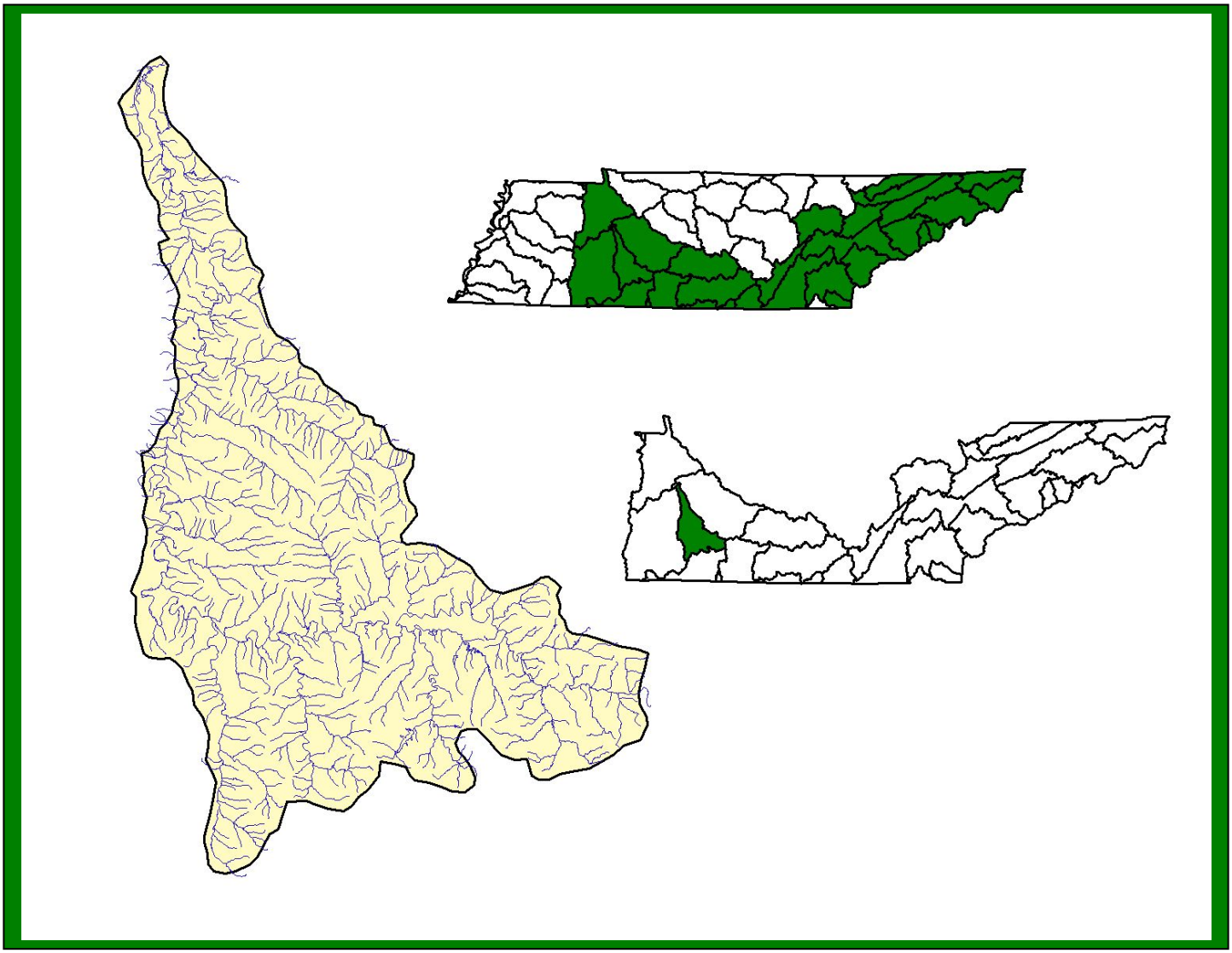
BUFFALO RIVER WATERSHED (06040004) OF THE TENNESSEE RIVER BASIN

WATERSHED WATER QUALITY MANAGEMENT PLAN



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

Presented to the people of the Buffalo River Watershed by the Division of Water Pollution Control November 3, 2005.

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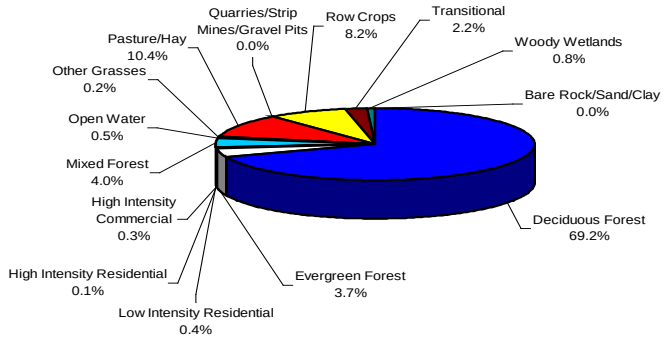
Summary – Buffalo River

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 Buffalo 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.

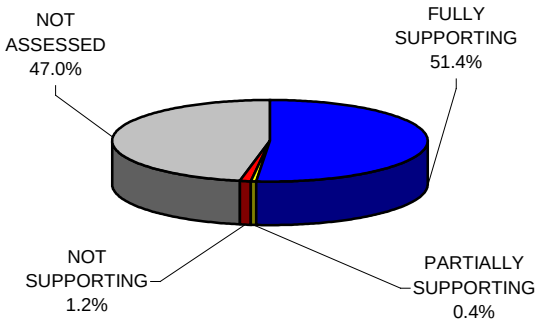
A detailed description of the watershed can be found in Chapter 2. The Buffalo River Watershed is approximately 763 square miles and includes parts of six Tennessee counties. A part of the Tennessee River drainage basin, the watershed has 1,200 stream miles and 349 lake acres.



Land Use Distribution in the Buffalo River Watershed.

Three greenways, two interpretive areas, and two wildlife management areas are located in the watershed. Forty-eight rare plant and animal species have been documented in the watershed, to include eleven rare fish species, three rare mussel species, four rare snail species and one rare crustacean species. Portions of one stream in the Buffalo River Watershed is listed in the National Rivers Inventory as having one or more outstanding natural or cultural values and a portion of the Buffalo River has also been designated as a State Scenic River.

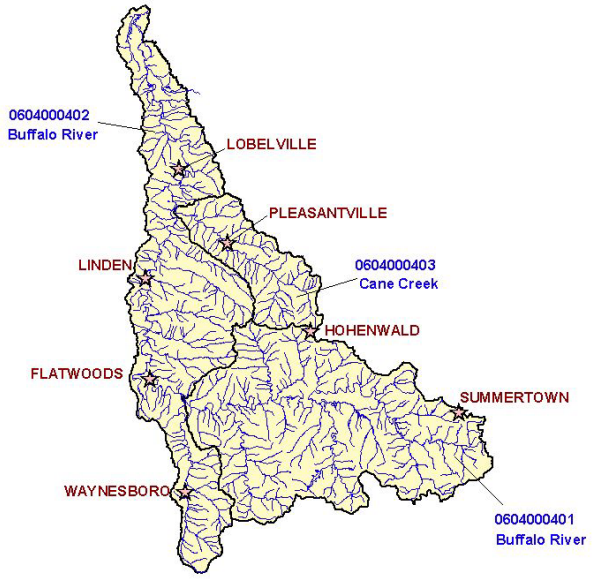
A review of water quality sampling and assessment is presented in Chapter 3. Using the Watershed Approach to Water Quality, 126 sampling events occurred in the Buffalo River Watershed in 1999-2000. These were conducted at ambient, ecoregion or watershed monitoring sites. Monitoring results support the conclusion that 51.4% of total stream miles (based on RF3) fully support designated uses.



Water Quality Assessment of Streams and Rivers in the Buffalo River Watershed. Assessment data are based on the 2002 Water Quality Assessment of 1,200.0 miles in the watershed.

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

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



The Buffalo River Watershed is Composed of three USGS-Delineated Subwatersheds (10-Digit Subwatersheds).

Point source contributions to the Buffalo River Watershed consist of seven individual NPDES-permitted facilities, two of which discharge into streams that have been listed on the 1998 303(d) list. Other point source permits in the watershed are Aquatic Resource Alteration Permits (22), Tennessee Multi-Sector Permits (7), Ready Mix Concrete Plant Permits (2) and Water Treatment Plant Permits (1). Agricultural operations include cattle, chicken, hog, and sheep farming. Maps illustrating the locations of NPDES and ARAP permit sites are presented in each subwatershed.

Chapter 5 is entitled *Water Quality Partnerships in the Buffalo River Watershed* and highlights partnerships between agencies and between agencies and landowners that are essential to success. Programs of federal agencies (Natural Resources Conservation Service, U.S. Fish and Wildlife Service, U.S. Geological Survey and Tennessee Valley Authority), and state agencies (TDEC Division of Community Assistance, TDEC Division of Water Supply and Tennessee Department of Agriculture) are summarized. Local initiatives of active watershed organizations (Five Rivers RC & D Council) are also described.

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

BUFFALO RIVER WATERSHED
WATER QUALITY MANAGEMENT PLAN

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GLOSSARY

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

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

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

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

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

AFO. Animal Feeding Operation.

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

ARAP. Aquatic Resource Alteration Permit.

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

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

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

Benthic. Bottom dwelling.

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

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

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

CAFO. Concentrated Animal Feeding Operation.

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

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

DO. Dissolved oxygen.

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

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

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

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

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

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

MRLC. Multi-Resolution Land Classification.

MS4. Municipal Separate Storm Sewer System.

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

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

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

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

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

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

SBR. Sequential Batch Reactor.

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

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

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

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

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

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

TMSP. Tennessee Multi-Sector Permit.

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

WAS. Waste Activated Sludge.

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

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

WET. Whole Effluent Toxicity.

WWTP. Waste Water Treatment Plant

CHAPTER 1

WATERSHED APPROACH TO WATER QUALITY

1.1 Background

1.2 Watershed Approach to Water Quality
1.2.A. Components of the Watershed Approach
1.2.B. Benefits of the Watershed Approach

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.

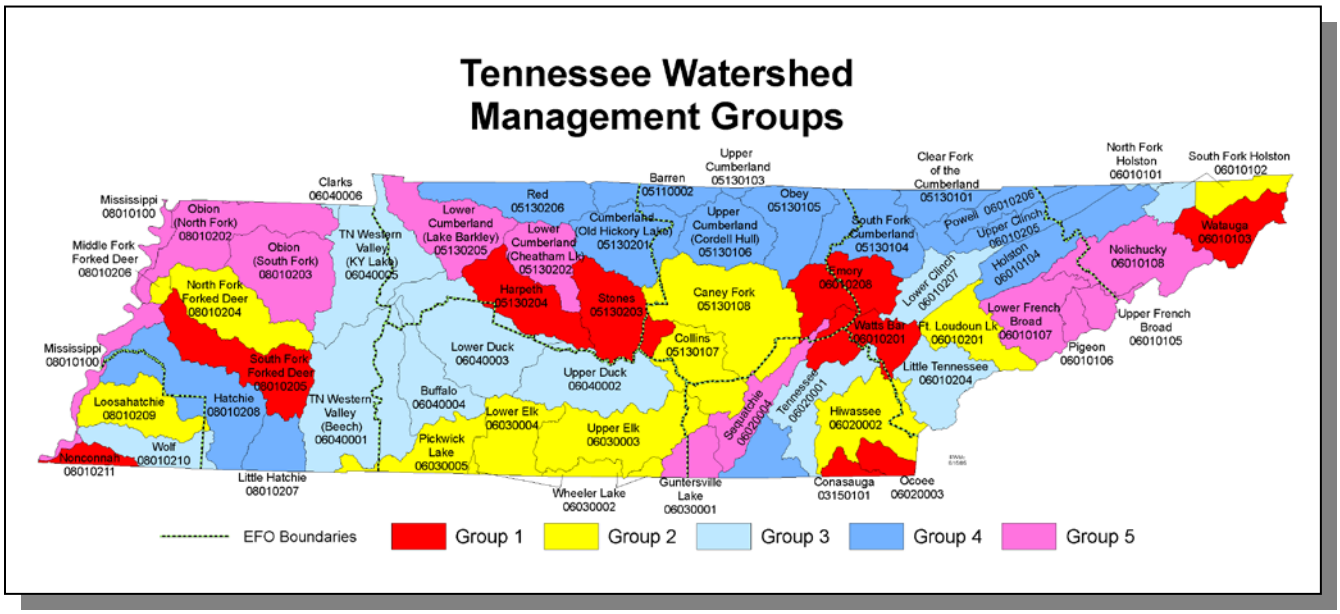

Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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.

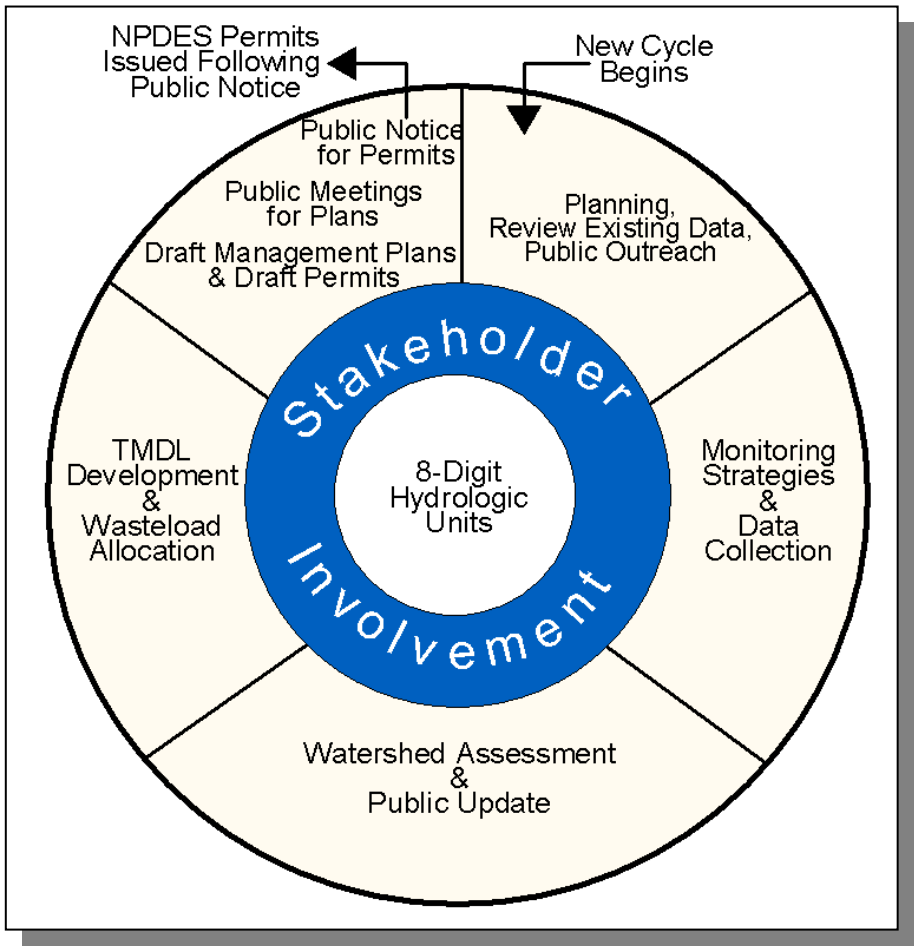

Figure 1-2. The Watershed Approach Cycle.

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 BUFFALO RIVER WATERSHED

2.1. Background

2.2. Description of the Watershed
2.2.A. General Location
2.2.B. Population Density Centers

2.3. General Hydrologic Description
2.3.A. Hydrology
2.3.B. Dams

2.4. Land Use

2.5. Ecoregions and Reference Streams

2.6. Natural Resources
2.6.A. Rare Plants and Animals
2.6.B. Wetlands

2.7. Cultural Resources
2.7.A. State Scenic River
2.7.B. Nationwide Rivers Inventory
2.7.C. Greenways
2.7.D. Interpretive Areas
2.7.E. Wildlife Management Area

2.8. Tennessee Rivers Assessment Project

2.1. BACKGROUND. The Buffalo River and Watershed are named for the buffalo fish, which were abundant in the Buffalo River when the first settlers arrived. The many river outfitters servicing the river attest to its value as a recreational river in middle Tennessee. Part of the Buffalo River is included in the State Scenic River System due to its pastoral nature.

This Chapter describes the location and characteristics of the Buffalo River Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Buffalo River Watershed is located in Middle Tennessee and includes parts of Hickman, Humphreys, Lawrence, Lewis, Perry, and Wayne Counties.

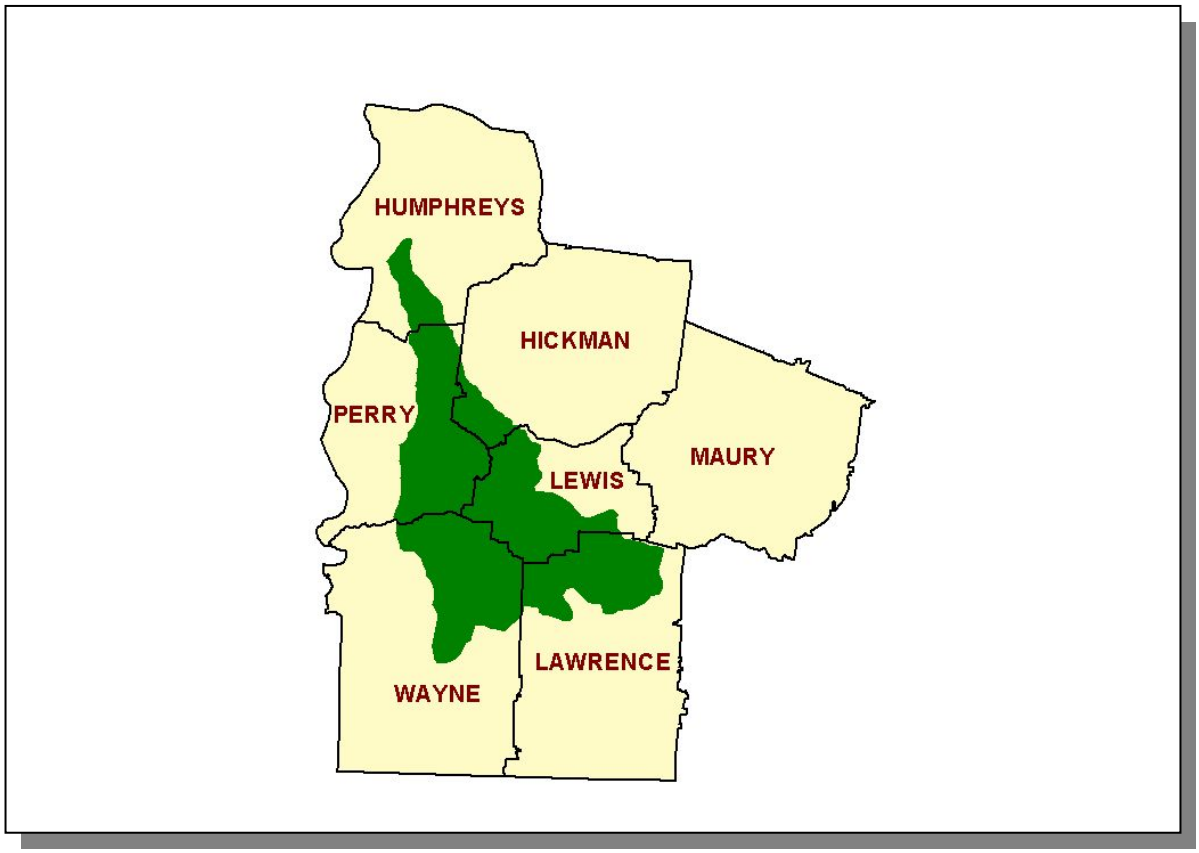

Figure 2-1. General Location of the Buffalo River Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Perry	25.1
Wayne	25.1
Lawrence	19.6
Lewis	19.5
Hickman	5.4
Humphreys	5.4

Table 2-1. The Buffalo River Watershed Includes Parts of Six Middle Tennessee Counties.

2.2.B. Population Density Centers. Six state highways and one interstate serve the major communities in the Buffalo River Watershed.

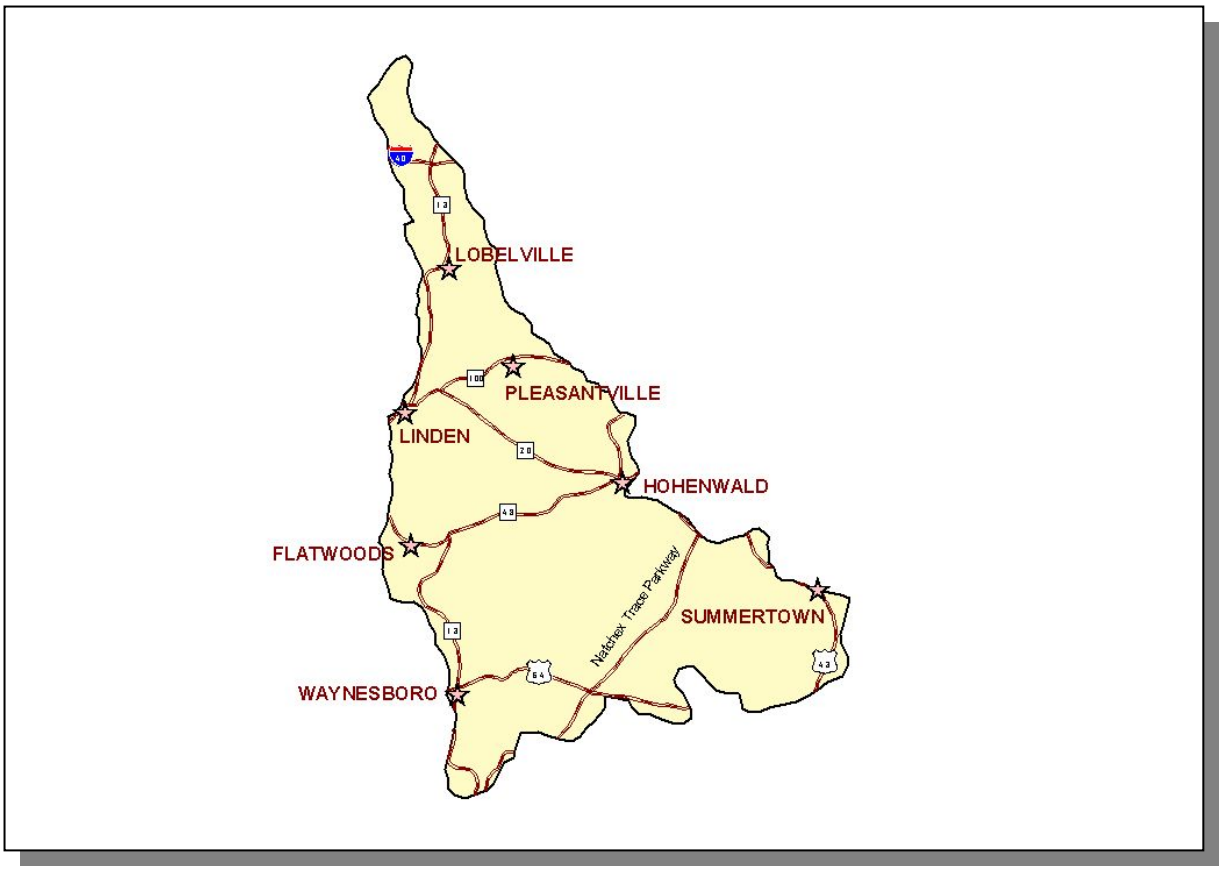

Figure 2-2. Municipalities and Roads in the Buffalo River Watershed.

MUNICIPALITY	POPULATION	COUNTY
Hohenwald*	4,672	Lewis
Waynesboro*	1,950	Wayne
Linden*	1,071	Perry
Lobelville	958	Perry

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

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Buffalo River Watershed, designated 06040004 by the USGS, drains approximately 763 square miles, and empties to the Lower Duck River Watershed (06040003).

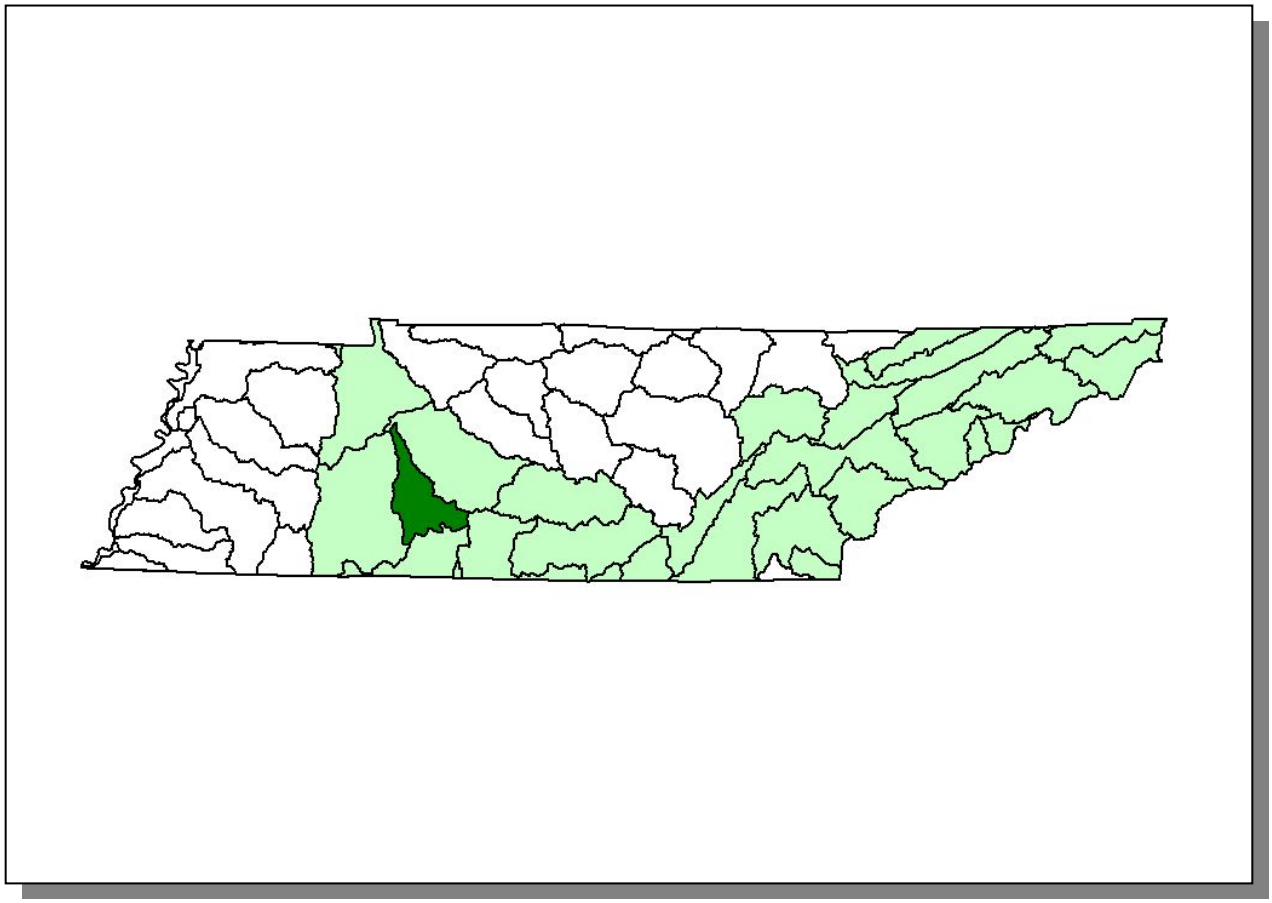

Figure 2-3. The Buffalo River Watershed is Part of the Tennessee River Basin.

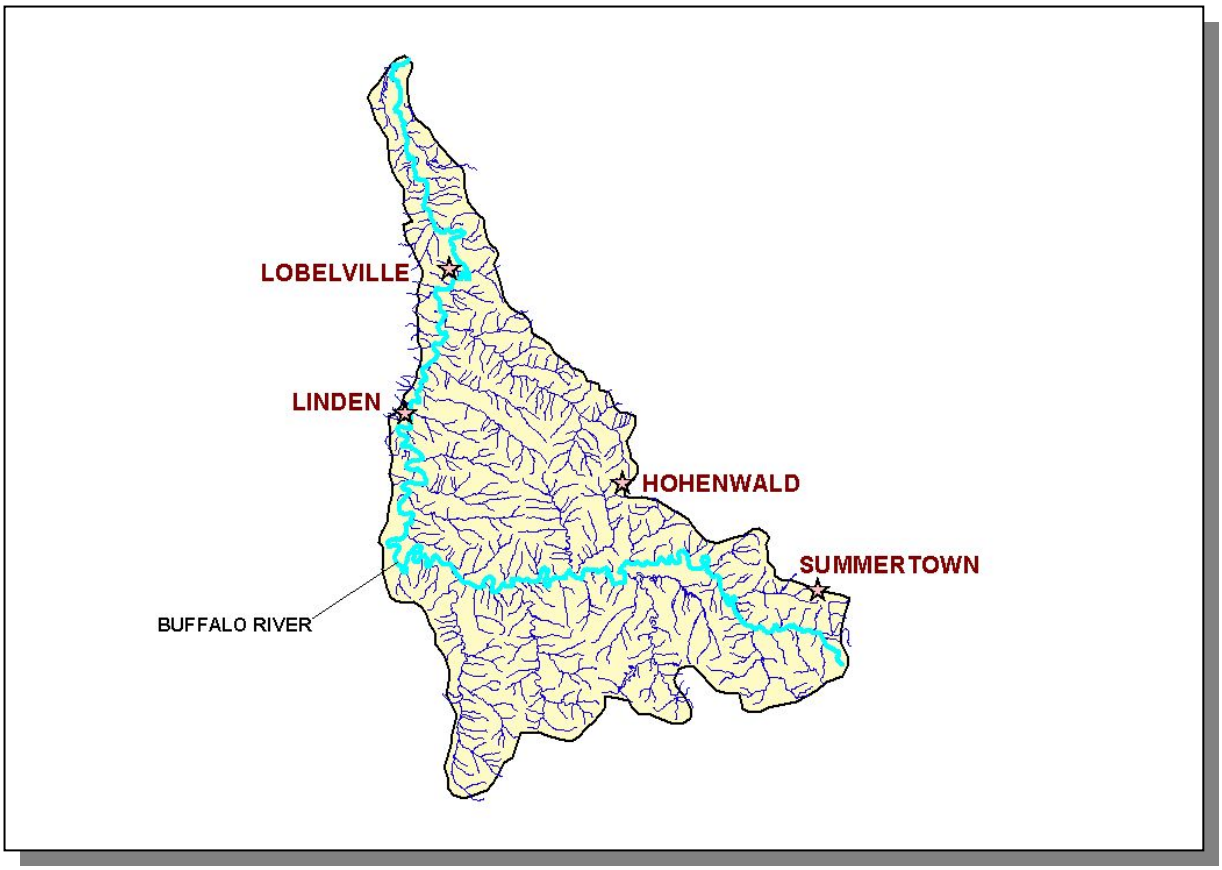

Figure 2-4. Hydrology in the Buffalo River Watershed. *There are 1,200 stream miles and 349 lake acres in the Buffalo River Watershed as catalogued in the assessment database. Location of the Buffalo River and the cities of Hohenwald, Linden, Lobelville, and Summertown are shown for reference.*

2.3.B. Dams. There are 10 dams inventoried by TDEC Division of Water Supply in the Buffalo River Watershed. These dams either retain 30 acre-feet of water or have structures at least 20 feet high.

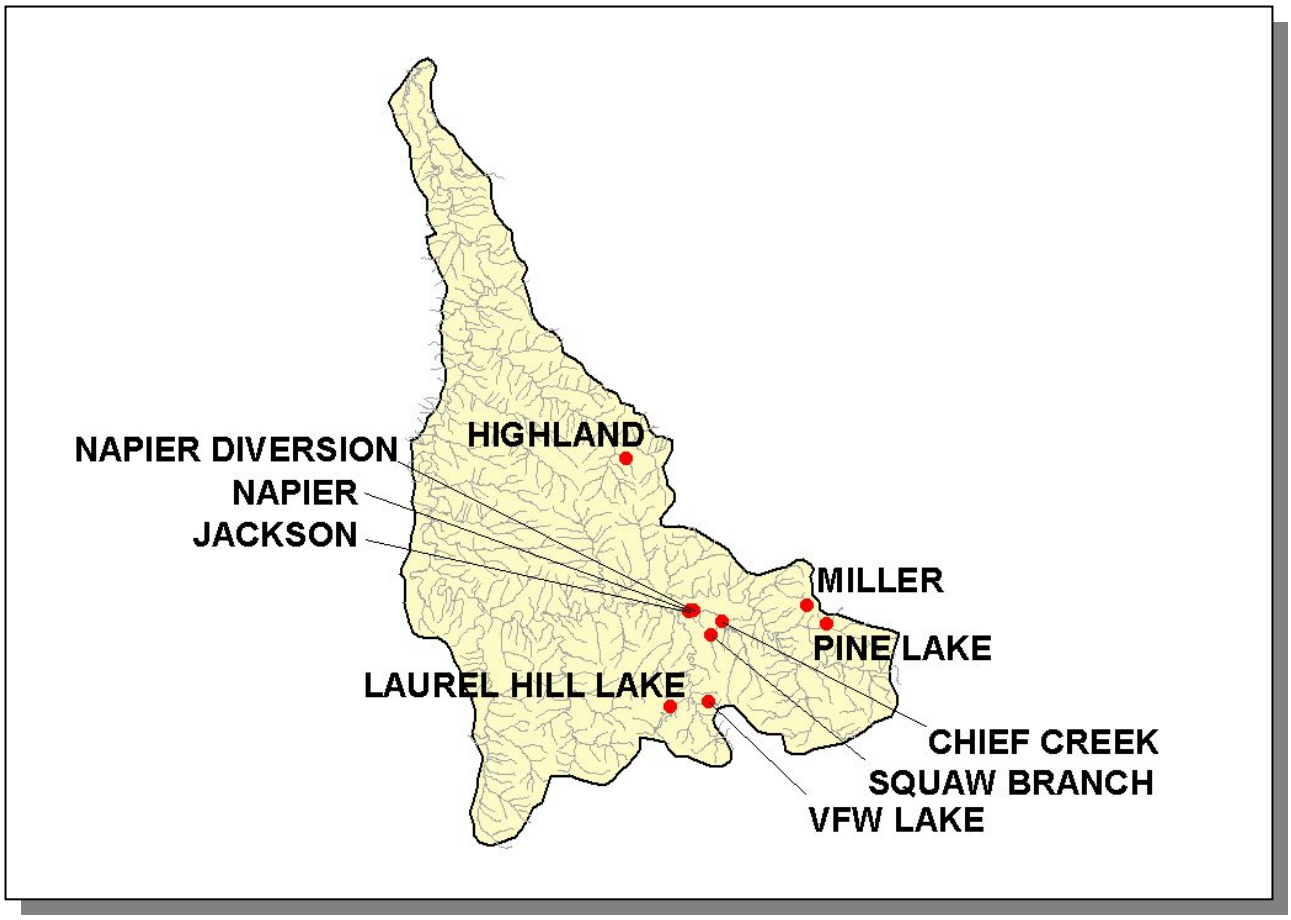

Figure 2-5. Location of Inventoried Dams in the Buffalo River Watershed. *More information is provided in Appendix II and on the TDEC homepage at http://gwidc.memphis.edu/website/dws/.*

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

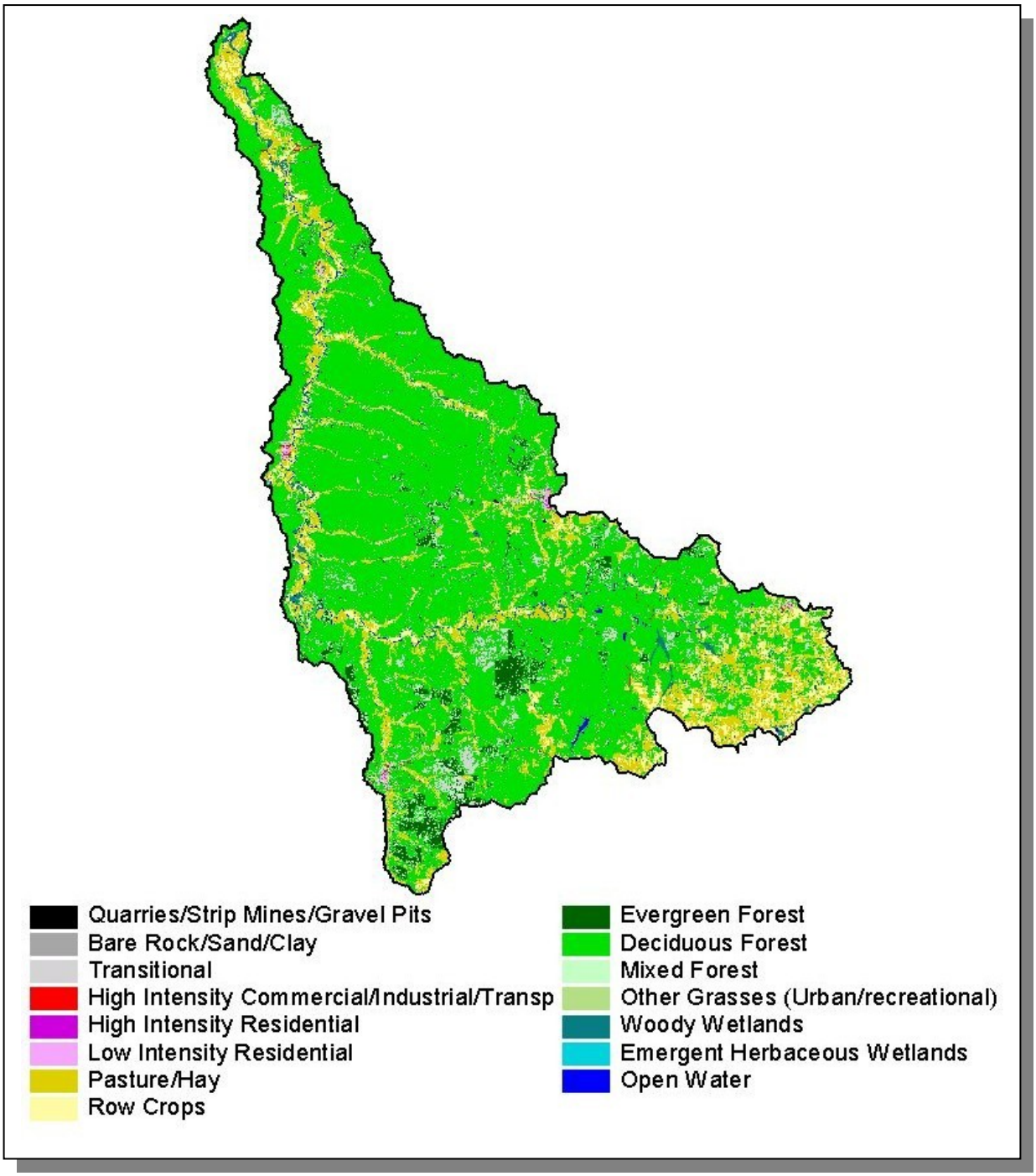

Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery in the Buffalo River Watershed.

