Co. (Mine #2)	1221	Coal Mining Bituminous, Underground	Disney Hollow	0601020701
TN0053678	The Tennessee Coal Co. (Deep Mine #5)	1221	Coal Mining Bituminous, Underground	Beech Grove Fork	0601020701
TN0053813	The Tennessee Coal Co. (Deep Mine #6)	1221	Coal Mining Bituminous, Underground	Beech Grove Fork	0601020701
TN0066061	The Tennessee Coal Co. (Mine #7)	1221	Coal Mining Bituminous, Underground	Beech Grove Fork	0601020701
TN0070921	The Tennessee Coal Co. (Deep Mine #10)	1221	Coal Mining Bituminous, Underground	Beech Grove Fork	0601020701
TN0026484	Vulcan Construction Materials (Dixie Lee Quarry)	1422	Limestone-Crushed and Broken	Hickory Creek	0601020701
TN0076236	Duracap Asphalt Materials (Asphalt Plant)	2951	Asphalt and Asphaltic Mixtures for Paving	Williams Branch	0601020702
TN0072150	Loyston Road Quarry	1422	Limestone-Crushed and Broken	UT to Bull Run Creek	0601020702
TN0072796	Renfro Construction Company (Diggs Gap Road Asphalt Plant)	2951	Asphalt and Asphaltic Mixtures for Paving	Foster Branch	0601020702
TN0063355	Rinker Materials South Central (I-75 Quarry)	1422	Limestone-Crushed and Broken	Williams Branch and Foster Branch	0601020702
TN0072460	Vulcan Construction Materials (Maynardville Quarry)	1422	Limestone-Crushed and Broken	Raccoon Creek and UT to Raccoon Creek	0601020702

FACILITY NUMBER	PERMITEE	SIC	SIC NAME	WATERBODY	HUC-10
TN0063274	Dalco of Tennessee (Poplar Creek Mine)	1221	Coal Mining Bituminous, Underground	Hundred Acre Hollow	0601020705
TN0072231	Dalco of Tennessee (Tipple #1)	1221	Preparation of Plants, Bituminous Coal or Lignite	Middle Creek	0601020705
TN0072249	Dalco of Tennessee (Hooper Mine)	1222	Coal Mining Bituminous, Underground	Geise Creek	0601020705
TN0025704	The Rogers Group (Oliver Springs Sand Quarry and Plant)	1422	Construction Sand and Gravel Mining	UT to Massengill Spring Creek	0601020705
TN0076198	Tennessee Mining, Inc. (SRA Surface Mine)	1221	Coal Mining Bituminous, Surface	Hundred Acre Hollow and Prudential Hollow	0601020705

Table A4-6. Active Permitted Mining Sites in the Lower Clinch River Watershed. *SIC, Standard Industrial Classification, UT, Unnamed Tributary.*

FACILITY NUMBER	PERMITEE	WATERBODY	HUC-10
TN0073253	Anderson County Utility District WTP	Clinch River	0601020701
TN0005576	North Anderson County Utility District WTP	Clinch River	0601020701
TN0004553	Norris WTP	Clear Creek @ RM 74.5	0601020701
TN077593	West Knox Utility District-Williams Bend WTP	Clinch River (Melton Hill Reservoir) @ RM 36.7	0601020701
TN0074233	East Tennessee Technology Park WTP	Clinch River @ RM 14.4	0601020701
TN0073288	Melton Hill WTP	Bull Run Creek @ RM 5.2	0601020702
TN0074501	Fowler Springs WTP	Fowler Springs Branch @ RM 1.03	0601020702
TN0061620	Oliver Springs WTP	Hord Creek @ RM 1.0	0601020705

Table A4-7. Water Treatment Plants in the Lower Clinch River Watershed. *RM, River Mile.*

FACILITY NUMBER	PERMITEE	SIC	SIC NAME	WATERBODY	HUC-10
TNG110058	APAC Tennessee	3273	Ready-Mix Concrete	Clinch River (Melton Hill Lake) @ RM 66.0	0601020701
TNG110087	Harrison Ready Mix	3273	Ready-Mix Concrete	Clinch River @ RM 50.0	0601020701
TNG110093	Harrison Ready Mix	3273	Ready-Mix Concrete	Poplar Creek	0601020701
TNG110028	Ready-Mix Concrete, Inc.	3273	Ready-Mix Concrete	Foster Branch to Bull Run Creek @ RM 12.6	0601020702
TNG110128	Union Concrete Company	3273	Ready-Mix Concrete	Raccoon Creek to Bull Run Creek	0601020702
TNG110030	C&C Ready-Mix	3273	Ready-Mix Concrete	UT to Indian Creek to Poplar Creek @ RM 14.2	0601020705

