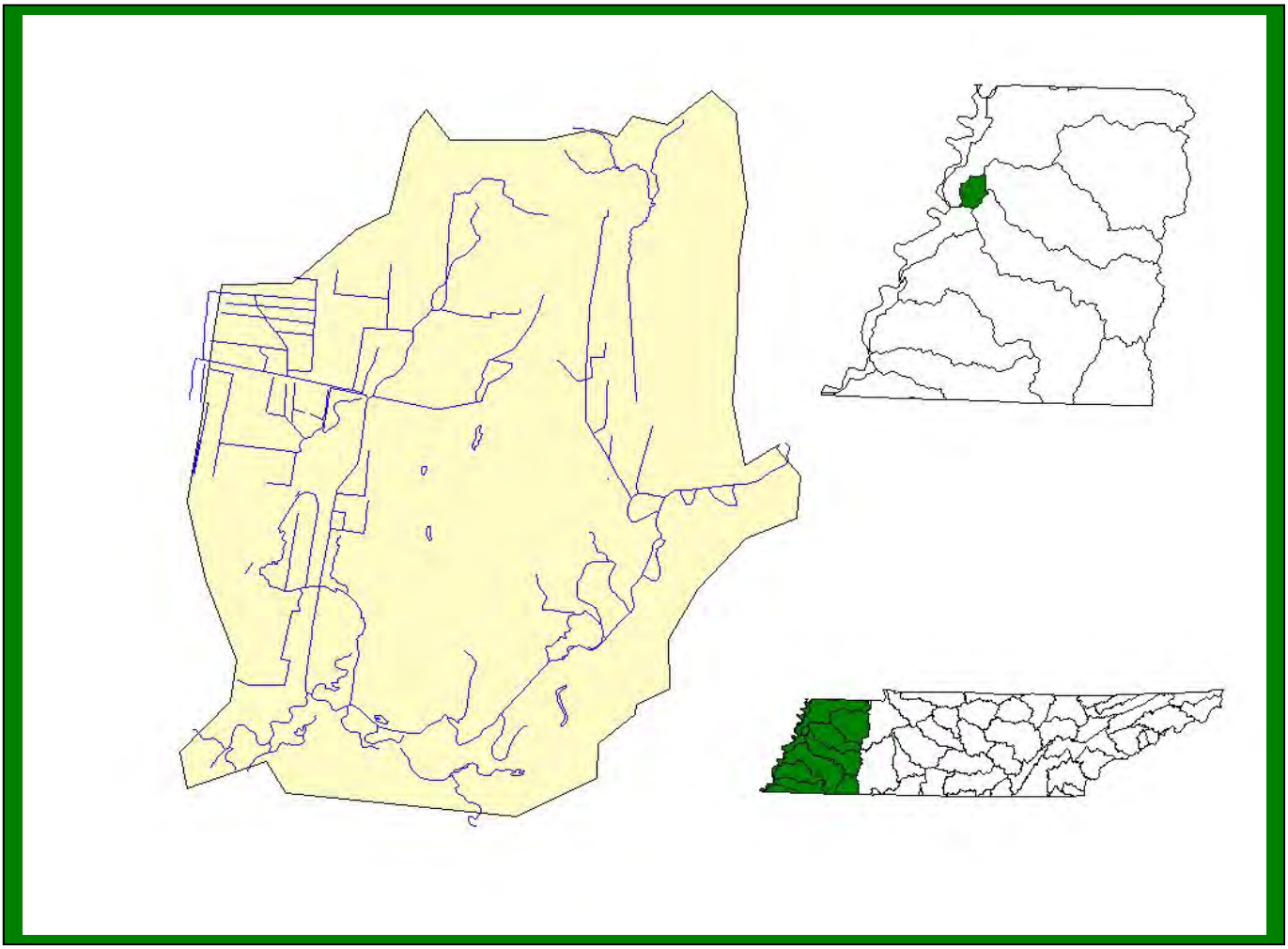
FORKED DEER RIVER WATERSHED (08010206)

OF THE MISSISSIPPI RIVER BASIN

WATERSHED WATER QUALITY MANAGEMENT PLAN



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

GLOSSARY

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

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

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

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

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

AFO. Animal Feeding Operation.

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

ARAP. Aquatic Resource Alteration Permit.

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

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

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

Benthic. Bottom dwelling.

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

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

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

CAFO. Concentrated Animal Feeding Operation.

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

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

DO. Dissolved oxygen.

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

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

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

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

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

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

MRLC. Multi-Resolution Land Classification.

MS4. Municipal Separate Storm Sewer System.

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

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

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

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

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

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

SBR. Sequential Batch Reactor.

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

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

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

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

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

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

TMSP. Tennessee Multi-Sector Permit.

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

WAS. Waste Activated Sludge.

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

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

WET. Whole Effluent Toxicity.

WWTP. Waste Water Treatment Plant

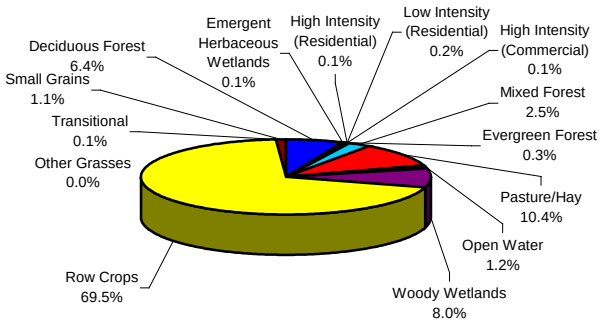
Summary – Forked Deer River

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 Forked Deer 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.

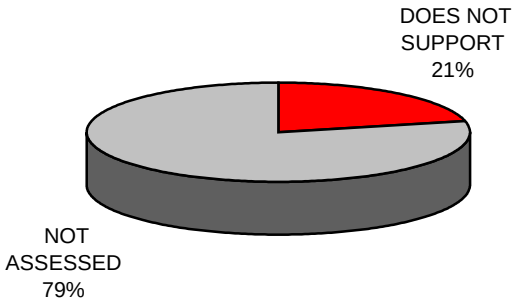
A detailed description of the watershed can be found in Chapter 2. The Forked Deer River Watershed is approximately 72 square miles and includes parts of two West Tennessee counties. A part of the Mississippi River drainage basin, the watershed has 55 stream miles.



Land Use in the Forked Deer River Watershed is based on MRLC Satellite Imagery.

Two rare plant and animal species have been documented in the watershed, including one rare fish species and one rare bird species.

A review of water quality sampling and assessment is presented in Chapter 3. The Forked Deer River Watershed is relatively small in size and thus using the Watershed Approach to Water Quality, only 1 ambient monitoring site was utilized. Monitoring results support the conclusion that the 21% of total stream miles (based on RF3) assessed do not support designated uses.



Water Quality Assessment in the Forked Deer River Watershed is Based on the 1998 303(d) List.

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

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

HUC-10 Subwatershed in the Forked Deer River Watershed.

Point source contributions to the Forked Deer River Watershed consist of one Mining Permit. Agricultural operations include cattle, chicken and hog farming. A maps illustrating the locations of the NPDES permit site is presented in the subwatershed.

Chapter 5 is entitled *Water Quality Partnerships in the Forked Deer 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. Army Corps of Engineers, U.S. Fish and Wildlife Service, U.S. Geological Survey), and state agencies (TDEC Division of Community Assistance, TDEC Division of Water Supply, West Tennessee River Basin Authority and Tennessee Department of Agriculture) are summarized.

Point and Nonpoint source approaches to water quality problems in the Forked Deer 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 Forked Deer 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.

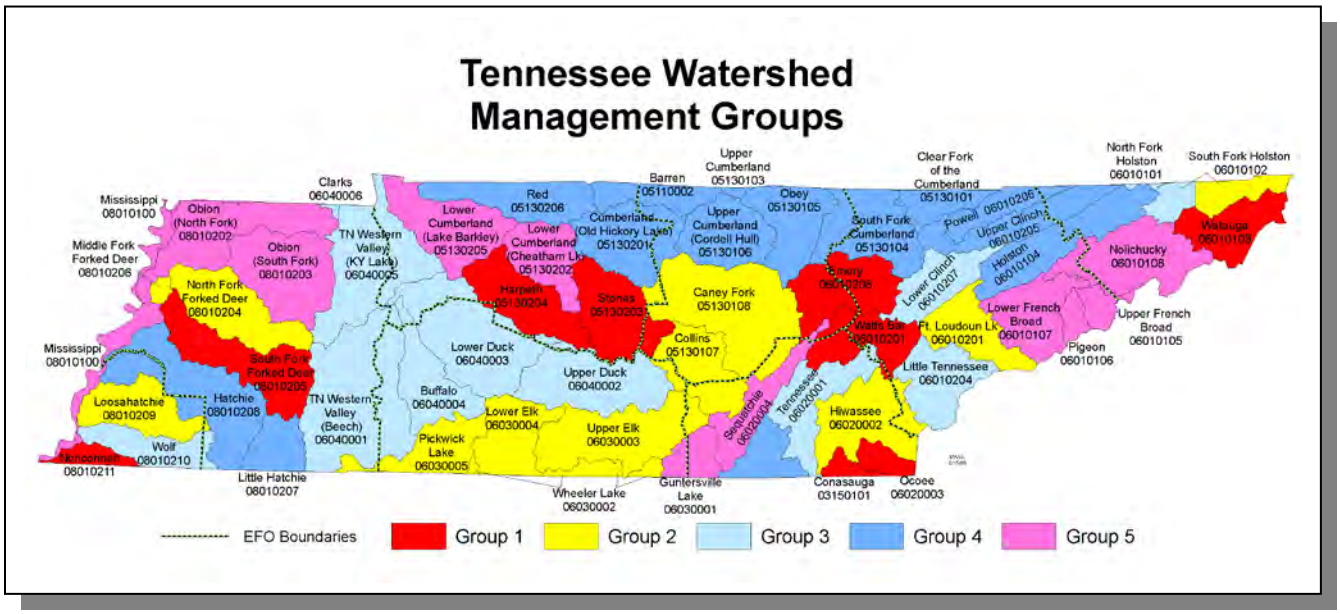


Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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.

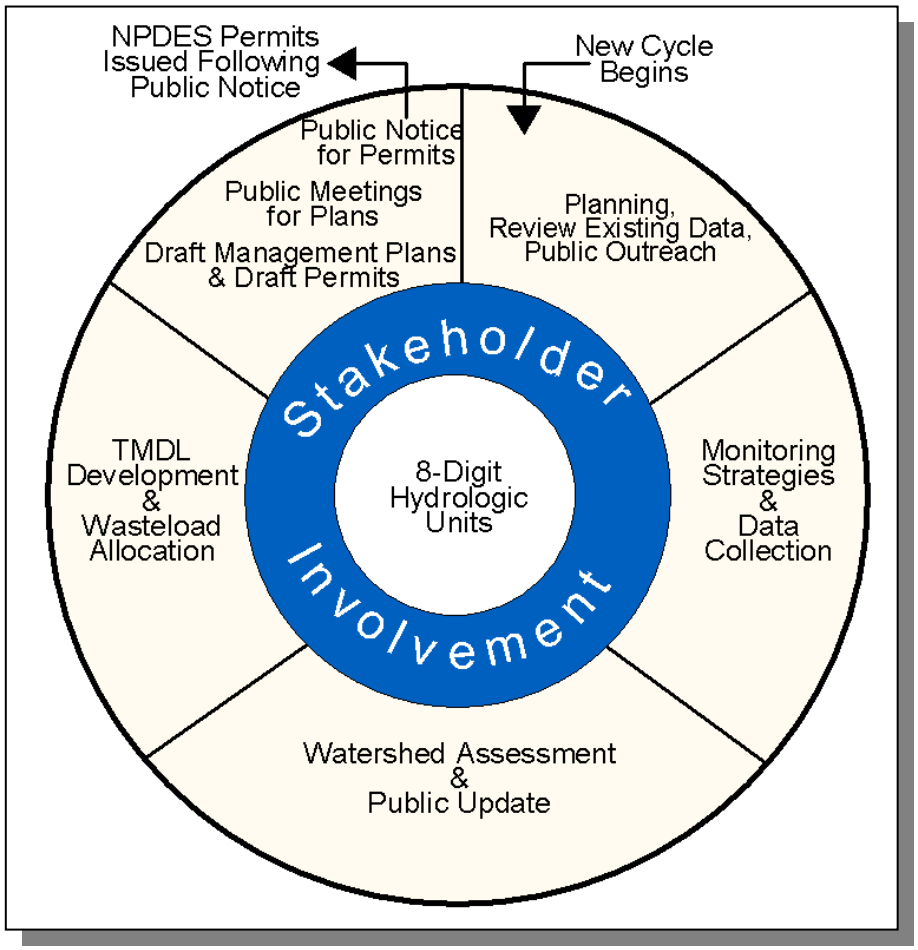


Figure 1-2. The Watershed Approach Cycle.

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 FORKED DEER RIVER WATERSHED

2.1. BACKGROUND. Originally called Okeena, the Forked Deer River was renamed in the 1780s when surveyors noticed that the branches flowing into the Mississippi River favored a deer's forked antlers. Sighting of a deer with deformed antlers convinced the surveyors to keep the name.

Fishing and hunting are common in this small watershed. Most of the region is in cropland, with some areas of deciduous forest. Soybeans, cotton, corn, sorghum, and vegetables are the main crops. The natural vegetation consists of Southern floodplain forest (oak, tupelo, bald cypress).

This Chapter describes the location and characteristics of the Forked Deer River Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. Located in West Tennessee, the Forked Deer River watershed includes parts of Dyer and Lauderdale Counties.

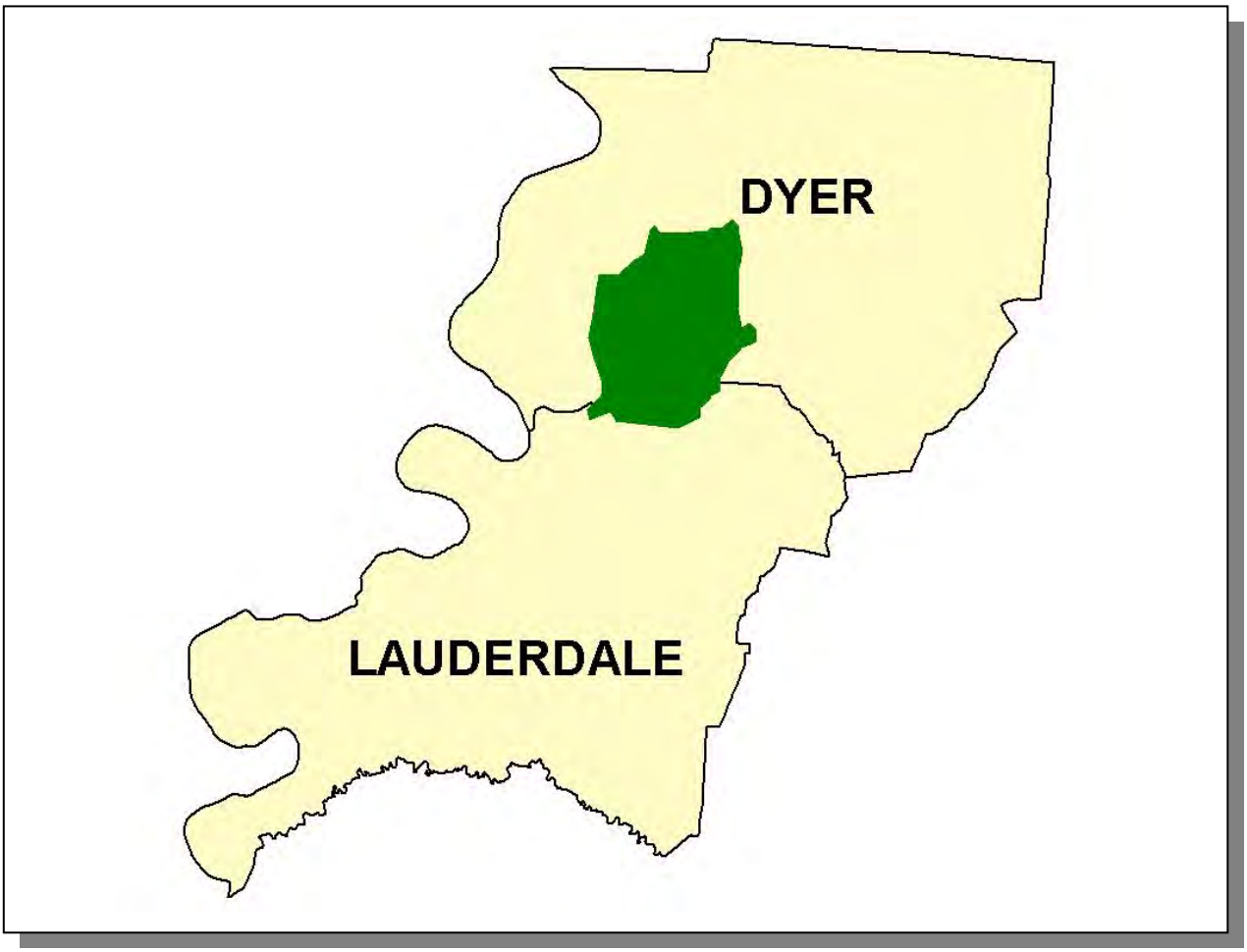


Figure 2-1. General Location of the Forked Deer River Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Dyer	94.3
Lauderdale	5.7

Table 2-1. The Forked Deer River Watershed Includes Parts of Two West Tennessee Counties.