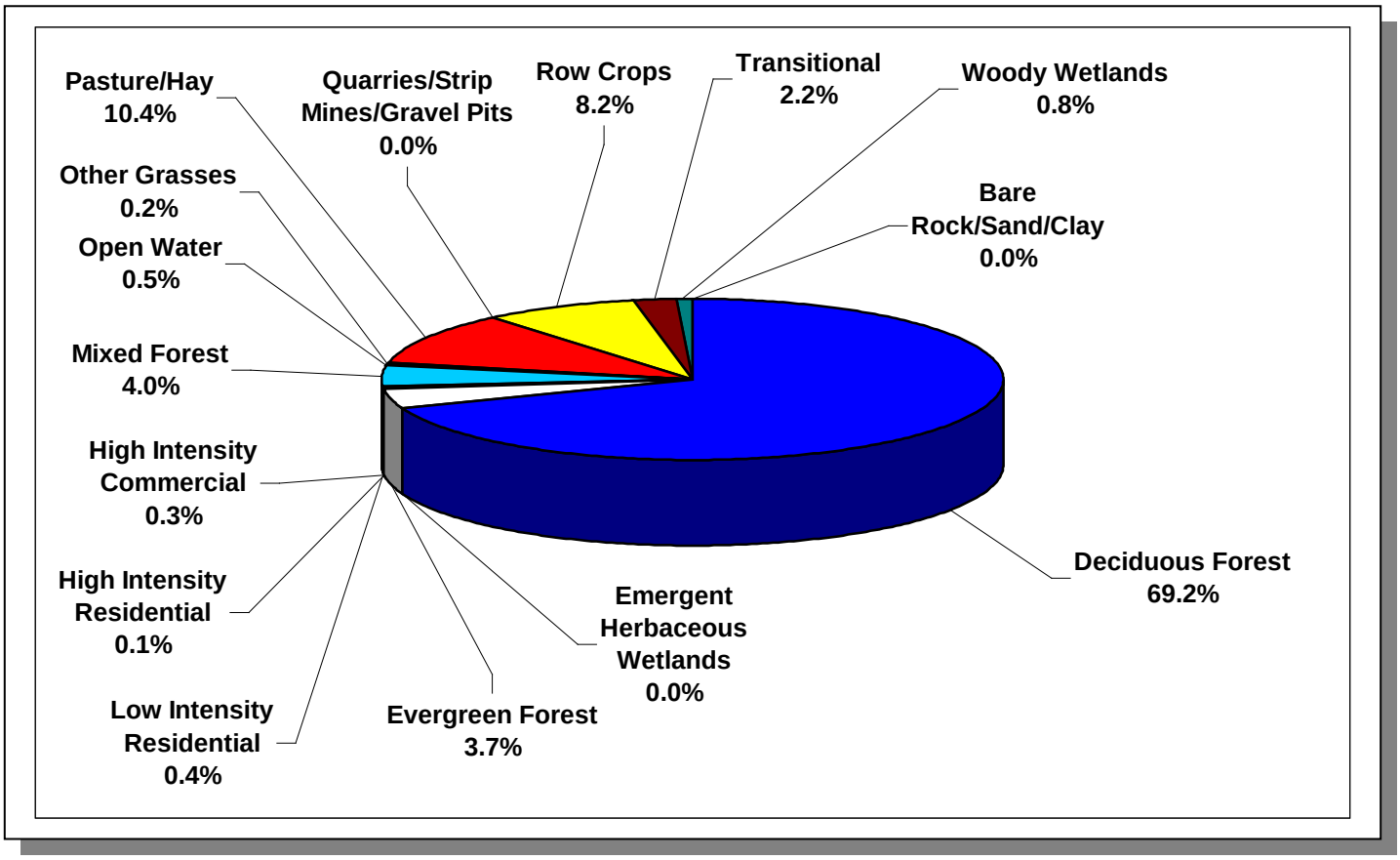

Figure 2-7. Land Use Distribution in the Buffalo River Watershed. *More information is provided in Appendix II.*

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

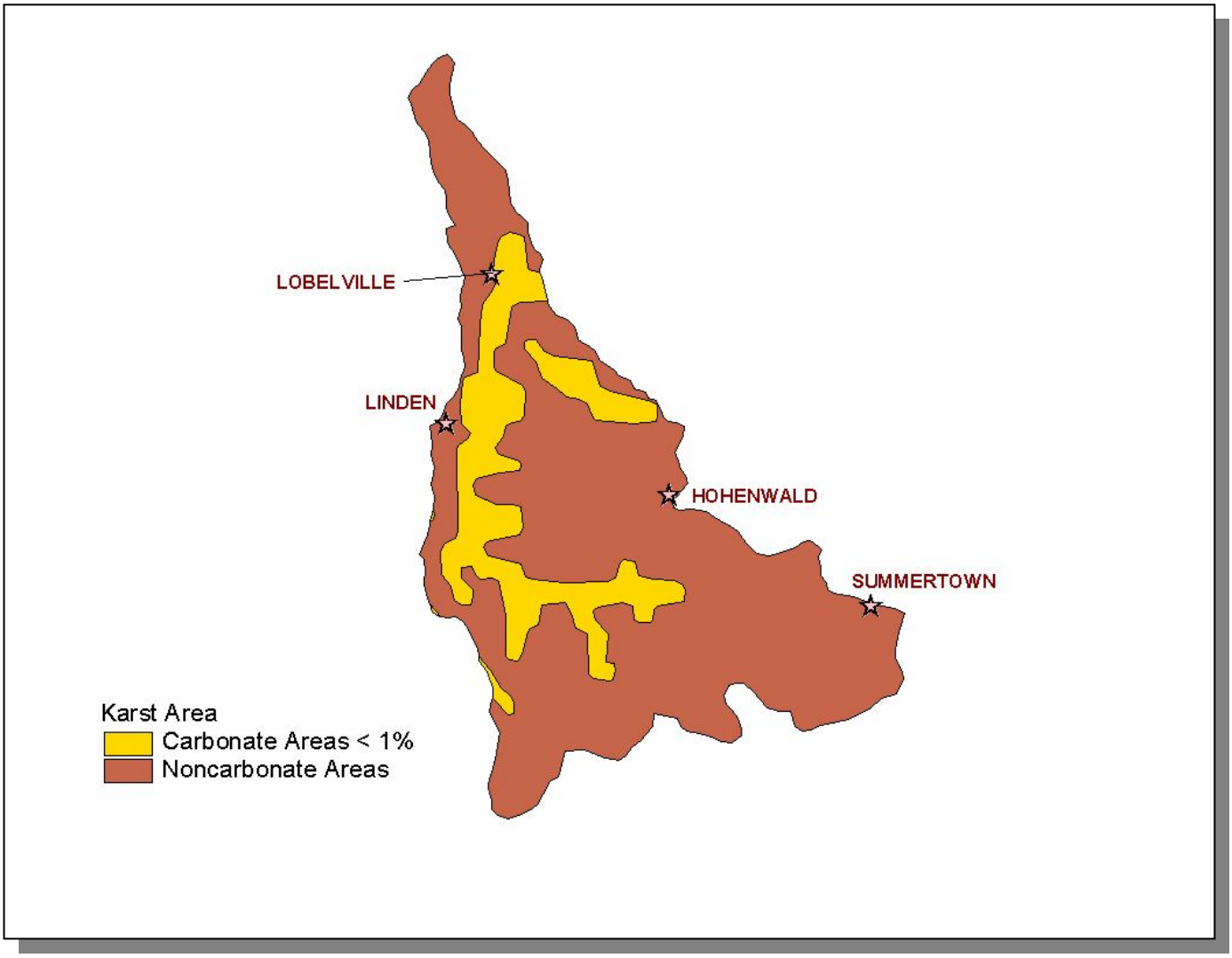

Figure 2-8. Illustration of Karst Areas in Buffalo River Watershed. *Locations of Hohenwald, Linden, Lobelville, and Summertown are shown for reference*

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

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Buffalo River Watershed lies within 2 Level III ecoregions (Southeastern Plains and Interior Plateau) and contains 2 Level IV subecoregions:

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

- **Western Highland Rim (71f)** is characterized by dissected, rolling terrain of open hills, with elevations of 400-1000 feet. The geologic base of Mississippian-age limestone, chert, and shale is covered by soils that tend to be cherty and acidic with low to moderate fertility. Streams are relatively clear with a moderate gradient. Substrates are coarse chert, gravel and sand with areas of bedrock. The native oak-hickory forests were removed over broad areas in the mid-to late 1800's in conjunction with the iron-ore related mining and smelting of the mineral limonite, however today the region is again heavily forested. Some agriculture occurs on the flatter interfluves and in the stream and river valleys. The predominant land uses are hay, pasture, and cattle with some cultivation of corn and tobacco.

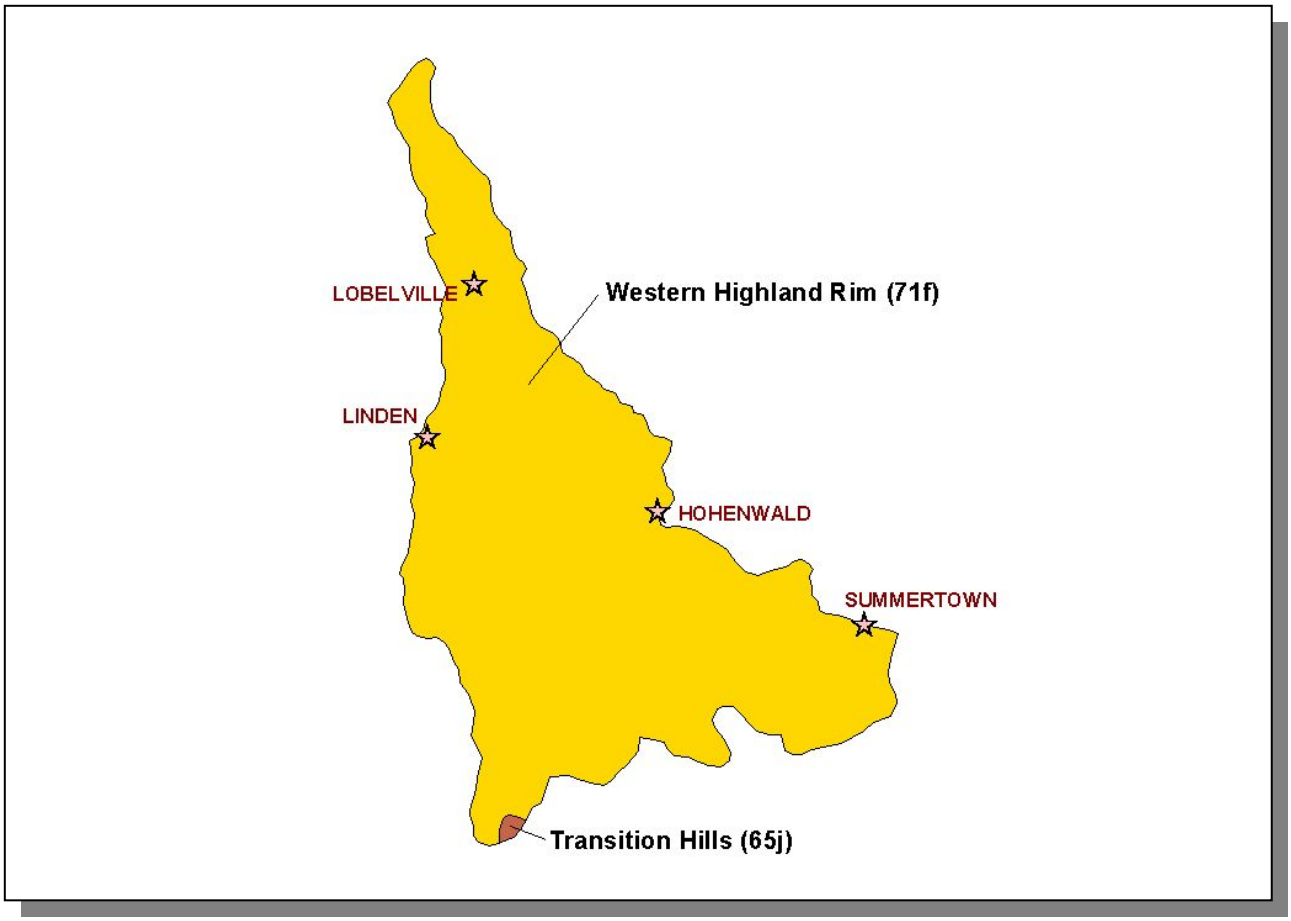

Figure 2-9. Level IV Ecoregions in the Buffalo River Watershed. *Locations of Hohenwald, Linden, Lobelville, and Summertown are shown for reference.*

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

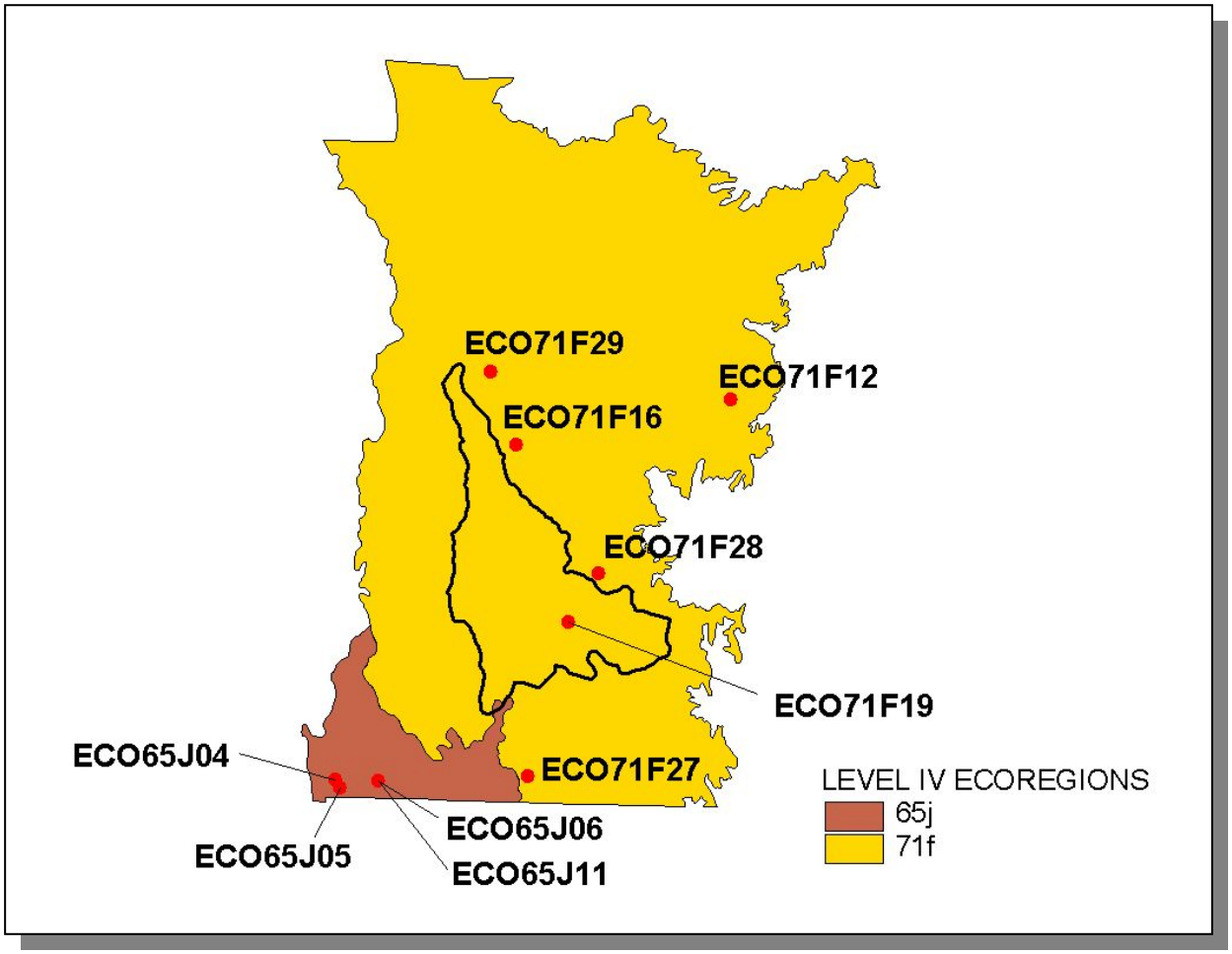

Figure 2-10. Ecoregion Monitoring Sites in Level IV Ecoregions 65j and 71f in Tennessee. *The Buffalo River Watershed boundary is shown for reference. More information is provided in Appendix II.*

2.6. NATURAL RESOURCES.

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

GROUPING	NUMBER OF RARE SPECIES
Crustaceans	1
Insects and Spiders	3
Mussels	3
Snails	4
Other Invertebrates	1
Amphibians	1
Birds	3
Fish	11
Mammals	1
Reptiles	2
Plants	18
Total	**48**

Table 2-3. There are 48 Known Rare Plant and Animal Species in the Buffalo River Watershed.

In the Buffalo River Watershed, there are 12 rare fish species, 1 rare crustacean species, 3 rare mussel species, and 4 rare snail species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Ammocrypta vivax	Scaly Sand Darter		D
Cyprinella monacha	Spotfin Chub	LT	T
Etheostoma aquali	Coppercheek Darter	MC	T
Etheostoma boschungi	Slackwater Darter	LT	T
Etheostoma cinereum	Ashy Darter	MC	T
Etheostoma denoncourti	Golden Darter		
Etheostoma pseudovulatum	Egg-Mimic Darter	MC	E
Noturus sp 3	Saddled Madtom		T
Percina burtoni	Blotchside Darter	MC	D
Percina macrocephala	Longhead Darter		T
Typhlichthys subterraneus	Southern Cavefish	MC	D
Orconectes alabamensis	A Crayfish		D
Hemistena lata	Cracking Pearly Mussel	LE	E
Quadrilla cylindrical cylindrical	Rabbitsfoot		
Toxolasma cylindrellus	Pale Lilliput	LE	E
Leptoxis praerosa	Onyx Rocksnail		
Lithasia duttoniana	Helmet Rocksnail		
Lithasia geniculata fuliginosa	Geniculate Rocksnail		
Lithasia geniculata fulginosa	Geniculate Riversnail		

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

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

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

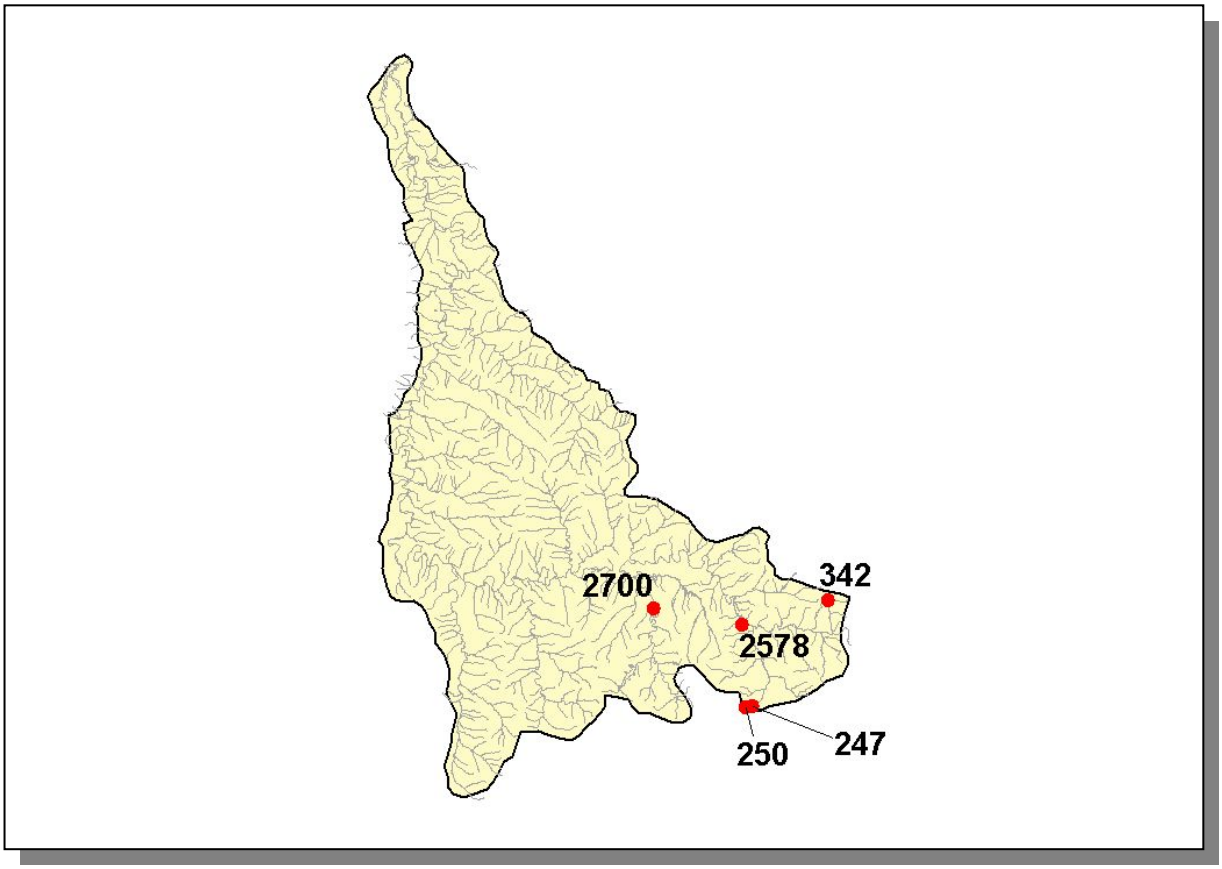

Figure 2-11. Location of Wetland Sites in TDEC Division of Natural Heritage Database in the Buffalo River Watershed. ***This map represents an incomplete inventory and should not be considered a dependable indicator of the presence of wetlands****. More information is provided in Appendix II.*

2.7. CULTURAL RESOURCES.

2.7.A. State Scenic River. A portion of the Buffalo River has been designated as a State Scenic River. The entire river, except that portion which lies within Wayne, Perry, Humphreys and Lewis counties has been designated as a Class II Pastoral River Area. The Tennessee Scenic Rivers Act of 1968, as amended, defines Class II State Scenic Rivers as flowing through agricultural areas or lands used for dispersed human activities. More information about Tennessee's State Scenic River Program may be found at:

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

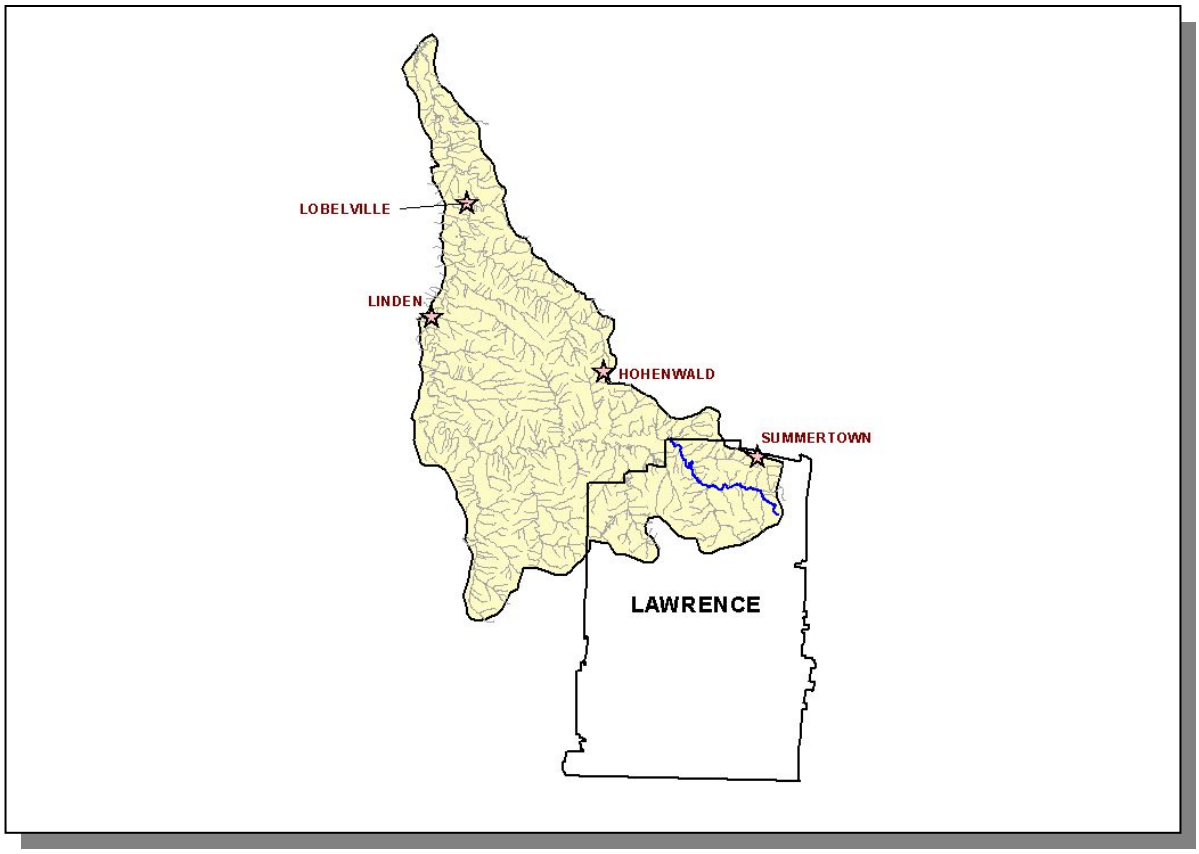

Figure 2-12. A Portion of the Buffalo River is Designated as a State Scenic River. *Locations of Hohenwald, Linden, Lobelville, and Summertown are shown for reference.*

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

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

Green River Creek, a scenic, rocky float stream.

RIVER	SCENIC	RECREATION	GEOLOGIC	FISH	WILDLIFE
Green River	X	X	X	X	X

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

Additional information may be found online at:

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

2.7.C. Greenways. The Buffalo River Watershed has at least two greenways/trails:

- City Park Walking Trail in Linden
- Lady's Bluff Trail in Perry County
- Buffalo River Trail in Perry County

More information about greenways and trails in the watershed may be found at:

http://www2.state.tn.us/tdec/GREENWAYS/tnmap.htm

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

- Lewis State Forest became a state forest in 1936 and features a demonstration forest road exemplifying the use of Best Management Practices. The primary recreational use of the 1,257-acre forest is hunting. The forest is managed by the Tennessee Department of Agriculture.

- Natchez Trace Parkway National Park commemorates an ancient trail that connected southern portions of the Mississippi River to salt licks in modern-day Tennessee. Between 1785 and 1820, boatmen floated down the Ohio and Mississippi Rivers to Natchez, MS and New Orleans, LA, and walked back to Nashville on the 444-mile Trace. The Parkway is managed by the National Park Service.

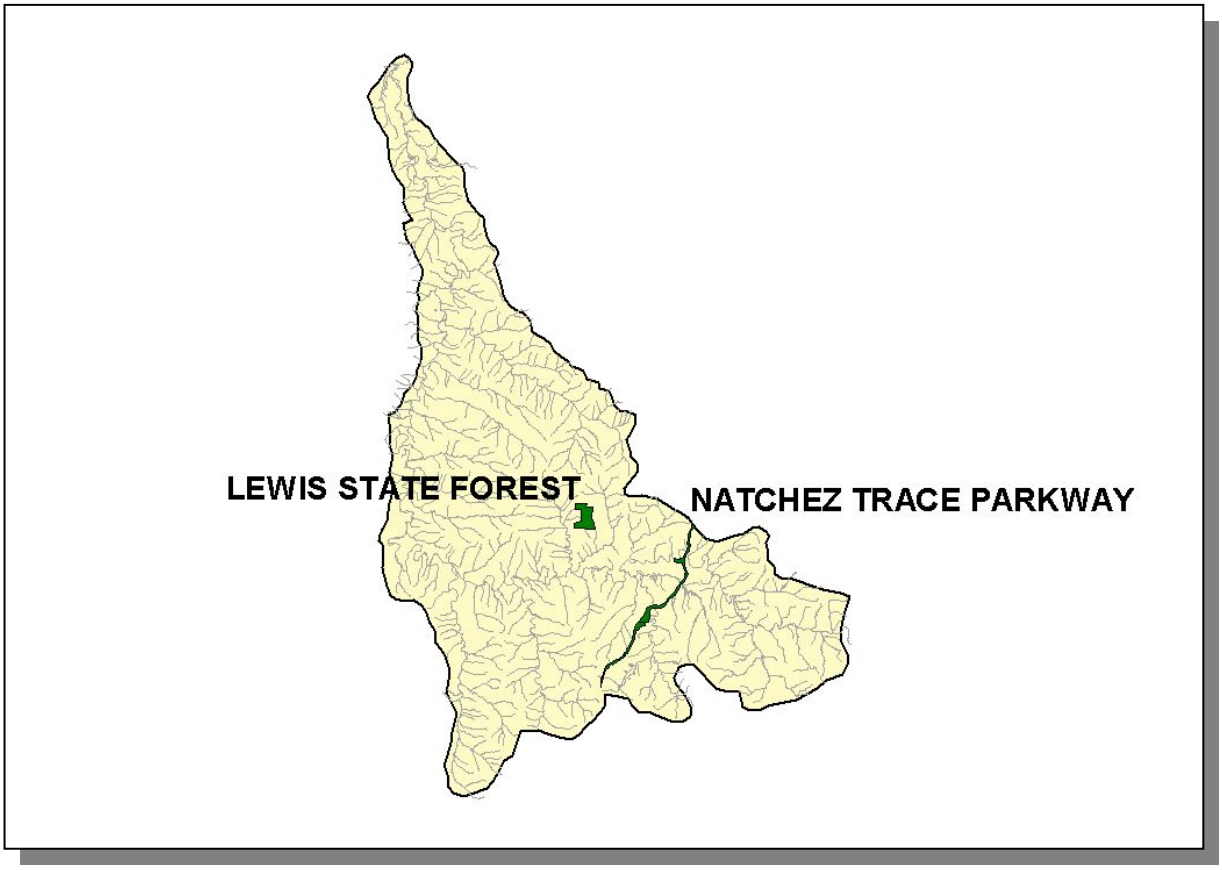

Figure 2-13. Locations of State- and Federally-Managed Lands in the Buffalo River Watershed.

2.7.E. Wildlife Management Area. The Tennessee Wildlife Resources Agency manages two wildlife management areas in the Buffalo River Watershed.