Table A4-8. Ready Mix Concrete Plants in the Lower Clinch River Watershed. *RM, River Mile; UT, Unnamed Tributary.*

LOG NUMBER	COUNTY	DESCRIPTION	WATERBODY	HUC-10
NRS03.118	Roane	SR-1 Bridge and Approach	Clinch River	0601020701
NRS04.029	Roane	I-40 Bridge	Clinch River	0601020701
NRS00.268	Roane	325' culvert	UT to Melton Branch	0601020701
NRS00.042	Roane	Wetland Fill	White Oak Creek and Wetlands	0601020701
NRS03.090	Anderson	Bridge and Approach	Coal Creek	0601020701
NRS02.163	Roane	Wetland Fill/Stream Relocation (2)	UT to Paw Paw Creek	0601020701
NRS03.142	Roane	Mitchell Bridge Cross Removal	Mitchell Branch	0601020701
NRS03.179	Anderson	Wetland Fill	Wetland to UT to Andy Branch	0601020702
NRS00.079	Anderson	Maintenenace Dredging	Clinch River	0601020702
NRS01.301	Anderson	Water Intake Structure	Clinch River	0601020702
NRS03.403	Knox	Wetland Fill	First Creek	0601020703
NRS01.284	Knox	SR 131 Construction	Isolated	0601020703
NRS02.320B	Knox	Road Widening	UT to Plumb Creek	0601020703
NRS02.320	Knox	Road Widening	Plumb Creek	0601020703
NRS02.320E	Knox	Road Widening	Plumb Creek	0601020703
NRS02.320F	Knox	Road Widening	UT to Plumb Creek	0601020703
NRS02.320C	Knox	Road Widening	UT to Plumb Creek	0601020703
NRS02.320D	Knox	Road Widening	UT to Plumb Creek	0601020703

Table A4-9. Individual ARAP Permits Issued January 2000 Through June 2004 in Lower Clinch River Watershed. *UT, Unnamed Tributary.*

\

FACILITY NUMBER	FACILITY NAME	SECTOR	RECEIVING STREAM	AREA*	HUC-10
TNR051823	Clayton Homes	A	UT(s) To Buffalo Creek	20	0601020701
TNR056456	MAG USA, Inc.	AB	Hinds Creek @ RM 7.2	1	0601020701
TNR051306	Becromal of America	AA	Clinch River @ RM 64.4	2.26	0601020701
TNR050535	Modive Manufacturing	AB	Clinch River	37.64	0601020701
TNR053601	Carlisle Tire	Y	Clinch River	110	0601020701
TNR053880	Breed Technologies	AB, V	UT to Fourth Creek	15	0601020701
TNR050171	DH Compounding Co.	Y	Clinch River	5	0601020701
TNR050016	Eagle Bend Manufacturing	AA	Clinch River	6	0601020701
TNR054184	Ultimate Tool and Die, Inc.	AB	Cane Creek	0.344	0601020701
TNR053185	TVA Bull Run Fossil Plant	O, P	Clinch River @ RM 47.9 and @ RM 48.1	114.1	0601020701
TNR053902	Yarnell Demolition Landfill	L	Hickory Creek	47.09	0601020701
TNR054049	Trailmanor	AB	Right Fork Coal Creek	15.7	0601020701
TNR056118	European Import Auto Parts	M	UT to Clinch River	6	0601020701
TNR054256	A&S Building Systems	AA	Right Fork Coal Creek	13.3	0601020701
TNR050694	Fox Auto Salvage	M	Clinch River	7	0601020701
TNR053196	Waste Connections	N, P	Melton Hill Lake	1.5	0601020701
TNR053750	The Mulch Company	A	UT to Hickory Creek	8	0601020701
TNR053322	Coorstek	E	Melton Hill Lake	15.4	0601020701
TNR050388	Manufacturing Services	A, AA	East Fork Poplar Creek	8	0601020701
TNR050708	Watt Road Plant	D	Hickory Creek	3	0601020701
TNR053814	TRU Waste Remediation Facility	K	White Oak Creek	5	0601020701
TNR051628	Duratek Services	AD, P	UT to Grassy Creek	30	0601020701
TNR052083	ATG Catalytic	C	Grassy Creek	6.31	0601020701
TNR050321	Diversified Scientific Service	K	WWC to Clinch River	6.9	0601020701
TNR056119	Floyd's Salvage and Wrecker Service	M	Potato Creek	1	0601020702
TNR050756	Smith Auto Parts and Used cars	M	Not Identified	4	0601020702
TNR054583	Jimmy's Automotive	M	Bull Run Creek	8	0601020702
TNR055906	Renfro Construction Company	D	Raccoon Creek	7.5	0601020702
TNR056277	Sexton Auto Parts	M	Bull Run Creek	5	0601020702
TNR053206	Clayton Homes	A	UT to North Fork Bull Run Creek	12	0601020702
TNR055929	Buckeye Wheel and Axle	AA	Suckstone Creek	1.5	0601020702
TNR053917	Overton's 33 Quarry	P	Bull Run Creek	4	0601020702
TNR055058	Underwood Auto Parts	M	WWC to Allen Creek	6	0601020702
TNR051248	Chestnut Ridge Landfill Recycling Center	L, P	Andy Branch Creek	412	0601020702
TNR050614	Lambert Auto Parts	M	Bull Run Creek	6	0601020702
TNR050291	Red Johnson Auto Parts	M	Jennings Branch	6	0601020702