2.2.B. Population Density Centers. Three state highways serve the major communities in the Forked Deer River Watershed.

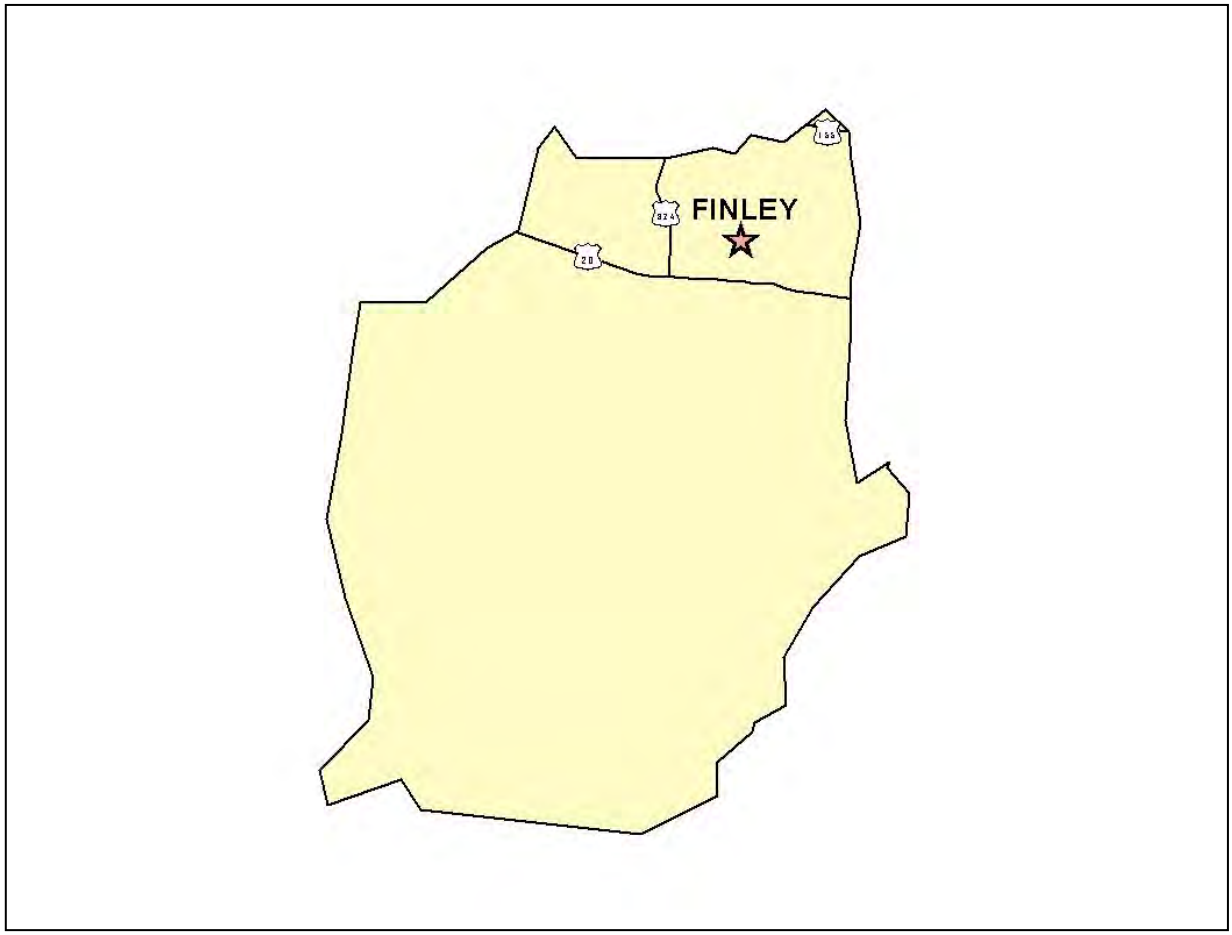


Figure 2-2. Municipalities and Roads in the Forked Deer River Watershed.

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Forked Deer River Watershed, designated 08010206 by the USGS, is approximately 72 square miles and empties to the Obion River.

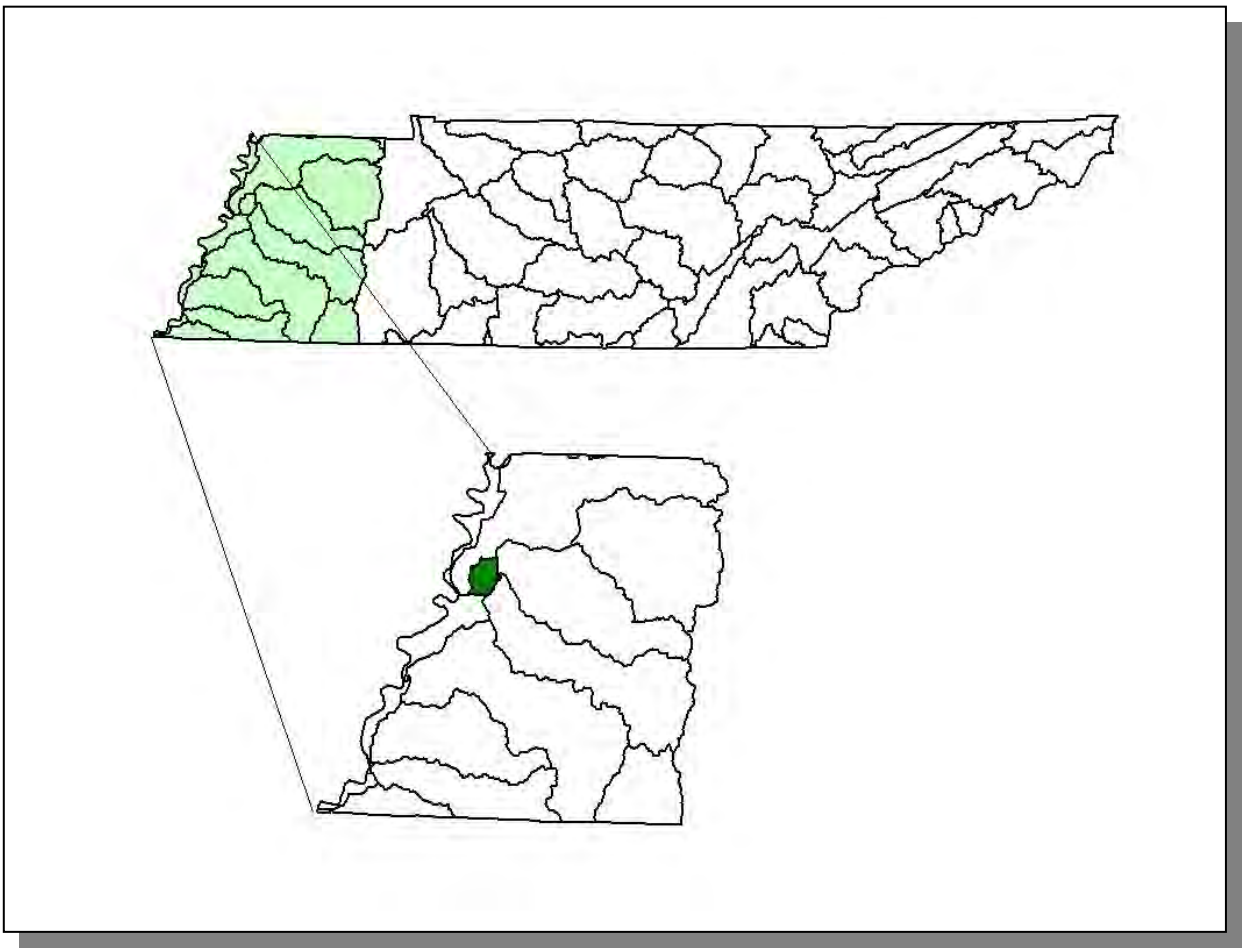


Figure 2-3. The Forked Deer River Watershed is Part of the Mississippi River Basin.

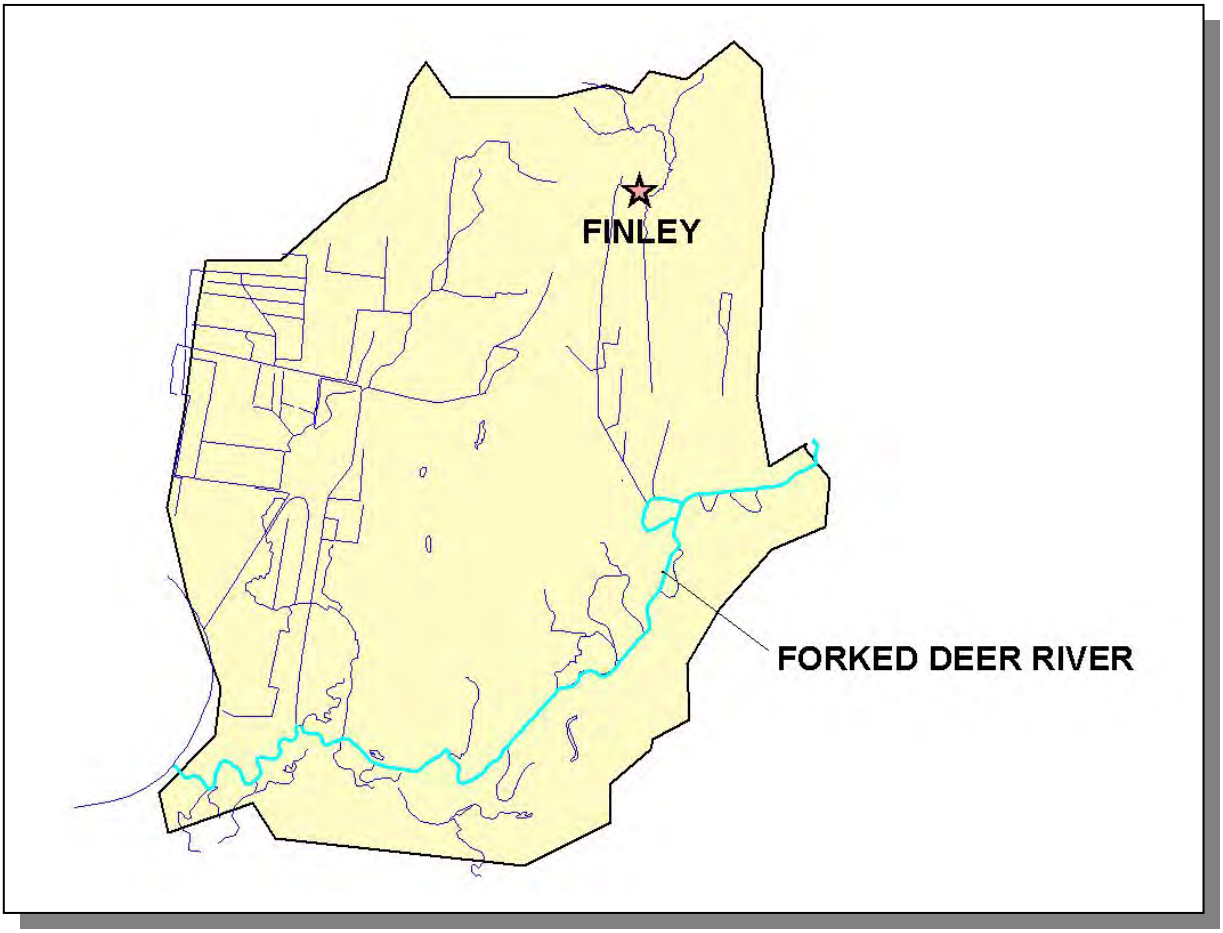


Figure 2-4. Hydrology in the Forked Deer River Watershed. *There are 55 stream miles recorded in River Reach File 3 in the Forked Deer River Watershed. Locations of Finley and Forked Deer River are shown for reference.*

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

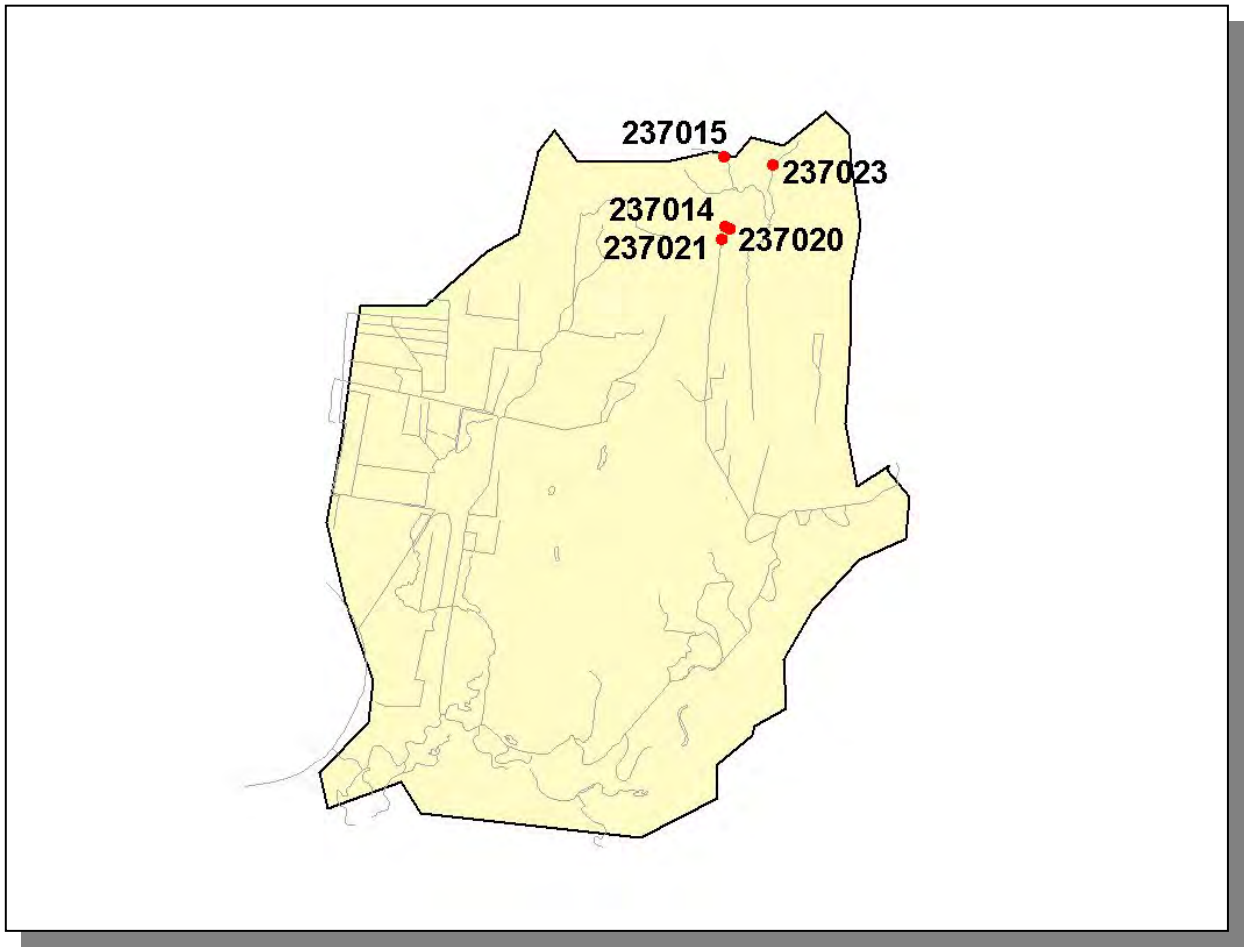


Figure 2-5. Location of Inventoried Dams in the Forked Deer River Watershed. *More information is provided in FD-Appendix II and on the TDEC homepage at:*
http://gwidc.gwi.memphis.edu/website/dams/viewer.htm