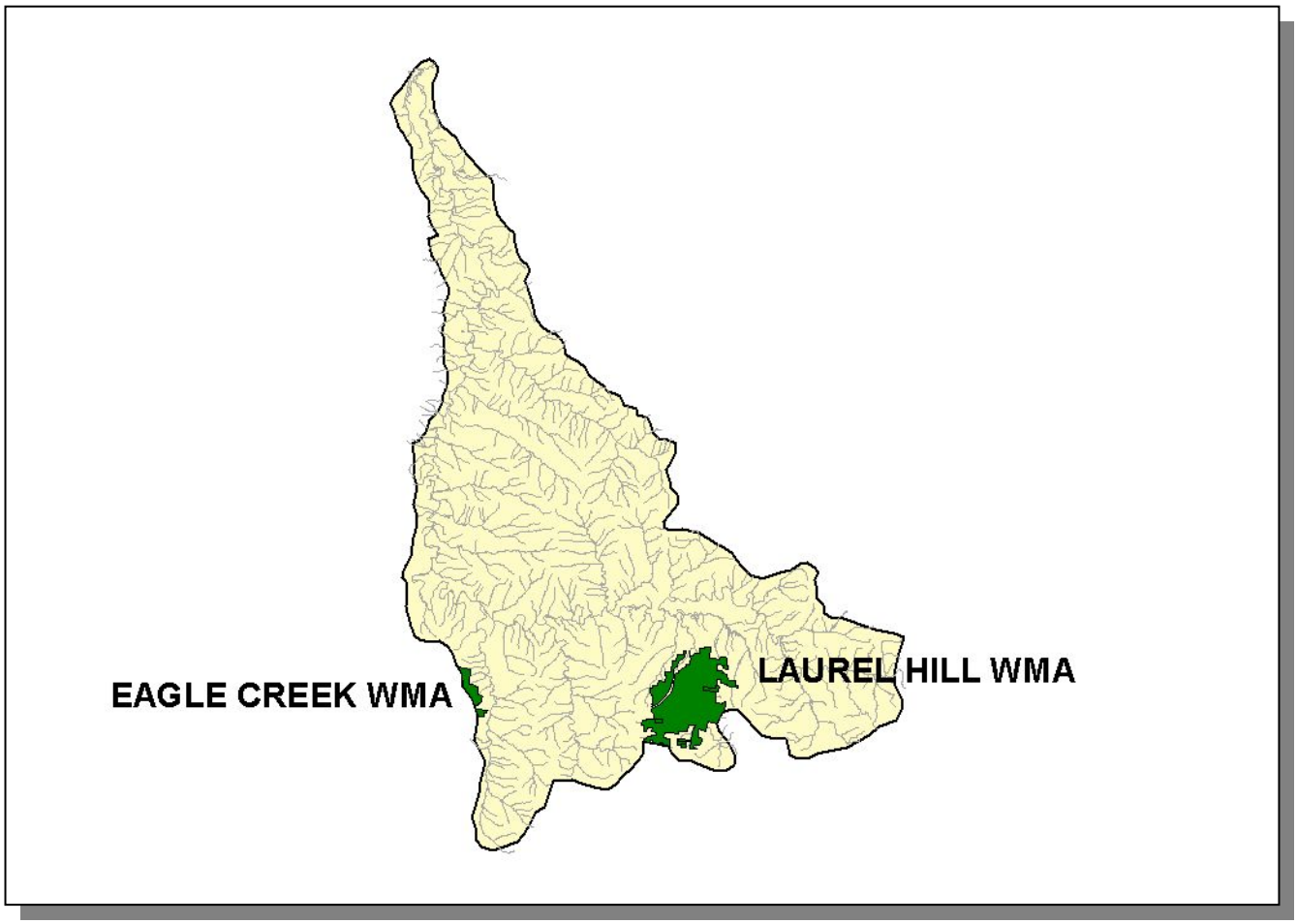

Figure 2-14. TWRA Manages Wildlife Management Areas in the Buffalo River Watershed.

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

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

STREAM	NSQ	RB	RF		STREAM	NSQ	RB	RF
Big Oppossum Creek	2				Hurricane Creek	1,2		1
Big Swan Creek	2	2			Little Buffalo River	1	2	1
Brush Creek (Chief Creek)	2		2		Peter Cove Creek	2		
Brush Creek (Buffalo)	2		4		Pond Creek			2
Buffalo River	1,2	1,2	2,3		Rockhouse Creek	2		
Cane Creek	2	2	1		Saw Creek	4		
Chief Creek	3		1		Sinking Creek	2		1
Coon Creek	2		2		Trace Creek	2		
Fortyeight Creek	2	3	2		Water Fork Creek	3		
Green River	2	2	3		West Fork Buffalo River	3		
Grinders Creek		2	1					

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

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

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

CHAPTER 3

WATER QUALITY ASSESSMENT OF THE BUFFALO RIVER WATERSHED.

3.1 Background

3.2 Data Collection
- 3.2.A Ambient Monitoring Sites
- 3.2.B Ecoregion Sites
- 3.2.C Watershed Screening Sites
- 3.2.D Special Surveys

3.3 Status of Water Quality
- 3.3.A Assessment Summary
- 3.3.B Use Impairment Summary

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

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

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

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

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

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

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

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

4. Highlight areas of improved water quality

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

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

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

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

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

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

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

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

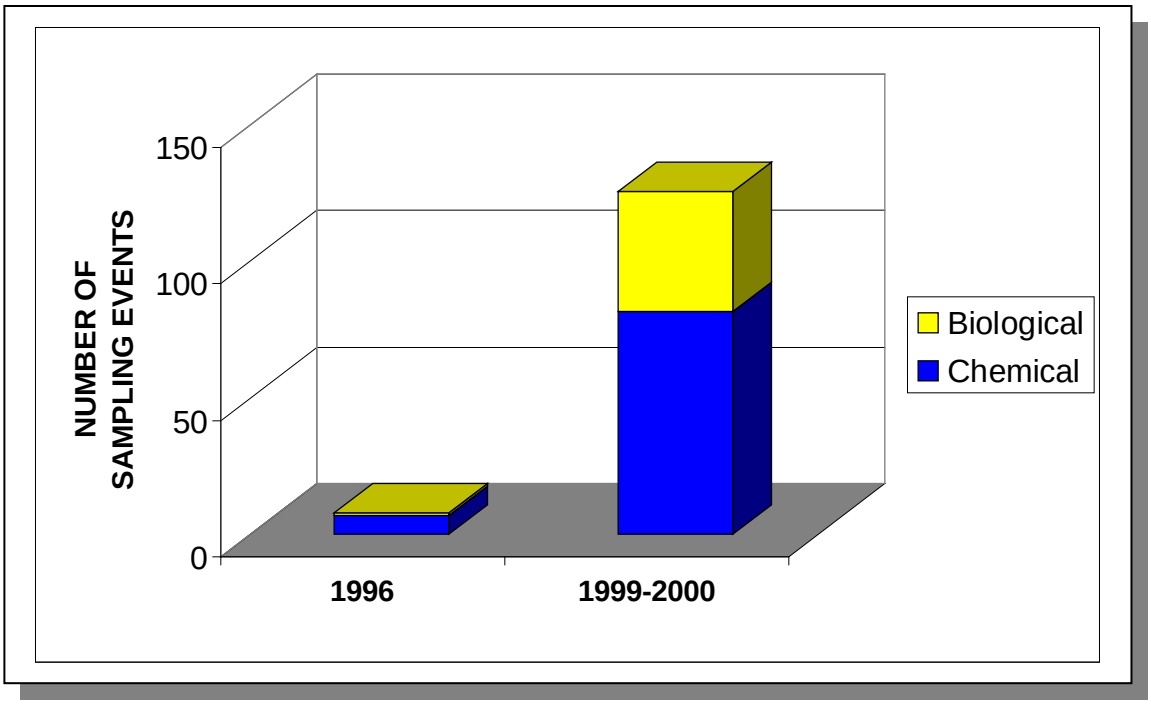

Figure 3-1. Number of Sampling Events Using the Traditional Approach (1996) and Watershed Approach (1999-2000) in the Buffalo River Watershed.

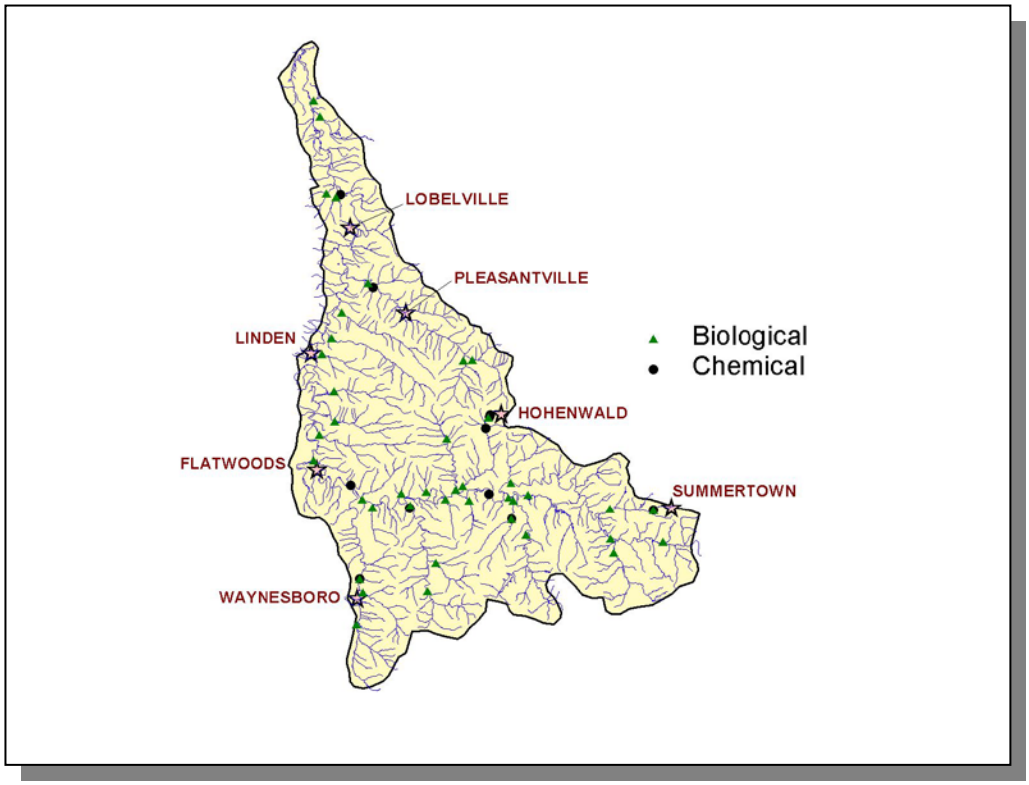

Figure 3-2. Location of Monitoring Sites in the Buffalo River Watershed. *Locations of Flatwoods, Hohenwald, Linden, Lobelville, Pleasantville, Summertown, and Waynesboro are shown for reference.*

	1996	1999-2000
Biological	1	44
Chemical	7	82
Total	**8**	**126**

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

3.2.A. Ambient Monitoring Sites. These fixed-station chemical monitoring sites are sampled quarterly or monthly by the Environmental Field Office-Columbia staff (this is in addition to samples collected by water and wastewater treatment plant operators). Samples are analyzed by the Tennessee Department of Health, Division of Environmental Laboratory Services. Ambient monitoring data are used to assess water quality in major bodies of water where there are NPDES facilities and to identify trends in water quality. Water quality parameters traditionally measured at ambient sites in the Buffalo River Watershed are provided in Appendix IV.

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

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

- Transition Hills (65j)
- Western Highland Rim (71f)

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

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

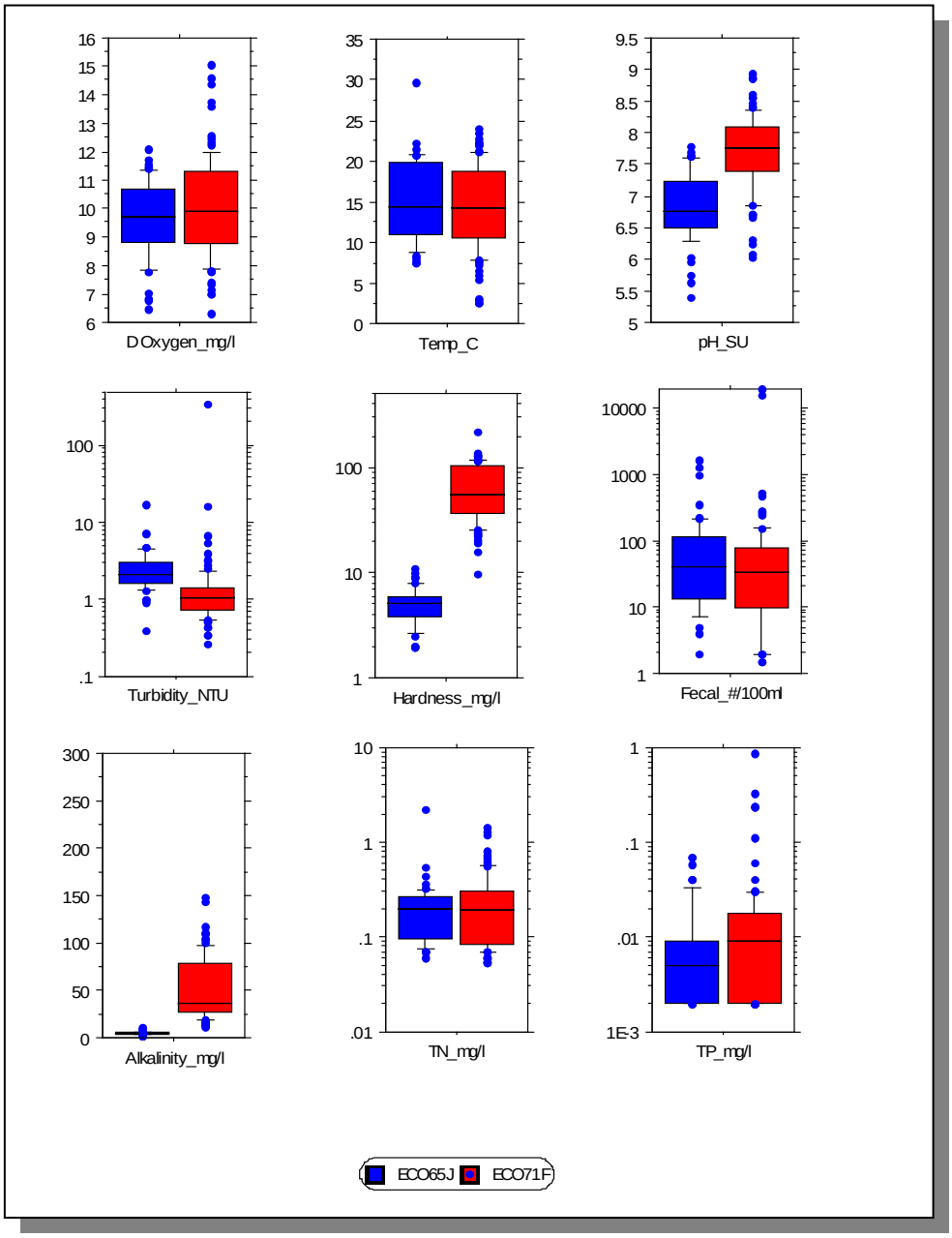

Figure 3-3. Select Chemical Data Collected in Buffalo River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. Fecal, fecal coliform bacteria; TN, Total Nitrogen; TP, Total Phosphorus.*

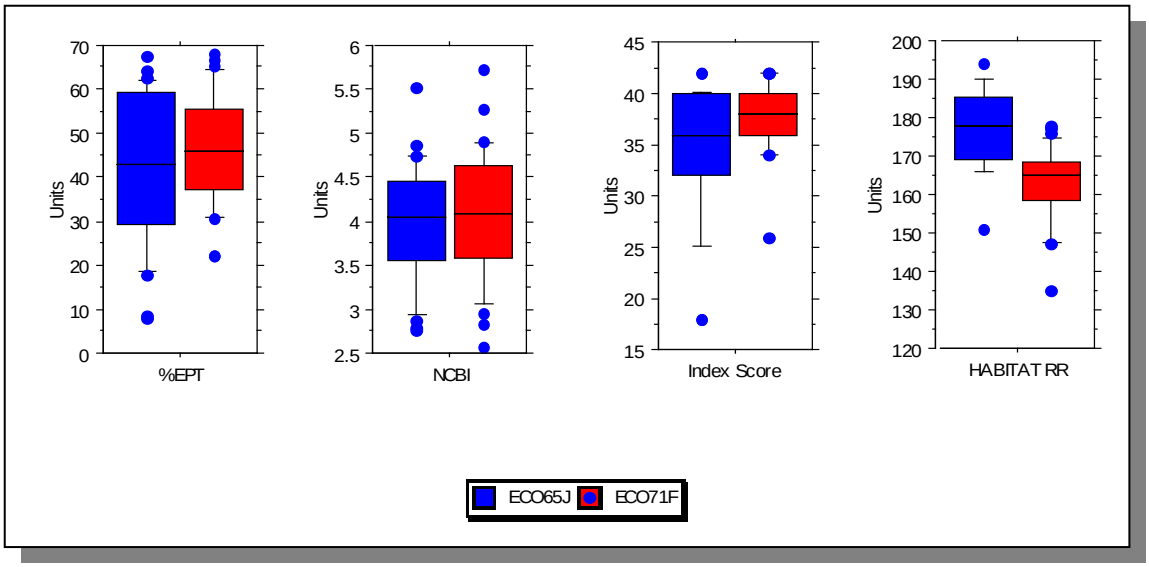

Figure 3-4. Benthic Macroinvertebrate and Habitat Scores for Buffalo River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score and Habitat Riffle/Run scoring system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

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

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

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

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

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

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

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

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

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

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

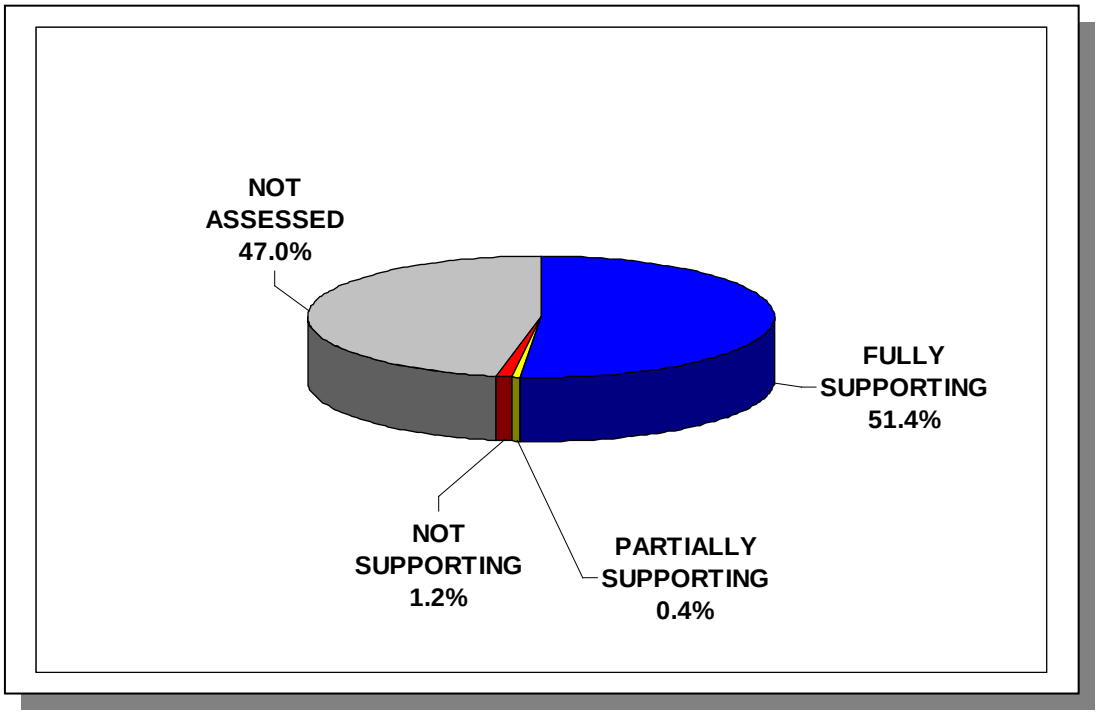

Figure 3-5. Water Quality Assessment of Streams and Rivers in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment of 1,200.0 miles in the watershed. More information is provided in Appendix III.*

3.3.A. Assessment Summary.

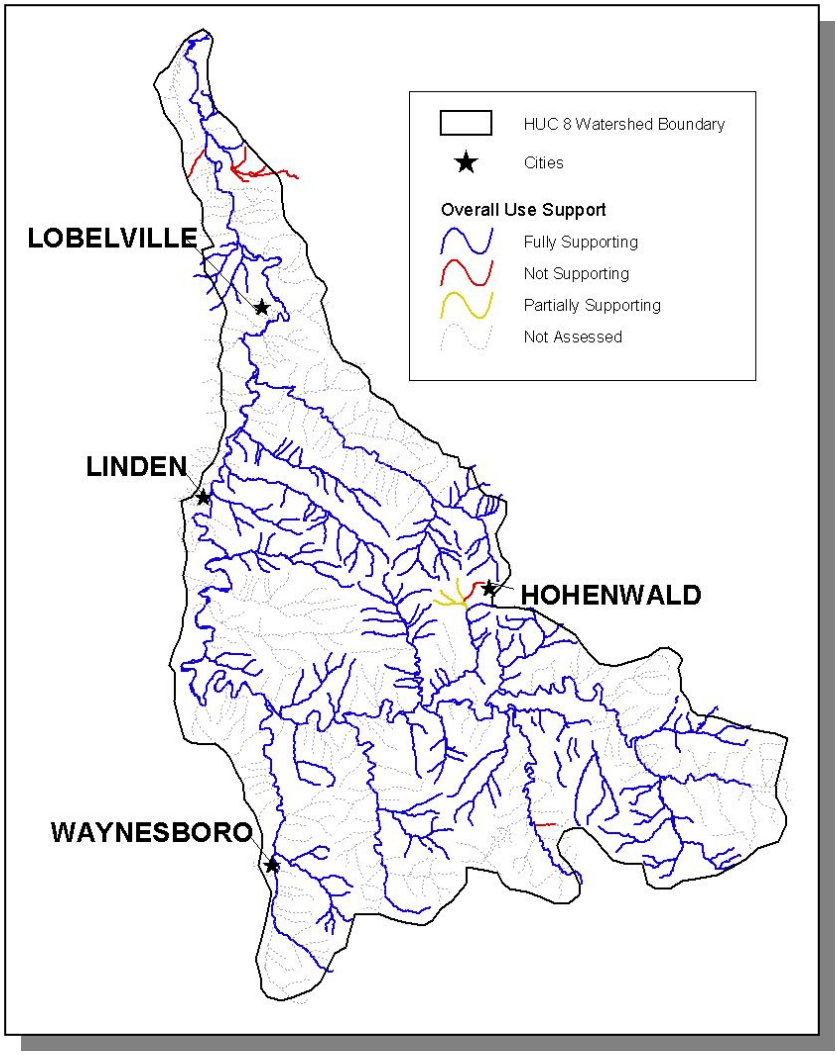

Figure 3-6a. Overall Use Support Attainment in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Hohenwald, Linden, Lobelville, and Waynesboro are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

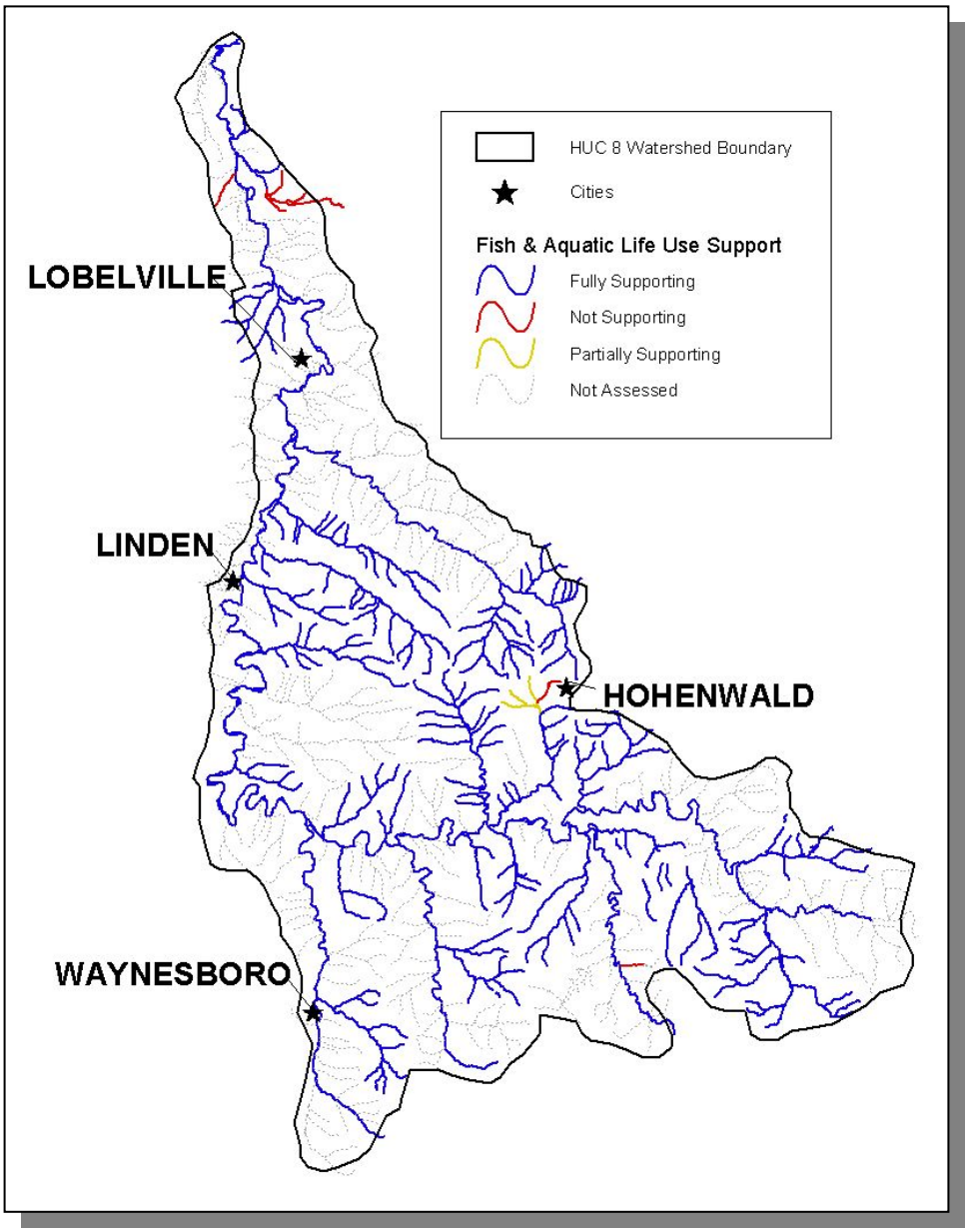

Figure 3-6b. Fish and Aquatic Life Use Support Attainment in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Hohenwald, Linden, Lobelville, and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

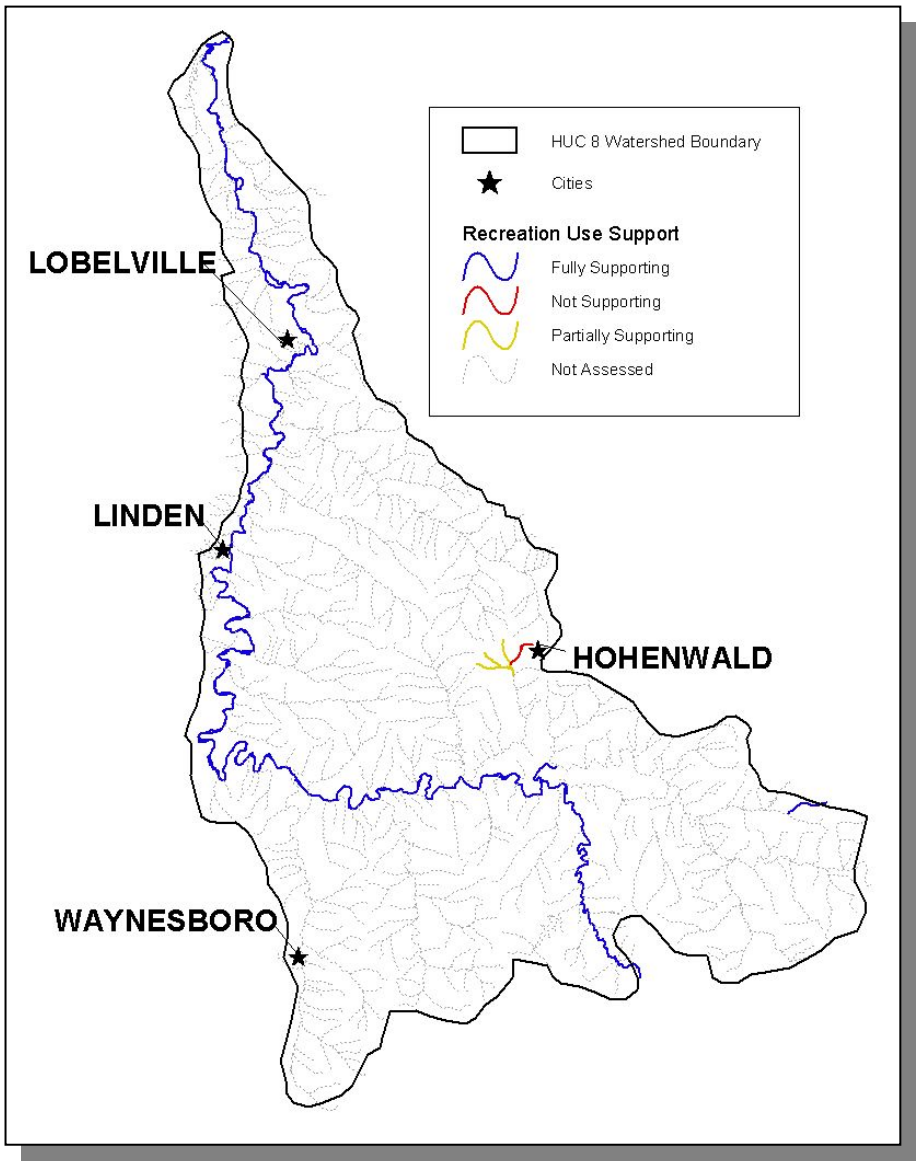

Figure 3-6c. Recreation Use Support Attainment in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Hohenwald, Linden, Lobelville, and Waynesboro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

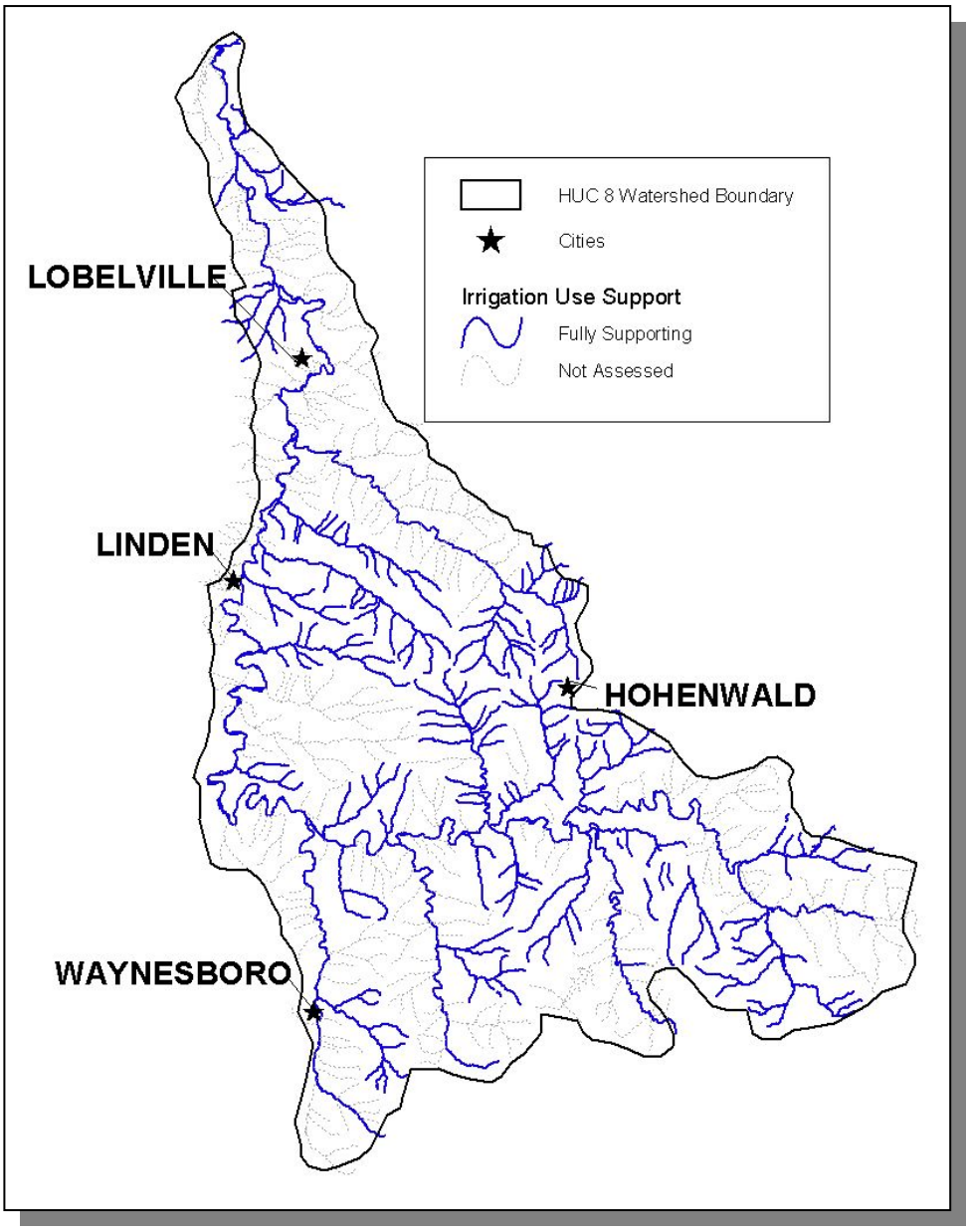

Figure 3-6d. Irrigation Use Support Attainment in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Hohenwald, Linden, Lobelville, and Waynesboro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

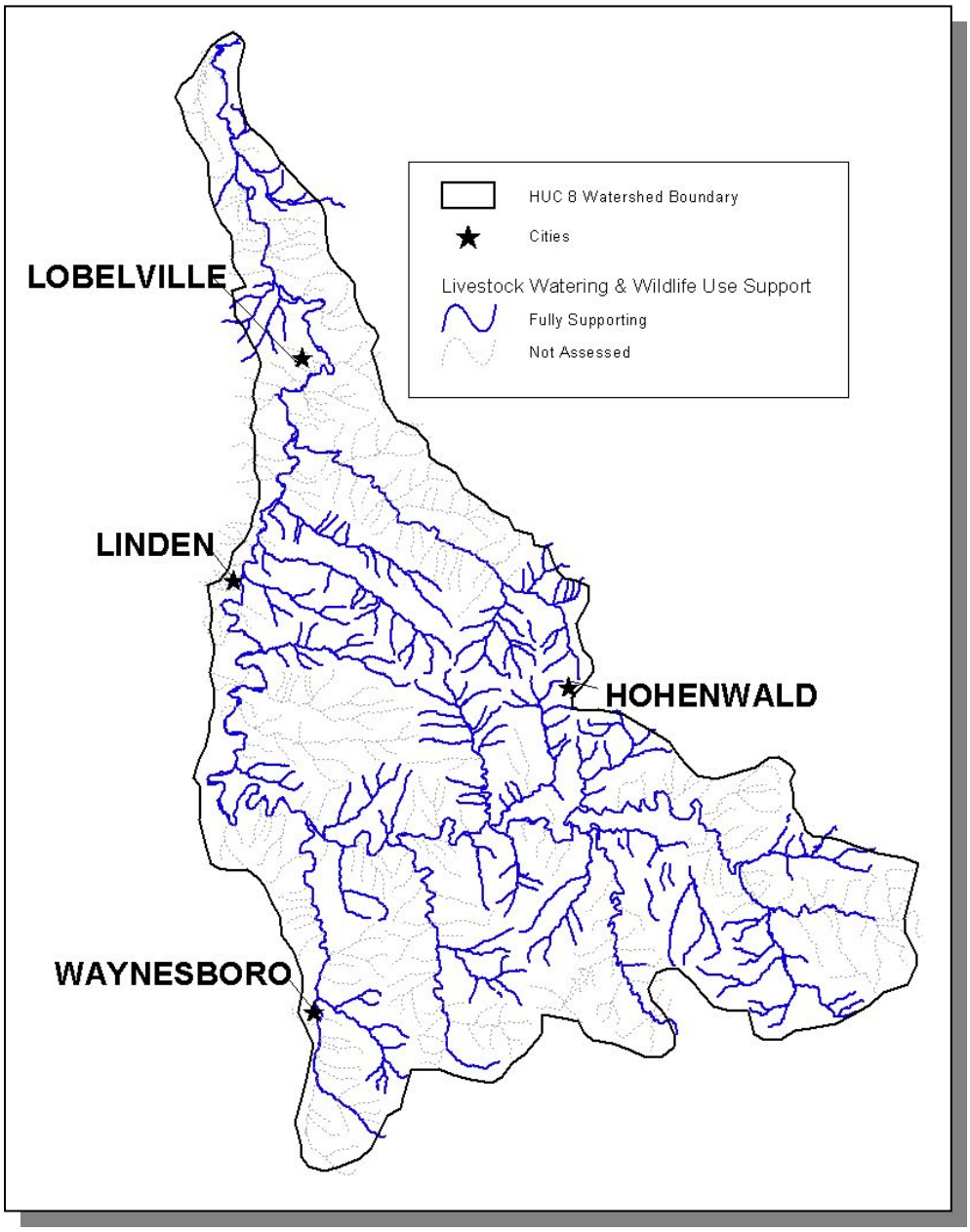

Figure 3-6e. Livestock Watering and Wildlife Use Support Attainment in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Locations of Hohenwald, Linden, Lobelville,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

3.3.B. Use Impairment Summary.