FACILITY NUMBER	FACILITY NAME	SECTOR	RECEIVING STREAM	AREA*	HUC-10
TNR050861	Car World	M	Beaver Creek	4	0601020702
TNR053768	Inskip Concrete Products	P	Knoxville Storm Sewer System	3	0601020703
TNR053208	CMH Manufacturing	A	Hines Branch	2.74	0601020702
TNR054542	Crossover Drives, Inc.	AB	Beaver Creek	0.2	0601020703
TNR051350	Mid-Lakes Corporation	V	Beaver Creek	1.1	0601020703
TNR054576	Volunteer Volvo	P	Haw Branch	5.5	0601020703
TNR053565	United Parcel Service	P	Haw Branch	22.49	0601020703
TNR053226	Safety-Kleen Systems	K	Beaver Creek	3	0601020703
TNR054298	Video Publishing/Printing	X	UT to Beaver Creek	0.945	0601020703
TNR056359	Petes Auto Parts	M	Melton Hill Reservoir	7	0601020703
TNR050723	Vinylex Corporation	Y	UT to Meadow Creek	16.8	0601020703
TNR054362	Initrac Railroad Materials	N	Meadow Creek and Beaver Creek	10	0601020703
TNR053696	PBR Automotive USA	AB, F	Beaver Creek	35	0601020703
TNR050990	Boeing Defense and Space Group	AB	Clinch River	205	0601020705
TNR053933	Tate Service Center and Auto Salvage	M	East Fork Poplar Creek	3.5	0601020705
TNR053559	Unites parcel Service	P	UT to Poplar Creek	1.49	0601020705
TNR054068	Road Products Corp.	Y	First Creek	0.28	0601020705

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

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

Table A4-11. TMSP Sectors and Descriptions.

APPENDIX V

NUTRIENT MANAGEMENT PLANS APPLIED	ACRES
Feed Management	0
Irrigation Management	0
Water Management	0
Nutrient Management	0
Waste Utilization	0

Table A5-1a. Nutrient Management Conservation Practices in Partnership with NRCS in the Lower Clinch River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period.*

PARAMETER	ACRES
Acres of Pest Management Systems Applied	17

Table A5-1b. Pest Management Conservation Practices in Partnership with NRCS in the Lower Clinch River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period.*

COMMUNITY	PROJECT DESCRIPTION	AWARD DATE	AWARD AMOUNT
Maynardville	Sewer Plant Expansion	03/25/1998	$406,089
Maynardville	Sewer Line Expansion	07/13/2000	$84,000
Oak Ridge	WTP, Pump Stations, Sewers Upgrade	02/26/1998	$11,970,000
Oak Ridge	Sanitary Sewer Collection System Upgrade	01/28/1999	$5,000,000
Oak Ridge	Pump Stations/Other Equipment Upgrade	02/03/2003	$7,000,000
Oliver Springs	WTP/Sanitary sewer Upgrade	05/05/1992	$3,060,000

Table A5-2. Communities in the Lower Clinch River Watershed Receiving SRF Grants or Loans.

PRACTICE	NRCS CODE	NUMBER OF BMPs
Critical Area Planting	342	11
Fence	382	2
Grade Stabilization Structure	410	1
Grassed Waterway	412	1
Heavy Use Area	561	16
Pasture/Hay Planting	512	58
Pipeline	516	6
Pond	378	21
Streambank Protection	580	3
Upland Wildlife Habitat Management	645	1
Waste Management System	312	1
Watering Facility	614	16

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