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

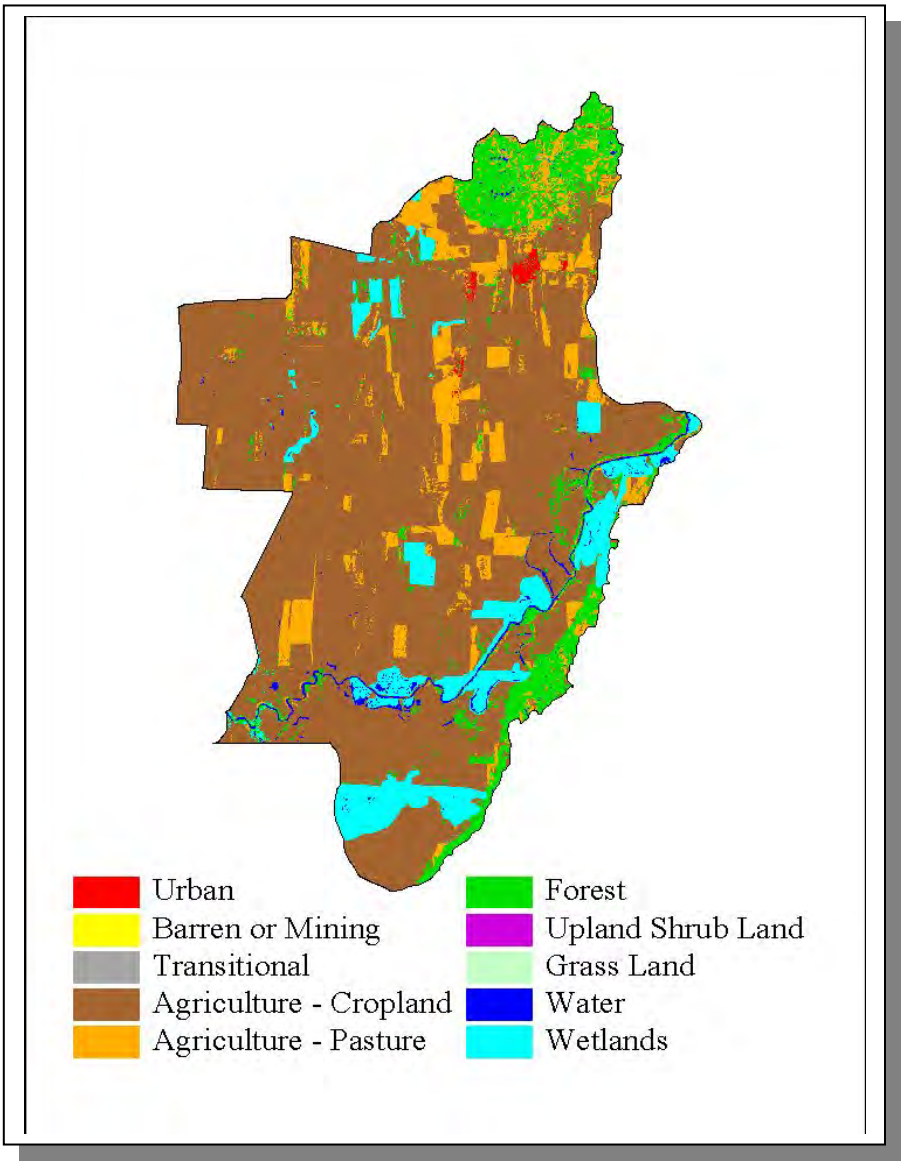


Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.

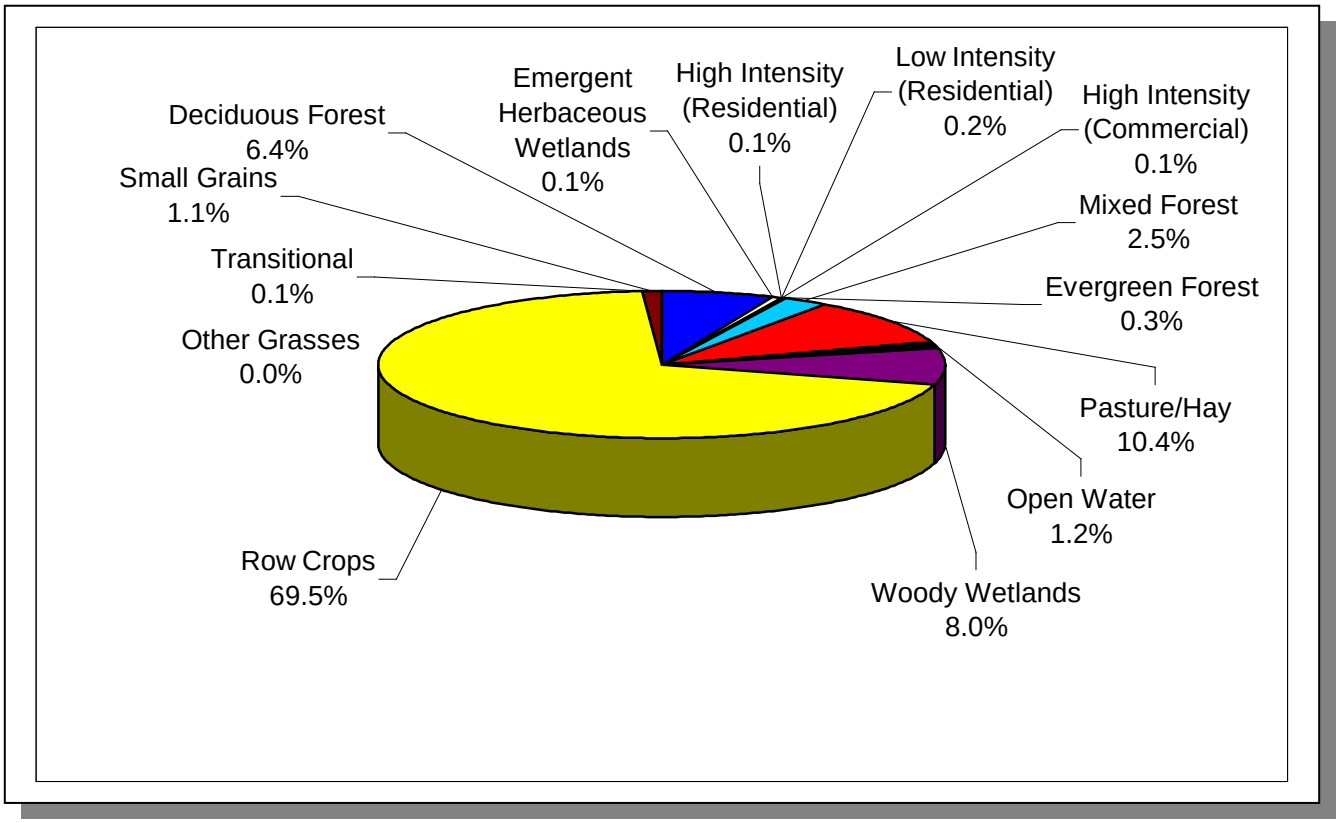


Figure 2-7. Land Use Distribution in the Forked Deer River Watershed. *More information is provided in FD-Appendix II.*

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

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Forked Deer River Watershed lies within 2 Level III ecoregions (Mississippi Alluvial Plain and Mississippi Valley Loess Plains) and contains 3 Level IV subecoregions (Griffen, Omernik, Azavedo):

- The Northern Mississippi Alluvial Plain (73a) within Tennessee is a relatively flat region of Quaternary alluvial deposits of sand, silt, clay, and gravel. It is bounded distinctly on the east by the Bluff Hills (74a), and on the west by the Mississippi River. Average elevations are 200-300 feet with little relief. Most of the region is in cropland, with some areas of deciduous forest. Soybeans, cotton, corn, sorghum, and vegetables are the main crops. The natural vegetation consists of Southern floodplain forest (oak, tupelo, bald cypress). The two main distinctions in the Tennessee portion of the ecoregion are between areas of loamy, silty, and sandy soils with better drainage, and areas of more clayey soils of poor drainage that may contain wooded swamp-land and oxbow lakes. Waterfowl, raptors, and migratory songbirds are relatively abundant in the region.

- The Bluff Hills (74a) consist of sand, clay, silt, and lignite, and are capped by loess greater than 60 feet deep. The disjunct region in Tennessee encompasses those thick loess areas that are generally the steepest, most dissected, and forested. The carved loess has a mosaic of microenvironments, including dry slopes and ridges, moist slopes, ravines, bottomland areas, and small cypress swamps. While oak-hickory is the general forest type, some of the undisturbed bluff vegetation is rich in mesophytes, such as beech and sugar maple, with similarities to hardwood forests of eastern Tennessee. Smaller streams of the Bluff Hills have localized reaches of increased gradient and small areas of gravel substrate that create aquatic habitats that are distinct from those of the Loess Plains (74b) to the east. Unique, isolated fish assemblages more typical of upland habitats can be found in these stream reaches. Gravels are also exposed in places at the base of the bluffs.

- The Loess Plains (74b) are gently rolling, irregular plains, 250-500 feet in elevation, with loess up to 50 feet thick. The region is a productive agricultural area of soybeans, cotton, corn, milo, and sorghum crops, along with livestock and poultry. Soil erosion can be a problem on the steeper, upland Alfisol soils; bottom soils are mostly silty Entisols. Oak-hickory and southern floodplain forests are the natural vegetation types, although most of the forest cover has been removed for cropland. Some less-disturbed bottomland forest and cypress-gum swamp habitats still remain. Several large river systems with wide floodplains, the Obion, Forked Deer, Hatchie,

Loosahatchie, and Wolf, cross the region. Streams are low-gradient and murky with silt and sand bottoms, and most have been channelized.

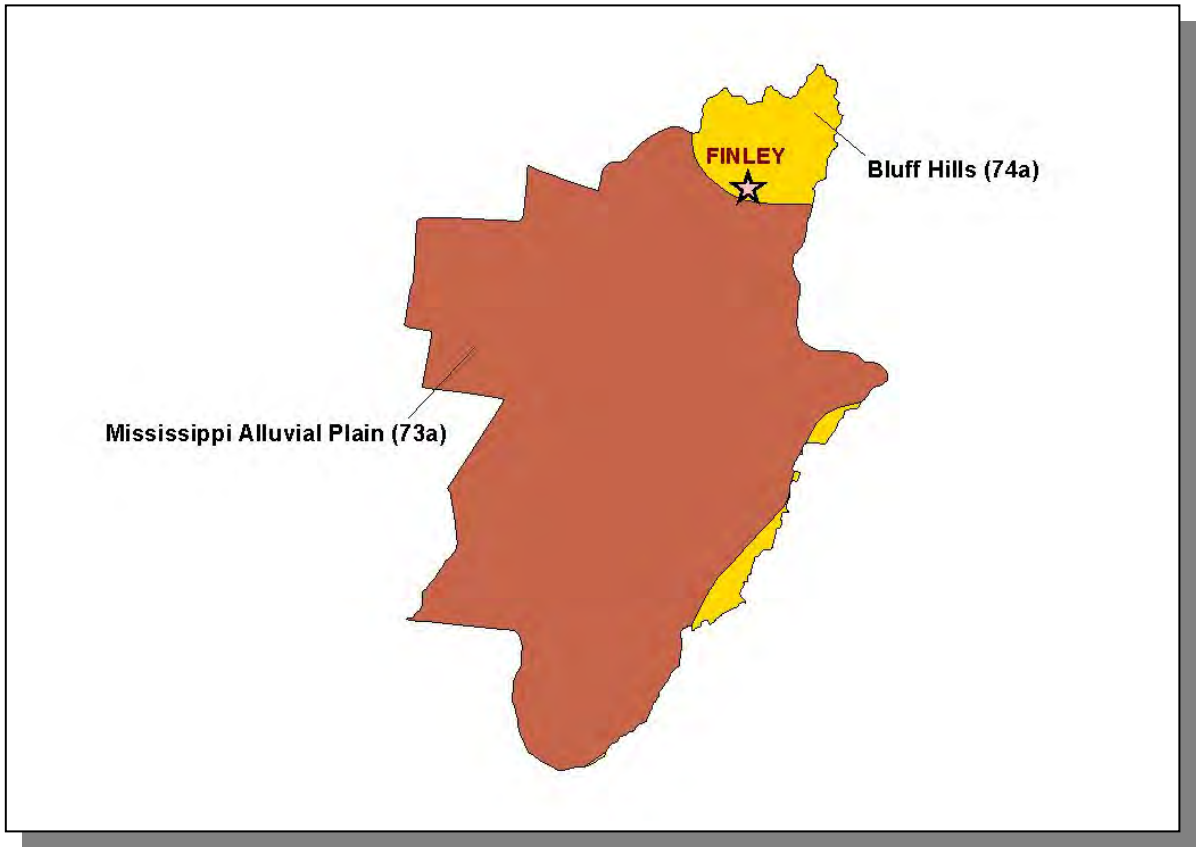


Figure 2-8. Level IV Ecoregions in the Forked Deer River Watershed.

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

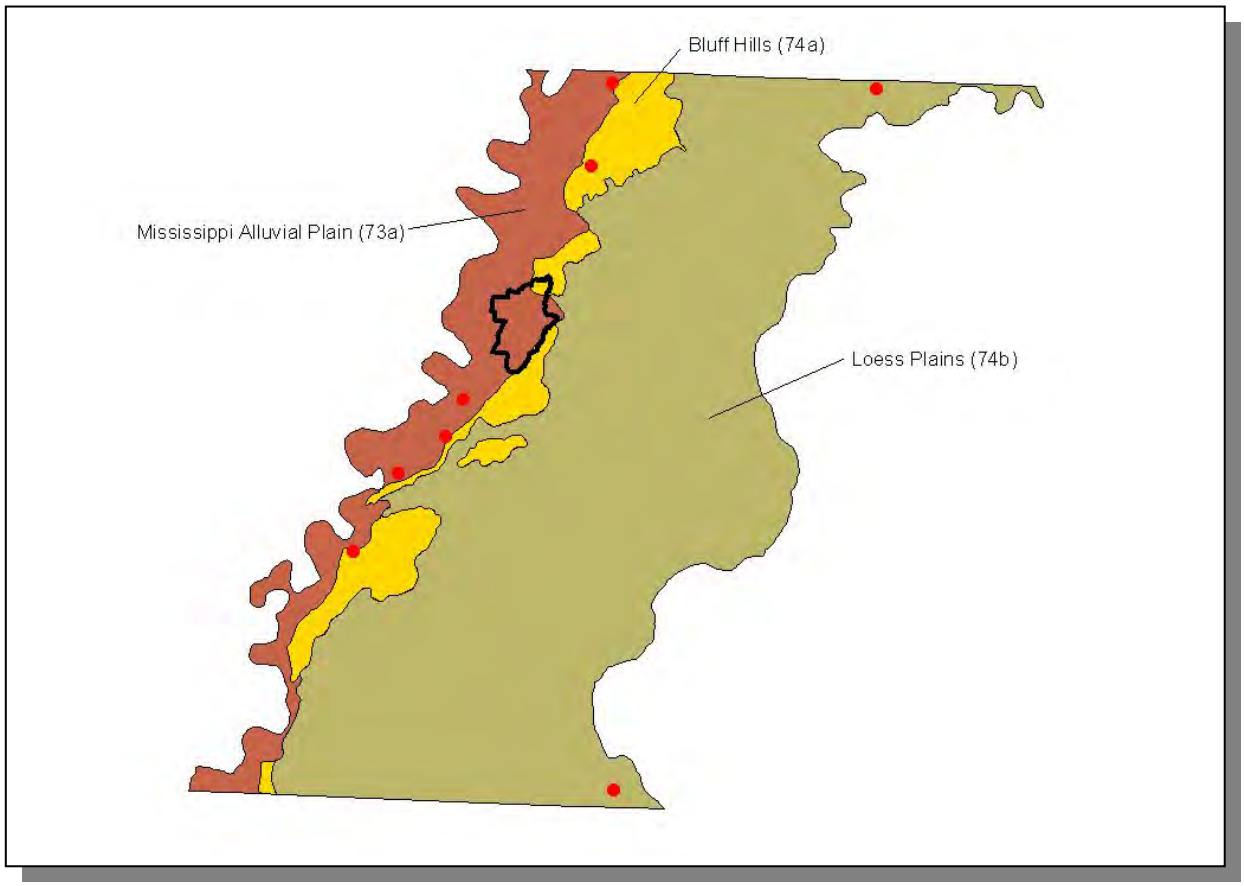


Figure 2-9. Ecoregion Monitoring Sites in Level IV Ecoregions 73a, 74a, and 74b. *The Forked Deer River Watershed is shown for reference. More information is provided in FD-Appendix II.*

2.6. NATURAL RESOURCES.

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

GROUPING	NUMBER OF RARE SPECIES
Crustaceans	0
Insects	0
Mussels	0
Snails	0
Amphibians	0
Birds	1
Fish	1
Mammals	0
Reptiles	0
Plants	0
Total	**2**

Table 2-2. There are 2 Rare Animal Species in the Forked Deer River Watershed.