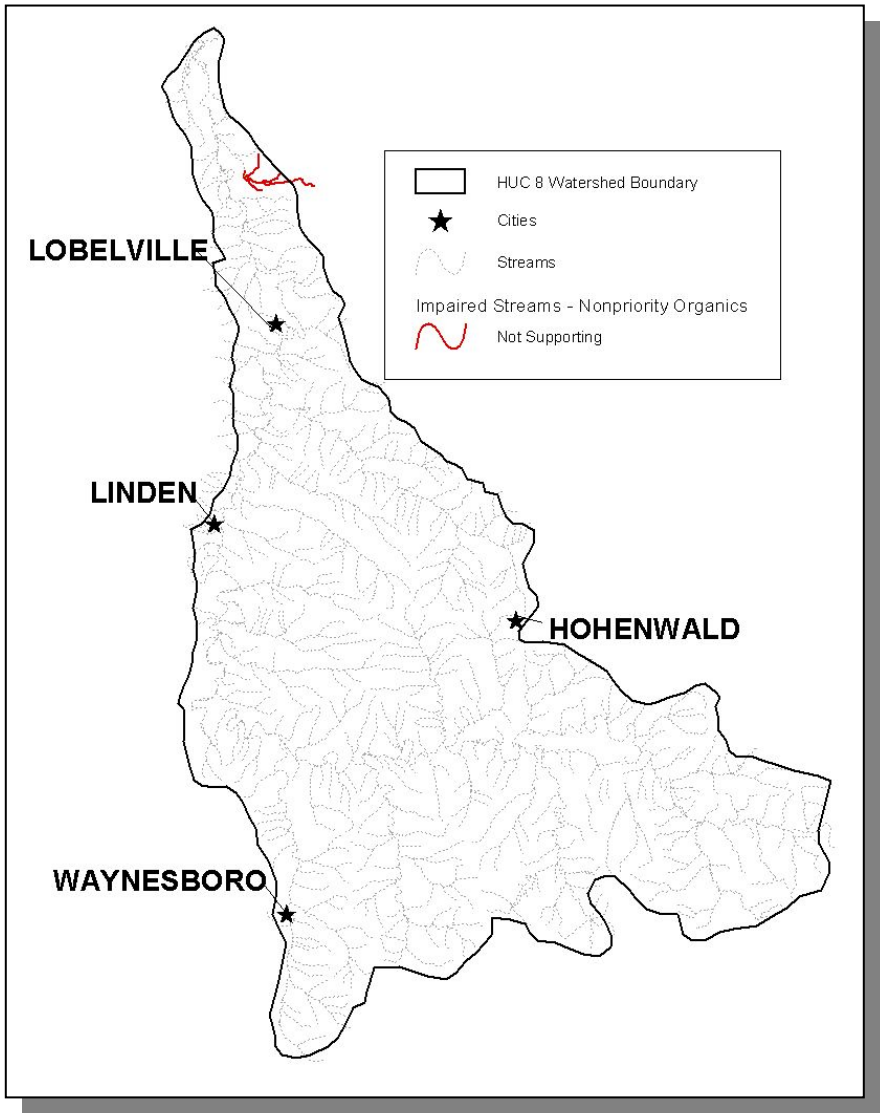

Figure 3-7a. Impaired Streams Due to Nonpriority Organics in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Hohenwald, Linden, Lobelville, and Waynesboro are shown for reference. More information is provided in Appendix III.*

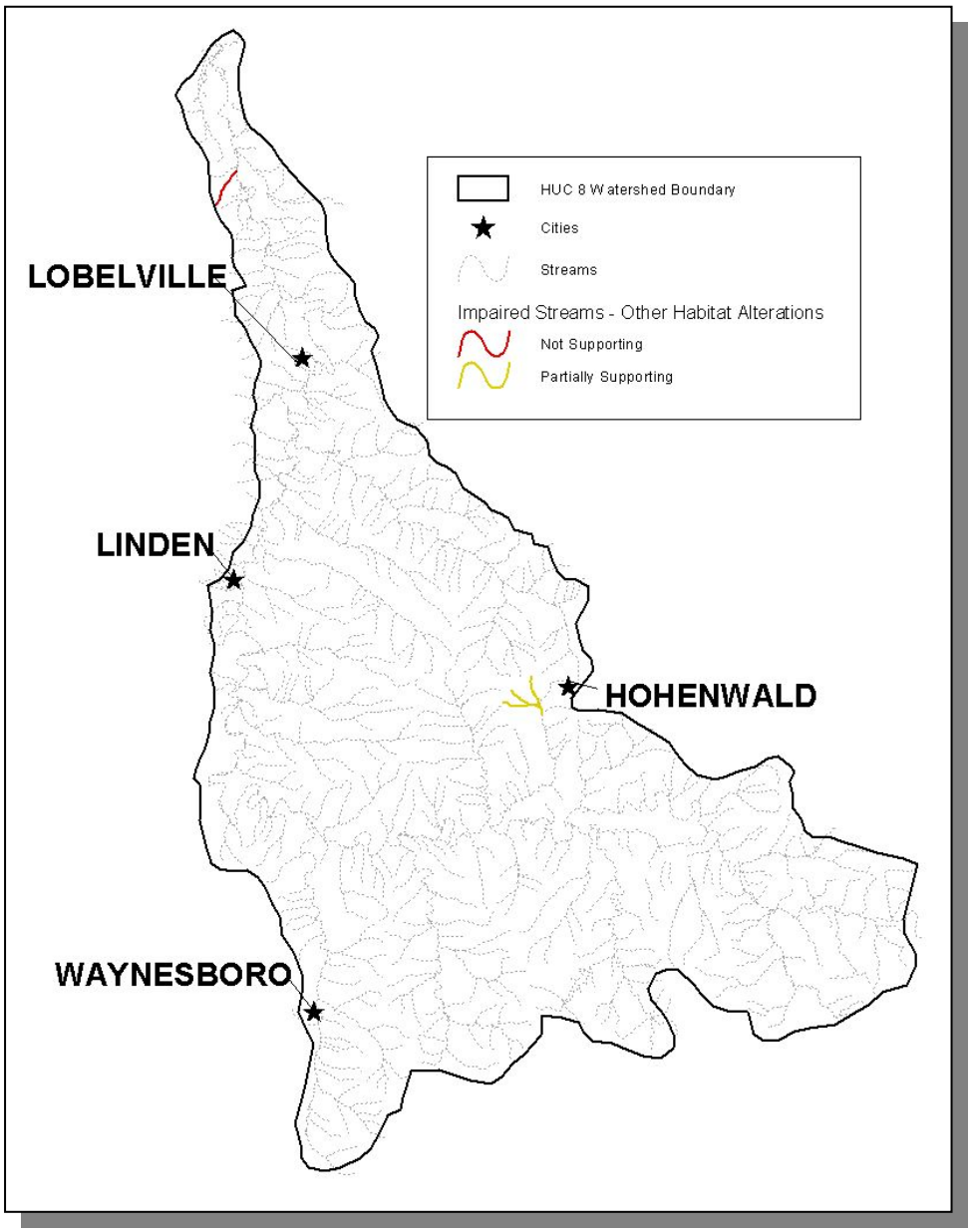

Figure 3-7b. Impaired Streams Due to Habitat Alteration in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Hohenwald, Linden, Lobelville, and Waynesboro are shown for reference. More information is provided in Appendix III.*

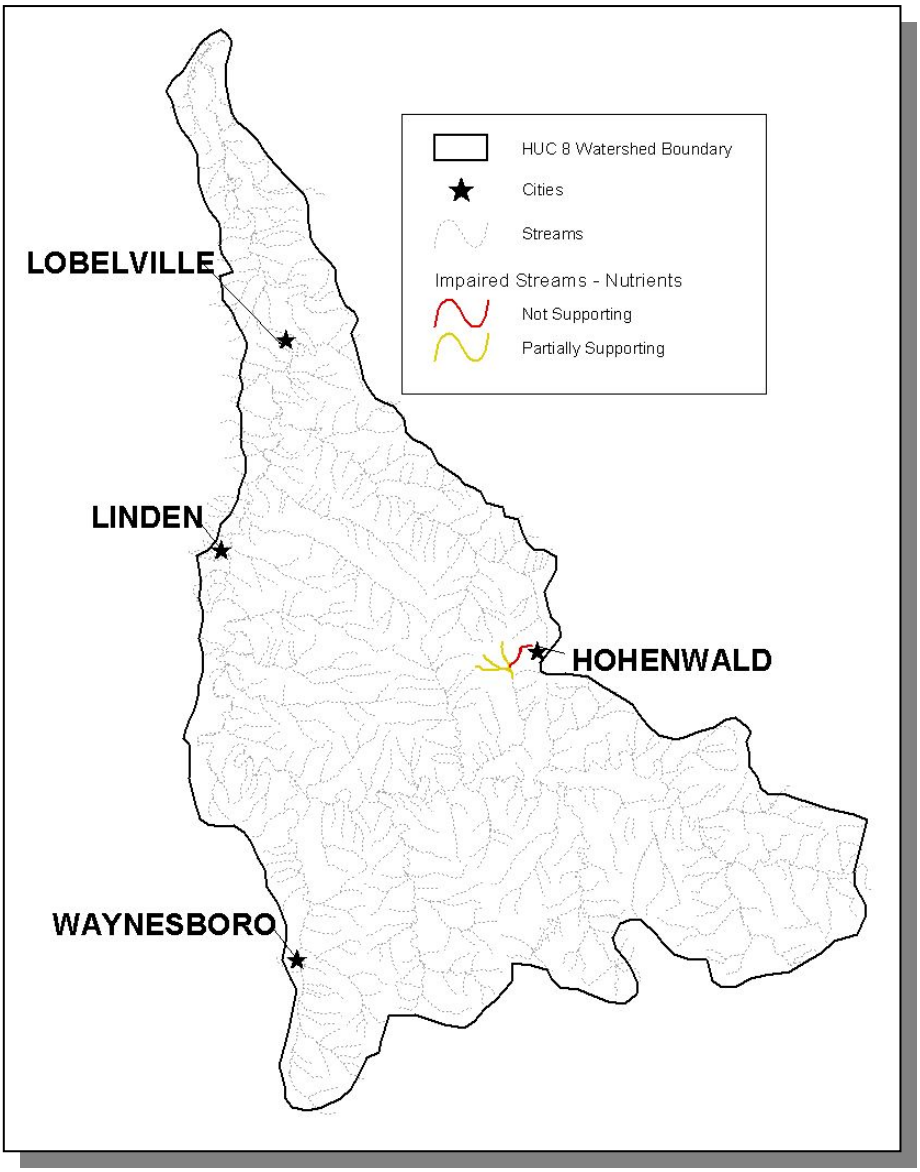

Figure 3-7c. Impaired Streams Due to Nutrient Enrichment in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Hohenwald, Linden, Lobelville, and Waynesboro are shown for reference. More information is provided in Appendix III.*

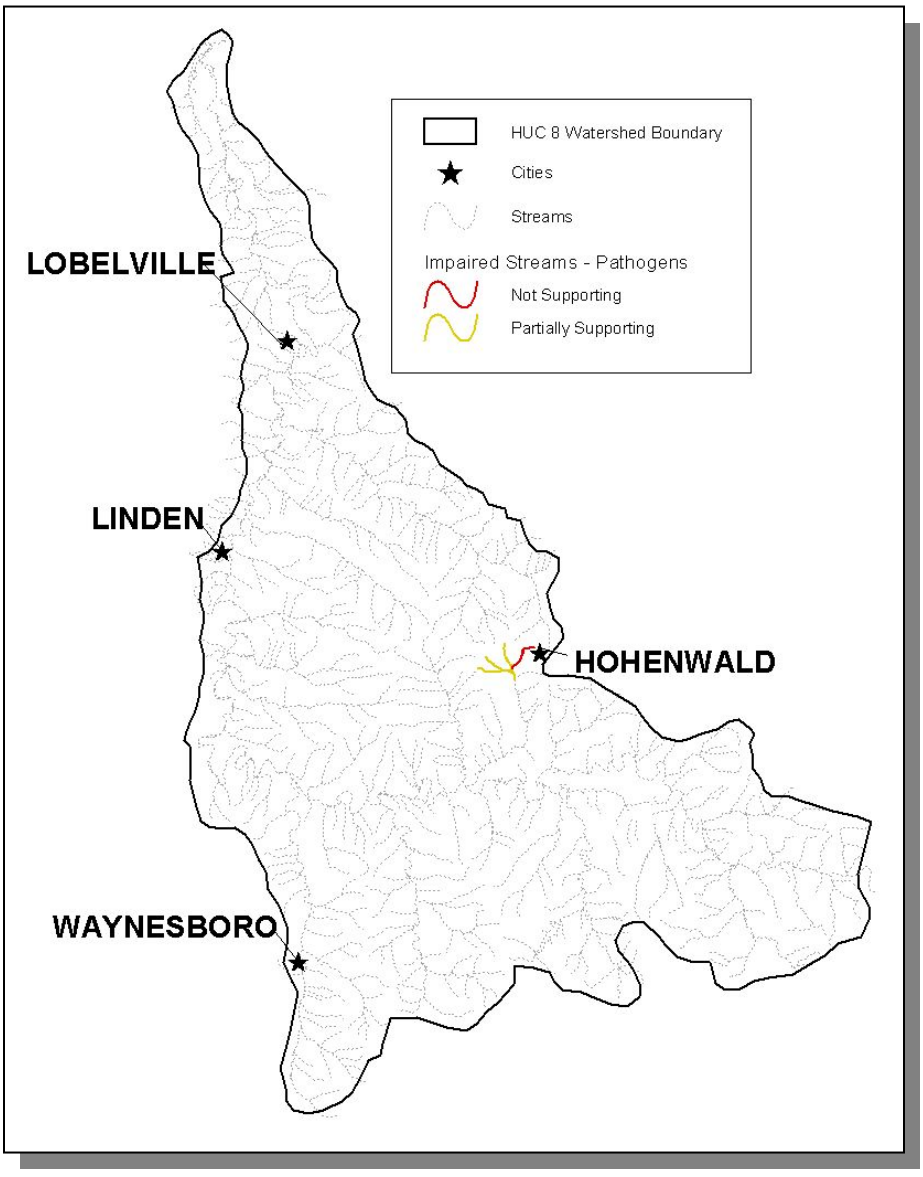

Figure 3-7d. Impaired Streams Due to Pathogens in the Buffalo River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Locations of Hohenwald, Linden, Lobelville, and Waynesboro are shown for reference. More information is provided in Appendix III.*

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

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

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

CHAPTER 4

POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE BUFFALO RIVER WATERSHED

4.1 Background.

4.2. Characterization of HUC-10 Subwatersheds
4.2.A. 0604000401 (Buffalo River)
4.2.B. 0604000402 (Buffalo River)
4.2.C. 0604000403 (Cane Creek)

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

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

The Buffalo River Watershed (HUC 06040004) has been delineated into three HUC 10-digit subwatersheds.

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

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

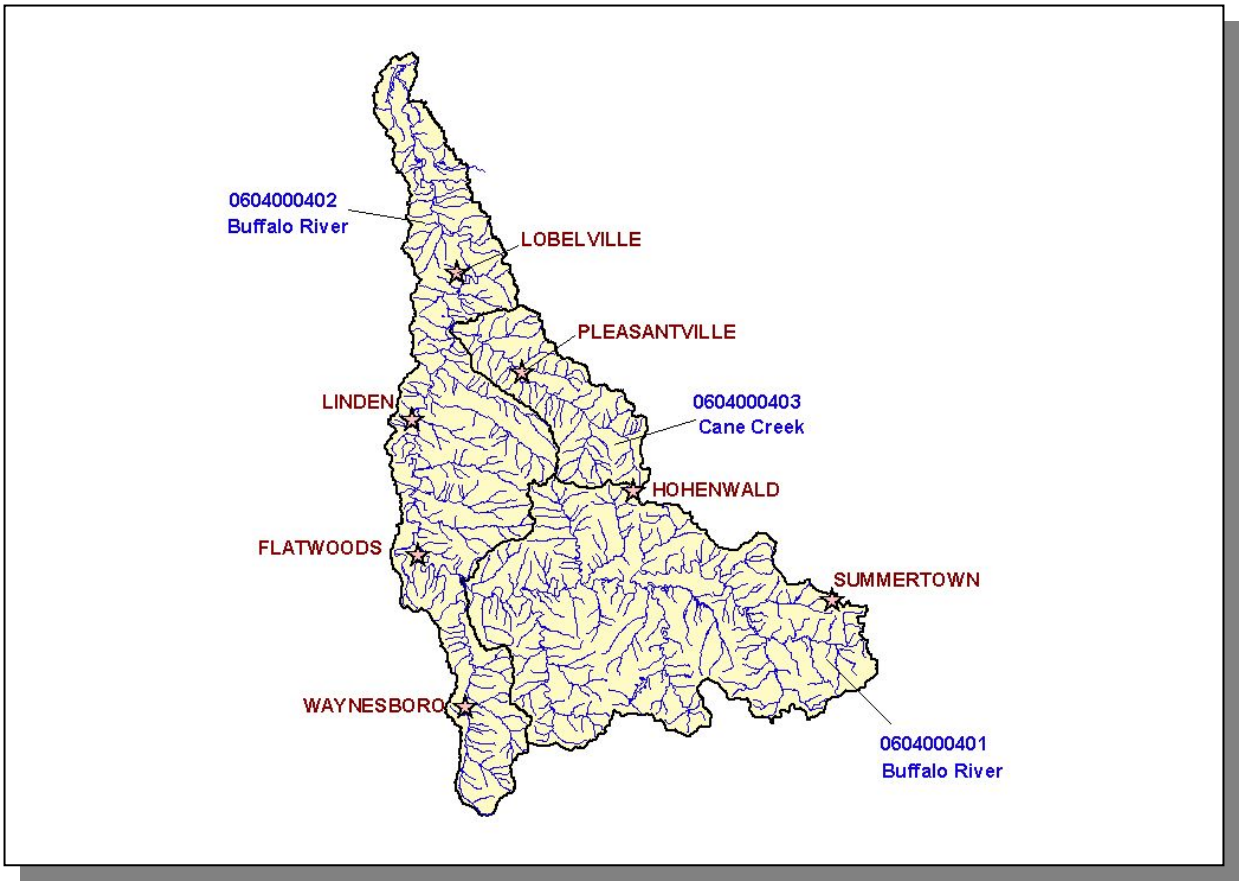

Figure 4-1. The Buffalo River Watershed is Composed of three USGS-Delineated Subwatersheds (10-Digit Subwatersheds). *Locations of Flatwood, Hohenwald, Linden, Lobelville, Pleasantville, Summertown, and Waynesboro are shown for reference.*

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

HUC-10	HUC-12
0604000401	060400040101 (Buffalo River)
	060400040102 (Buffalo River)
	060400040103 (Buffalo River)
	060400040104 (Buffalo River)
	060400040105 (Chief Creek)
	060400040106 (Little Buffalo River)
	060400040107 (Buffalo River)
	060400040108 (Fortyeight Creek)
	060400040109 (Buffalo River)
0604000402	060400040201 (Green River)
	060400040202 (Buffalo River)
	060400040203 (Buffalo River)
	060400040204 (Buffalo River)
	060400040205 (Buffalo River)
	060400040206 (Buffalo River)
0604000403	060400040301 (Upper Cane Creek)
	060400040302 (Lower Cane Creek)

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

4.2.A. 0604000401 (Buffalo River).

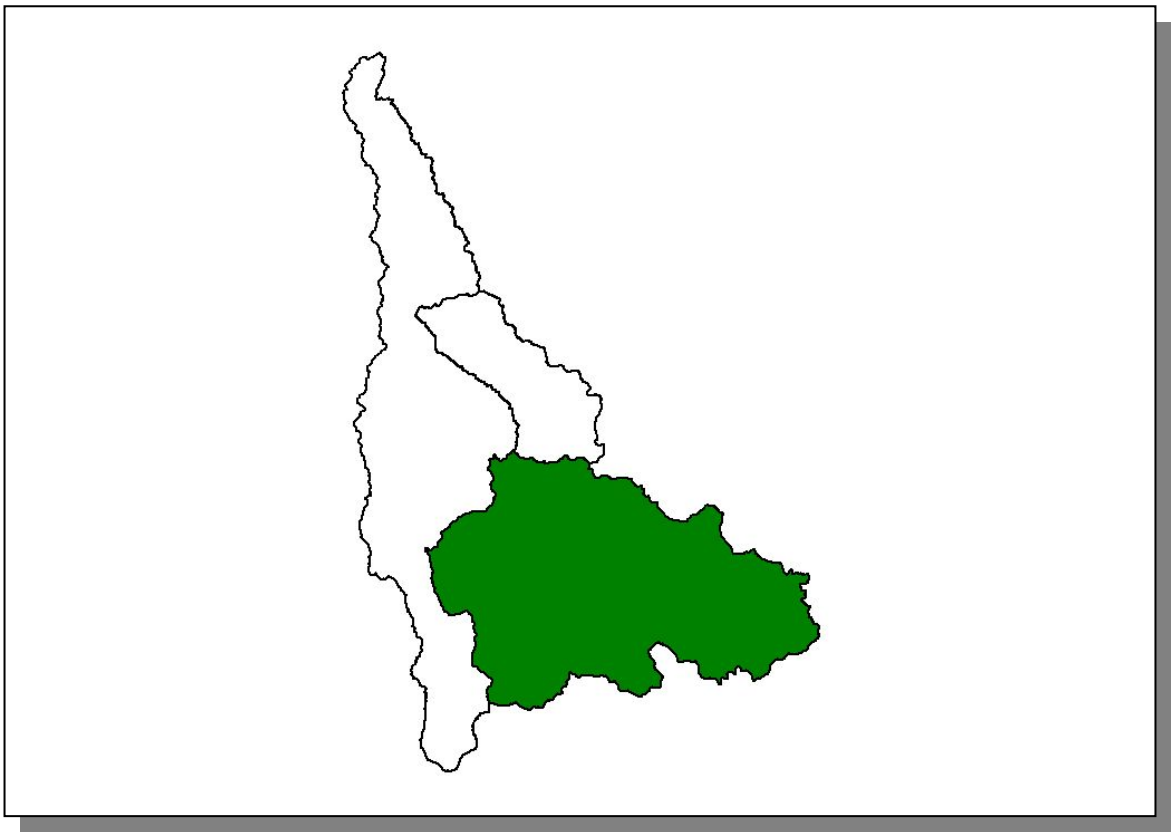

Figure 4-2. Location of Subwatershed 0604000401. *All Buffalo River HUC-10 subwatershed boundaries are shown for reference.*

4.2.A.i. General Description.

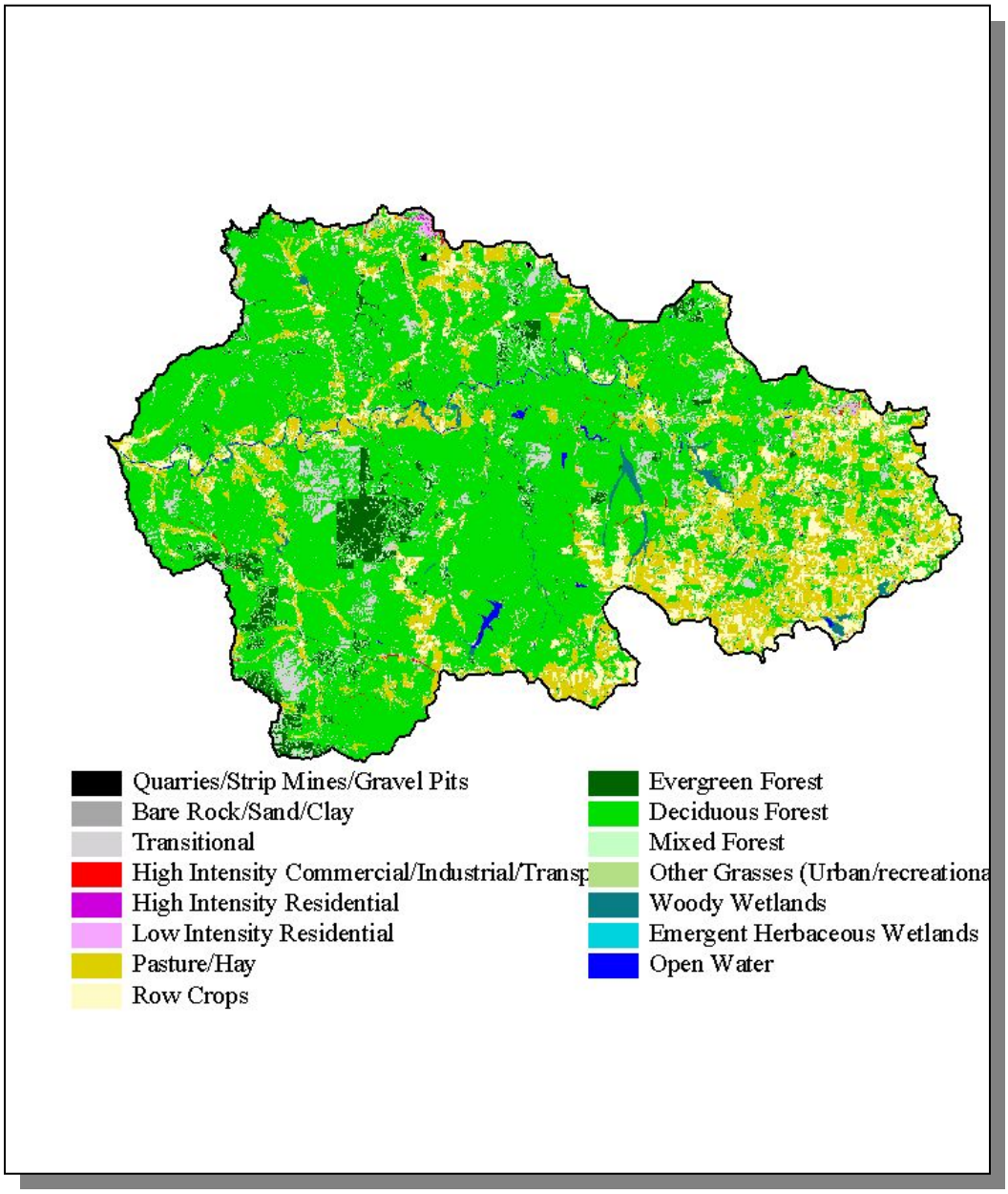

Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0604000401.

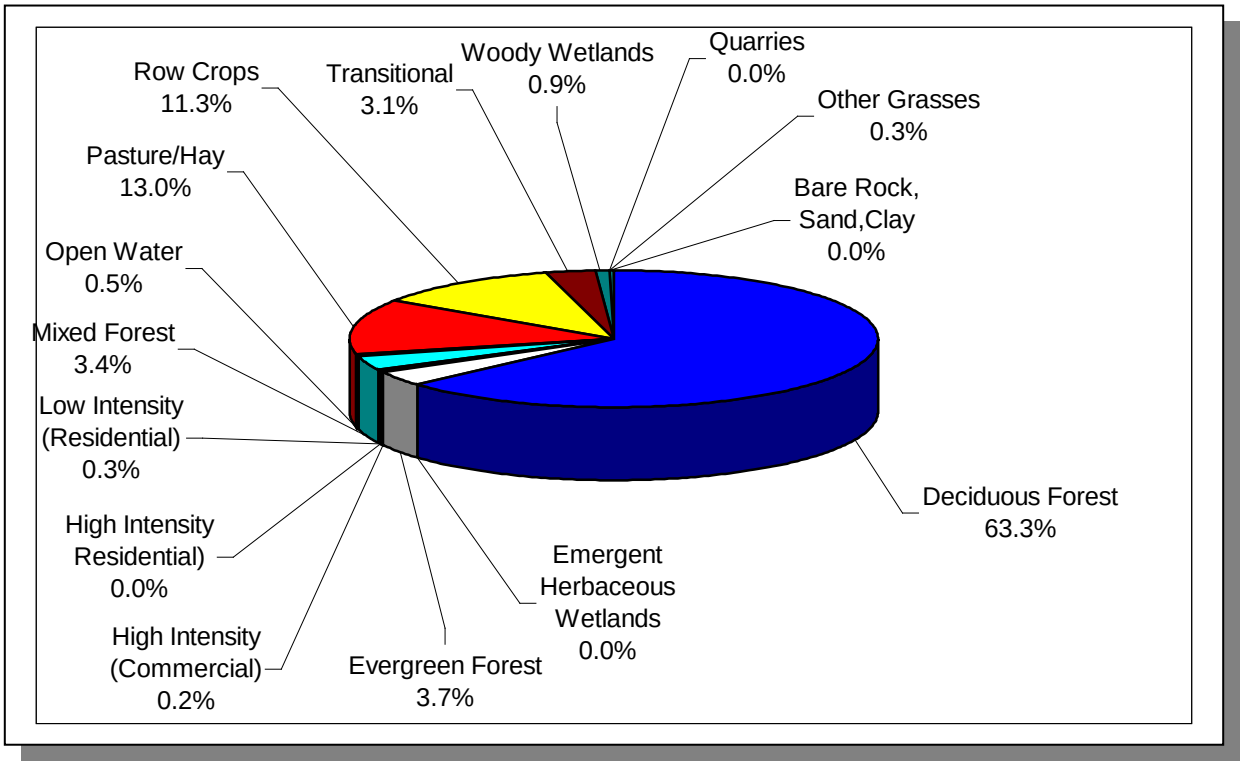

Figure 4-4. Land Use Distribution in Subwatershed 0604000401. *More information is provided in Appendix IV.*

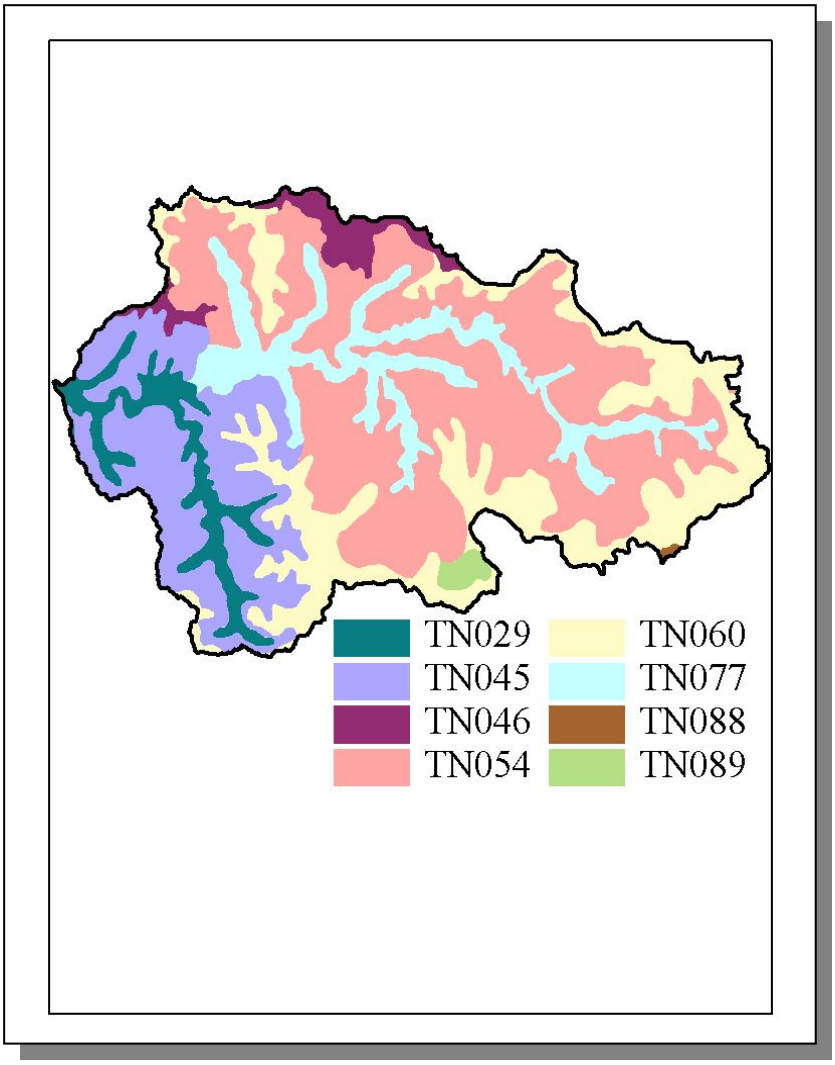

Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000401.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN029	8.00	C	2.96	5.40	Loam	0.33
TN045	0.00	B	1.95	5.45	Loam	0.35
TN046	0.00	B	1.98	5.09	Silty Loam	0.38
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN077	4.00	C	2.16	5.03	Loam	0.34
TN088	1.00	B	1.38	5.43	Silty Loam	0.34
TN089	3.00	B	1.46	5.36	Loam	0.35

Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000401. *More details are provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Lawrence	35,303	39,095	39,926	23.89	8,433	9,339	9,537	13.1
Lewis	9,247	10,789	11,367	38.67	3,576	4,172	4,396	22.9
Perry	6,612	7,438	7,631	0.03	<5	<5	<5	-
Wayne	13,935	16,498	16,842	14.33	1,997	2,364	2,414	20.9
Totals	**65,097**	**73,820**	**75,766**		**14,008**	**15,878**	**16,3450**	**16.7**

Table 4-3. Population Estimates in Subwatershed 0604000401.