In the Forked Deer River Watershed, there is one rare fish species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Lepisosteus spatula	Alligator gar		D

Table 2-3. Rare Aquatic Species in the Forked Deer River Watershed. *State Status: D, Deemed in Need of Management by the Tennessee Wildlife Resources Agency. More information may be found at http://www.state.tn.us/environment/nh/tnanimal.html.*

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

http://www.state.tn.us/environment/epo/wetlands/strategy.zip.

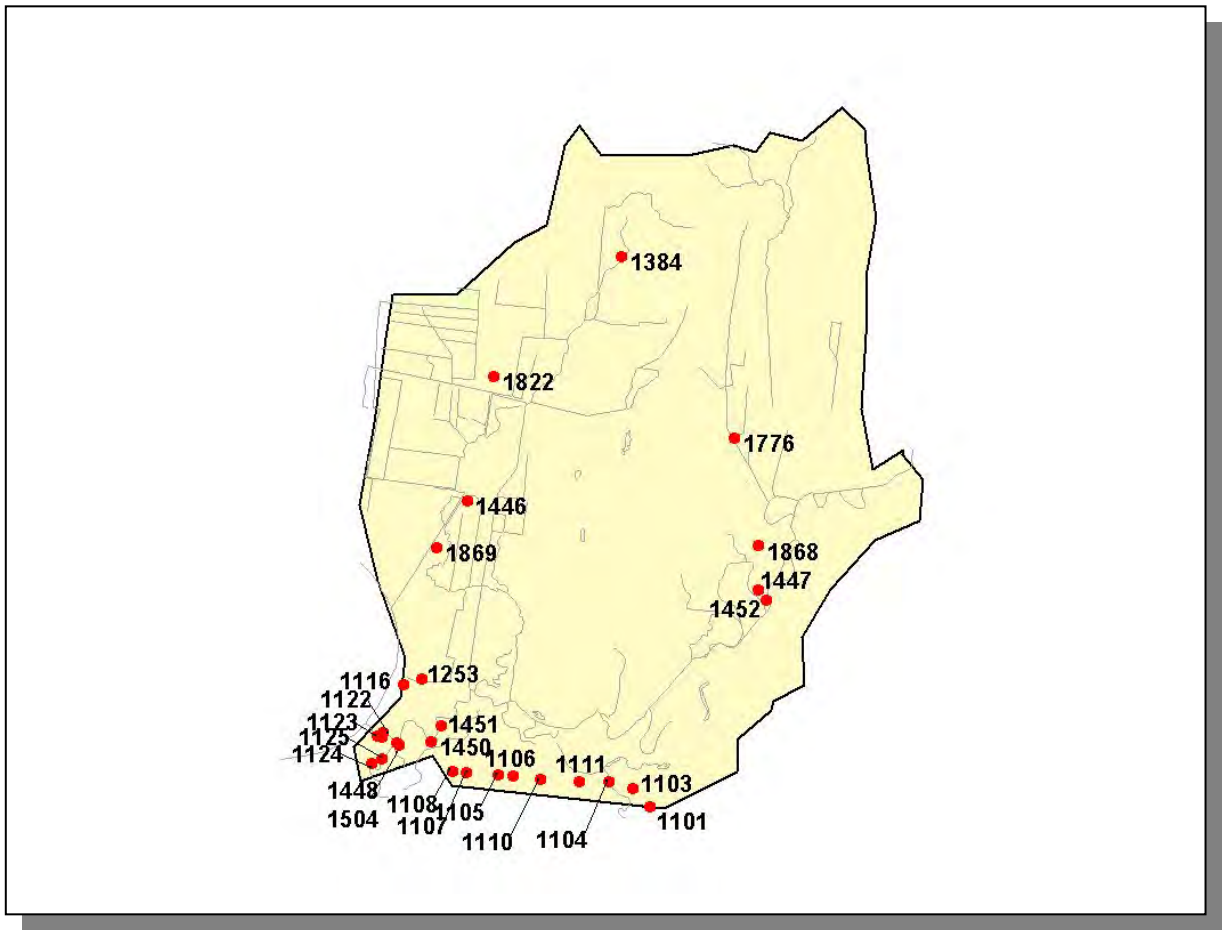


Figure 2-10. Location of Wetland Sites in TDEC Division of Natural Heritage Database in Forked Deer River Watershed. This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands in the watershed. *More information is provided in FD-Appendix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

2.7. 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
Crockett Creek Drainage Ditch	4			Old Bed Forked Deer River			4
Rock Slough	4						

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

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

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

CHAPTER 3

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

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

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

The current 303(d) List is available on the TDEC homepage at:
http://www.state.tn.us/environment/wpc/publications/2002303dpropfinal.pdf

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

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

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

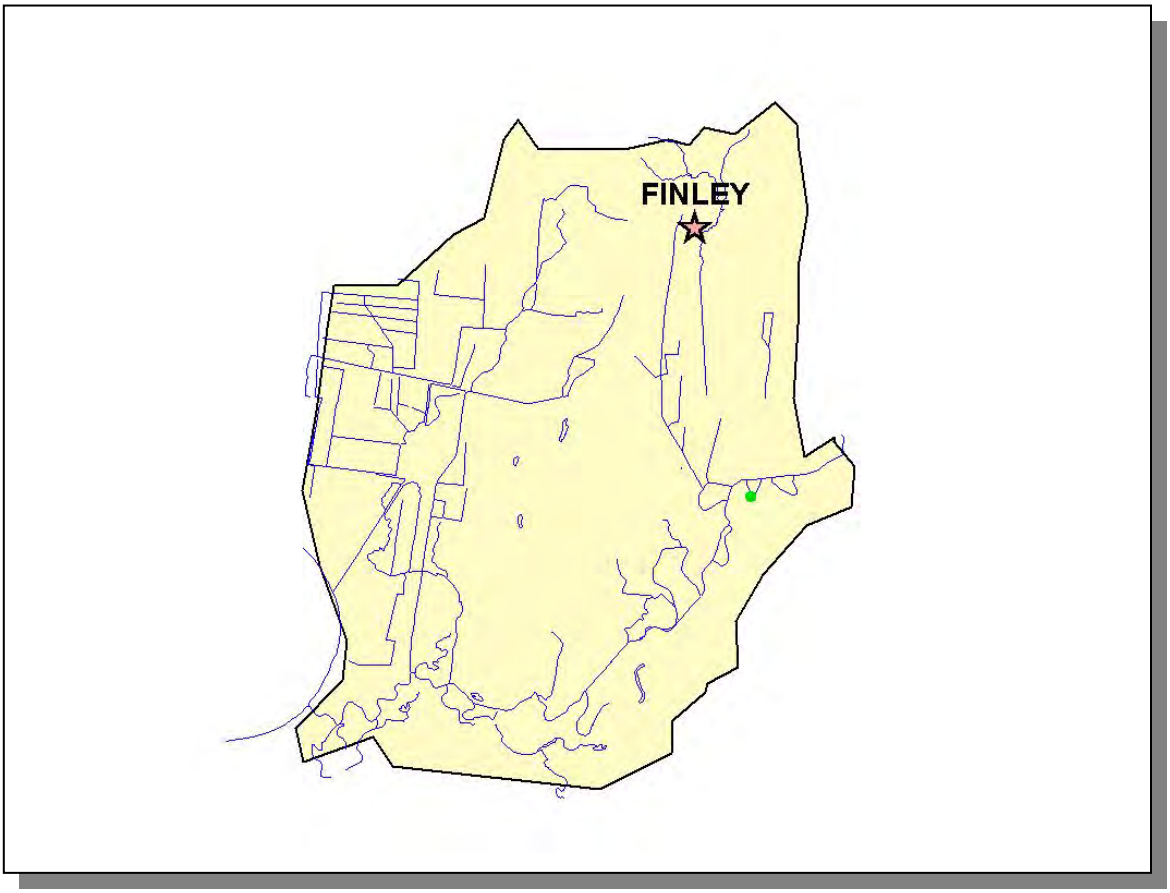


Figure 3-1. Location of Monitoring Sites in the Forked Deer River Watershed. *Red, Watershed Monitoring Sites; Black, Observational Data Sites; Orange, Rapid Bioassessment Sites; Green, Ambient Monitoring Sites. Location of Finley is shown for reference.*

TYPE	NUMBER	TOTAL NUMBER OF SAMPLING EVENTS		
		CHEMICAL ONLY	BIOLOGICAL ONLY	BIOLOGICAL PLUS CHEMICAL (FIELD PARAMETERS)
Ambient	1	1		
Ecoregion				
Watershed				
ARAP Site Inspections				
Totals	**1**	**1**		

Table 3-1. Monitoring Sites in the Forked Deer River Watershed During the Data Collection Phase of the Watershed Approach.

In addition to the sampling events, 12 citizen complaints were investigated in 2002.

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Assistance Center-Jackson 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 Forked Deer River Watershed are provided in FD-Appendix IV.

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

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

- Northern Mississippi Alluvial Plain (73a)
- Bluff Hills (74a)
- Loess Plains (74b)

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

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

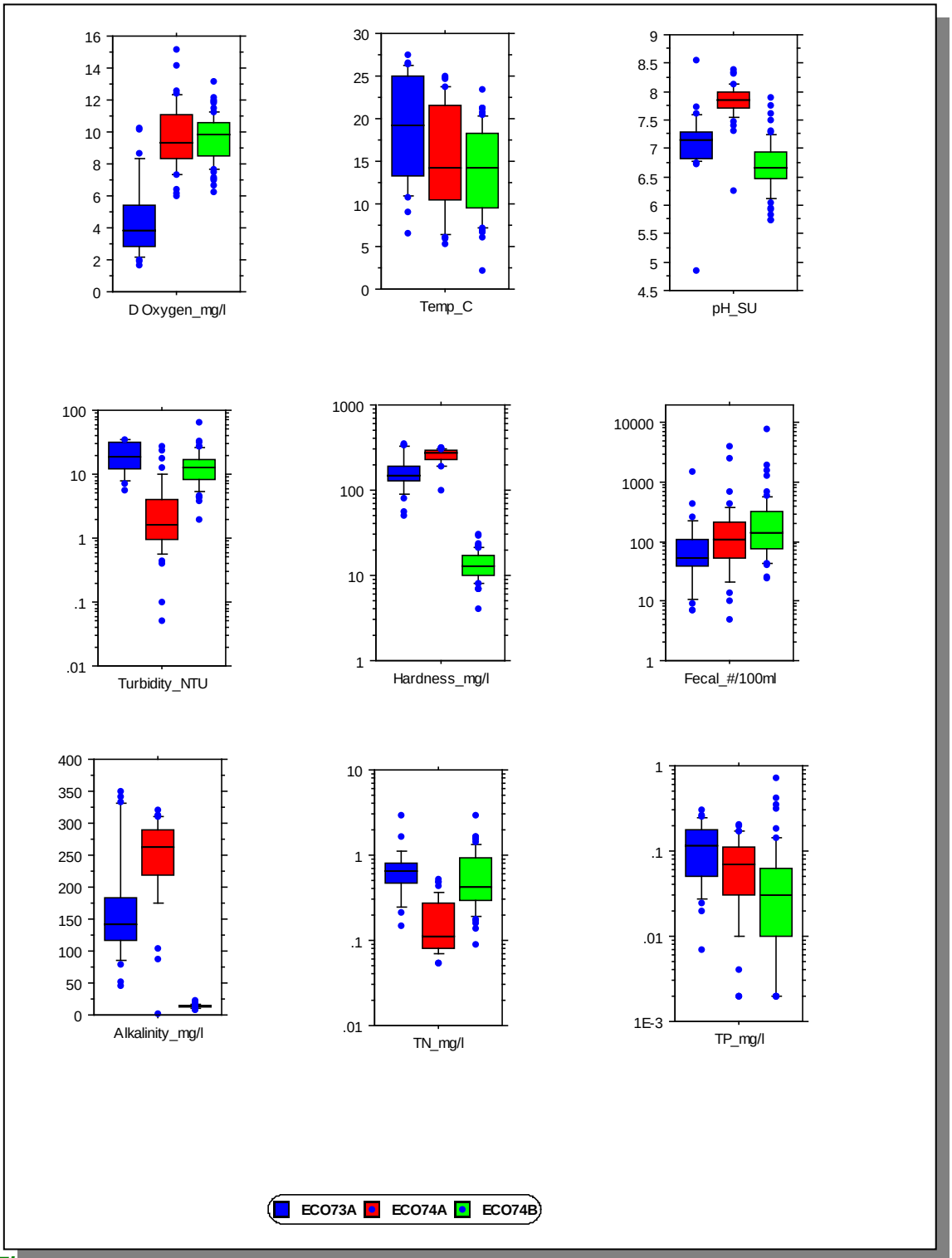


Figure 3-2. Select Chemical Data Collected in Forked Deer River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots.* Fecal, fecal coliform bacteria; TN, Total Nitrogen; TP, Total Phosphorus.

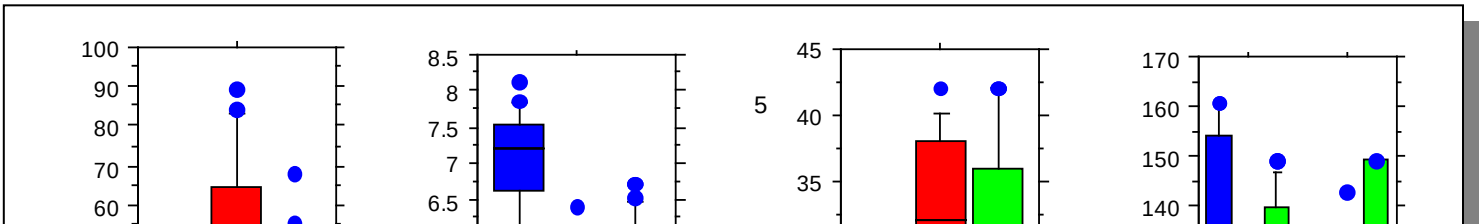


Figure 3-3. Benthic Macroinvertebrate and Habitat Scores for Forked Deer River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score, Habitat Riffle/Run, and Habitat Glide/Pool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

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

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

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

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

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

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

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

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

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

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

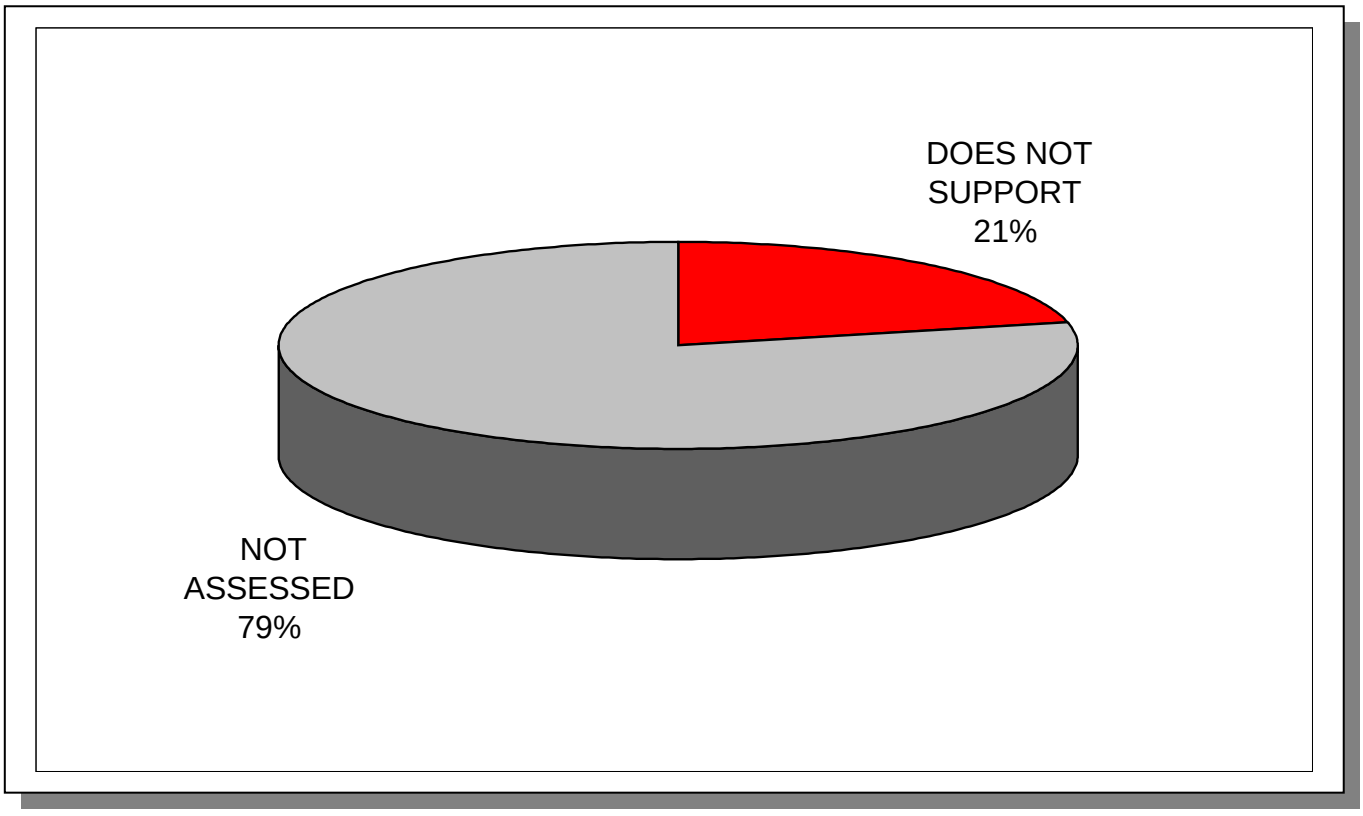


Figure 3-4. Water Quality Assessment for Streams and Rivers in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment.*

3.3.A. Assessment Summary.

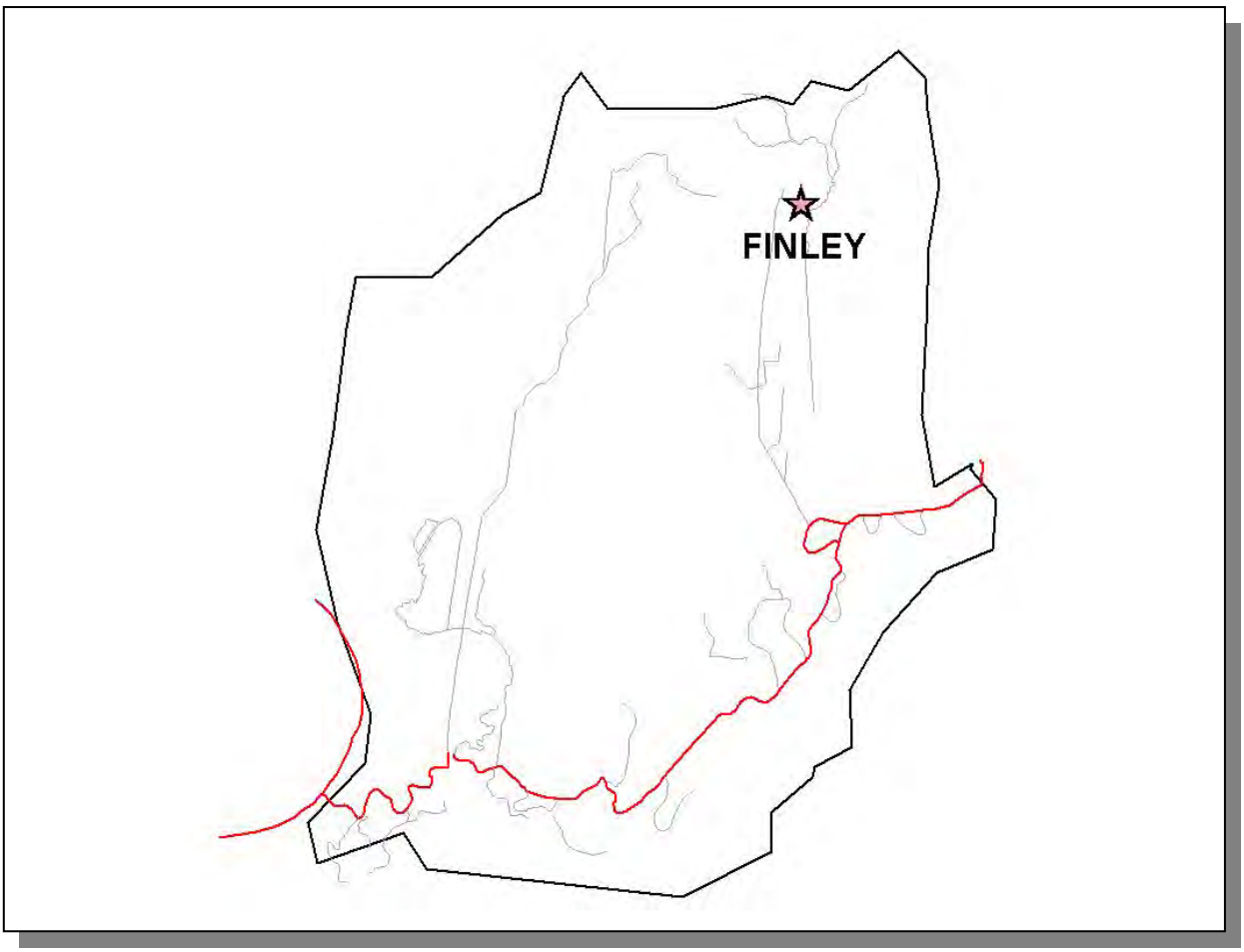


Figure 3-5a. Overall Use Support Attainment in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Finley is shown for reference. More information is provided in FD-Appendix III.*

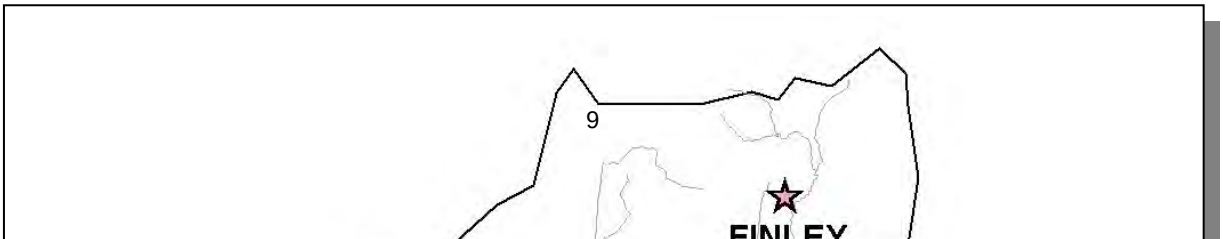


Figure 3-5b. Fish and Aquatic Life Use Support Attainment in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Finley is shown for reference.*

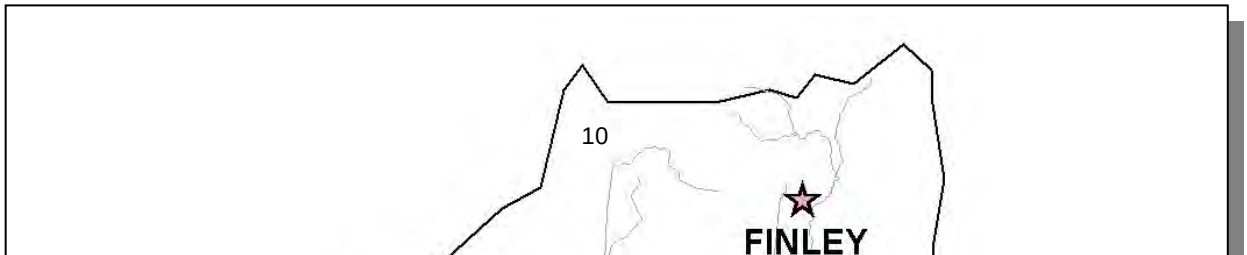


Figure 3-5c. Recreation Use Support Attainment in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Finley is shown for reference.*

Figure 3-5d. Irrigation Use Support Attainment in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Finley is shown for reference.*

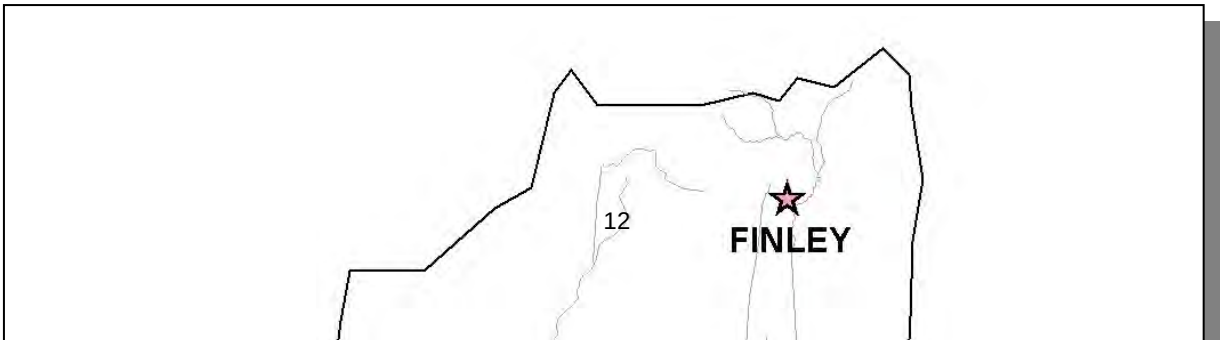


Figure 3-5e. Livestock Watering and Wildlife Use Support Attainment in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Finley is shown for reference.*

3.3.B. Use Impairment Summary.

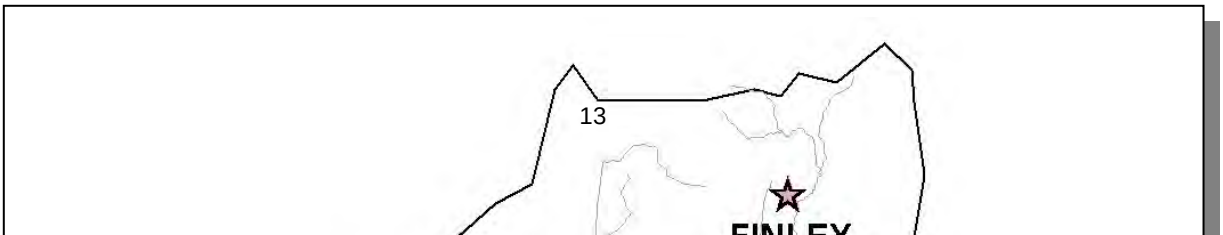


Figure 3-6a. Impaired Streams Due to Habitat Alteration in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports designated Use; Red, Does Not Support Designated Use; Finley is shown for reference. More information is provided in FD-Appendix III.*

Figure 3-6b. Impaired Streams Due to Pathogens in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Finley is shown for reference. More information is provided in FD-Appendix III.*

Figure 3-6c. Impaired Streams Due to Siltation in the Forked Deer River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Finley is shown for reference. More information is provided in FD-Appendix III.*

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

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

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

3.4. FLUVIAL GEOMORPHOLOGY. Stream width, depth, and cross-sectional dimensions at bankful discharge are key parameters used in characterizing the shape and stability of rivers. Characterization of streams using the fluvial geomorphic stream

classification system, which allows prediction of stream stability and physical evolution, is a valuable management tool (Rosgen, 1996).

A fluvial geomorphic curve illustrates relationships between drainage area, bankful dimensions of width, depth and cross-sectional area, and bankful discharge of stream systems that are in dynamic equilibrium. It is a tool to evaluate and predict the physical impacts of channel modifications, flow alterations, and other watershed changes, as well as determining appropriate physical parameters for stream and riparian restoration. Regional curves have been developed and applied in various regions of the country since the mid-1970's (Dunne and Leopold, 1978).

There are several benefits to using regional curves:

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

CHAPTER 4

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

Information for this chapter was obtained from databases maintained by the Division of Water Pollution Control or provided in the WCS (Watershed Characterization System) data set. The WCS used was version 1.1 beta (developed by Tetra Tech, Inc for EPA Region 4) released in 2000.

WCS integrates with ArcView® v3.2 and Spatial Analyst® v1.1 to analyze user-delineated (sub)watersheds based on hydrologically connected water bodies. Reports are generated by integrating WCS with Microsoft® Word. Land Use/Land Cover information from 1992 MRLC (Multi-Resolution Land Cover) data are calculated based on the proportion of county-based land use/land cover in user-delineated (sub)watersheds. Nonpoint source data in WCS are based on agricultural census data collected 1992–1998; nonpoint source data were reviewed by Tennessee NRCS staff.

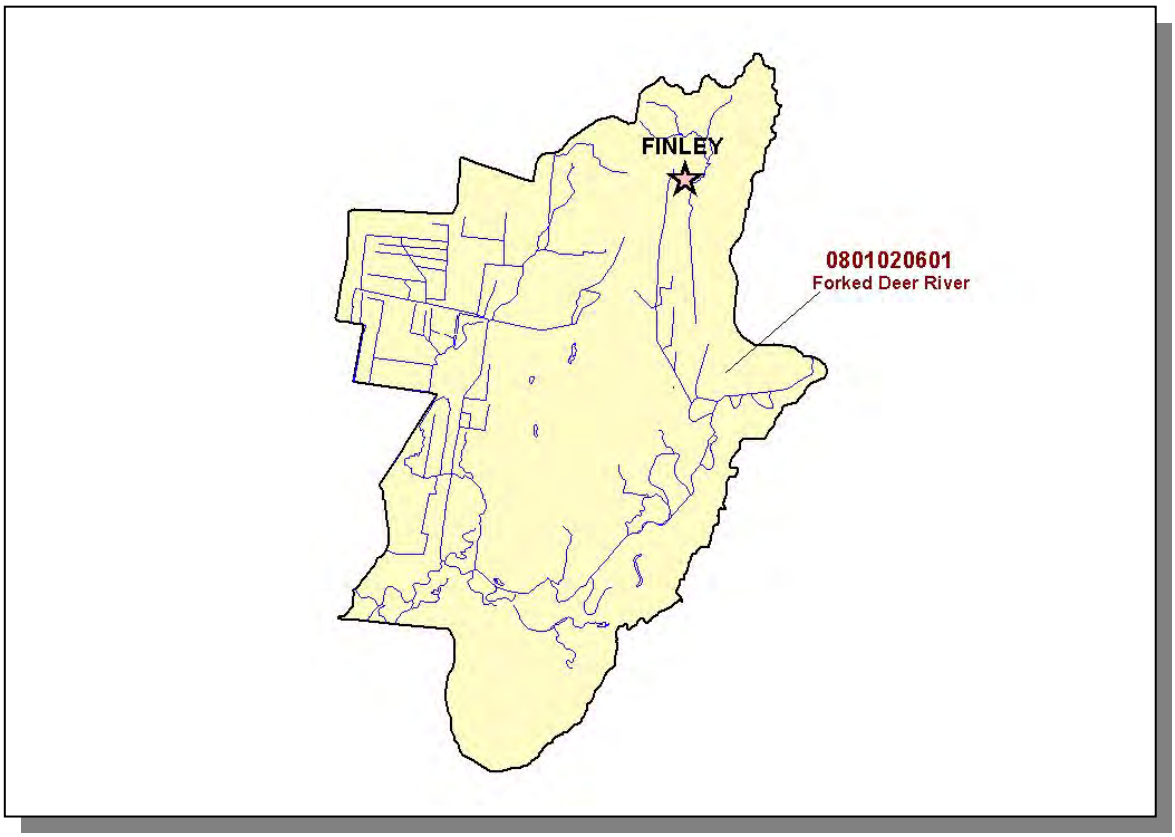


Figure 4-1. The Forked Deer River Watershed has just one USGS-Delineated Subwatershed (10-Digit Subwatersheds). *Location of Finley is shown for reference.*

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 the one subwatershed in the Forked Deer River Watershed.

HUC-10	HUC-12
0801020601	080102060101 (Forked Deer River)

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. 0801020601.