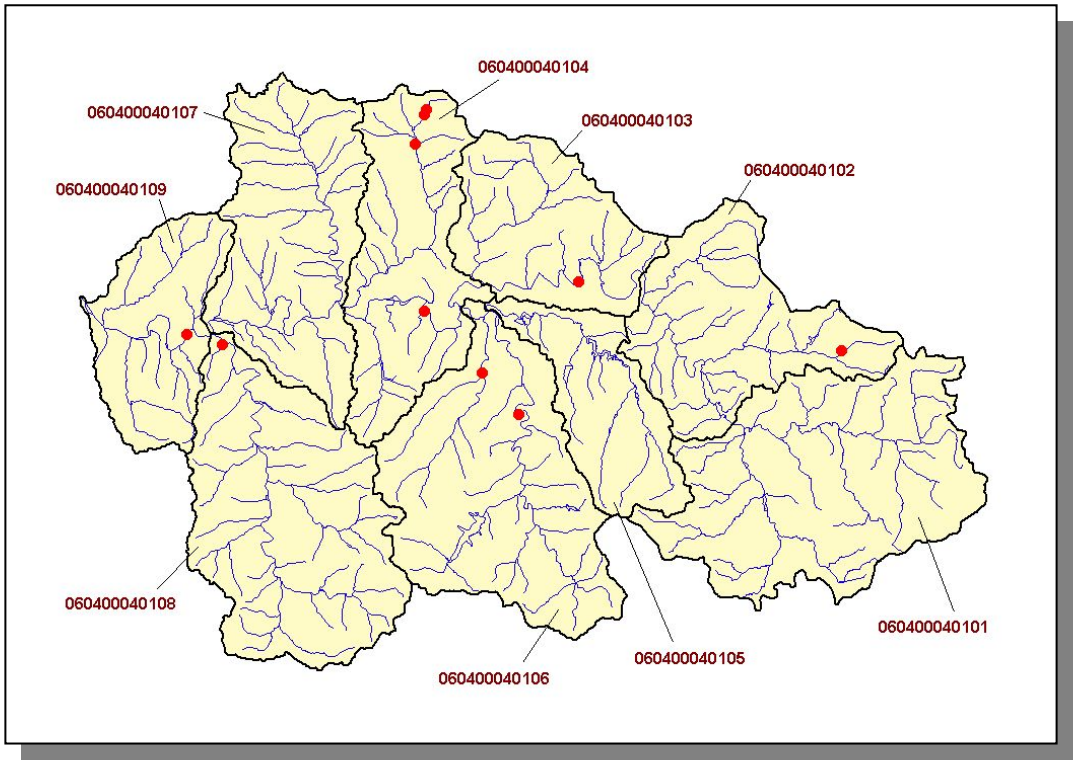

Figure 4-6. Location of STORET Monitoring Sites in Subwatershed 0604000401. *Subwatershed 060400040101, 060400040102, 060400040103, 060400040104, 060400040105, 060400040106, 060400040107, 060400040108, and 060400040109 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.A.ii Point Source Contributions.

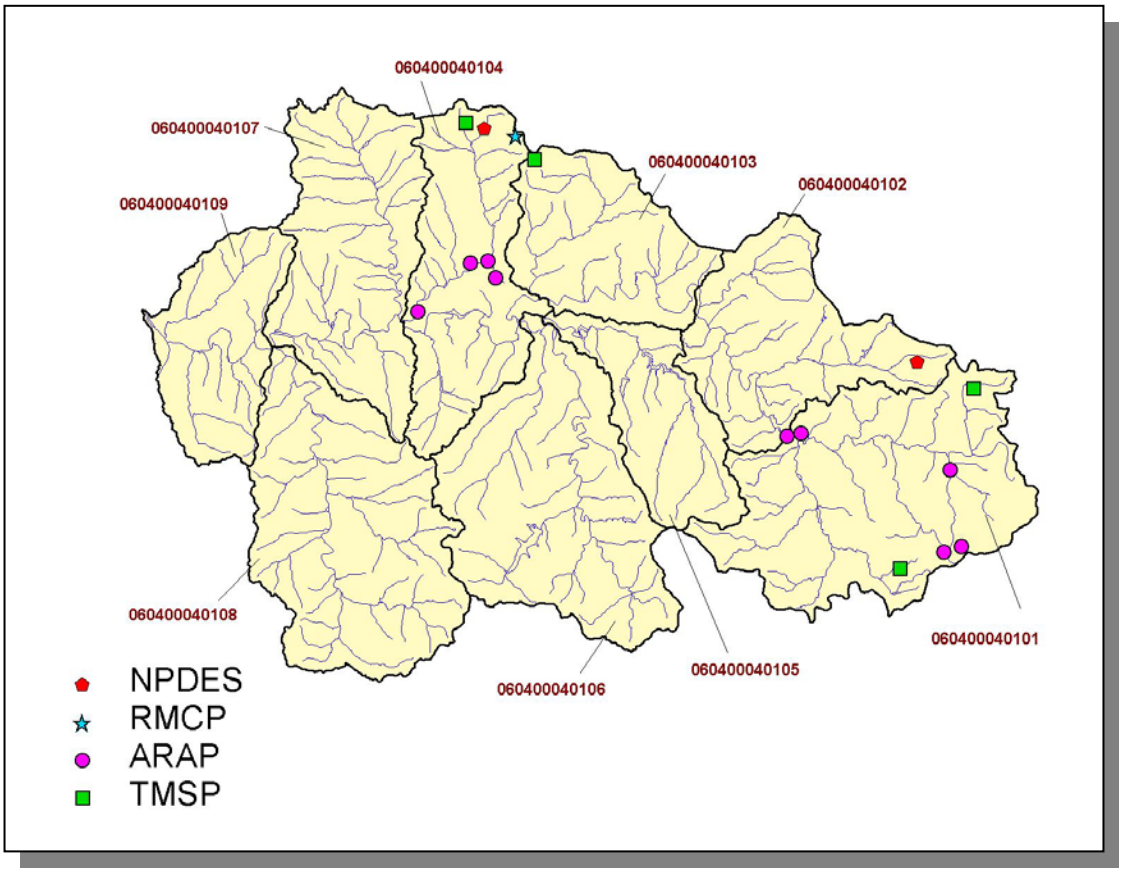

Figure 4-7. Location of Active Point Source Facilities in Subwatershed 0604000401. *Subwatershed 060400040101, 060400040102, 060400040103, 060400040104, 060400040105, 060400040106, 060400040107, 060400040108, and 060400040109 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

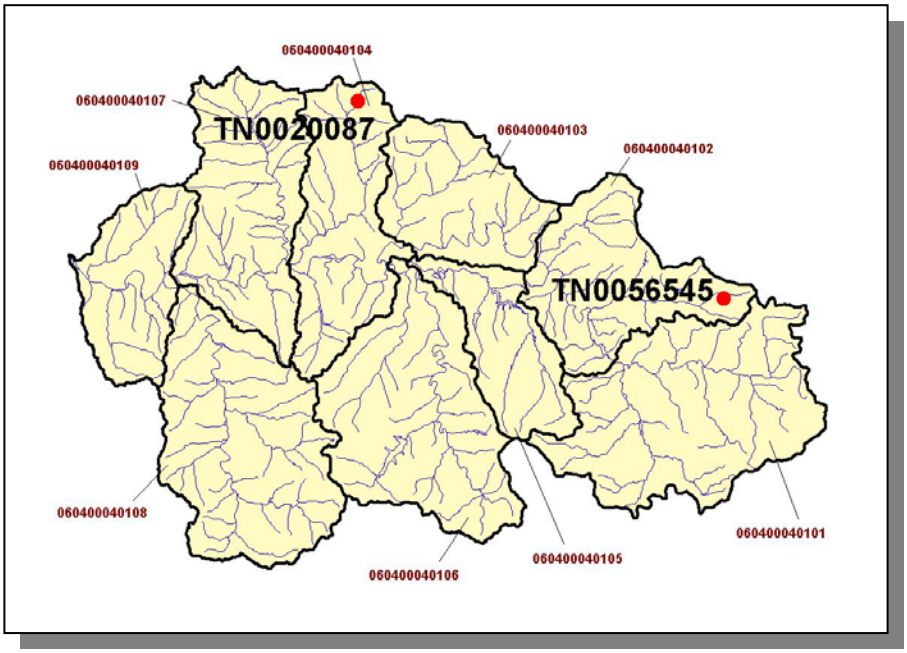

Figure 4-8. Location of NPDES Facilities in Subwatershed 0604000401. *Subwatershed 060400040101, 060400040102, 060400040103, 060400040104, 060400040105, 060400040106, 060400040107, 060400040108, and 060400040109 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

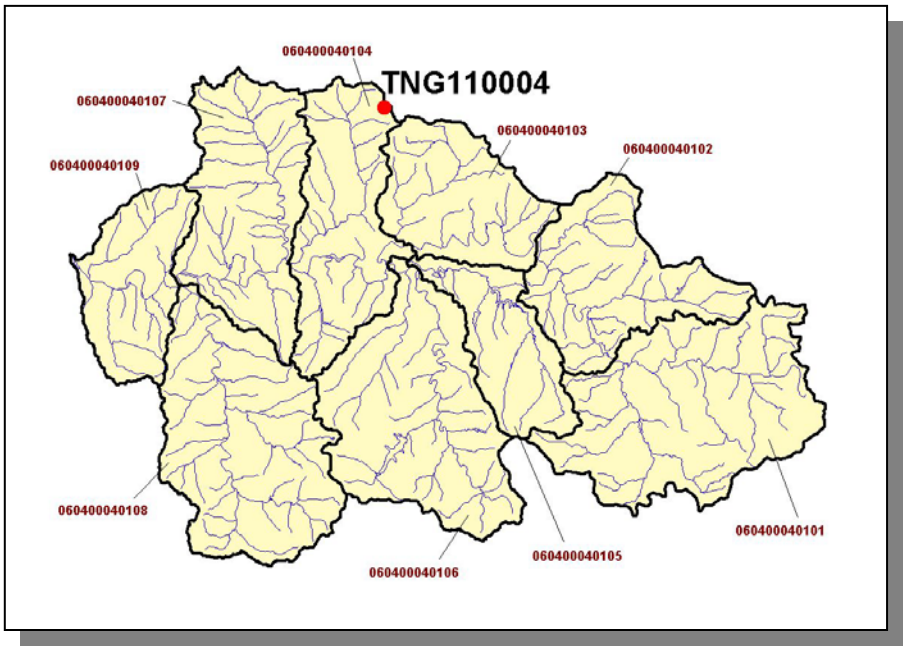

Figure 4-9. Location of Ready Mix Concrete Plants in Subwatershed 0604000401. *Subwatershed 060400040101, 060400040102, 060400040103, 060400040104, 060400040105, 060400040106, 060400040107, 060400040108, and 060400040109 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

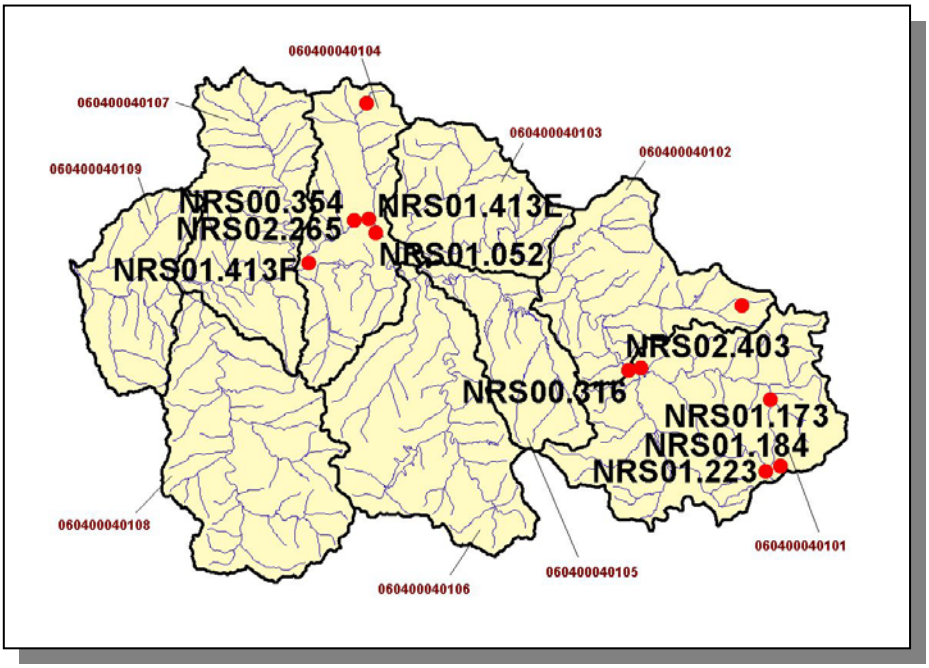

Figure 4-10. Location of ARAP Sites (Individual Permits) in Subwatershed 0604000401. *Subwatershed 060400040101, 060400040102, 060400040103, 060400040104, 060400040105, 060400040106, 060400040107, 060400040108, and 060400040109 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

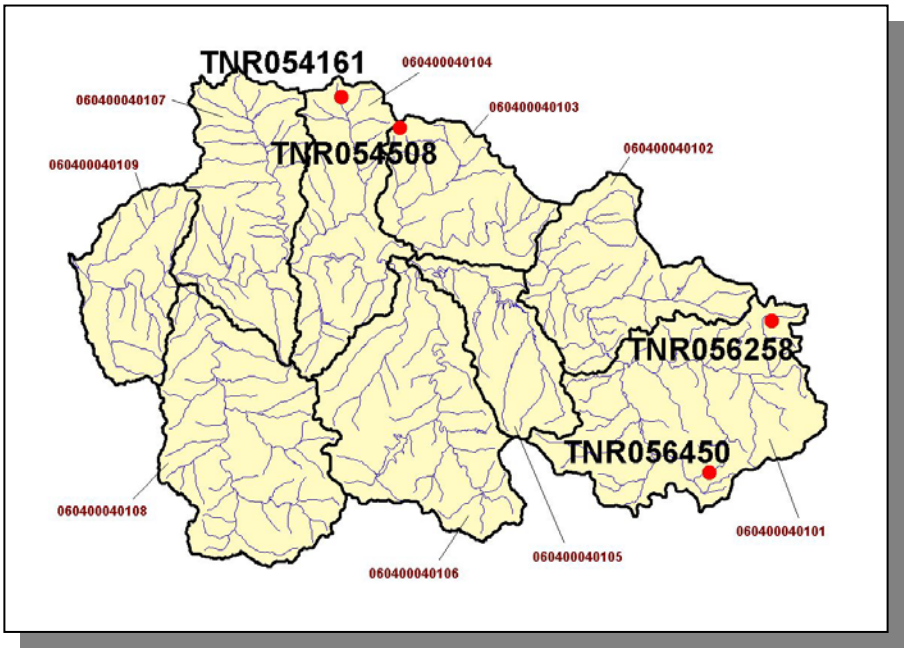

Figure 4-11. Location of TMSP Facilities in Subwatershed 0604000401. *Subwatershed 060400040101, 060400040102, 060400040103, 060400040104, 060400040105, 060400040106, 060400040107, 060400040108, and 060400040109 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

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

There is one NPDES facility discharging to water bodies listed on the 2002 303(d) list in Subwatershed 0604000401:

- TN0020087 (Hohenwald High School STP) discharges to Mile 0.1 of a ditch to North Fork Shaw Creek @ RM 1.2

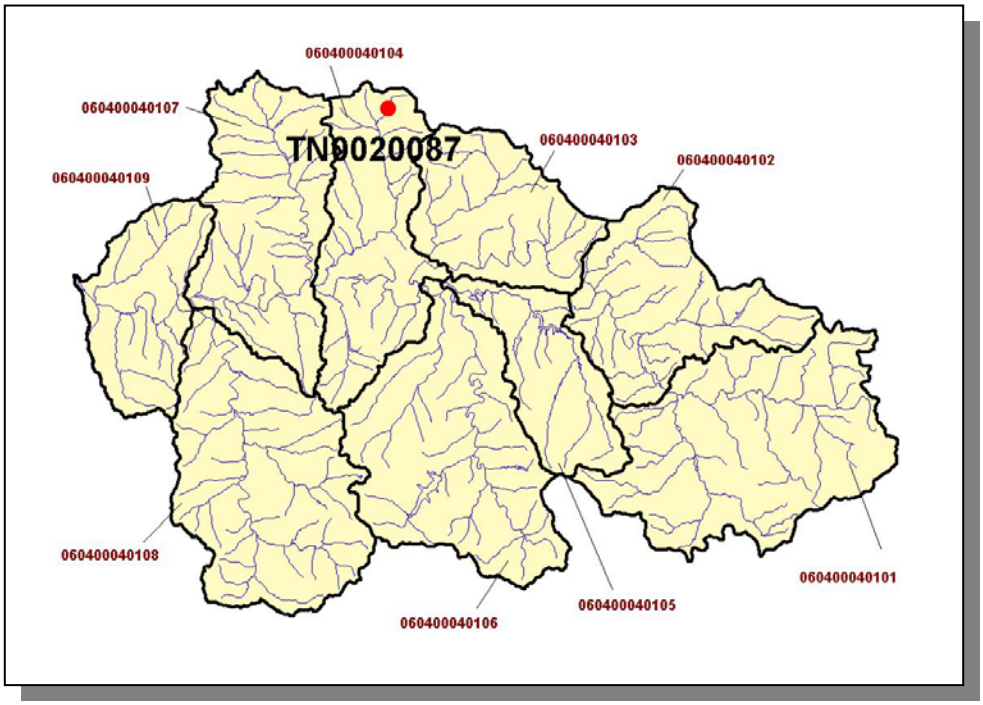

Figure 4-12. Location of NPDES Dischargers to Water Bodies Listed on the 2002 303(d) List in Subwatershed 0604000401. *Subwatershed 060400040101, 060400040102, 060400040103, 060400040104, 060400040105, 060400040106, 060400040107, 060400040108, and 060400040109 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

PERMIT #	1Q10	3Q10	7Q10	3Q20	QDESIGN
TN0020087	0	0	0	0	1.1

Table 4-4. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0604000401. *Data are in million gallons per day (MGD). Data were obtained from the USGS publication Flow Duration and Low Flows of Tennessee Streams Through 1992 or from permit files.*

PERMIT #	WET	$CBOD_5$	NH_3	Hg	TRC	TSS	CN	DO	pH
TN0020087	X	X	X	X	X	X	X	X	X

Table 4-5. Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0604000401. *WET, Whole Effluent Toxicity; $CBOD_5$, Carbonaceous Biochemical Oxygen Demand (5-Day); TRC, Total Residual Chlorine; TSS, Total Suspended Solids.*

4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens (Broilers Sold)	Hogs	Sheep
10,774	20,299	748	30	8	3,228	100

Table 4-6. Summary of Livestock Count Estimates in Subwatershed 0604000401. *According to the 1997 Census of Agriculture (http://www.nass.usda.gov/census/), "Cattle" includes heifers, heifer calves, steers, bulls and bull calves; "Chickens" are layers 20 weeks and older; "Chickens Sold" are all chickens used to produce meat.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Lawrence	199.8	199.8	6.6	27.1
Lewis	158.0	158.0	4.0	10.2
Perry	223.6	223.6	5.1	22.0
Wayne	372.6	372.6	14.1	41.1
Total	**954.0**	**954.0**	**29.8**	**100.4**

Table 4-7. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0604000401.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.65
Grass (Hayland)	0.21
Legumes, Grass (Hayland)	0.64
Grass, Forbs, Legumes (Mixed Pasture)	0.35
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	6.46
Cotton (Row Crops)	8.07
Sorghum (Row Crops)	4.17
Soybeans (Row Crops)	28.85
Wheat (Close-Grown Cropland)	14.15
All Other Close-Grown Cropland	1.80
Other Cropland not Planted	8.11
Conservation Reserve Program Lands	0.65
Non-Agricultural Land Use	0.00
Other Land in Farms	1.21
Farmsteads and Ranch Headquarters	2.95

Table 4-8. Annual Estimated Total Soil Loss in Subwatershed 0604000401.

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4.2.B. 0604000402 (Buffalo River).

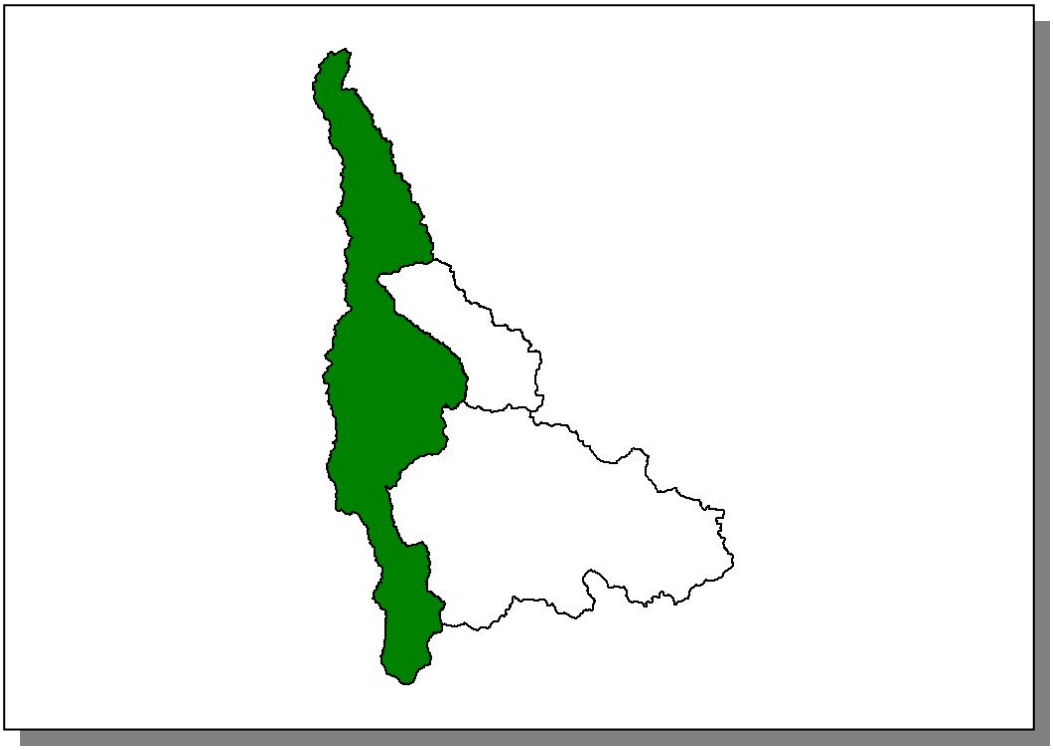


Figure 4-13. Location of Subwatershed 0604000402. *All Buffalo River HUC-10 subwatershed boundaries are shown for reference.*

4.2.B.i. General Description.

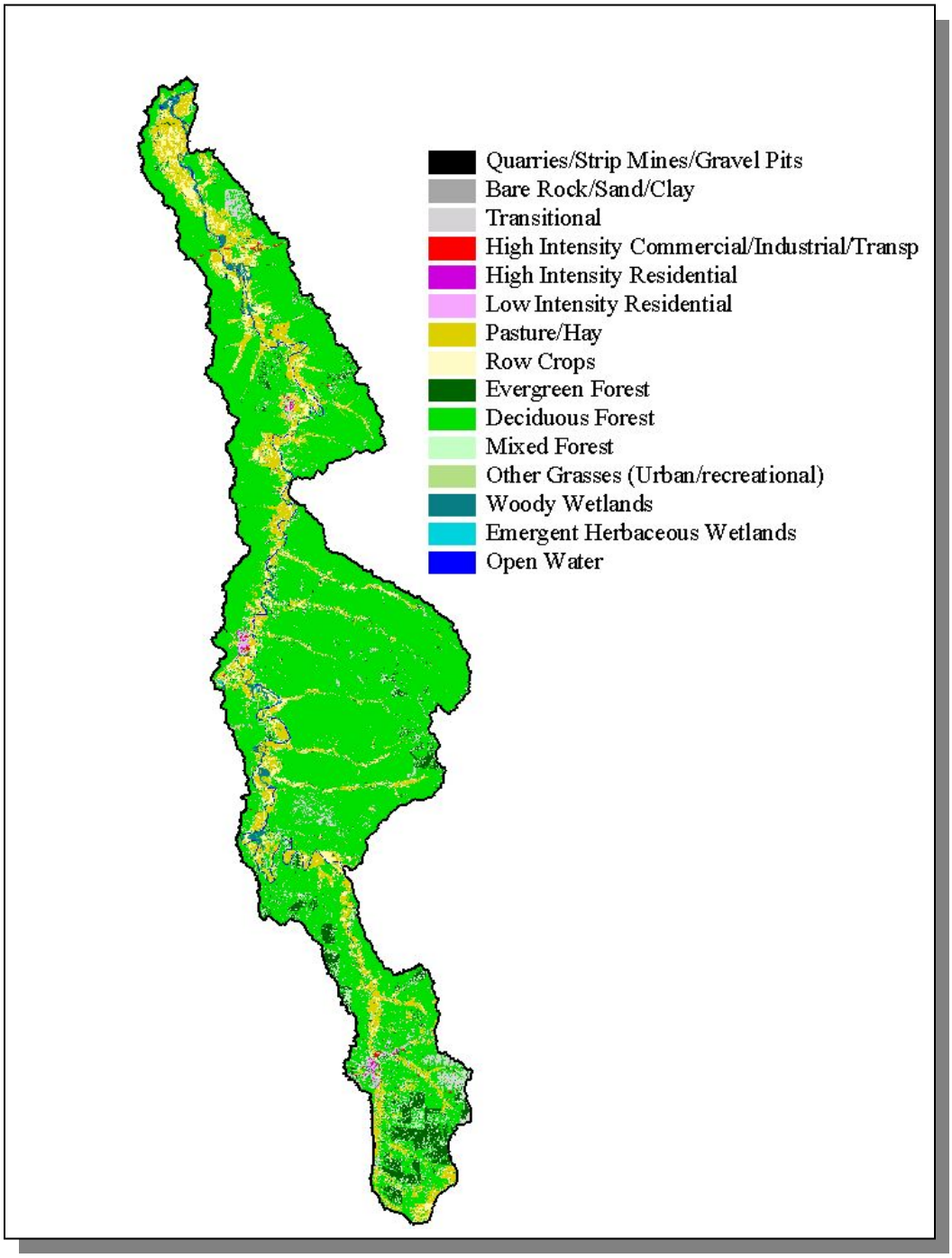


Figure 4-14. Illustration of Land Use Distribution in Subwatershed 0604000402.

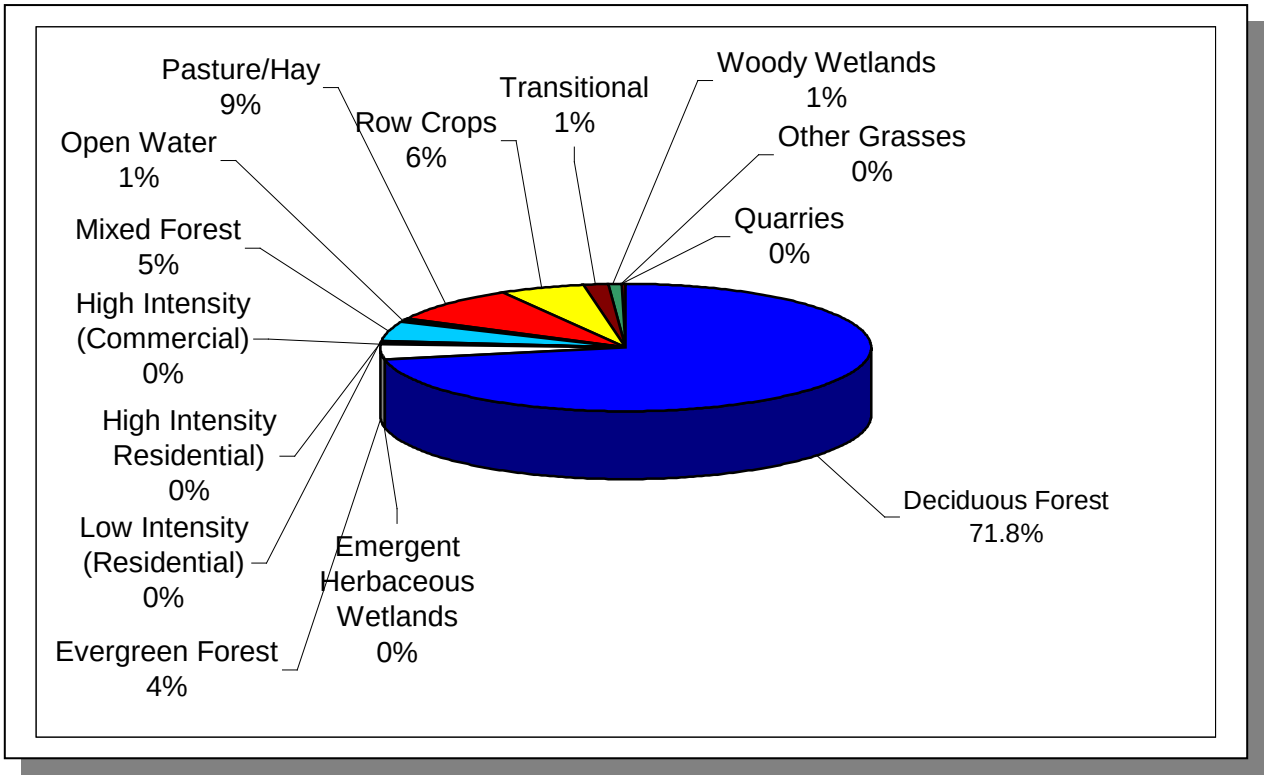


Figure 4-15. Land Use Distribution in Subwatershed 0604000402. *More information is provided in Appendix IV.*

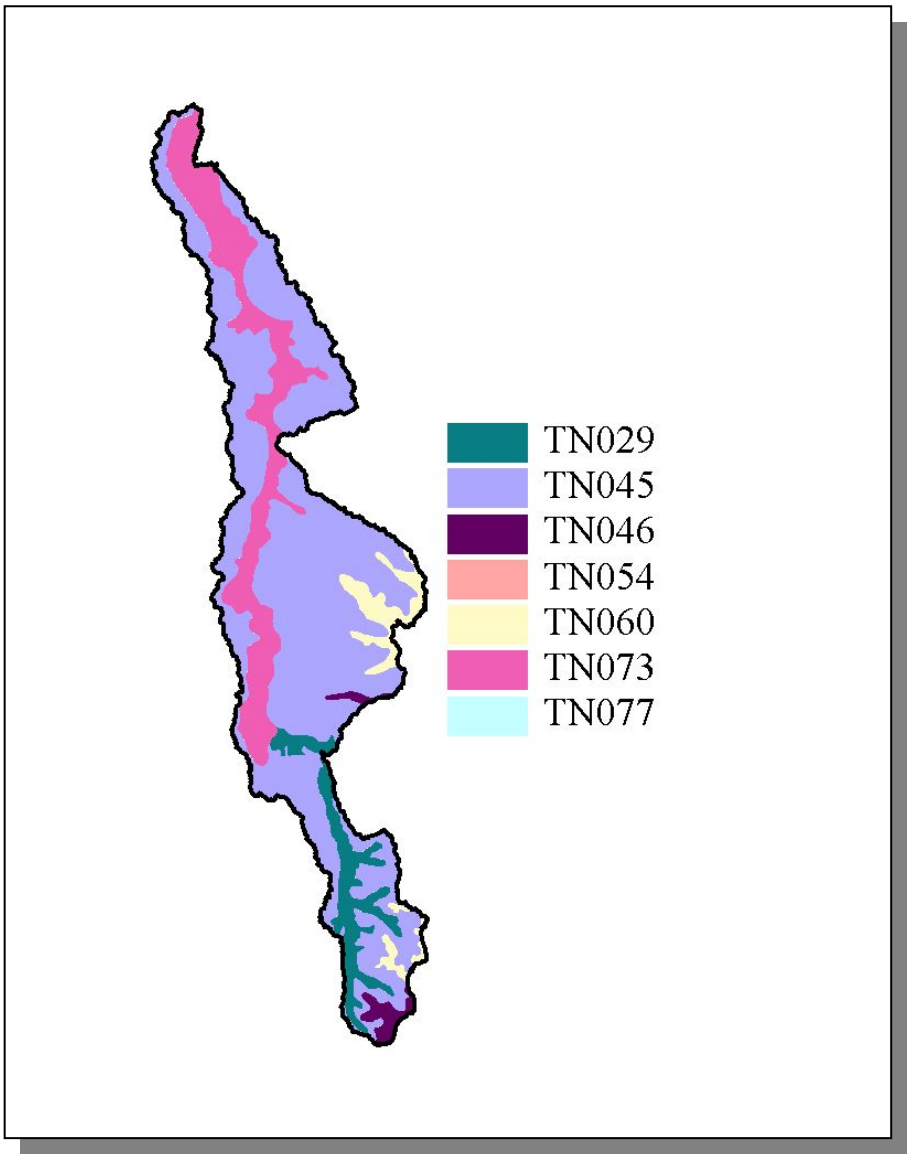


Figure 4-16. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000402.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN029	8.00	C	2.96	5.40	Loam	0.33
TN045	0.00	B	1.95	5.45	Loam	0.35
TN046	0.00	B	1.98	5.09	Silty Loam	0.38
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN073	0.00	B	2.97	5.21	Loam	0.34
TN077	4.00	C	2.16	5.03	Loam	0.34

Table 4-9. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000402. *More information is provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Hickman	16,754	19,926	22,295	0.68	114	135	151	32.5
Humphreys	15,795	16,839	17,929	7.41	1,171	1,248	1,329	13.5
Lewis	9,274	10,789	11,367	1.16	107	125	132	23.4
Perry	6,612	7,438	7,631	43.42	2,871	3,229	3,313	15.4
Wayne	13,935	16,498	16,842	11.67	1,626	1,925	1,965	20.8
Totals	**62,343**	**71,490**	**76,064**		**5,889**	**6,662**	**689**	**17.0**

Table 4-10. Population Estimates in Subwatershed 0604000402.