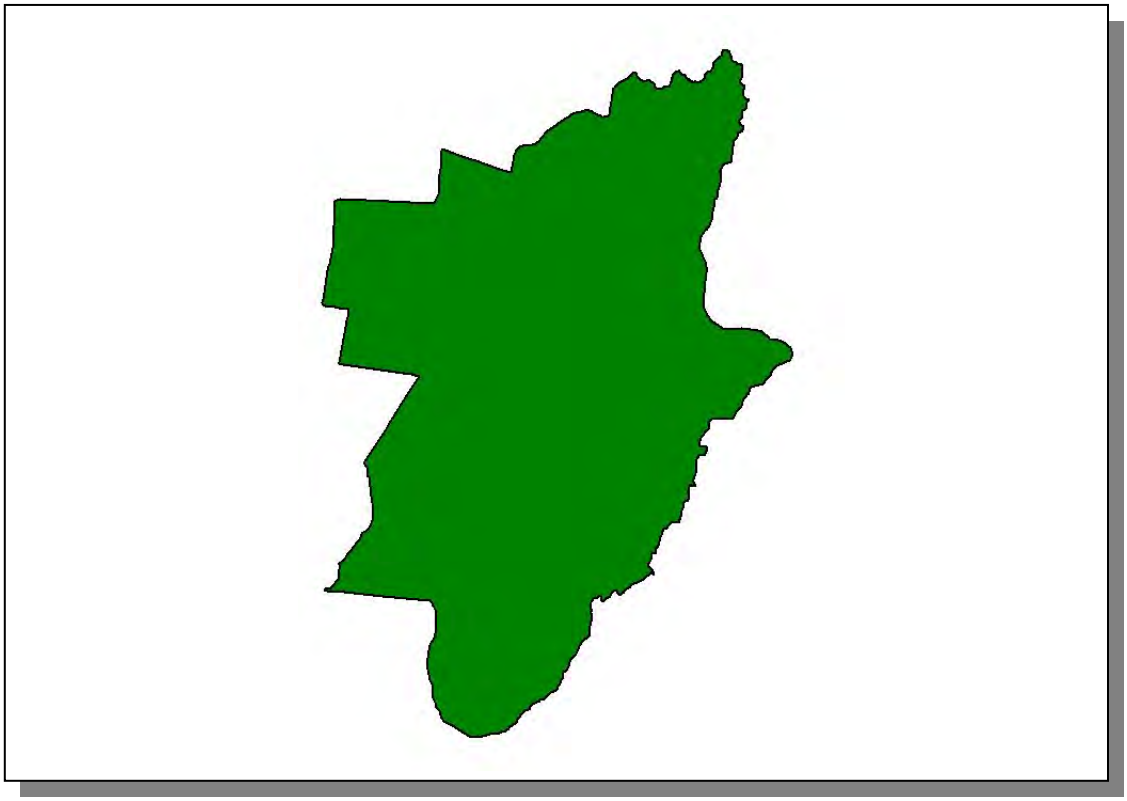


Figure 4-2. Location of Subwatershed 0801020601. *The Forked Deer River Watershed is composed of one HUC-10 subwatershed.*

4.2.A.i. General Description.

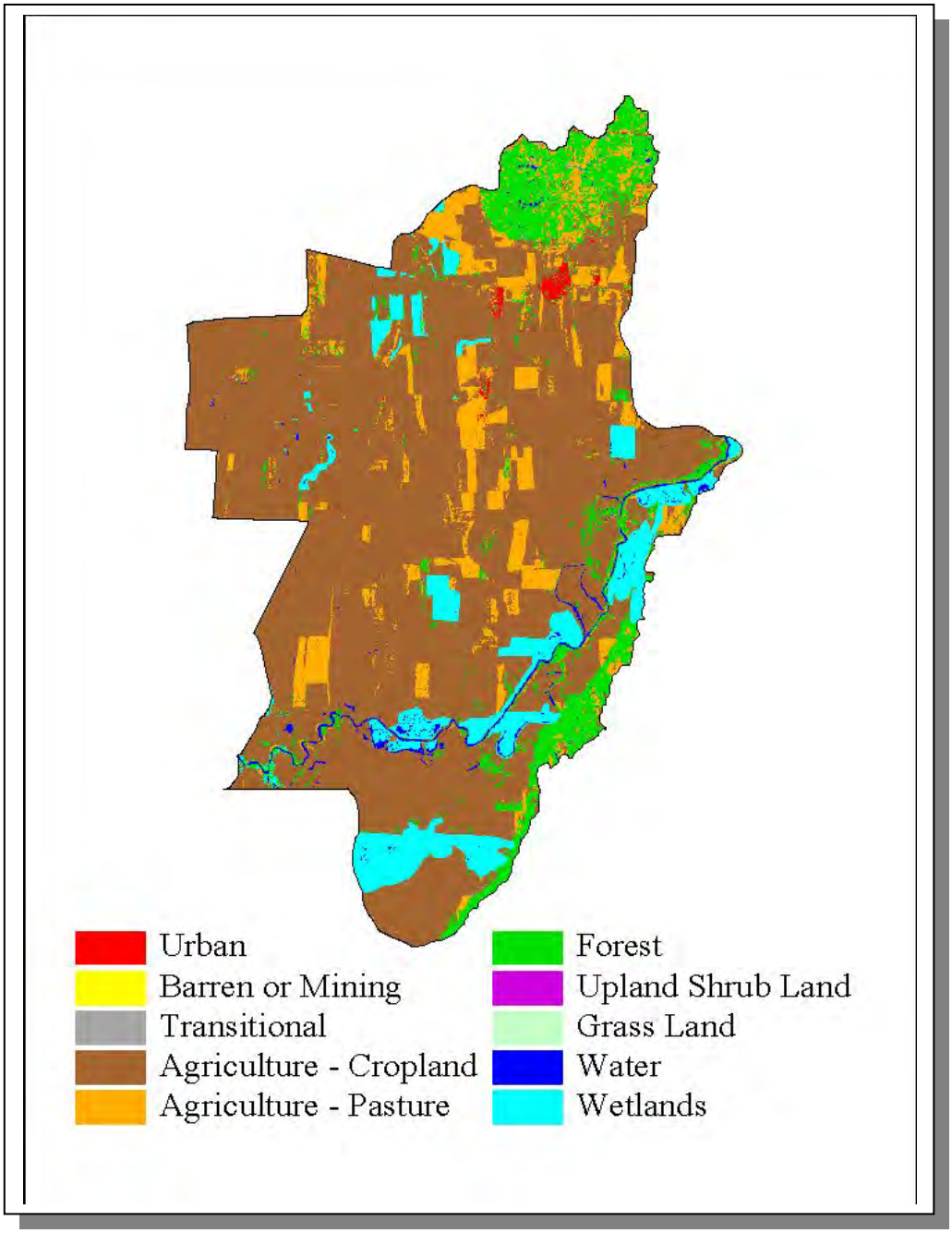


Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0801020601.

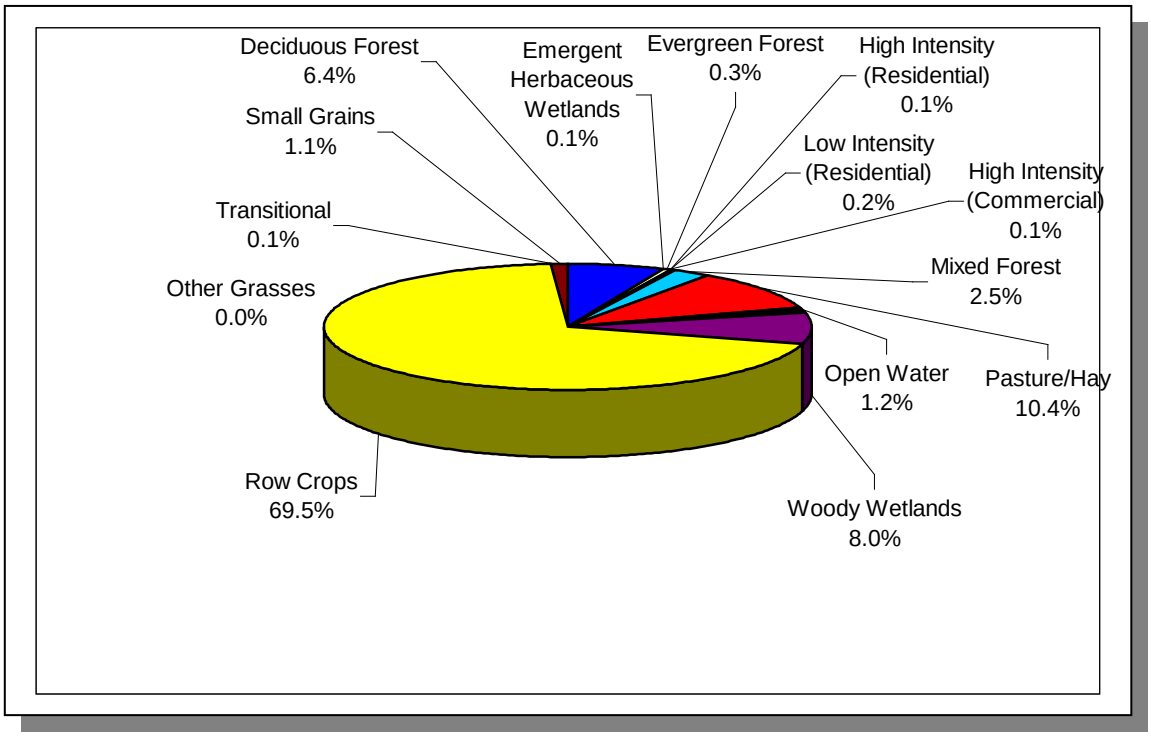


Figure 4-4. Land Use Distribution in Subwatershed 0801020601. *More information is provided in FD-Appendix IV.*

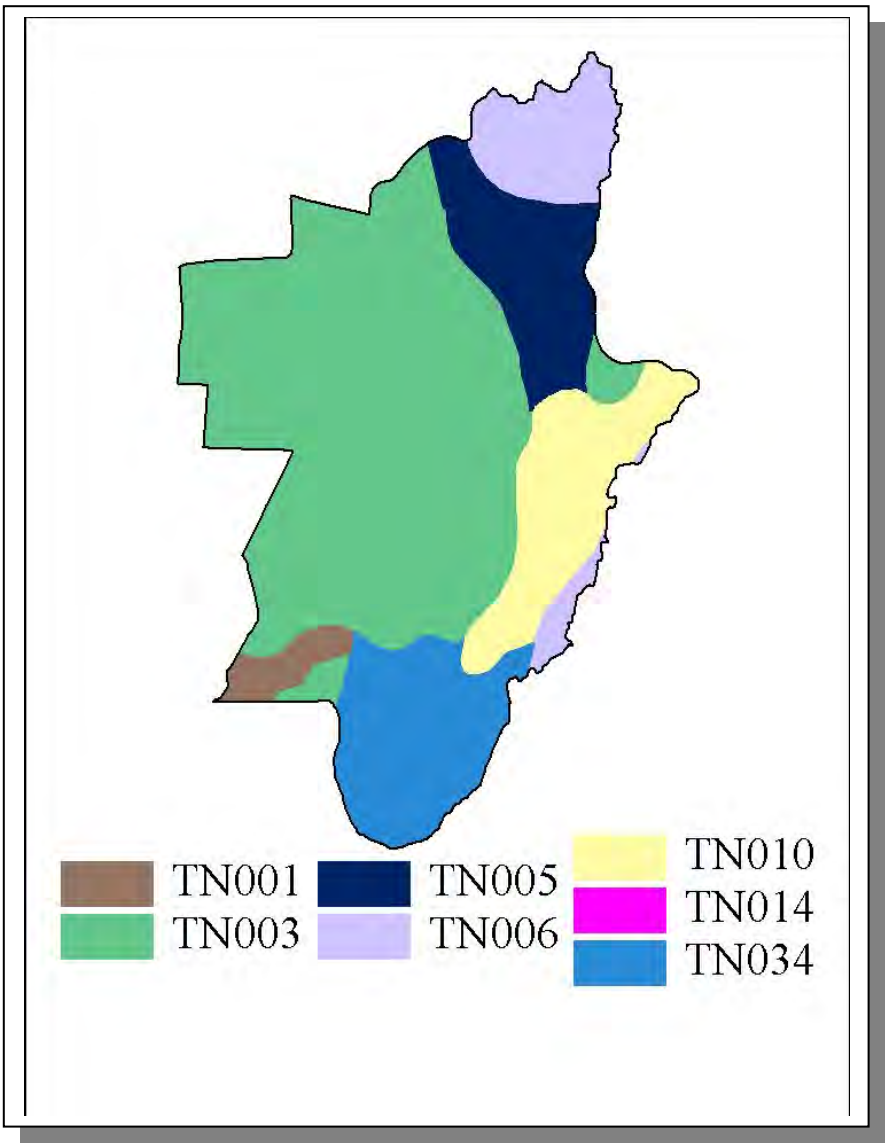


Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0801020601.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN001	14.00	C	2.31	7.00	Silty Loam	0.33
TN003	62.00	C	0.50	6.65	Silty Clay	0.33
TN005	10.00	C	1.79	6.68	Silty Loam	0.41
TN006	0.00	C	1.30	5.42	Silty Loam	0.48
TN010	81.00	C	1.33	5.11	Silty Loam	0.44
TN014	30.00	C	1.30	5.12	Silty Loam	0.47
TN034	36.00	D	0.48	6.07	Silty, Clayey Loam	0.35

Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0801020601. *More details are provided in FD-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Dyer	34,854	36,465	11.11	3,872	4,051	4.6
Lauderdale	23,491	24,128	2.4	564	580	2.8
Totals	58,345	60,593		4,436	4,631	4.4

Table 4-3. Population Estimates in Subwatershed 0801020601.

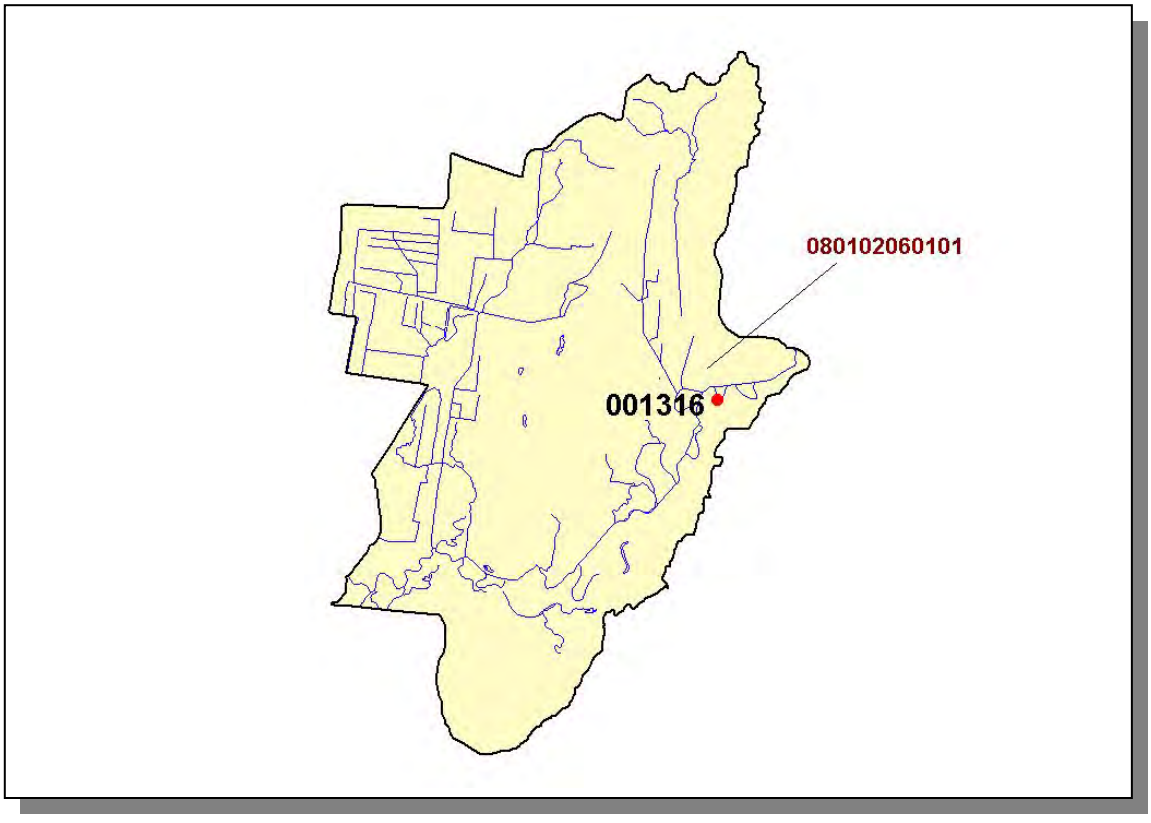


Figure 4-6. Location of STORET Monitoring Sites in Subwatershed 0801020601. *HUC-10 and HUC-12 subwatershed boundaries are identical. More information is provided in FD-Appendix IV.*

4.2.A.ii. Point Source Contributions.

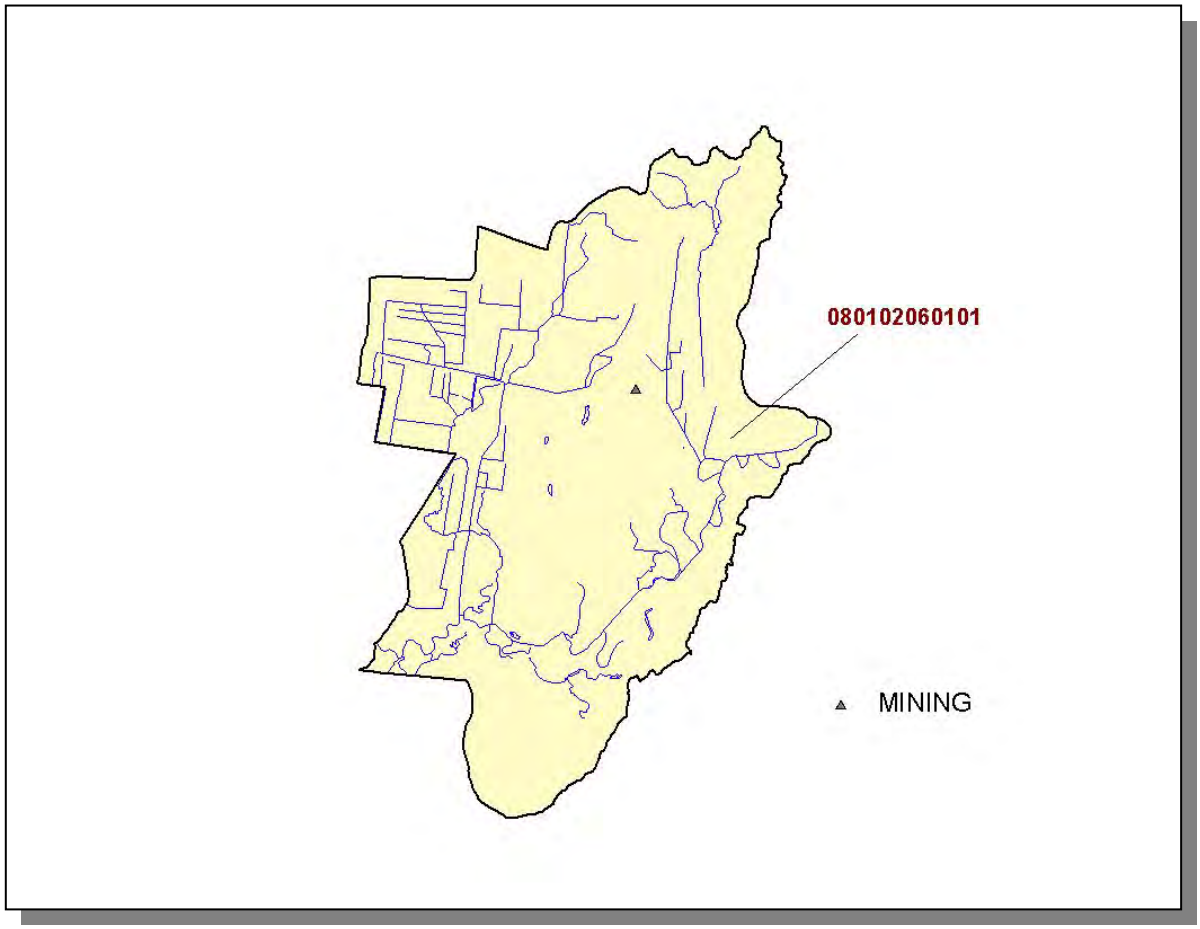


Figure 4-7. Location of Active Point Source Facilities in Subwatershed 0801020601. *HUC-10 and HUC-12 subwatershed boundaries are identical. More information is provided in the following charts.*

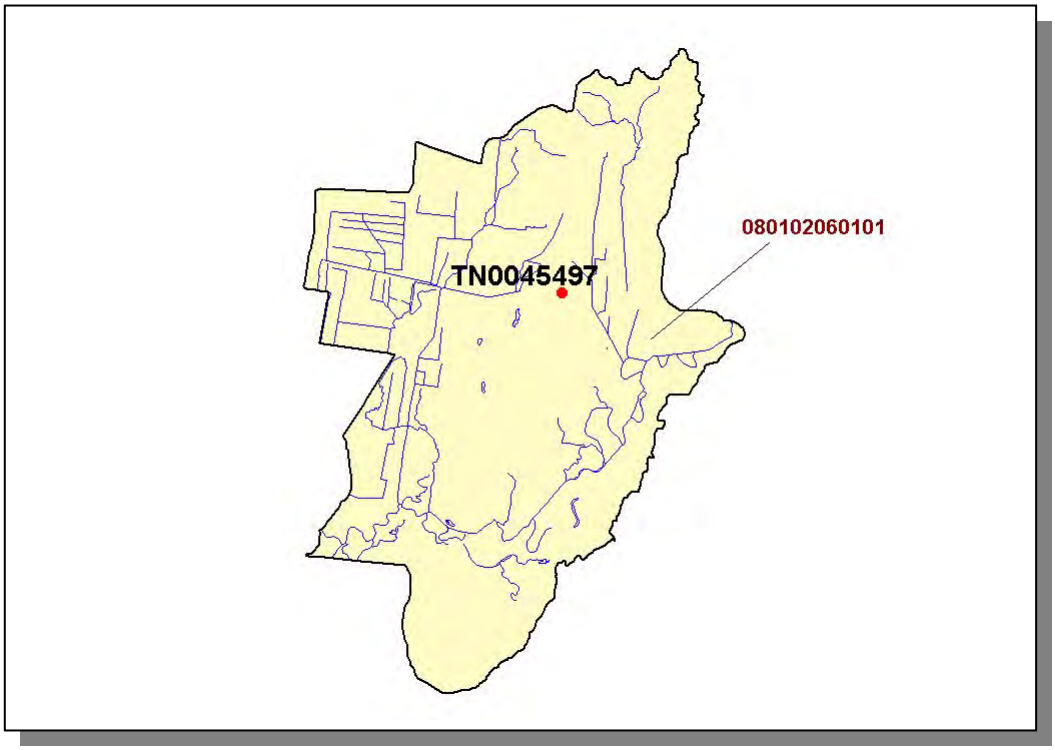


Figure 4-8. Location of Active Mining Sites in Subwatershed 0801020601. *HUC-10 and HUC-12 subwatershed boundaries are identical. More information, including the names of facilities, is provided in FD-Appendix IV.*

4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens	Chickens Sold	Hogs	Sheep
0	1,604	0	2	0	227	0

Table 4-4. Summary of Livestock Count Estimates in Subwatershed 0801020601. *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)
Dyer	40.4	40.4	0.8	2.8
Lauderdale	90.0	88.8	0.4	1.2
Totals	**130.4**	**129.2**	**1.2**	**4.0**

Table 4-5. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0801020601.

CROPS	TONS/ACRE/YEAR
Corn (Row Crops)	8.68
Soybeans (Row Crops)	6.94
Cotton (Row Crops)	6.69
Sorghum (Row Crops)	5.90
Grass (Hayland)	0.18
Legume (Hayland)	0.65
Legume/Grass (Hayland)	0.58
Grass (Pastureland)	1.76
Grass, Forbs, Legumes (Mixed Pasture)	0.71
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Conservation Reserve Program Land	0.62
Wheat (Close Grown Cropland)	4.79
Oats (Close Grown Cropland)	3.34
Other Vegetable and Truck Crops	4.00
Summer Fallow (Other Cropland)	8.70
Nonagricultural Land Use	0.00
Farmsteads and Ranch Headquarters	1.04
Other Land in Farms	0.05
Other Cropland (Not Planted)	1.36

Table 4-6. Annual Estimated Total Soil Loss in Subwatershed 0801020601.

CHAPTER 5

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

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

CONSERVATION PRACTICE	TOTAL
Comprehensive Nutrient Management Plans (Number)	0
Conservation Buffers (Acres)	99
Erosion Reduction (Tons/Year)	5,495
Inventory and Evaluations (Number)	6
Irrigation Management (Acres)	0
Nutrient Management (Acres)	0
Pest Management (Acres)	0
Prescribed Grazing (Acres)	0
Residue Management (Acres)	43
Tree and Shrub Practices (Acres)	23
Waste Management (Number)	0
Wetlands Created, Restored, or Enhanced (Acres)	54
Wildlife Habitat (Acres)	276

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

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

The USGS collects hydrologic data to document current conditions and provide a basis for understanding hydrologic systems and solving hydrologic problems. In Tennessee,

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

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

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

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

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

Recovery is the process by which the decline of an endangered or threatened species is stopped and reversed, and threats to the species' survival are eliminated, so that long-term survival in nature can be ensured. The goal of the recovery process is to restore

listed species to a point where they are secure and self-sustaining in the wild and can be removed from the endangered species list. Under the ESA, the Service and National Marine Fisheries Service were delegated the responsibility of carrying out the recovery program for all listed species.

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

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

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

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

How To Participate:

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

- When the project is completed, the Service reimburses the landowner after receipts and other documentation are submitted according to the Wildlife Extension Agreement.

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

5.2.D. United States Army Corps of Engineers-Memphis District. Memphis is one of six districts in the Mississippi Valley Division of the Corps of Engineers. The District's area of responsibility encompasses 25,000 square miles, portions of six states, 15 major drainage basins, and approximately 3 million citizens. Responsibilities also include maintaining a 355-mile, 9-feet deep, and 300-feet wide Mississippi River channel from Cairo, Illinois to the mouth of the White River in Arkansas.

The Memphis District serves the Nation by planning, designing, constructing and operating high quality and reasonably priced Civil Works water resource projects, primarily in the major mission areas of flood damage reduction, navigation, and environmental restoration and stewardship. The Corps' ongoing Civil Works responsibilities date back to the early 1800's when Congress authorized the removal of navigation hazards and obstacles in the early years of the nation's development. Over the years, succeeding Administrations and Congresses have expanded the Corps' missions to include most all water-related planning, development, and construction areas where a Federal interest is involved. Funds for Civil Works are provided through annual Energy and Water Appropriations Acts and through contributions from non-Federal entities for planning and /or construction of specific projects. All Civil Works projects involve a non-Federal, cost sharing sponsor.

Civil Works projects may also be funded under the Continuing Authorities Program (CAP). Congress has provided the Corps with standing authorities to study and build specific water resource projects for specific purposes and with specified spending limits. The CAP projects are implemented in a faster time frame, are limited in complexity, have Federal cost limits determined by the specific authority, are approved by the Division Commander, and do not need Congressional authorization.

The West Tennessee Tributaries flood control project is located along the Obion, Forked Deer Rivers, and their tributaries. The project sponsor is the State of Tennessee acting through the West Tennessee Basin Authority. The project involves 225 miles of flood control improvements on the Obion and Forked Deer Rivers and construction of 7.6 miles of levees, 174 water control structures, 216 erosion control structures, 37 miles of water management connector channels to restore bottomland hardwoods and fisheries, and the acquisition of 32,000 acres of mitigation.

Ninety-three miles of flood control improvements were completed before the project was halted by a lawsuit in 1973. Approximately 13,500 acres of mitigation have been acquired. The project is currently on hold pending the resolution of issues.

To obtain additional information about the District, please refer to the home page at: http://www.mvm.usace.army.mil, or contact the following offices:

Public Affairs Office (General Information):	(901) 544-3348
Regulatory Branch:	(901) 544-3473
Planning, Programs, and Project Management Branch:	(901) 544- 0658
Continuing Authorities Program:	(901) 544-0798
Environmental Analysis Branch:	(901) 544-3857

5.3. STATE PARTNERSHIPS.

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

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

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

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

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

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

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

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

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

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

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

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

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

projects that have met SRF technical, financial, and administrative requirements and are ready to proceed.

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

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

5.3.C. West Tennessee River Basin Authority. The West Tennessee River Basin Authority, an agency of the Department of Environment and Conservation, is responsible for the preservation of the natural flow and function of rivers and streams in the Forked Deer, Obion and Hatchie River Basins. As a Water Quality Partner, the Basin Authority conducts a variety of activities directly related to the conservation of resources in these river basins. In carrying out its mission the Basin Authority:

- Pursues and implements meandering stream and river restoration projects, with the goal of restoring natural floodplain dynamics and the associated riverine ecosystems.
- Implements watershed level projects designed to reduce the volume of sediment entering streams, and rivers. Excessive sedimentation can severely impair water quality as well as aquatic and floodplain habitats.
- Performs environmentally sensitive removal of logjams and obstructions to flow in streams and rivers, resulting in the preservation of environmental and economic resources.
- Maintains 110 Flood Control and Sediment Retention Structures, designed to increase flood storage capacity and to improve water quality through removal of suspended sediments.
- In support of its work, receives donations of Conservation Easements on Bottomland Hardwood Timber and other Wetlands. To date, over 23 square miles have been donated to the Basin Authority by private landowners.
- Maintains several large Bank Stabilization Projects in the Obion and Forked Deer River Systems, designed to prevent severe bank erosion. Where feasible, the Basin Authority utilizes bioengineering techniques to stabilize river banks, while, at the same time, reestablishing the riparian corridor.
- Maintains several Grade Control Structures designed to prevent further vertical degradation of altered streams and rivers. These structures, not only protect vital infrastructure, but help prevent the release of large volumes of sediment.

Through its efforts, the West Tennessee River Basin Authority will remain a strong advocate for the conservation and sustainable utilization of the resources within the Hatchie, Obion and Forked Deer River Basins.

The West Tennessee River Basin Authority office is located at 3628 East End Drive in Humboldt, Tennessee. For additional information or assistance, call 731/784-8173.

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

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

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

Participating contractors in the program are encouraged to develop a watershed emphasis for their individual areas of responsibility, focusing on waters listed on the Tennessee 303(d) List as being impaired by agriculture. Current guidelines for the

TDA-ARCF are available. Landowners can receive up to 75% of the cost of the BMP as a reimbursement.

Since January of 1999, the Department of Agriculture and the Department of Environment and Conservation have had a Memorandum of Agreement whereby complaints received by TDEC concerning agriculture or silviculture projects would be forwarded to TDA for investigation and possible correction. Should TDA be unable to obtain correction, they would assist TDEC in the enforcement against the violator. More information about the joint policy to address Bad Actors in forestry operations is available at http://www.state.tn.us/environment/news/release/jan99/badact.htm

CHAPTER 6

FUTURE DIRECTIONS IN THE FORKED DEER RIVER WATERSHED

6.1. BACKGROUND.

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

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

This Chapter addresses point and nonpoint source approaches to water quality problems in the Forked Deer 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 frequently chosen after consulting with people who live and work in the watershed. Everyone with an interest in clean water is encouraged to be a part of the public meeting process. The times and locations of watershed meetings are posted at: http://www.state.tn.us/environment/wpc/public.htm.

6.2.A. Year 1 Public Meeting. The first Forked Deer River Watershed public meeting was held April 15, 1997 in Humboldt. 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

- Lack of watershed associations in West Tennessee
- Need better coordination between all agencies doing sampling
- Need increased limits if wasteload allocations support it

6.2.B. Year 5 Public Meeting. The third scheduled Forked Deer River Watershed public meeting was held October 6, 2003 at the Humboldt Municipal Center (the meeting was for the Forked Deer and North Fork Forked Deer River Watersheds). The meeting featured five 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

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

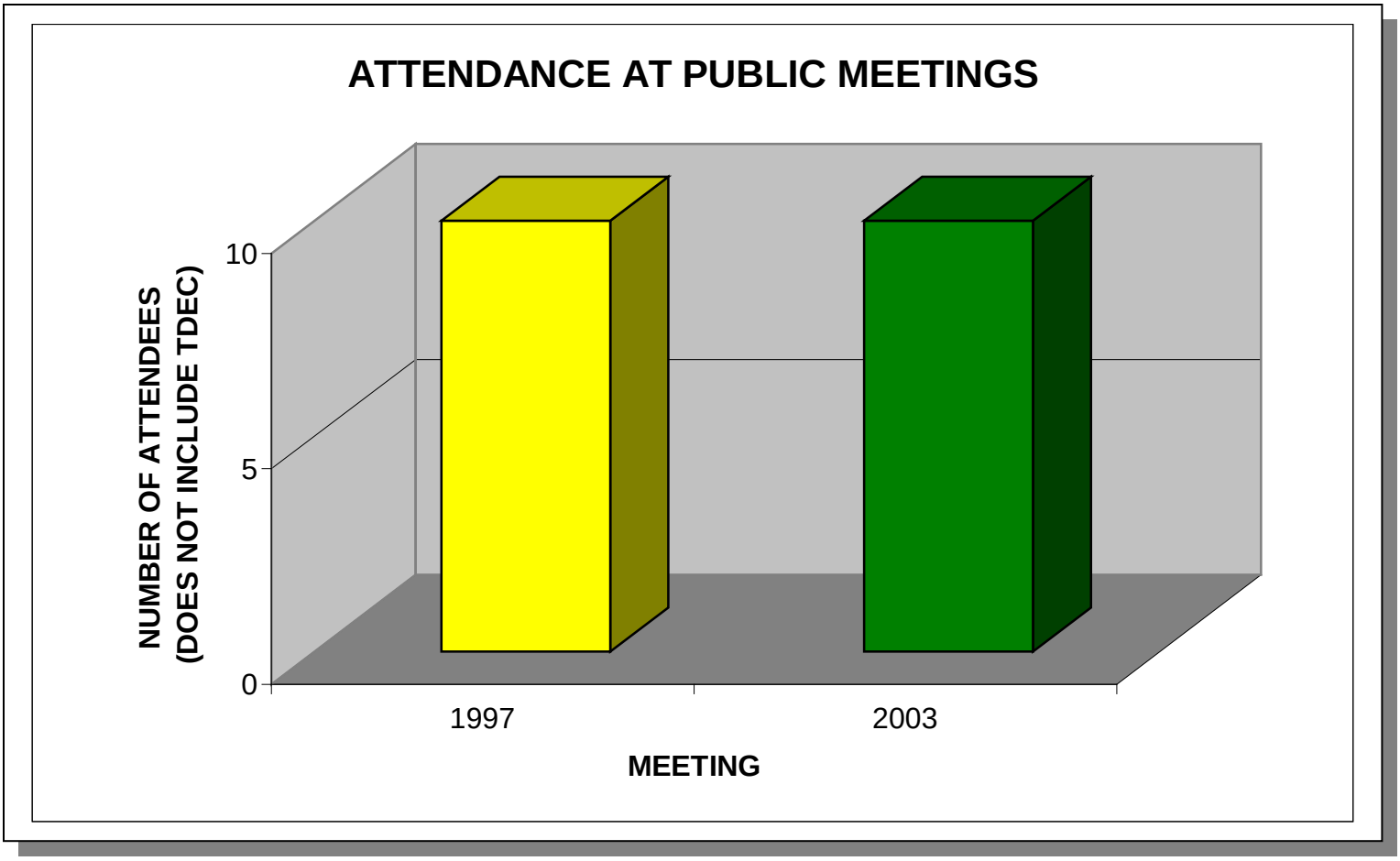


Figure 6-1. Attendance at Public Meetings in the Forked Deer River Watershed. *Watershed meeting numbers represent Forked Deer River and North Fork Forked Deer River Watersheds joint meetings.*

Figure 6-2. The SmartBoard™ is an effective interactive tool to teach citizens about the power of GIS.