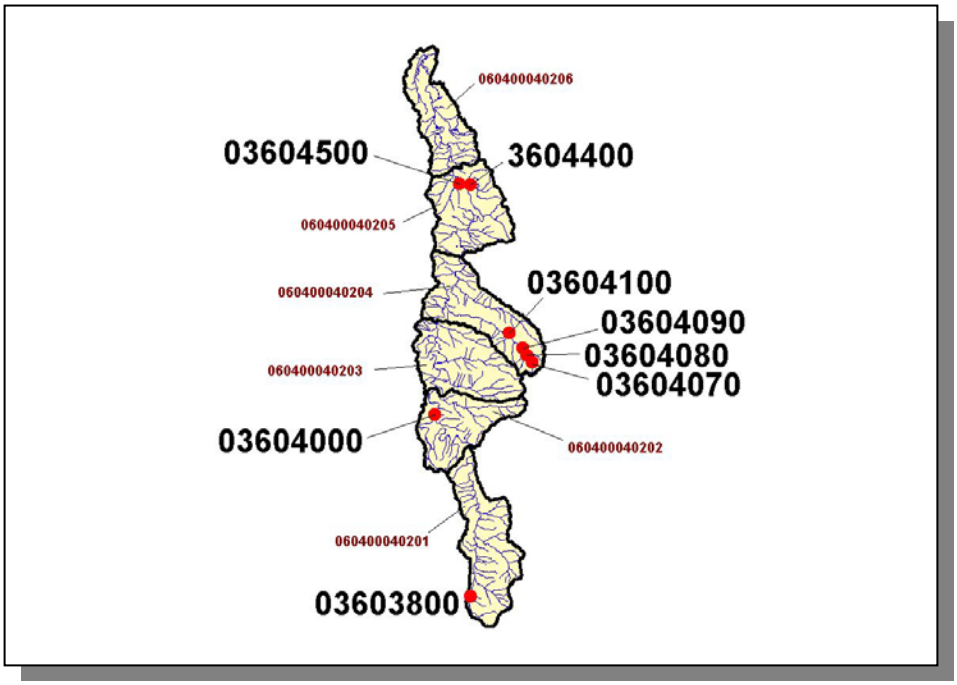


Figure 4-17. Location of Historical Streamflow Data Collection Sites in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040205, and 060400040206 boundaries are shown for reference. More information is provided in Appendix IV.*

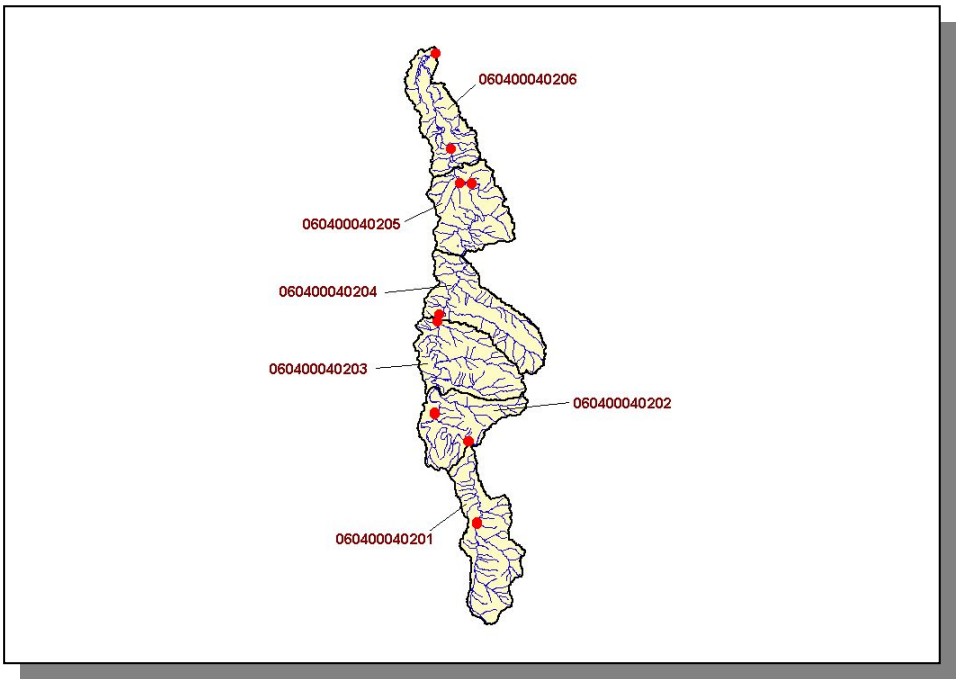


Figure 4-18. Location of STORET Monitoring Sites in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206, boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.B.ii. Point Source Contributions.

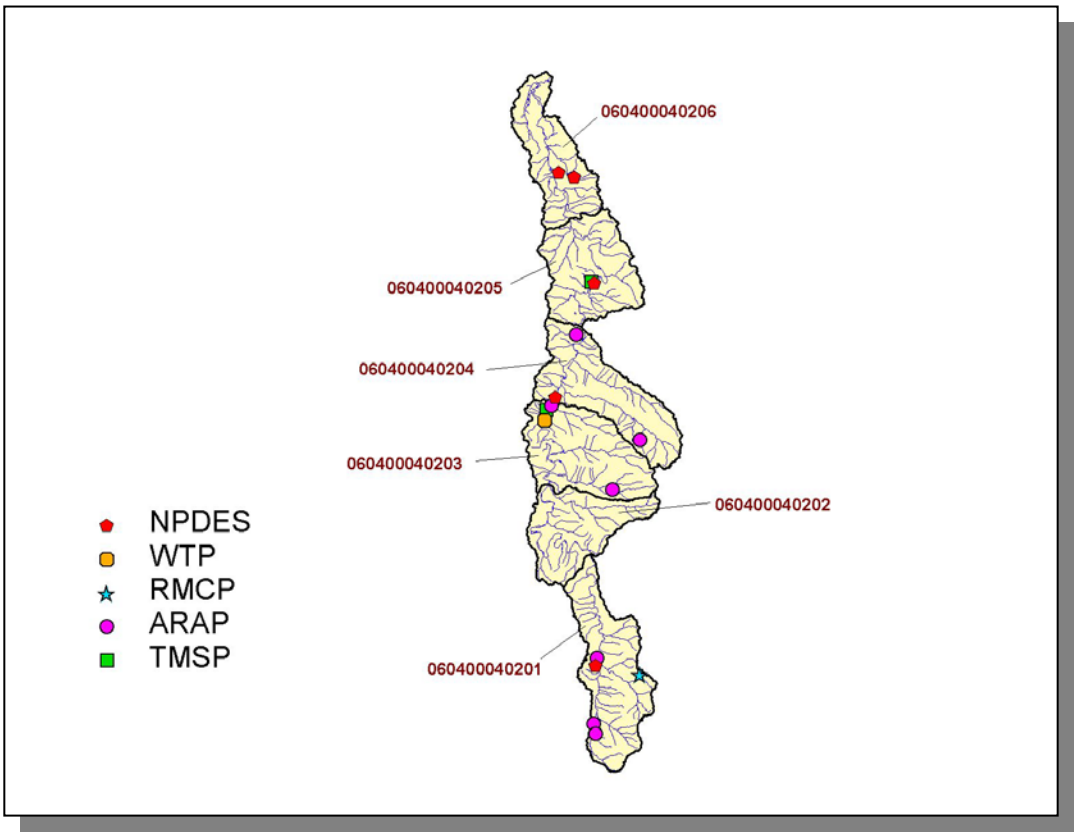


Figure 4-19. Location of Active Point Source Facilities in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

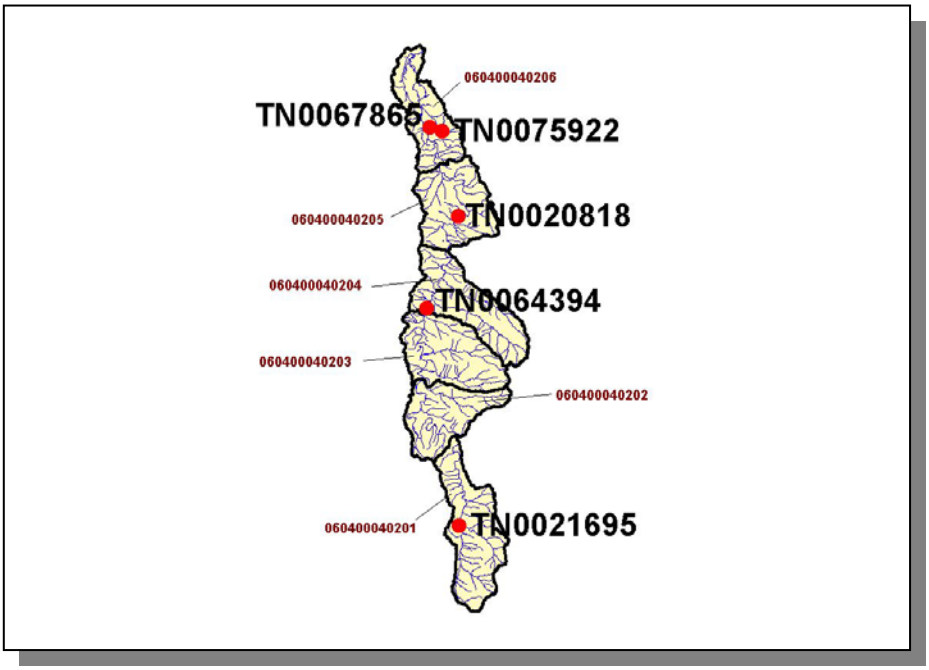


Figure 4-20. Location of NPDES Facilities in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

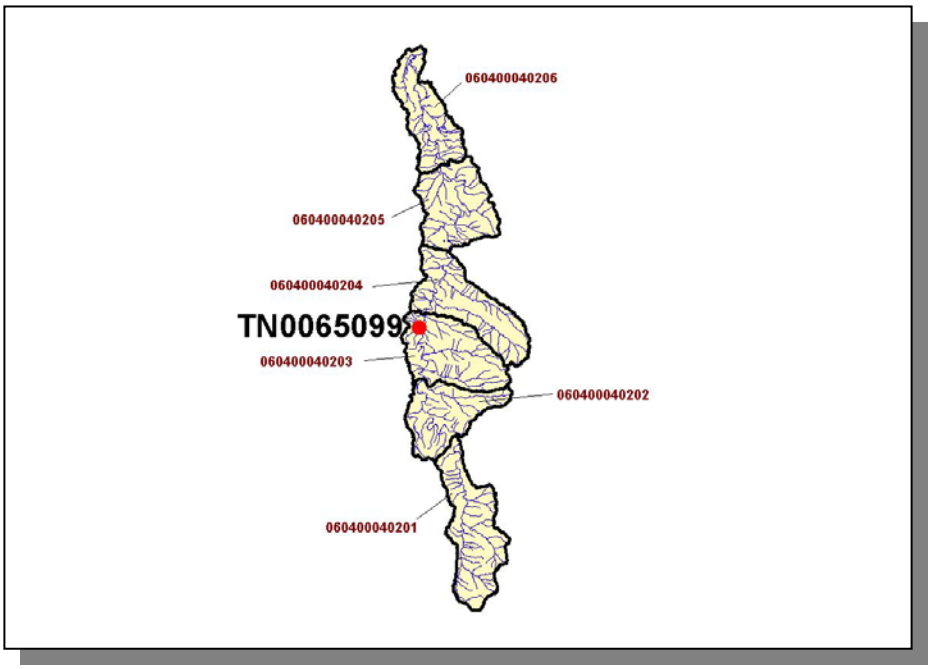


Figure 4-21. Location of Water Treatment Plants in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

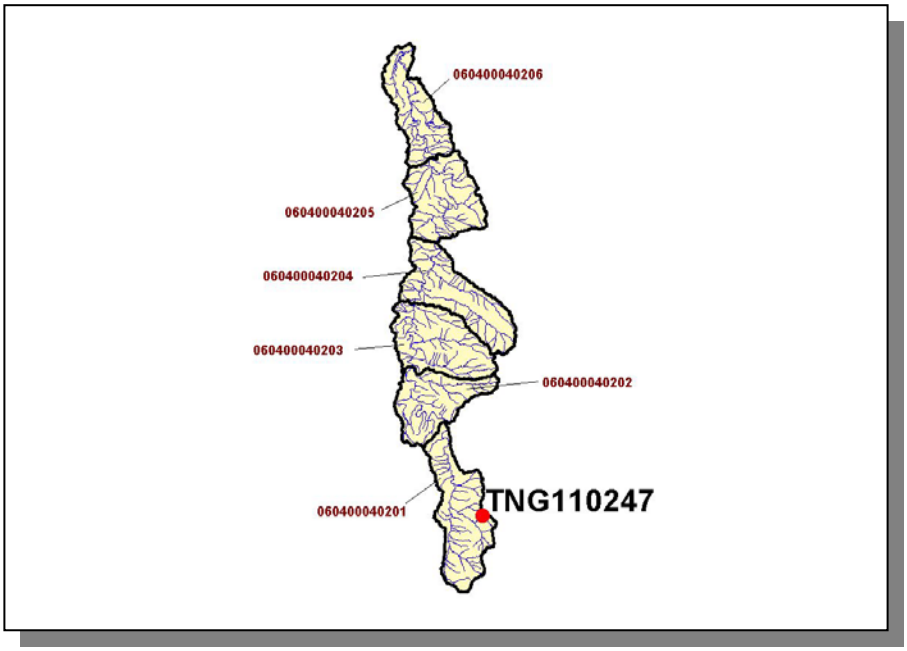


Figure 4-22. Location of Ready Mix Concrete Plants in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

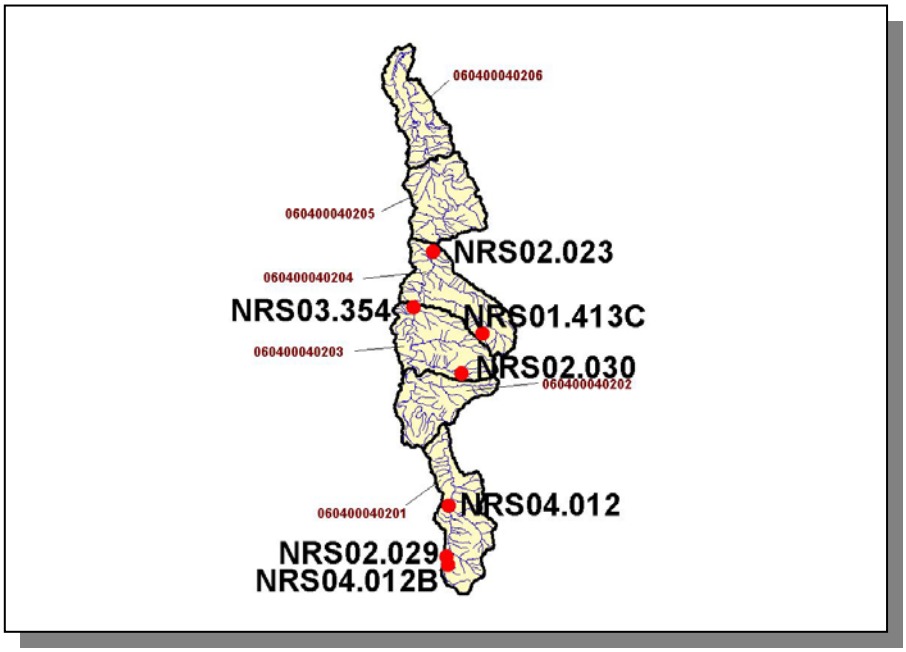


Figure 4-23. Location of ARAP Sites (Individual Permits) in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

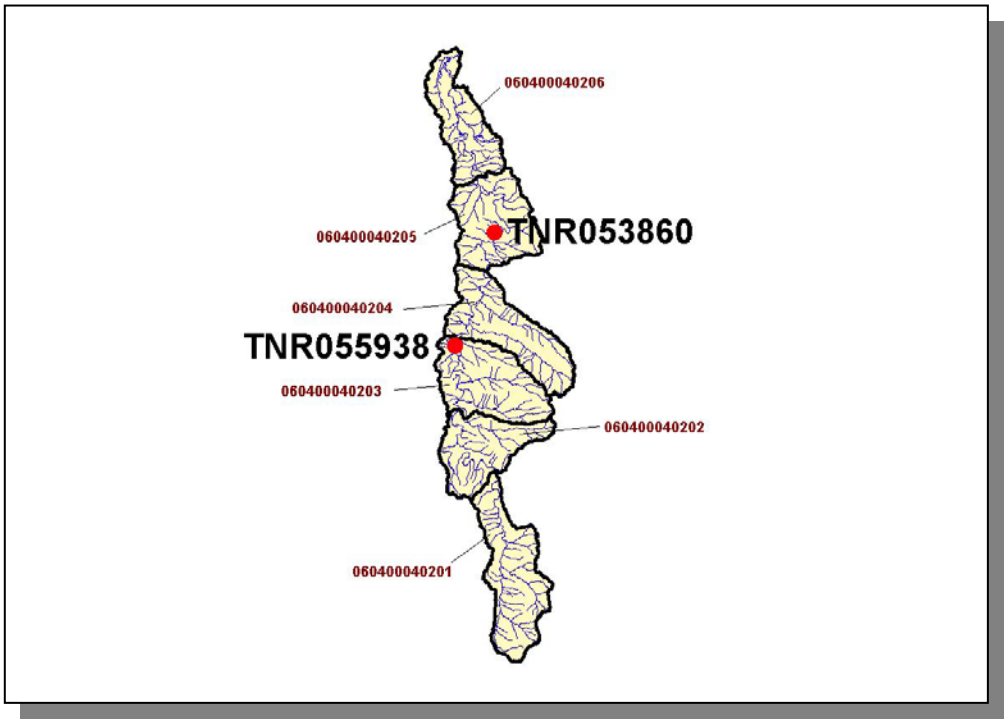


Figure 4-24. Location of TMSP Facilities in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

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

There is one NPDES facility discharging to water bodies listed on the 2002 303(d) list in Subwatershed 0604000402:

- TN0075922 (Pilot Travel Center #053) discharges to an unnamed Tributary to Black Branch

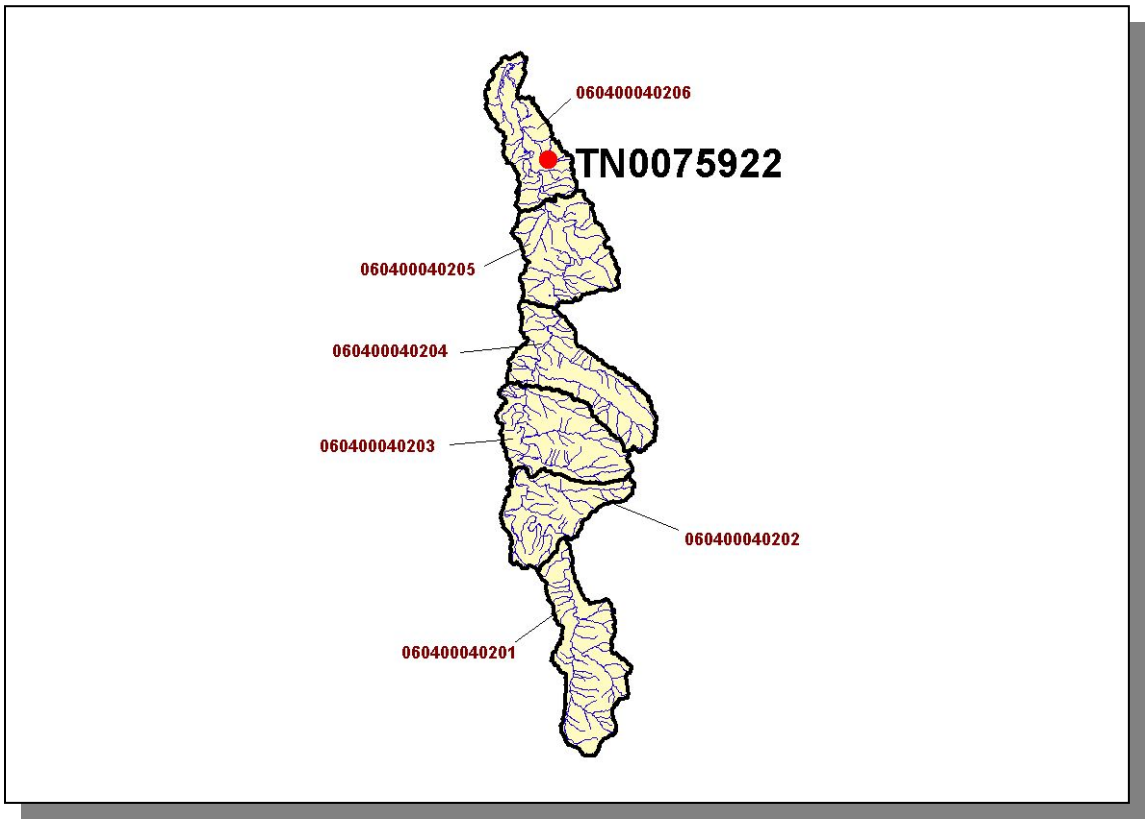


Figure 4-25. Location of NPDES Dischargers to Water Bodies Listed on the 2002 303(d) List in Subwatershed 0604000402. *Subwatershed 060400040201, 060400040202, 060400040203, 060400040204, 060400040205, and 060400040206 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

PERMIT #	1Q10	3Q10	7Q10	3Q20	QDESIGN
TN0075922	0		0	0	

Table 4-11. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0604000402. *Data are in million gallons per day (MGD). Data were obtained from the USGS publication Flow Duration and Low Flows of Tennessee Streams Through 1992 or from permit files.*

PERMIT #	WET	TSS	pH
TN0075922	X	X	X

Table 4-12. Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0604000402. *WET, Whole Effluent Toxicity; TSS, Total Suspended Solids.*

PERMIT #	OIL and GREASE	BENZENE
TN0075922	X	X

Table 4-13. Organic Parameters Monitored for Daily Maximum Limits for NPDES Dischargers to Waterbodies Listed on the 2002 303(d) List in Subwatershed 0604000402.

4.2.B.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens (Broilers Sold)	Hogs	Sheep
6,609	12,861	86	21	9	1,148	26

Table 4-14. Summary of Livestock Count Estimates in Subwatershed 0604000402. *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)
Hickman	297.2	297.2	5.8	23.0
Humphreys	241.2	241.2	3.7	14.4
Lewis	158.0	158.0	4.0	10.2
Perry	223.6	223.6	5.1	22.0
Wayne	372.6	372.6	14.1	41.1
Total	**1,292.6**	**1,292.6**	**32.7**	**110.7**

Table 4-15. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0604000402.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.73
Legumes (Pastureland)	0.68
Grass (Hayland)	0.16
Legumes (Hayland)	1.92
Legumes, Grass (Hayland)	0.08
Grass, Forbs, Legumes (Mixed Pasture)	0.43
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	7.14
Sorghum (Row Crops)	4.48
Soybeans (Row Crops)	21.82
Tobacco (Row Crops)	7.68
Other Cropland not Planted	0.65
Conservation Reserve Program Lands	0.11
Non-Agricultural Land Use	0.00
Other Land in Farms	0.99
Farmsteads and Ranch Headquarters	0.40

Table 4-16. Annual Estimated Total Soil Loss in Subwatershed 0604000402.

4.2.C. 0604000403 (Cane Creek).

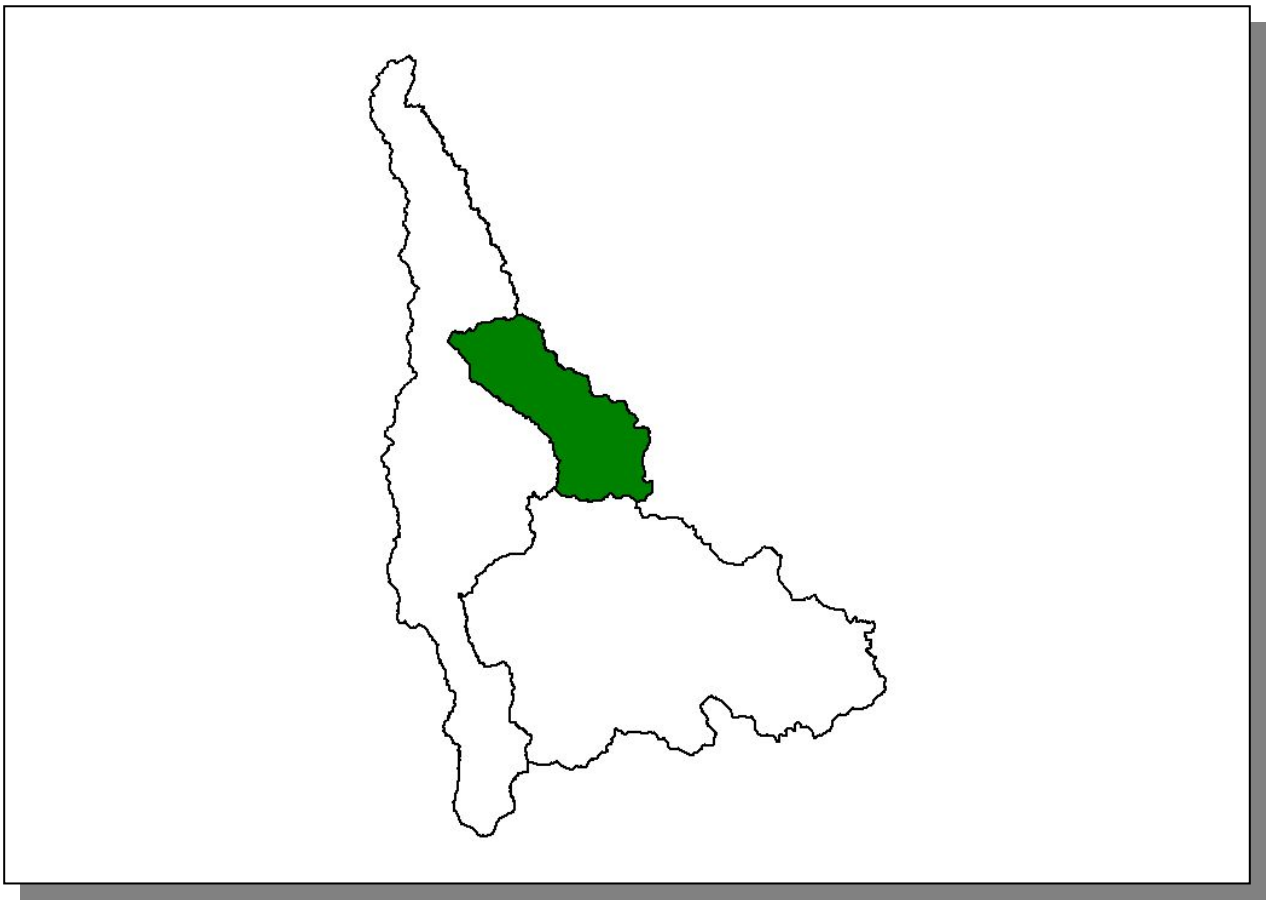


Figure 4-26. Location of Subwatershed 0604000403. *All Buffalo River HUC-10 subwatershed boundaries are shown for reference.*

4.2.C.i. General Description.

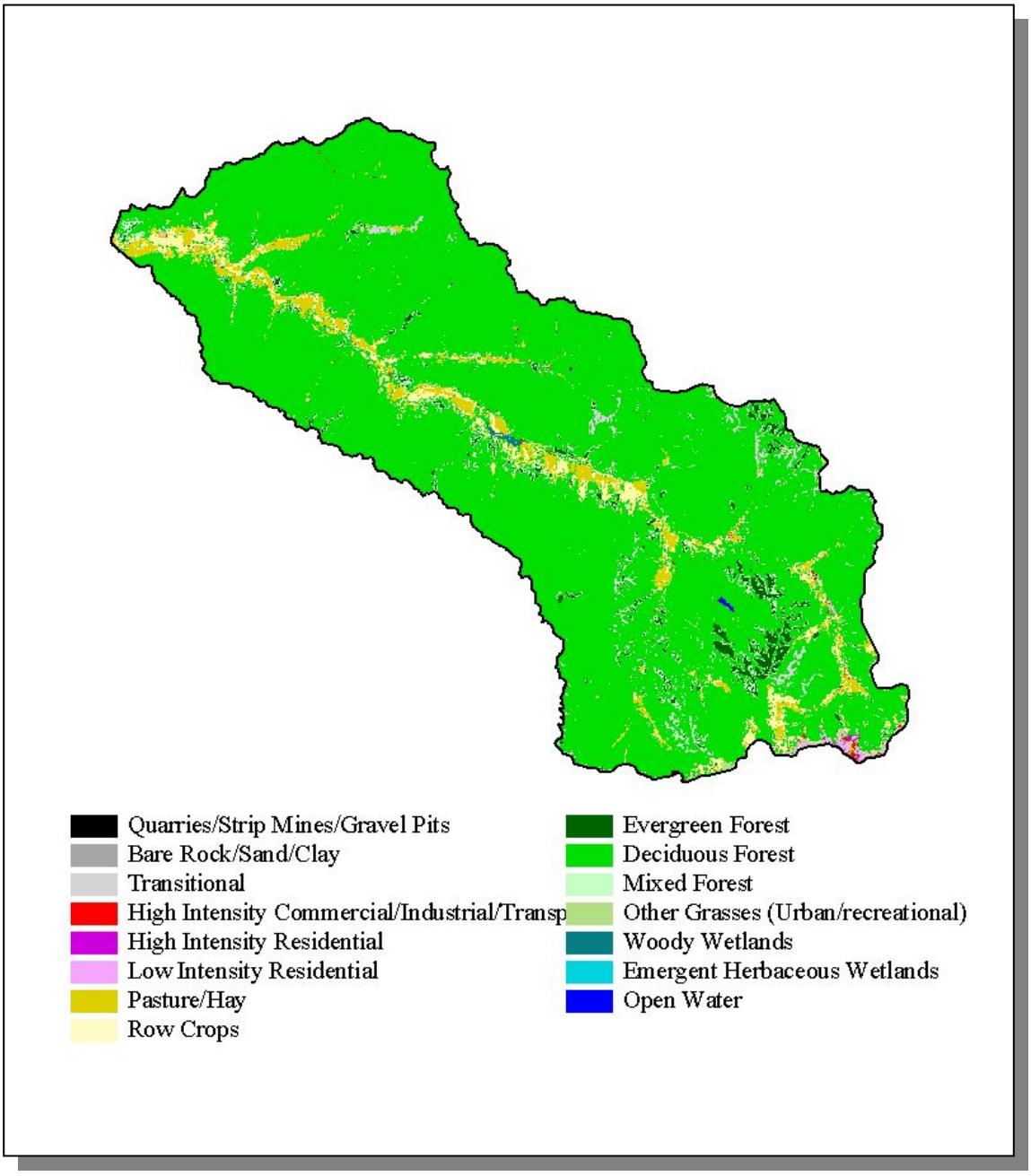


Figure 4-27. Illustration of Land Use Distribution in Subwatershed 0604000403.

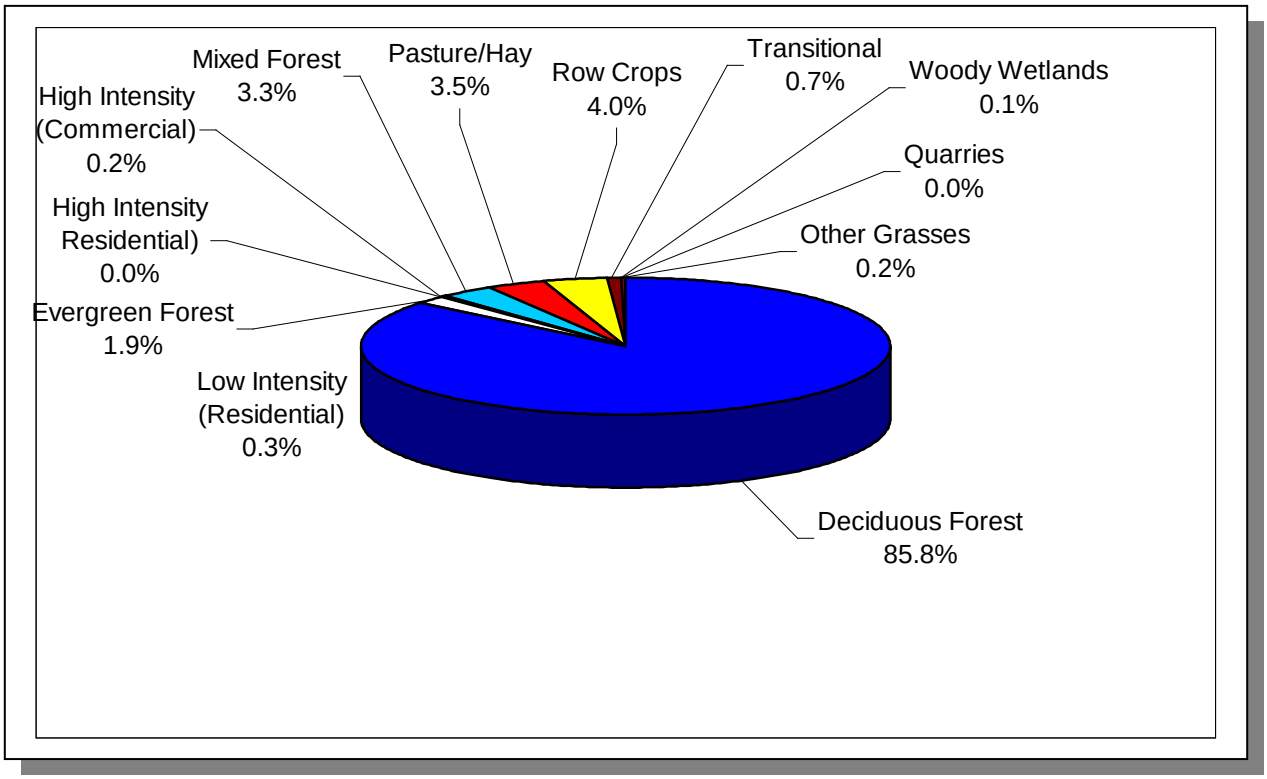


Figure 4-28. Land Use Distribution in Subwatershed 0604000403. *More information is provided in Appendix IV.*

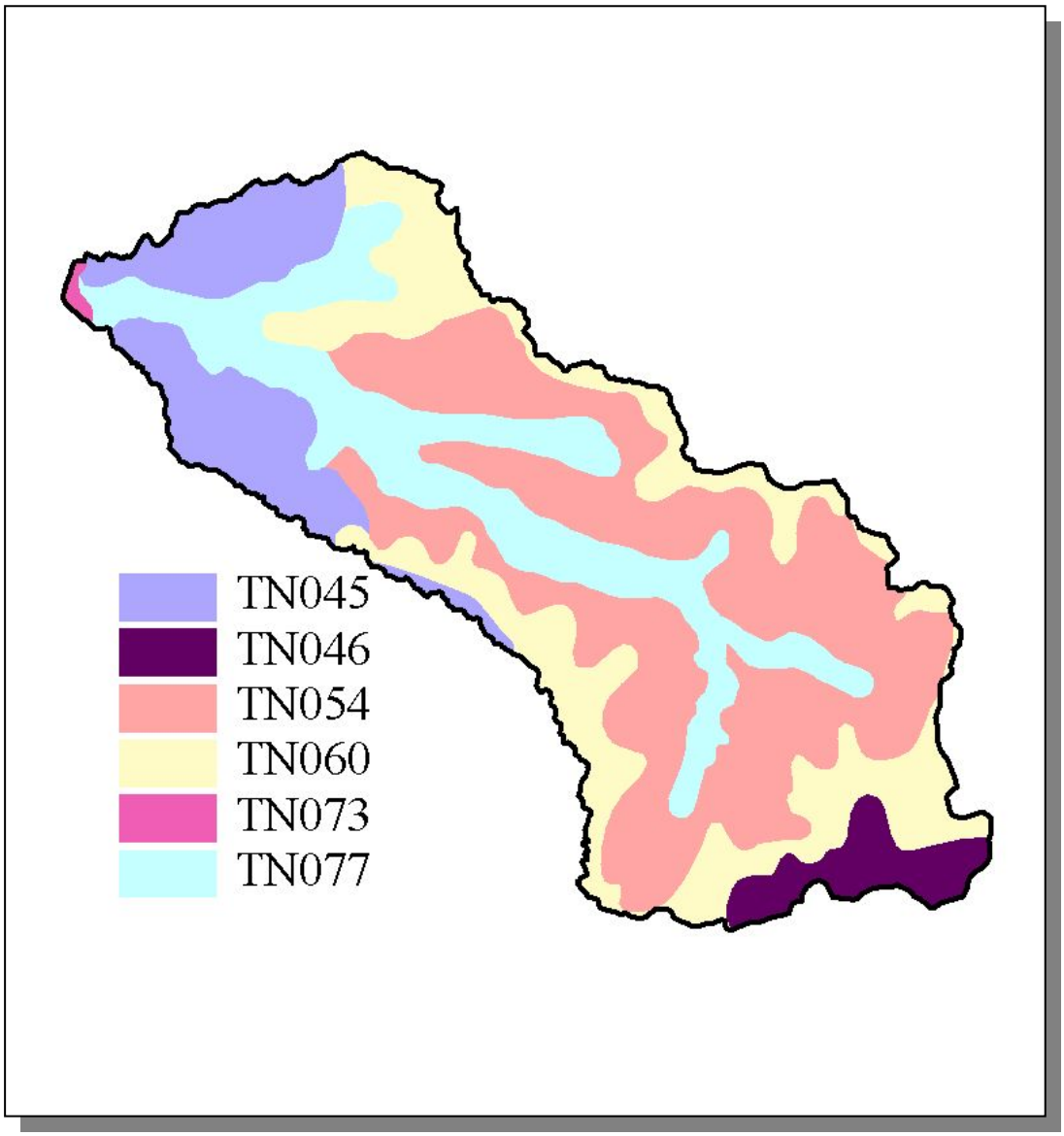


Figure 4-29. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000403.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN045	0.00	B	1.95	5.45	Loam	0.35
TN046	0.00	B	1.98	5.09	Silty Loam	0.38
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN073	0.00	B	2.97	5.21	Loam	0.34
TN077	4.00	C	2.16	5.03	Loam	0.34

Table 4-17. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000403. *More information is provided in Appendix IV.*

	COUNTY POPULATION				ESTIMATED POPULATION IN WATERSHED			
County	1990	1997	2000	Portion of Watershed (%)	1990	1997	2000	% Change (1990-1997)
Hickman	16,754	19,926	22,295	5.86	981	1,167	1,306	33.1
Lewis	9,247	10,789	11,367	12.57	1,163	1,357	1,429	22.9
Perry	6,612	7,438	7,631	3.21	212	239	245	15.6
Totals	**32,613**	**38,153**	**41,293**		**2,356**	**2,763**	**2,980**	**26.5**

Table 4-18. Population Estimates in Subwatershed 0604000403.

Figure 4-30. Location of Historical Streamflow Data Collection Sites in Subwatershed 0604000403. *Subwatershed 060400040301, and 060400040302 boundaries are shown for reference. More information is provided in Appendix IV.*

Figure 4-31. Location of STORET Monitoring Sites in Subwatershed 0604000403. *Subwatershed 060400040301, and 060400040302 boundaries are shown for reference. More information, including site names and locations, is provided in Appendix IV.*

4.2.C.ii. Point Source Contributions.

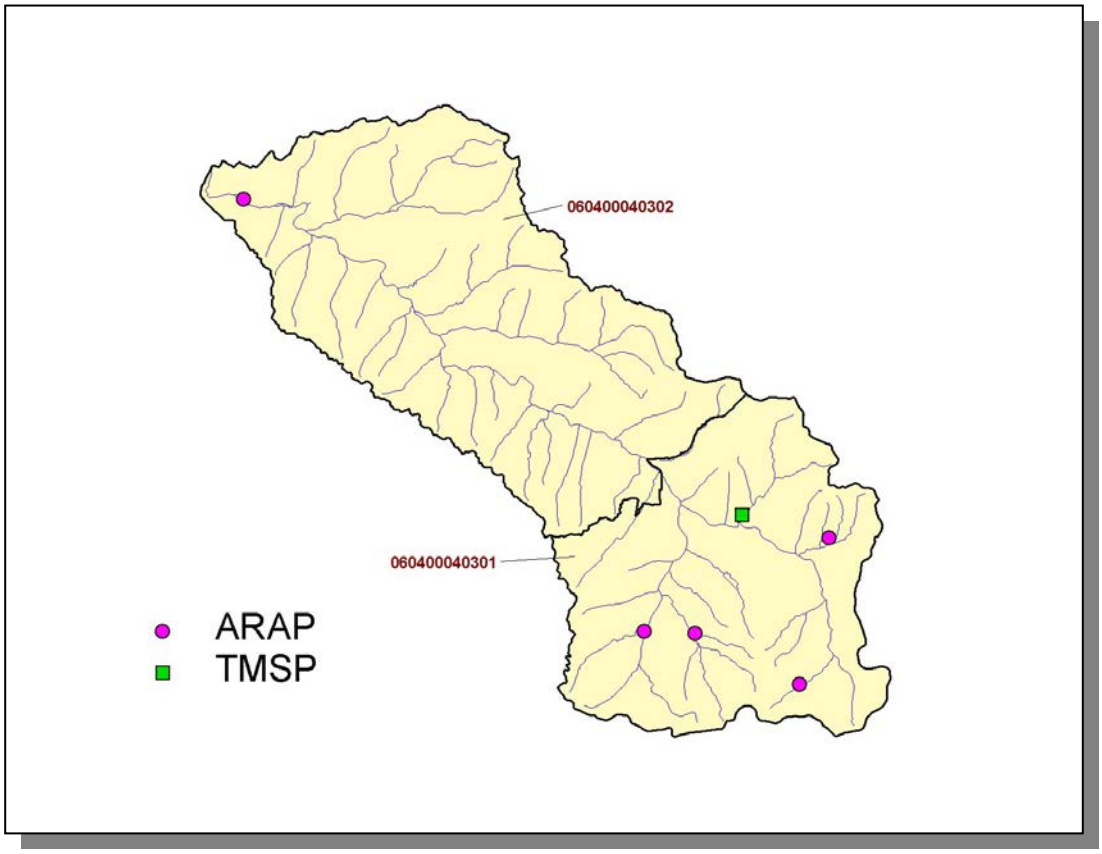


Figure 4-32. Location of Active Point Source Facilities in Subwatershed 0604000403. *Subwatershed 060400040301 and 060400040302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

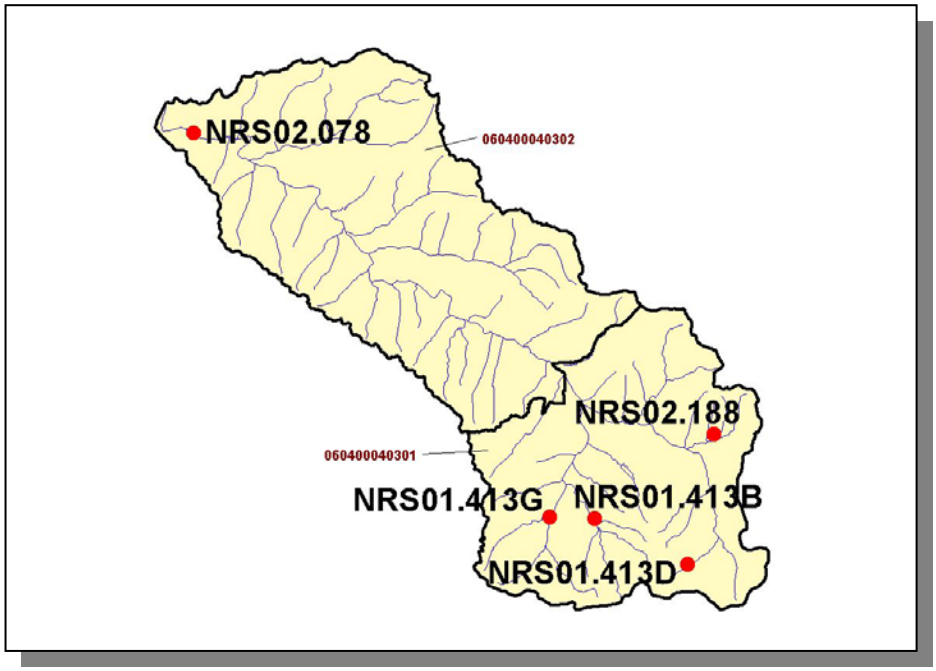


Figure 4-33. Location of ARAP Sites (Individual Permits) in Subwatershed 0604000403. *Subwatershed 060400040301 and 060400040302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

Figure 4-34. Location of TMSP Facilities in Subwatershed 0604000403. *Subwatershed 060400040301 and 060400040302 boundaries are shown for reference. More information, including the names of facilities, is provided in Appendix IV.*

4.2.C.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chicken (Layers)	Chickens Sold	Hogs	Sheep
554	1,031	2	<5	<5	187	4

Table 4-19. Summary of Livestock Count Estimates in Subwatershed 0604000403. *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)
Hickman	297.2	297.2	5.8	23.0
Lewis	158.0	158.0	4.0	10.2
Perry	223.6	223.6	5.1	22.0
Totals	**678.8**	**678.8**	**14.9**	**55.2**

Table 4-20. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 0604000403.

CROPS	TONS/ACRE/YEAR
Legumes (Pastureland)	0.68
Grass (Pastureland)	1.32
Grass (Hayland)	0.18
Legume (Hayland)	1.05
Legumes, Grass (Hayland)	0.30
Grass, Forbs, Legumes (Mixed Pasture)	0.52
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	2.52
Sorghum (Row Crops)	4.17
Soybeans (Row Crops)	5.35
Tobacco (Row Crops)	7.68
Other Cropland not Planted	0.65
Conservation Reserve Program Lands	0.46
Non-Agricultural Land Use	0.00
Other Land in Farms	1.21
Farmsteads and Ranch Headquarters	0.13

Table 4-21. Annual Estimated Total Soil Loss in Subwatershed 0604000403.

CHAPTER 5

WATER QUALITY PARTNERSHIPS IN THE BUFFALO RIVER WATERSHED

5.1 Background

5.2 Federal Partnerships
- **5.2.A. Natural Resources Conservation Service**
- **5.2.B. United States Geological Survey**
- **5.2.C. United States Fish and Wildlife Service**
- **5.2.D. Tennessee Valley Authority**

5.3 State Partnerships
- **5.3.A. TDEC Division of Water Supply**
- **5.3.B. State Revolving Fund**
- **5.3.C. Tennessee Department of Agriculture**

5.4 Local Initiatives
- **5.4.A. Five Rivers RC&D Council**

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 Buffalo River Watershed. The information presented is provided by the agencies and organizations described.

5.2. FEDERAL PARTNERSHIPS.

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

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

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

CONSERVATION PRACTICE	TOTAL	
	FEET	ACRES
Comprehensive Nutrient Management Plans		1,143
Streambank and Shoreline Protection	1,650	
Water Detention/Retention		1
Pest Management		1,443
Land Treatment: Buffers	1,650	25
Grazing/Forages Practices	26,922	1,249

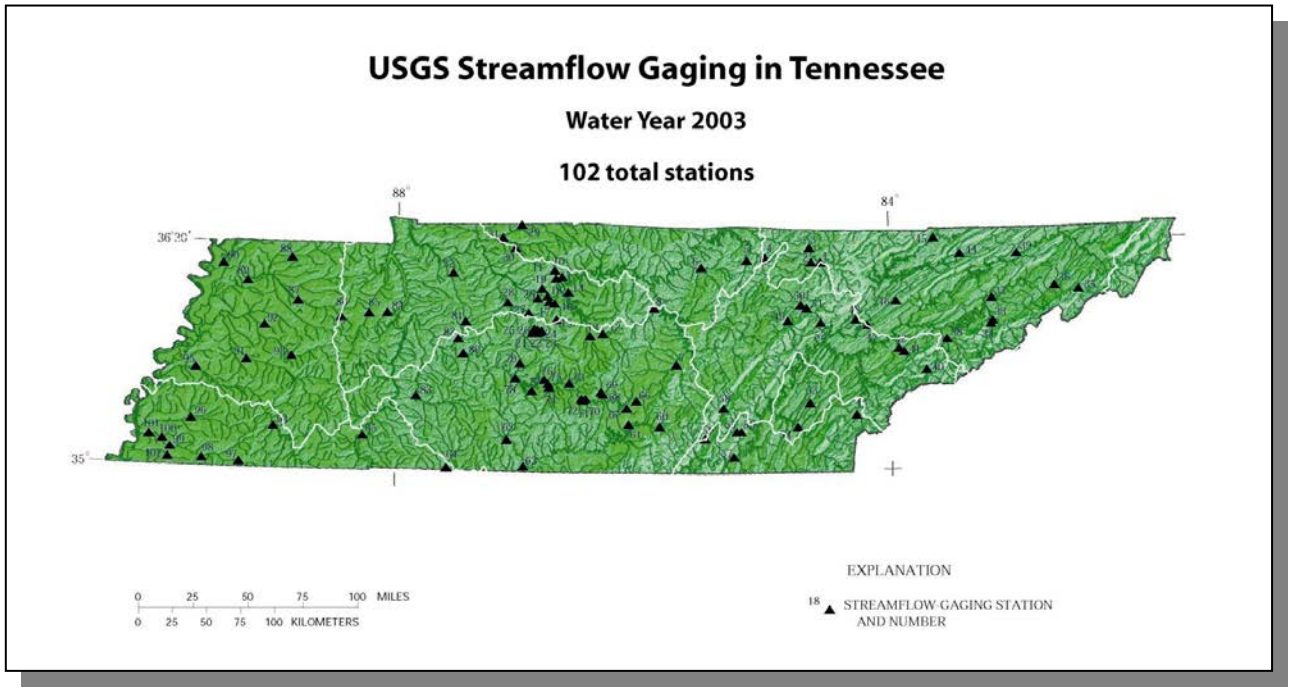
Table 5-1. Landowner Conservation Practices in Partnership with NRCS in the Buffalo River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period. More information is provided in Appendix V.*

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

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

the USGS records streamflow continuously at more than 102 gaging stations equipped with recorders and makes instantaneous measurements of streamflow at many other locations. Ground-water levels are monitored Statewide, and the physical, chemical, and biologic characteristics of surface and ground waters are analyzed. USGS activities also include the annual compilation of water-use records and collection of data for National baseline and water-quality networks. National programs conducted by the USGS include the National Atmospheric Deposition Program (http://bqs.usgs.gov/acidrain/), National Stream Quality Accounting Network (http://water.usgs.gov/nasqan/), and the National Water-Quality Assessment Program (http://water.usgs.gov/nawqa/). For specific information on the Upper and Lower Tennessee NAWQA studies, please visit http://tn.water.usgs.gov/lten/tenn.html

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



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

Endangered Species Program

Through the Endangered Species Program, the Service consults with other federal agencies concerning their program activities and their effects on endangered and threatened species. Other Service activities under the Endangered Species Program include the listing of rare species under the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.) and the recovery of listed species. Once listed, a species is afforded the full range of protections available under the ESA, including prohibitions on killing, harming or otherwise taking a species. In some instances, species listing can be avoided by the development of Candidate Conservation Agreements, which may remove threats facing the candidate species, and funding efforts such as the Private Stewardship Grant Program. Federally endangered and threatened species in the Buffalo River watershed include the gray bat (*Myotis grisescens*), spotfin chub (*Cyprinella* (=*Hybopsis*) *monacha*), slackwater darter (*Etheostoma boschungi*), Price's potato-bean (*Apios priceana*), Tennessee yellow-eyed grass (*Xyris tennesseensis*), and Eggert's sunflower (*Helianthus eggertii*). Federally designated critical habitat for the threatened slackwater darter exists in the Buffalo River and its tributaries in Lawrence County. For a complete listing of endangered and threatened species in Tennessee, please visit the Service's website at http://www.fws.gov/cookeville/.

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

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

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

Partners for Fish and Wildlife Program

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

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

The Service is actively involved with the Buffalo River Resource Conservation and Development District and private landowners in the Buffalo River watershed to protect riparian habitats for the Federally threatened spotfin chub and slackwater darter. Specific projects have included the installation of livestock exclusion fencing and alternate water supply sources.

HOW TO PARTICIPATE

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

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

5.2.D. Tennessee Valley Authority. The Tennessee Valley Authority's (TVA) goals for the 21st Century are to generate prosperity for the Tennessee Valley by promoting economic development, supplying low-cost, reliable power, and supporting a thriving river system. TVA is committed to the sustainable development of the region and is engaged in a wide range of watershed protection activities. TVA has seven multidisciplinary Watershed Teams to help communities across the Tennessee Valley actively develop and implement protection and restoration activities in their local watersheds. These teams work in partnership with business, industry, government agencies, and community groups to manage, protect, and improve the quality of the Tennessee River and its tributaries. TVA also operates a comprehensive monitoring program to provide real-time information to the Watershed Teams and other entities about the conditions of these resources. The following is a summary of TVA's resource stewardship activities in the Buffalo River watershed.

Stream Monitoring

The condition of water resources in the Buffalo River watershed streams is measured using three independent methods; Index of Biotic Integrity (IBI), number of mayfly, stonefly, and caddisfly taxa (EPT), and Habitat Assessment. Not all of these tools were used at each stream sample site.

IBI. The index of biotic integrity (IBI) assesses the quality of water resources in flowing water by examining a stream's fish assemblage. Fish are useful in determining long-term (several years) effects and broad habitat conditions because they are relatively long-lived and mobile. Twelve metrics address species richness and composition, trophic structure (structure of the food chain), fish abundance, and fish health. Each metric reflects the condition of one aspect of the fish assemblage and is scored against reference streams in the region known to be of very high quality. Potential scores for each of the twelve metrics are 1-poor, 3-intermediate, or 5-the best to be expected. Scores for the 12 metrics are summed to produce the IBI for the site. The following table associates IBI ranges with attributes of fish assemblages.

Attributes	IBI Range
Comparable to the best situations without influence of man; all regionally expected species for the habitat and stream size, including the most intolerant forms, are present with full array of age and sex classes; balanced trophic structure.	58-60
Species richness somewhat below expectation, especially due to loss of most intolerant forms; some species with less than optimal abundance or size distribution; trophic structure shows some signs of stress.	48-52
Signs of additional deterioration include fewer intolerant forms, more skewed trophic structure (e.g., increasing frequency of omnivores); older age classes of top predators may be rare.	40-44
Dominated by omnivores, pollution-tolerant forms, and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; hybrids and diseased fish often present.	28-34
Few fish present, mostly introduced or tolerant forms; hybrids common; disease, parasites, fin damage, and other anomalies regular.	12-22

EPT. The number and types of aquatic insects, like fish, are indicative of the general quality of the environment in which they live. Unlike fish, aquatic insects are useful in determining short-term and localized impacts because they are short-lived and have limited mobility. The method TVA uses involves only qualitative sampling and field identification of mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) to the family taxonomic level (EPT). The score for each site is simply the number of EPT families. The higher EPT scores are indicative of high quality streams because these insect larvae are intolerant of poor water quality.

Habitat Assessment. The quality and quantity of habitat (physical structure) directly affect aquatic communities. Habitat assessments are done at most stream sampling sites to help interpret IBI and EPT results. If habitat quality at a site is similar to that found at a good reference site, any impacts identified by IBI and EPT scores can reasonably be attributed to water quality problems. However, if habitat at the sample site differs considerably from that at a reference site, lower than expected IBI and EPT scores might be due to degraded habitat rather than water quality impacts.

The habitat assessment method used by TVA (modified EPA protocol) compares observed instream, channel, and bank characteristics at a sample site to those expected at a similar high-quality stream in the region. Each of the stream attributes listed below is given a score of 1 (poorest condition) to 4 (best condition). The habitat score for the sample site is simply the sum of these attributes. Scores can range from a low of 10 to a high of 40.

1. Instream cover (fish)
2. Epifaunal substrate
3. Embeddedness
4. Channel Alteration
5. Sediment Deposition
6. Frequency of Riffle
7. Channel Flow Status
8. Bank vegetation protection - Left bank and right bank, separately
9. Bank stability - Left bank and right bank, separately
10. Riparian vegetation zone width - Left bank and right bank, separately

Sample Site Selection. EPT sampling and fish community assessment (IBI) are conducted at the same sites. Site selection is governed primarily by study objectives, stream physical features, and stream access. TVA's objective is to characterize the quality of water resources within a sub-watershed (11-digit hydrologic unit). Sites are typically located in the lower end of sub-watersheds and at intervals on the mainstem to integrate the effects of land use. TVA began monitoring the ecological health of the Buffalo River in 1994. In 1999, a monitoring plan was implemented for the Buffalo River watershed with 18 sites selected for routine assessment. These sites are typically sampled every five years to keep a current picture of watershed condition.

Contacts
Details about stream bioassessment sampling sites and scores in the Buffalo River watershed can be obtained by contacting Amy Wales at (423)-876-6748 or akwales@tva.gov or http://www.tva.gov .

Watershed Assistance

At present, TVA is not involved in any large-scale watershed protection or restoration projects in the Buffalo River watershed. However, TVA has worked with and maintains a relationship with the local NRCS offices and Soil Conservation Districts in the Buffalo River watershed.

Promote Riparian Buffers. An effective line of water quality protection is maintaining the vegetative plant cover along water bodies. TVA encourages waterfront property owners to maintain or establish vegetated riparian buffers by providing information to the riparian property owner. TVA has also developed a series of 11 fact sheets that will enable riparian property owners to restore, manage, and be better stewards of riparian land. The fact sheets are available on the TVA internet site http://www.tva.com/river/landandshore/index.htm.

Further information on TVA's involvement in the Buffalo River watershed can be obtained by writing: Tennessee Valley Authority, PO Box 280, Paris, TN 38242 or calling the Kentucky Watershed Team at (731)-641-2026. Also, contact can be made by calling 1-800-TVA-LAND or http://www.tva.gov.

5.3. STATE PARTNERSHIPS.

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

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

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

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

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

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

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

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

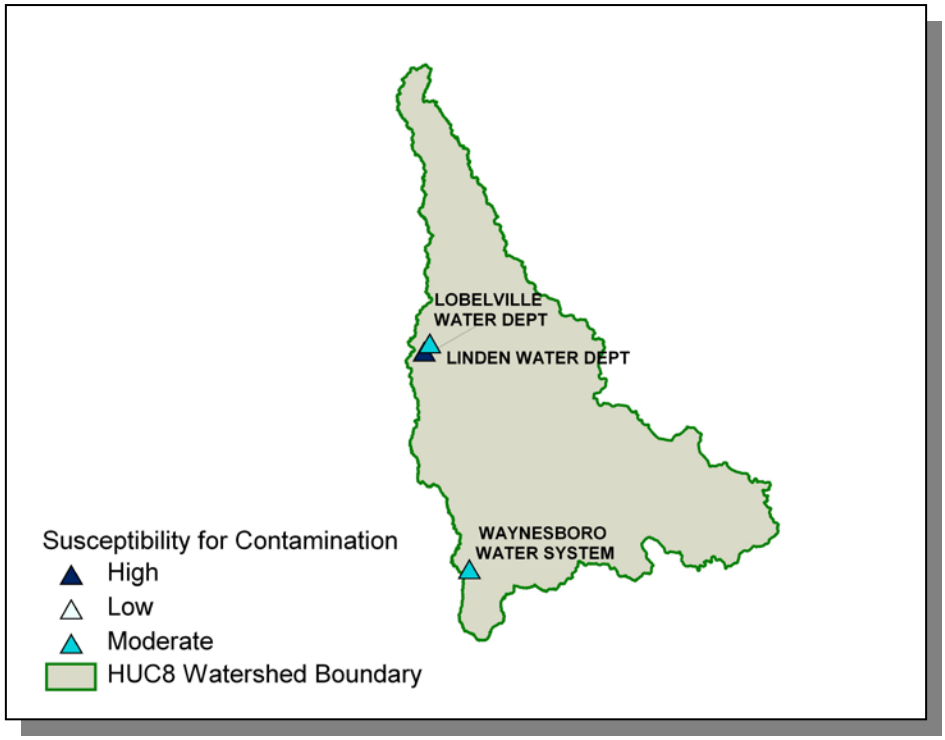


Figure 5-1. Susceptibility for Contamination in the Buffalo River Watershed.

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

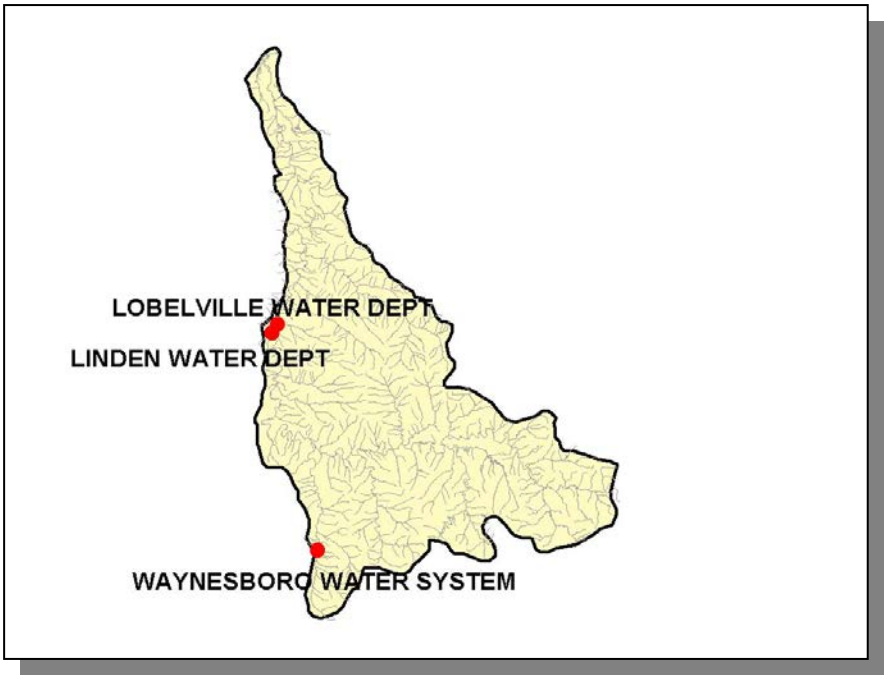


Figure 5-2. Locations of Community and Non-Community Public Water Supply Intakes in the Buffalo River Watershed.

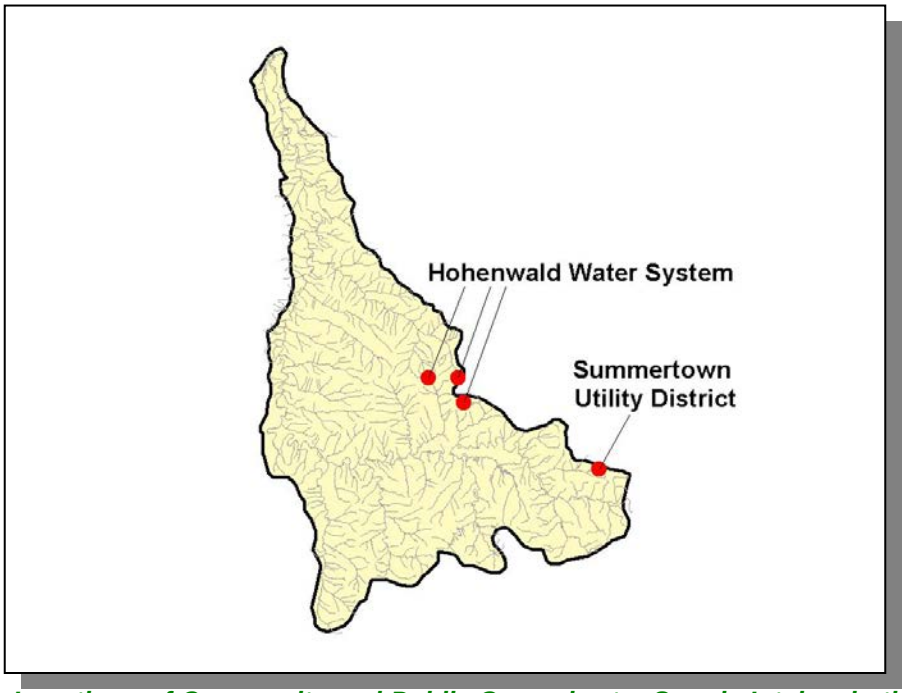


Figure 5-3. Locations of Community and Public Groundwater Supply Intakes in the Buffalo River Watershed.

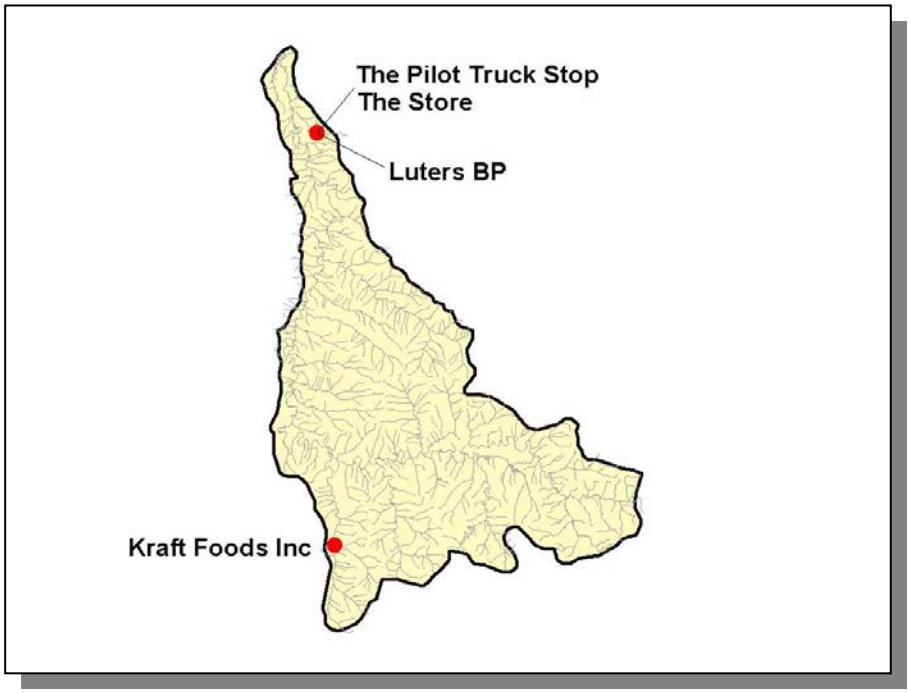


Figure 5-4. Locations of UIC (Underground Injection Control) Sites in the Buffalo Watershed. *Injection wells include stormwater sinkholes modified for drainage, commercial/industrial septic tanks, and large capacity septic tanks.*

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

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

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

maximum loan term is 20 years or the design life of the proposed wastewater facility, whichever is shorter.

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

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

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

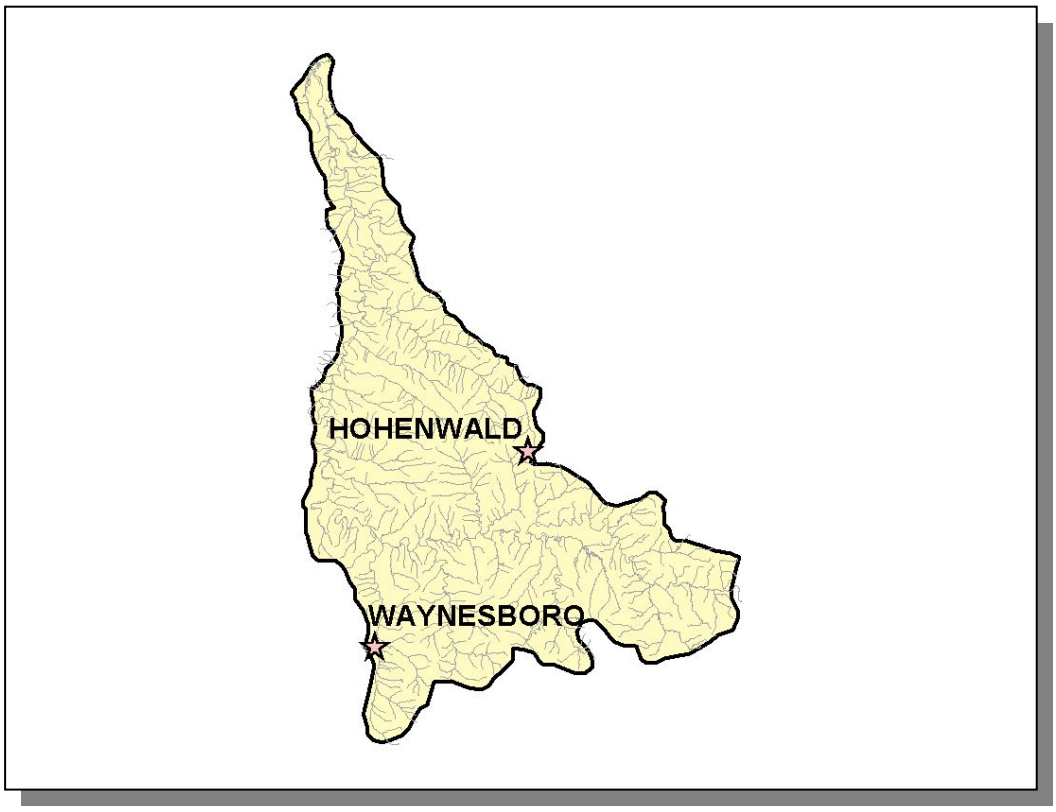


Figure 5-5. Location of Communities Receiving SRF Loans or Grants in the Buffalo River Watershed. *More information is provided in V.*

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

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

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

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

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

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

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

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

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

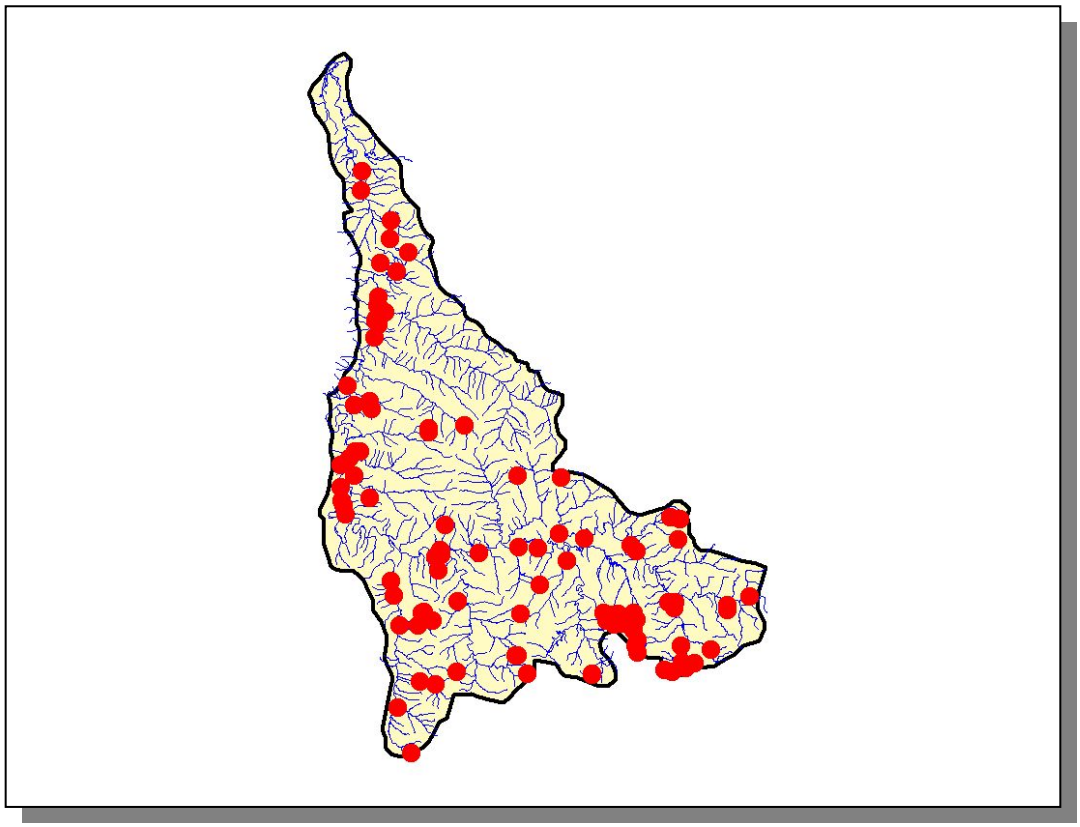


Figure 5-6. Location of BMPs installed from 1999 through 2003 in the Buffalo River Watershed with Financial Assistance from the Tennessee Department of Agriculture's Nonpoint Source and Agricultural Resources Conservation Fund Grant Programs. *More information is provided in Appendix V.*

5.4. LOCAL INITIATIVES.

5.4.A. Five Rivers RC&D Council. The Mission of the Five Rivers RC&D Council is to promote activities that will enhance the quality of life, conserve natural resources, and promote economic development in the council area.