6.3. APPROACHES USED.

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

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

TMDLs are prioritized for development based on many factors.

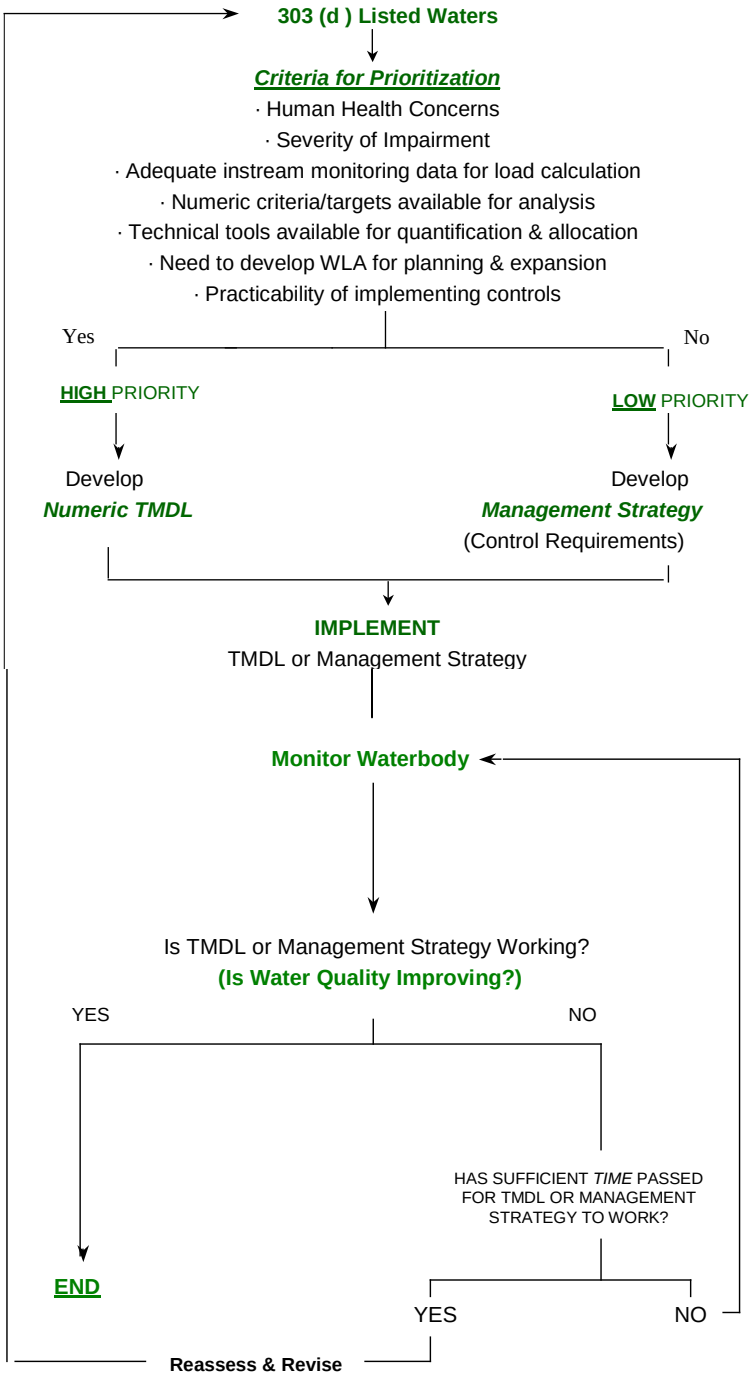


Figure 6-3. Prioritization scheme for TMDL Development.

6.3.B. Nonpoint Sources

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

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

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

6.3.B.i. Sedimentation.

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

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

The same requirements apply to sites in the drainage of high quality waters, however there are no high quality waters designated in the Forked deer River Watershed.

6.3.B.i.b. From Channel and/or Bank Erosion. Due to the past alteration of the Forked deer River, the North and South Forks of the Forked deer River, and many of its tributaries, the channels are unstable. Several agencies are working to stabilize portions of stream banks. These include NRCS, TDOT, the U.S. Army Corps of Engineers, and

the West Tennessee River basin Authority. Other methods or controls that might be necessary to address common problems are:

Voluntary activities

- Re-establishment of bank vegetation and riparian zones.
- Allowing a stream to reestablish a natural channel within its floodplain.

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.
- Restrictions requiring post construction run-off rates to be no greater than pre-construction rates in order to avoid in-channel erosion, (examples: the North and South Forks of the Forked deer River).
- Prohibition of clearing of stream and ditch banks (example: Crockett Creek). *Note: Permits may be required for work along streams.*
- Additional restriction to road and utilities crossings of streams.
- Restrictions on the use of off-highway vehicles on stream banks and in stream channels.
- Requirement that levees have a set-back that leaves an adequate floodway along streams (example: the Forked Deer River and most of its tributaries).
- Cease the maintenance efforts on channelized segments of streams where a natural, stable channel can be established (example: the Forked deer River and Crockett Creek).

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

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

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

6.3.B.ii. Pathogen Contamination.

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

The 1998 303(d) List does not indicate that pathogens are a problem in the Forked Deer River Watershed.

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

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

The 1998 303(d) List does not indicate that excessive nutrients and/or dissolved oxygen depletion are a problem in the Forked Deer River Watershed. In order to ensure that a problem does not develop, the following measures are recommended:

Voluntary activities

- Encourage no-till farming.
- Encourage farmers to use the proper rate of fertilizer for the soil and crop.
- Educate homeowners and lawn care companies in the proper application of fertilizers.
- Encourage landowners, developers, and builders to leave stream buffer zones. Streamside vegetation can filter out many nutrients and other pollutants before they reach the stream. These riparian buffers are also vital along livestock pastures.
- Use grassed drainage ways that can remove fertilizer before it enters streams.
- Use native plants for landscaping since they don't require as much fertilizer and water.

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

- Maintain shade over a stream. Cooler water can hold more oxygen and retard the growth of algae. The Forked Deer River and all its tributaries could benefit from added canopy.
- Discourage impoundments. Ponds and lakes do not aerate water. *Note: Permits may be required for any work on a stream, including impoundments.*

6.3.B.iv. Toxins and Other Materials.

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

Voluntary activities

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

Needing regulation

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

6.3.B.v. Habitat Alteration.

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

Measures that can help address this problem are:

Voluntary activities

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

Current regulations

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

Additional Enforcement

- Increased enforcement may be needed when violations of current regulations occur.
- Pass laws prohibiting the construction of levees within a set distance from the stream.

APPENDIX II

ID	NAME	HAZARD
237014	Finley Ditch #420-Sw-13a	2
237015	Crockett Creek Trib #1	2
237020	Finley Ditch #420-Sw-13b	2
237021	Ofdba #60-12	N
237023	Crockett Creek #2	2

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

LAND COVER/LAND USE	ACRES	% OF WATERSHED
Open Water	551	1.2
Other Grasses	4	0.0
Pasture/Hay	4,754	10.4
Row Crops	31,361	69.4
Woody Wetlands	3,633	8.0
Emergent Herbaceous Wetlands	23	0.1
Deciduous Forest	2,919	6.4
Mixed Forest	1,157	2.5
Evergreen Forest	157	0.3
High Intensity: Commercial/Industrial	48	0.1
High Intensity: Residential	40	0.1
Low Intensity: Residential	93	0.2
Small Grains	496	1.1
Transitional	48	0.1
Total	**45,554**	**99.9**

Table A2-2. Land Use Distribution in the Forked Deer 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)
Northern Mississippi Alluvial Plain (73a)	Cold Creek Middle Fork Forked Deer River Cold Creek Bayou du Chien	Mississippi River Mississippi River Mississippi River Obion River	08010100 08010100 08010100 08010102
Bluff Hills (74a)	Sugar Creek Paw Paw Creek	Mississippi River Obion River	08010100 08010202
Loess Plains (74b)	Terrapin Creek Powell Creek Wolf River	Obion River Obion River Wolf River	08010202 08010202 08010210

Table A2-3. Ecoregion Monitoring Sites in Ecoregions 73a, 74a and 74b.

CODE	NAME	AGENCY	AGENCY ID
1101	BRAD BINGHAM THESIS: SITE 8 KNOB CREEK QUAD	USFWS	KNOB CREEK.8
1103	BRAD BINGHAM THESIS: SITE 10 KNOB CREEK QUAD	USFWS	KNOB CREEK.10
1104	BRAD BINGHAM THESIS: SITE 11 KNOB CREEK QUAD	USFWS	KNOB CREEK.11
1105	BRAD BINGHAM THESIS: SITE 12 KNOB CREEK QUAD	USFWS	KNOB CREEK.12
1106	BRAD BINGHAM THESIS: SITE 13 KNOB CREEK QUAD	USFWS	KNOB CREEK.13
1107	BRAD BINGHAM THESIS: SITE 14 KNOB CREEK QUAD	USFWS	KNOB CREEK.14
1108	BRAD BINGHAM THESIS: SITE 15 KNOB CREEK QUAD	USFWS	KNOB CREEK.15
1110	BRAD BINGHAM THESIS: SITE 17 KNOB CREEK QUAD	USFWS	KNOB CREEK.17
1111	BRAD BINGHAM THESIS: SITE 18 KNOB CREEK QUAD	USFWS	KNOB CREEK.18
1116	BRAD BINGHAM THESIS: SITE 23 KNOB CREEK QUAD	USFWS	KNOB CREEK.23
1122	BRAD BINGHAM THESIS: SITE 29 KNOB CREEK QUAD	USFWS	KNOB CREEK.29
1123	BRAD BINGHAM THESIS: SITE 30 KNOB CREEK QUAD	USFWS	KNOB CREEK.30
1124	BRAD BINGHAM THESIS: SITE 31 KNOB CREEK QUAD	USFWS	KNOB CREEK.31
1125	BRAD BINGHAM THESIS: SITE 32 KNOB CREEK QUAD	USFWS	KNOB CREEK.32
1253	TWRA SITE	TWRA	
1384	USACOE OBION RIVER (TN) 96-003 [TF] SITE	USACOE-M	
1446	USACOE FORKED DEER/ROCK SLOUGH-3 SITE	USACOE-M	
1447	USACOE FORKED DEER/ROCK SLOUGH-3 SITE	USACOE-M	
1448	USACOE FORKED DEER RIVER-5 SITE	USACOE-M	
1449	USACOE FORKED DEER RIVER-6 SITE	USACOE-M	
1450	USACOE FORKED DEER RIVER-7 SITE	USACOE-M	
1451	USACOE FORKED DEER RIVER-8 SITE	USACOE-M	
1452	USACOE FORKED DEER RIVER-9 SITE	USACOE-M	
1504	USACOE-LMM N.F. FORKED DEER RIVER-93-00 [TD] SITE	USFWS	
1776	USACOE NORTH FORK FORKED DEER RIVER POND CREEK-25	USACOE-M	
1822	NRCS SITE	NRCS	
1868	NRCS SITE	NRCS	
1869	NRCS SITE	NRCS	

Table A2-4. Wetland Sites in Forked Deer River Watershed in TDEC Database. *TDEC, Tennessee Department of Environment and Conservation; USACOE, United States Army Corps of Engineers-Memphis District; WPC, Water Pollution Control; TDOT, Tennessee Department of Transportation' USFWS, United States Fish and Wildlife Service; TWRA, Tennessee Wildlife Resources Agency; DNH, Division of Natural Heritage, NRCS, Natural Resources Conservation Service.* ***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)
Forked Deer River	TN08010206001_1000	14.9

Table A3-1a. Streams Not Supporting Designated Uses in Forked Deer River Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Crockett Creek	TN08010206001_0200	15.5
Misc. Tribs to Forked Deer River	TN08010206001_0999	18.6
Rock Slough	TN08010206001_0100	21.0

Table A3-1b. Streams Not Assessed in Forked Deer River Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SIZE (MILES)	SUPPORT DESCRIPTION
Forked Deer River	TN08010206001_1000	14.9	Not supporting

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

SEGMENT NAME	WATERBODY SEGMENT ID	SIZE (MILES)	SUPPORT DESCRIPTION
Forked Deer River	TN08010206001_1000	14.9	Not supporting

Table A3-2b. Stream Impairment Due to Siltation in Forked Deer River Watershed. *Data are based on Year 2000 Water Quality Assessment.*

APPENDIX IV

LAND USE/LAND COVER	AREA IN HUC-10 SUBWATERSHED (ACRES)
	01
Deciduous Forest	2,919
Emergent Herbaceous Wetlands	23
Evergreen Forest	157
High Intensity: Commercial/Industrial/Transportation	48
High Intensity: Residential	40
Low Intensity: Residential	93
Mixed Forest	1,157
Open Water	551
Other Grasses: Urban/Recreational	4
Pasture/Hay	4,754
Row Crops	31,631
Transitional	48
Woody Wetlands	3,633
Small Grains	496
Total	**45,554**

Table A4-1. Land Use Distribution in Forked Deer 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.

FACILITY NUMBER	PERMITEE	SIC	SIC NAME	WATERBODY	HUC-10
TN0045497	United Clays, Inc.	1455	Kaolin and Ball Clay	Beaver Creek	0801020601

Table A4-4. Active Permitted Mining Sites in the Forked Deer River Watershed. *SIC, Standard Industrial Classification.*

APPENDIX V

CONSERVATION PRACTICE	UNITS	AMOUNT
Alley Cropping	Acres	0
Contour Buffer Strips	Acres	0
Crosswind Trap Strips	Acres	0
Field Borders	Feet	0
Filter Strips	Acres	99
Grassed Waterways	Acres	0
Riparian Forest Buffers	Acres	0
Streambank and Shoreline Protection	Feet	0
Windbreaks and Shelterbelts	Feet	0
Hedgerow Plantings	Feet	0
Herbaceous Wind Barriers	Feet	0
Total Conservation Buffers	Acres	99

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

PARAMETER	TOTAL
Erosion Reduction Applied (Acres)	166
Highly Erodible Land With Erosion Control Practices (Acres)	133
Estimated Annual Soil Saved By Erosion Control Measures (Tons/Year)	5,495
Total Estimated Soil Saved (Tons/Year)	5,495

Table A5-1b. Erosion Control Conservation Practices in Partnership with NRCS in Forked Deer River Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

CONSERVATION PRACTICE	ACRES
Acres Prepared for Revegetation of Forestland	23
Acres Improved Through Forest Stand Improvement	0
Acres of Tree and Shrub Establishment	23

Table A5-1c. Tree and Shrub Conservation Practices in Partnership with NRCS in Forked Deer River Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

CONSERVATION PRACTICE	ACRES
Acres of Wetlands Created or Restored	31
Acres of Wetlands Enhanced	23
Total Acres Created, Restored, or Enhanced	54

Table A5-1d. Wetland Conservation Practices in Partnership with NRCS in Forked Dreer River Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*

CONSERVATION PRACTICE	ACRES
Acres of Upland Habitat Management	222
Acres of Wetland Habitat Management	54
Total Acres Wildlife Habitat Management	276

Table A5-1e. Wildlife Habitat Management Conservation Practices in Partnership with NRCS in Forked Deer River Watershed. *Data are from PRMS for October 1, 2001 through September 30, 2002 reporting period.*