The Five Rivers RC&D Council covers seven counties in Middle Tennessee. Named for the 5 major rivers flowing through the area, the council serves Cheatham, Dickson, Houston, Humphreys, Montgomery, Robertson, and Stewart Counties. With the natural resources and community activities being diverse in geography, the Council responds to the needs of their local communities, both for conservation issues and for economic and rural development. The collaboration of its numerous partners makes the Five Rivers RC & D Council Area distinctive.

The Five Rivers RC & D Council assists in administering the Resource Conservation and Development Program, which is a unique combination of private enterprise and federal assistance that encourages economic growth through development, conservation and planned utilization of natural resources across the Council Area and Tennessee. Just a few services the RC&D program is providing in our community are Conservation Education, Farmland Protection, providing Technical Assistance, ensuring Community Services, establishing Sustainable Development, encouraging Natural Resources Protection, and Communicating Local Issues.

Since 1999, the Five Rivers RC&D Council has worked with local landowners along the Buffalo and Duck Rivers in Humphreys County to demonstrate solutions to sedimentation and non-point source pollution loading by installing Best Management Practices. The U S Fish & Wildlife Service awarded $20,000 to the Council to assist the enhancements of this watershed. The problems were mostly caused by severe streambank erosion, livestock accessibility to these streams, a lack of buffer or riparian zones, and improper farming techniques that have impaired the river systems.

This project has installed 10,613 linear feet of fencing for livestock use exclusion, and over 1000 linear feet of bioengineering to restore the streambanks and to provide protection against river swells. Landowners have improved their pasture lands by providing intensive rotational grazing systems to adequately feed forages and maintain healthy open lands. Many included alternatives to watering animals from the streams with new solar ram watering troughs.

The project installations totaled over $47,000 in addition to improving water quality along the Buffalo and Duck Rivers. The knowledge by these landowners will carry on ensuring the rest of the farming community grasped the conservation concepts for generations to come and to expand to others areas in the region.

For more information on the Five Rivers RC&D Council and its programs, contact Chandra Berry, RC&D Coordinator at (931)-368-0252 ext. 5 or visit the web site at: http://www.fiveriversrcd.org.

CHAPTER 6

RESTORATION PRIORITIES IN THE BUFFALO RIVER WATERSHED

6.1. Background

6.2. Comments from Public Meetings
6.2.A. Year 1 Public Meeting
6.2.B. Year 3 Public Meeting
6.2.C. Year 5 Public Meeting

6.3. Approaches Used
6.3.A. Point Sources
6.3.B. Nonpoint Sources

6.1. BACKGROUND.

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

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

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

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

6.2.A. Year 1 Public Meeting. The first Buffalo River Watershed public meeting was held October 6, 1998 at Columbia State Community College. 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

- Increased population that leads to more development pressures
- Protection of high quality waters
- Algae and other signs of degradation on the Buffalo River
- Clear cutting effects on Buffalo River Watershed
- Lack of public awareness of water quality standards

6.2.B. Year 3 Public Meeting. The second Buffalo River Watershed public meeting was held March 13, 2001 at Columbia State Community College. The goals of the meeting were to: (1) provide an overview of the watershed approach, (2) review the monitoring strategy, (3) summarize the most recent water quality assessment, (4) discuss the TMDL schedule and citizens' role in commenting on draft TMDLs, and (5) discuss BMPs and other nonpoint source tools available through the Tennessee Department of Agriculture 319 Program and NRCS conservation assistance programs.

Major Concerns/Comments

- Water Withdrawals
- Water Quality and Quantity effects on the local economy
- Sediment from construction problems
- Effects of new development on existing STP capacity
- Clear cutting near small streams
- Building in Buffalo River floodplain
- Lack of environmental education by TDEC via mass media

6.2.C. Year 5 Public Meeting. The third scheduled Buffalo River Watershed public meeting was held November 3, 2005 at Columbia State Community College. The meeting was held jointly with the Lower Duck River Watershed and featured ten 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
- TWRA display
- TVA display
- Duck River Development Agency display
- Duck River Opportunity Project display
- Swan River Trust display

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

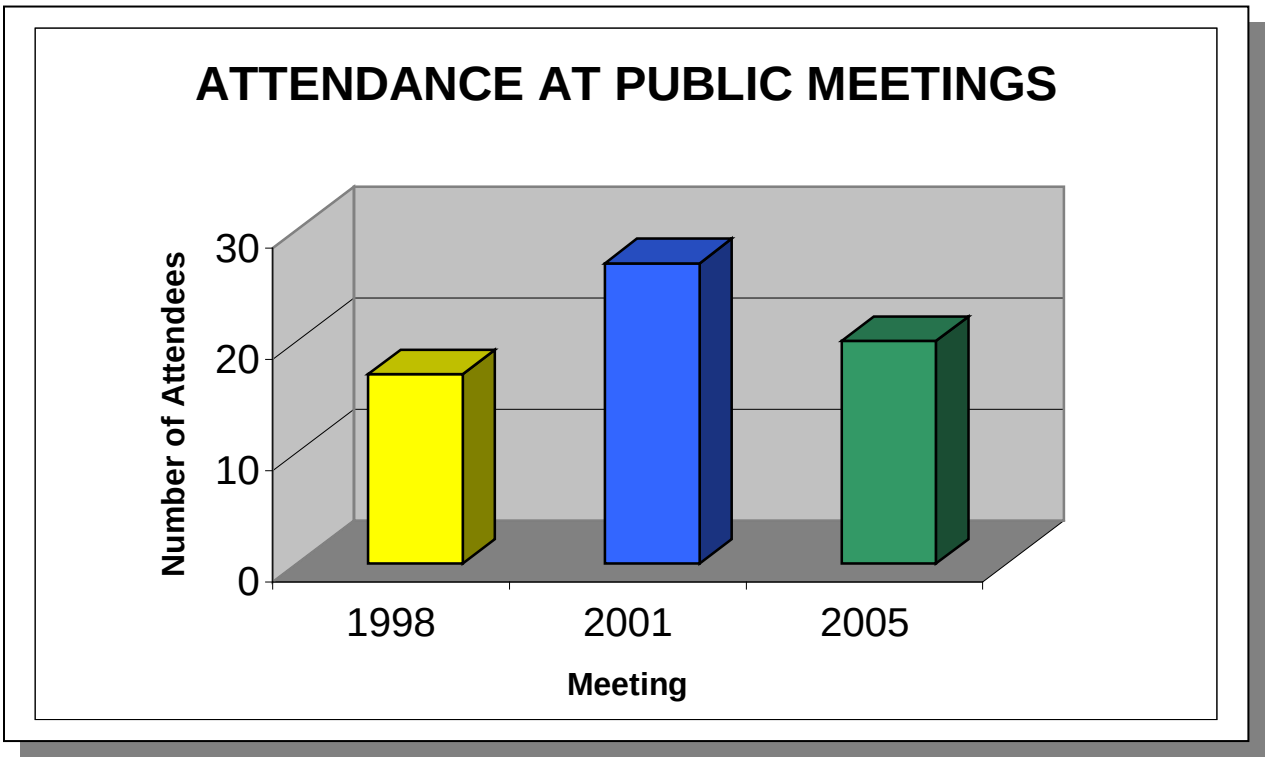


Figure 6-1. Attendance at Public Meetings in the Buffalo River Watershed. *1998 meeting attendance numbers represents Buffalo River, Upper Duck River and Lower Duck River Watersheds joint meeting; 2001 and 2005 meeting attendance numbers represent Buffalo River and Lower Duck River Watersheds joint meeting. Attendance numbers do not include TDEC personnel.*

Figure 6-2. Watershed Meetings are an Effective Way to Facilitate Networking Among Consultants, Local Officials, Non-Government Organizations, Government Agencies, and Staff.

Figure 6-3. The SmartBoard™ is an Effective Interactive Tool to Teach Citizens About the Power of GIS.

Figure 6-4. Watershed Meetings Begin With A Short Presentation To Review The Watershed Water Quality Management Plans With Interested Citizens.

Figure 6-5. Informal Discussions Among Residents of the Watershed Are an Important Part of TDEC's Watershed Meetings.

6.3. APPROACHES USED.

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

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

Approved TMDL:

Booker Hollow Creek and Rockhouse Creek. TMDL for pathogens in the Buffalo River Watershed. Approved March 1, 2005.
http://www.state.tn.us/environment/wpc/tmdl/approvedtmdl/BuffaloF2.pdf

TMDLs are prioritized for development based on many factors.

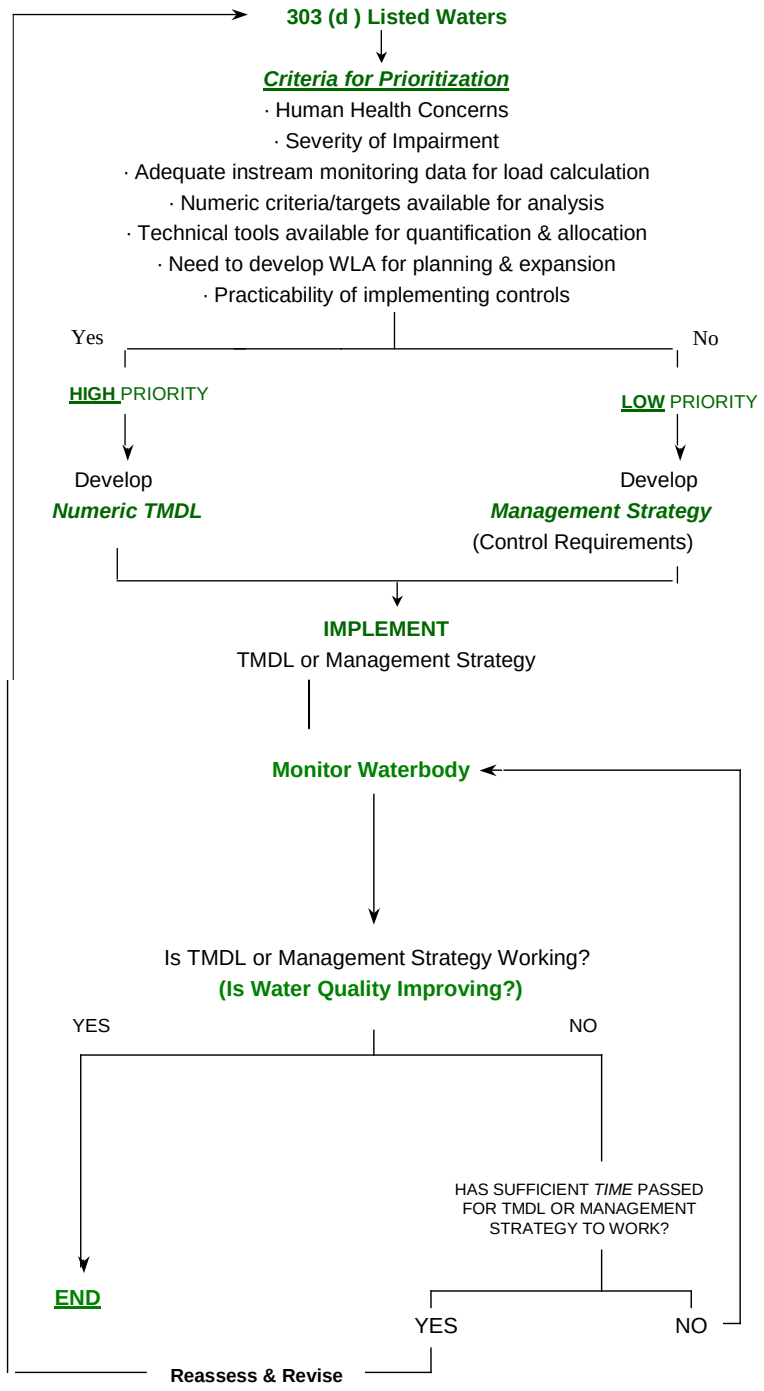


Figure 6.6. Prioritization Scheme for TMDL Development.

6.3.B. Nonpoint Sources

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

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

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

6.3.B.i. Sedimentation.

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

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

The same requirements apply to sites that drain into high quality waters. The Buffalo River and Little Buffalo River are examples of high quality streams in the Buffalo River Watershed.

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

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

Voluntary activities

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

Additional strategies

- Increase efforts in the Master Logger program to recognize impaired streams and require more effective management practices.
- Better community planning for the impacts of development on small streams, especially development in growing areas (examples: headwaters of buffalo River, East Fork Cane Creek).
- Require post-construction run-off rates to be no greater than pre-construction rates in order to avoid in-channel erosion (examples: drainages from Waynesboro to the Green River).
- Implement additional restrictions on logging in streamside management zones.
- Limit clearing of stream and ditch banks (examples: Rockhouse Creek, Coon Creek). *Note: Permits may be required for any work along streams.*
- Limit road and utilities crossings of streams.
- Restrict the use of off-highway vehicles on stream banks and in stream channels.

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

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

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

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

6.3.B.ii. Pathogen Contamination.

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

Currently, only two stream systems in the Buffalo River Watershed are known to have excessive pathogen contamination. They are Booker Hollow and Rockhouse Creek. Other measures that may be necessary to control pathogens are:

Voluntary activities

- Off-channel watering of livestock (examples: tributaries of Back Creek, Beaver Creek and Boone Lake).
- Limit livestock access to streams (examples: Back Creek and Steele Creek).
- Improve and educate on the proper management of animal waste from feeding operations.

Enforcement strategies

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

Additional strategies

- Develop intensive planning in areas where sewer is not available and treatment by subsurface disposal is not an option due to poor soils, floodplains, or high water tables.
- Develop and enforce leash laws and controls on pet fecal material (example: cities of Waynesboro, Hohenwald, Linden, and Summertown).
- Greater efforts by sewer utilities to identify leaking lines or overflowing manholes (example: Cities of Waynesboro, Hohenwald, and Linden).

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

These two impacts are usually listed together because high nutrients often contribute to low dissolved oxygen within a stream. Since nutrients often have the same source as pathogens, the measures previously listed can also address many of these problems. Elevated nutrient loadings are also often associated with urban runoff from impervious surfaces, from fertilized lawns and croplands, and faulty sewage disposal processes. Nutrients are often transported with sediment, so many of the measures designed to reduce sediment runoff will also aid in preventing organic enrichment of streams and lakes.

Other sources of nutrients can be addressed by:

Voluntary activities

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

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

- Maintain shade over a stream. Cooler water can hold more oxygen and retard the growth of algae. As a general rule, all stream channels suffer from some

canopy removal. An intact riparian zone also acts as a buffer to filter out nutrient loads before they enter the water.
- Discourage impoundments. Ponds and lakes do not aerate water. *Note: Permits may be required for any work on a stream, including impoundments.*

Regulatory strategies.
- Strengthen enforcement of regulations governing on-site wastewater treatment.
- Impose more stringent permit limits for nutrients discharged from sewage treatment plants (including Waynesboro STP, Linden STP, and Hohenwald STP).
- Timely and appropriate enforcement for noncomplying sewage treatment plants, large and small, and their collection system.
- Identify Concentrated Animal Feeding Operations not currently permitted.

6.3.B.iv. Toxins and Other Materials.

Although some toxic substances are discharged directly into waters of the state from a point source, much of these materials are washed in during rainfalls from an upland location, or via improper waste disposal that contaminates groundwater. In the Buffalo River Watershed, a relatively small number of streams are damaged by storm water runoff from industrial facilities or urban areas. More stringent inspection and regulation of permitted industrial facilities, and local strormawter quality initiatives and regulations, could help reduce the amount of contaminated runoff reaching state waters.

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

Some of these problems can be addressed by:

Voluntary activities
- Provide public education.
- Paint warnings on storm drains that connect to a stream. (This would benefit Green River, East Fork Cane Creek, and Rockhouse Creek).
- Sponsor community clean-up days (This would benefit Green River).
- Landscape public areas.
- Encourage public surveillance of their streams and reporting of dumping activities to their local authorities.

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

6.3.B.v. Habitat Alteration.

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

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

Voluntary activities

- Sponsor litter pickup days to remove litter that might enter streams
- Organize stream cleanups removing trash, limbs and debris before they cause blockage.
- Avoid use of heavy equipment to "clean out" streams (Rockhouse Creek and Fortyeight Creek have suffered from such activities).
- Plant native vegetation along streams to stabilize banks and provide habitat
- Encourage developers to avoid extensive use of culverts in streams.

Current regulations

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

Additional Enforcement

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

APPENDIX II

ID	NAME	HAZARD		ID	NAME	HAZARD
507001	Laurel Hill Lake	2		517002	Napier	S
507003	Pine Lake	3		517003	Jackson	S
507004	VFW Lake	3		517004	Squaw Branch	2
507008	Miller	S		517005	Cjief Creek	2
517001	Highland	2		517006	Napier Diversion	S

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

LAND COVER/LAND USE	ACRES	% OF WATERSHED
Open Water	2,558	0.52
Other Grasses	1,176	0.24
Pasture/Hay	50,715	10.39
Row Crops	39,879	8.17
Woody Wetlands	4,045	0.83
Emergent Herbaceous Wetlands	109	0.02
Deciduous Forest	337,198	69.25
Mixed Forest	19,723	4.04
Evergreen Forest	17,859	3.66
High Intensity: Commercial/Industrial	1,272	0.26
High Intensity: Residential	253	0.05
Low Intensity: Residential	1,746	0.36
Quarries/Strip Mines/Gravel Pits	111	0.02
Bare Rock/Sand/Clay	1	0.00
Transitional	10,620	2.18
Total	**487,985**	**100.00**

Table A2-2. Land Use Distribution in Buffalo 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)	
Transition Hills (65j)	Right Fork Whites Creek (65JO6)	TWV-Beech River	06040001
	Unnamed Trib to Right Fork Whites Creek (65J11)	TWV-Beech River	06040001
	Dry Creek (65J05)	Pickwick lake	06030005
	Pompeys Branch (65J04)	Pickwick Lake	06030005
Western Highland Rim (71f)	South Harpeth Creek (71F12)	Harpeth River	05130204
	Little Swan Creek (71F28)	Lower Duck River	06040003
	Brush Creek (71F19)	Buffalo River	06040004
	Swanegan Branch (71F27)	Pickwick Lake	06030005
	Wolf Creek (71F16)	Lower Duck River	06040003
	Hurricane Creek (71F29)	Lower Duck River	06040003

Table A2-3. Ecoregion Monitoring Sites in Ecoregions 65j and 71f.

CODE	NAME	AGENCY	AGENCY ID
247	USACOE-Nashville Client Site	USACOE-Nashville	
250	USACOE-Nashville Client Site	USACOE-Nashville	
342	TDOT SR 6 Mitigation/Permit Site	TDOT	
2578	TWRA Site	TWRA	
2700	TDEC/DNH Little Buffalo River Bottoms Site	TDEC/DNH	S.USTHNP 440

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

APPENDIX III

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Allens Creek	TN06040004008_0400	10.3
Big Opossum Creek	TN06040004008_0100	10.9
Black Branch	TN06040004001_0200	4.1
Brush Creek	TN06040004013_0400	17.3
Brush Creek	TN06040004030_1000	27.2
Buffalo River	TN06040004001_1000	38.3
Buffalo River	TN06040004002_1000	54.4
Buffalo River	TN06040004008_1000	27.0
Buffalo River	TN06040004019_1000	19.4
Buffalo River	TN06040004019_2000	6.8
Camp Branch	TN06040004001_0100	3.2
Cane Creek	TN06040004031_1000	20.0
Chief Creek	TN06040004013_0100	28.7
Coon Creek	TN06040004029_1000	29.0
East Fork Cane Creek	TN06040004031_0400	24.8
Fortyeight Creek	TN06040004009_1000	9.3
Fortyeight Creek	TN06040004009_2000	8.0
Green River	TN06040004007_1000	11.8
Green River	TN06040004007_2000	9.2
Grinders Creek	TN06040004024_1000	22.1
Hurricane Creek	TN06040004028_1000	2.00
Little Buffalo River	TN06040004013_1000	18.3
Little Fortyeight Creek	TN06040004009_0100	16.3
Little Opossum Creek	TN06040004002_0100	7.1
Moccasin Branch	TN06040004008_0700	8.0
North Fork Saw Creek	TN06040004019_0210	2.3
Red Bank Creek	TN06040004001_0800	8.1
Robinette Creek	TN06040004008_0500	5.6
Rockhouse Creek	TN06040004025_1000	18.1
Saw Creek	TN06040004019_0200	1.05
Short Creek	TN06040004032_1000	12.1
South Fork Cane Creek	TN06040004031_0500	24.2
Terrapin Creek	TN06040004001_0700	7.3
Trace Creek	TN06040004026_1000	36.5
West Fork (Water Fork) Creek	TN06040004019_0600	35.9

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Rockhouse Creek	TN06040004025_2000	5.1

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Black Branch	TN06040004001_0250	8.9
Booker Hollow	TN06040004025_0200	1.8
Tanyard Creek	TN06040004001_0900	2.1
Weaver Branch	TN06040004013_0200	1.3

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Barnett Branch	TN06040004009_0200	13.2
Bowstring Branch	TN06040004009_0400	4.3
Bridy Creek	TN06040004019_0500	6.3
Canoe Branch	TN06040004002_0300	3.6
Cave Branch	TN06040004031_0200	5.7
Chalk Creek	TN06040004007_0300	12.0
Dry Branch	TN06040004008_0600	3.2
Furnace Branch	TN06040004009_0300	5.7
Harper Valley Branch	TN06040004002_0200	6.3
Jacks Branch	TN06040004025_0100	5.0
King Branch	TN06040004002_0400	4.3
Kirk Branch	TN06040004019_0700	3.7
Lagoon Branch	TN06040004001_0600	11.5
Laurel Hill Lake	TN06040004LAURELHILL_1000	327.0
Lost Creek	TN06040004001_0400	7.3
Lower Sinking Creek	TN06040004031_0100	13.3
Misc tribs to Buffalo River	TN06040004019_0999	45.4
Misc. tribs to Buffalo River	TN06040004001_0999	69.9
Misc. tribs to Buffalo River	TN06040004002_0999	54.2
Misc. tribs to Buffalo River	TN06040004008_0999	25.8
Misc. tribs to Cane Creek	TN06040004031_0999	41.9
Misc. tribs to Fortyeight Creek	TN06040004009_0999	28.2
Misc. tribs to Green River	TN06040004007_0999	37.1
Misc. tribs to Little Buffalo River	TN06040004013_0999	28.0
North Fork Buffalo River	TN06040004019_0300	10.7
Pond Creek	TN06040004019_0100	12.5
Pruette Branch	TN06040004001_0300	3.0
Reed Branch	TN06040004013_0300	5.0
Rockhouse Creek	TN06040004059_1000	24.1

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Russell Creek	TN06040004001_0500	7.2
Simmons Branch	TN06040004007_0100	8.0
Sinking Creek	TN06040004027_1000	24.1
South Fork Buffalo River	TN06040004019_0400	8.3
Sweetwater Branch	TN06040004026_0100	4.9
Tucker Branch	TN06040004008_0300	7.1
Upper Sinking Creek	TN06040004031_0300	13.4
VFW Lake	TN06040004VFWLK_1000	22.0

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (ACRES)
Laurel Hill Lake	TN06040004LAURELHILL_1000	327
VFW Lake	TN06040004VFWLK_1000	22

Table A3-1e. Lakes Not Assessed in the Buffalo River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Black Branch	TN06040004001_0250	8.9	Not supporting

Table A3-2a. Stream Impairment Due to Nonpriority Organics in the Buffalo River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Rockhouse Creek	TN06040004025_2000	5.1	Partial
Tanyard Creek	TN06040004001_0900	2.1	Not supporting

Table A3-2b. Stream Impairment due to Other Habitat Alterations in the Buffalo River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Booker Hollow	TN06040004025_0200	1.8	Not supporting
Rockhouse Creek	TN06040004025_2000	5.1	Partial

Table A3-2c. Stream Impairment Due to Nutrients in the Buffalo River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Booker Hollow	TN06040004025_0200	1.8	Not supporting
Rockhouse Creek	TN06040004025_2000	5.1	Partial

Table A3-2d. Stream Impairment due to Pathogens in the Buffalo River Watershed.

APPENDIX IV

LAND USE/LAND COVER	AREAS IN HUC-10 SUBWATERSHEDS (ACRES)		
	01	02	03
Bare Rock, Sand, Clay	1		
Deciduous Forest	147,316	144,074	45,528
Emergent Herbaceous Wetlands	6	102	1
Evergreen Forest	8,721	8,083	1,055
High Intensity: Commercial/Industrial/Transportation	569	602	101
High Intensity: Residential	98	127	27
Low Intensity: Residential	739	823	185
Mixed Forest	7,924	10,014	1,785
Open Water	1,134	1,405	19
Other Grasses: Urban/Recreational	587	468	120
Pasture/Hay	30,365	18,467	1,883
Row Crops	26357	11,356	2,166
Transitional	7,207	3,012	401
Woody Wetlands	2,094	1,906	44
Quarries/Strip Mines	48	44	19
Total	**233,168**	**200,482**	**54,335**

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

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

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

STATION	HUC-10	AGENCY	STREAM NAME	AREA (SQ MILES)	LOW FLOW (CFS)		
					1Q10	7Q10	3Q20
03604000	0604000402	USGS	Buffalo River	447	102	107	93.7
03604070	0604000402	USGS	Coon Creek Tributary				
03604080	0604000402	USGS	Hugh Hollow Branch				
03604090	0604000402	USGS	Coon Creek				
03604100	0604000402	USGS	Coon Creek	10.1	0.3	0.4	0.2
03604400	0604000402	USGS	Buffalo River	702	158	178	159
03604500	0604000402	USGS	Buffalo River				
03603800	0604000403	USGS	Chalk Creek				
03604200	0604000403	USGS	Cane Creek	45.1	11.5	12.0	10.6

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

AGENCY	STATION	ALIAS	LOCATION	HUC-10
TDEC			Brush Creek	0604000401
TDEC	BUFFA093.5LS		Buffalo River @ RM 93.5	0604000401
TDEC	FORTY000.4WE		Fortyeight Creek @ RM 0.4	0604000401
TDEC	LBUFF006.5LW		Little Buffalo River @ RM 6.5	0604000401
TDEC	NFSAW000.3LW		North Fork Saw Creek @ RM 0.3	0604000401
TDEC	ROCKH008.2LS		Rockhouse Creek @ RM 8.2	0604000401
TDEC	ROCKH1T0.6LS		UT To Rockhouse Creek @ RM 0.6	0604000401
TDEC	ROCKH1T0.8LS		UT To Rockhouse Creek @ RM 0.8	0604000401
TVA	476343		Buffalo River	0604000401
TVA	476315		Buffalo River At Metal Ford	0604000401
TVA	476316		Buffalo River At Metal Ford	0604000401
TVA	476317		Buffalo River At Metal Ford	0604000401
TVA	476341		Unnamed Tributary	0604000401
TDEC			Buffalo River	0604000402
TDEC	408		Buffalo River	0604000402
TDEC	BUFFA017.7PE		Buffalo River @ RM 17.7	0604000402
TDEC	BUFFA073.1WE	000408	Buffalo River @ RM 73.1	0604000402
TDEC	GREEN010.5WE		Green River @ RM 10.5	0604000402
TVA	475047		Buffalo River	0604000402
TVA	475794		Buffalo River	0604000402
TVA	475840		Buffalo River	0604000402
TVA	475867		Buffalo River	0604000402
TVA	475868		Buffalo River	0604000402
TVA	475872		Green River	0604000402
USEPA	2301		Buffalo River	0604000402
TDEC	CANE004.1PE		Cane Creek @ RM 4.1	0604000403

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

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	MADI	WATERBODY	HUC-10
TN0056545	Summertown High School	4952	Sewerage Systems	Minor	Mile 0.1 of a ditch to North Fork Saw Creek @ RM 1.2	0604000401
TN0020087	Hohenwald High School	4952	Sewerage Systems	Minor	Rockhouse Creek @ RM 9.5	0604000401
TN0021695	Waynesboro STP	4952	Sewerage Systems	Minor	Green River @ RM 11.9	0604000402
TN0020818	Lobelville STP	4952	Sewerage Systems	Minor	Buffalo River @ RM 26.0	0604000402
TN0075922	Pilot Travel Center #053	5541	Gasoline Service Station	Minor	UT to Black Branch	0604000402
TN0064394	Linden Lagoon	4952	Sewerage Systems	Minor	Buffalo River @ RM 40.0	0604000402
TN0067865	Humphreys County-Buffalo Community STP	4952	Sewerage Systems	Minor	Buffalo River @ RM11.0	0604000402

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

FACILITY NUMBER	FACILITY NAME	WATERBODY	HUC-10
TN0065099	Town of Linden WTP	Buffalo River @ RM 42.9	0604000402

Table A4-6. Water Treatment Plants in the Buffalo River Watershed. *RM; River Mile.*

FACILITY NUMBER	FACILITY NAME	WATERBODY	HUC-10
TNG110004	V & W Ready Mix Concrete	WWC to Rockhouse Creek	0604000401
TNG110247	River City Concrete, Inc.	Mink Creek	0604000402

Table A4-7. Ready Mix Concrete Plants in the Buffalo River Watershed. *WWC, Wet Weather Conveyance.*

LOG NUMBER	COUNTY	DESCRIPTION	WATERBODY	HUC-10
NRS01.173	Lawrence	Pipeline Crossing	Brewers Branch	0604000401
NRS01.184	Lawrence		Beuerline Creek	0604000401
NRS01.223	Lawrence	Crossing Bluewater Creek Plus Two Tribs	Bluewater Creek and 2 UTs to Bluewater Creek	0604000401
NRS02.403	Lawrence	200' Rip-Rap	Buffalo River	0604000401
NRS00.316	Lawrence	Water Withdrawal	Buffalo River	0604000401
NRS01.052	Lawrence	Railroad Bridge Replacement	Buffalo River	0604000401
NRS01.413E	Lewis	Bank Stabilization	Rockhouse Branch	0604000401
NRS00.354	Lewis	Concreete Mats Over Exposed Gas Pipes	Rockhouse Branch	0604000401
NRS02.265	Lewis	Bank Stabilization	Rockhouse Branch	0604000401
NRS01.413F	Lewis	Bank Stabilization	Rockhouse Branch	0604000401
NRS03.354	Perry	SR-20 Bridge and Approach	Buffalo River and Short Creek	0604000402
NRS02.029	Wayne	Rip-Rap	Chalk Creek	0604000402
NRS04.012	Wayne	Emergency Watershed Protection	Barfnett Branch	0604000402
NRS04.012B	Wayne	Emergency Watershed Protection	Green River	0604000402
NRS02.030	Wayne	Rip-Rap	Moccasin Creek	0604000402
NRS01.413C	Lewis	Bank Stabilization	Goodman Branch	0604000402
NRS02.023	Perry	Bridge Repair	King Branch	0604000402
NRS02.078	Perry	Water Line Crossing	Cane Creek	0604000403
NRS02.188	Lewis	Bridge Repair	UT to Ashton Branch	0604000403
NRS01.413D	Lewis	Bank Stabilization	Norman Hollow Branch	0604000403
NRS01.413B	Lewis	Bank Stabilization	Goodman Branch	0604000403
NRS01.413G	Lewis	Bank Stabilization	South Fork Cane Creek	0604000403

Table A4-8. Individual ARAP Permits Issued January 2000 Through June 2004 in Buffalo River Watershed. *UT, Unnamed Tributary.*

FACILITY NUMBER	FACILITY NAME	SECTOR	RECEIVING STREAM	AREA*	HUC-10
TNR056258	Rail's Auto Salvage	M	North Fork Buffalo River	15	0604000401
TNR056450	Auto Mart Salvage	M	UT to Oehmen Branch to West Fork Buffalo River	23.89	0604000401
TNR054508	SW Apparel Corp.	V	Unknown	0.4	0604000401
TNR054161	The Sawmill, Inc.	A	Rockhouse Creek	32	0604000401
TNR053860	Reliable Products, Inc.	Y	Furguson Branch and Buffalo River	10	0604000402
TNR055938	Graham Lumber Co.	A	Lick Creek to Cypress Creek	6	0604000402
TNR055044	T-N-T Hardwoods	A	Cane Creek	3	0604000403

Table A4-9. Active Permitted TMSP Facilities in the Buffalo River Watershed. *Area, acres of property associated with industrial activity; UT, Unnamed Tributary. Sector details may be found in Table A4-10.*

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

Table A4-10. TMSP Sectors and Descriptions.

APPENDIX V

CONSERVATION PRACTICE	AMOUNT	
	FEET	ACRES
Alley Cropping		
Contour Buffer Strips		
Crosswind Trap Strips		
Field Borders		
Filter Strips		
Grassed Waterways		
Hedgerow Plantings		
Herbaceous Wind Barriers		
Riparian Forest Buffers		25
Streambank and Shoreline Protection	1,650	
Windbreaks and Shelterbelts		
Total Conservation Buffers	**1,650**	**25**

Table A5-1a. Conservation Buffers Conservation Practices in Partnership with NRCS in the Buffalo River Watershed. *Data are from Performance & Results Measurement System (PRMS) for October 1, 2003 through September 30, 2004 reporting period.*

NUTRIENT MANAGEMENT PLANS APPLIED	ACRES
Feed Management	0
Irrigation Management	0
Water Management	0
Nutrient Management	1,143
Waste Utilization	0

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

CONSERVATION PRACTICE	NUMBER
Grade Stabilization Structure	1

Table A5-1c. Water Detention/Retention Conservation Practices in Partnership with NRCS in the Buffalo River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period.*

PARAMETER	ACRES
Acres of Pest Management Systems Applied	1,443

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

CONSERVATION PRACTICE	AMOUNT	
	Feet	**Acres**
Fence	26,922	
Firebreak		
Forest Harvest Management		532
Heavy Use Area Protection		
Pasture and Hay Planting		264
Prescribed Grazing		453
Range Planting		
Use Exclusion		
Pipeline		
Prescribed Burning		
Total	**26,922**	**1,249**

Table A5-1e. Grazing/Forages Conservation Practices in Partnership with NRCS in the Buffalo River Watershed. *Data are from PRMS for October 1, 2003 through September 30, 2004 reporting period.*

COMMUNITY	PROJECT DESCRIPTION	AWARD DATE	AWARD AMOUNT
Hohenwald	Wastewater Collection Extension	01/22/1997	$265,000
Waynesboro	Wastewater Collection System Upgrade	01/22/1997	$70,000

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

PRACTICE	NRCS CODE	NUMBER OF BMPs
Conservation Cover	327	7
Critical Area Planting	342	3
Fence	382	6
Grade Stabilization Structure	410	1
Grassed Waterway	412	3
Heavy Use Area	561	4
Nutrient Management	590	1
Pasture/Hay Planting	512	56
Pipeline	516	4
Pond	378	22
Riparian Forest Buffer	391	1
Streambank Protection	580	4
Underground Outlet	620	1
Waste Management System	312	1
Waste Utilization	633	2
Watering Facility	614	4
Well Decommissioning	351	1

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