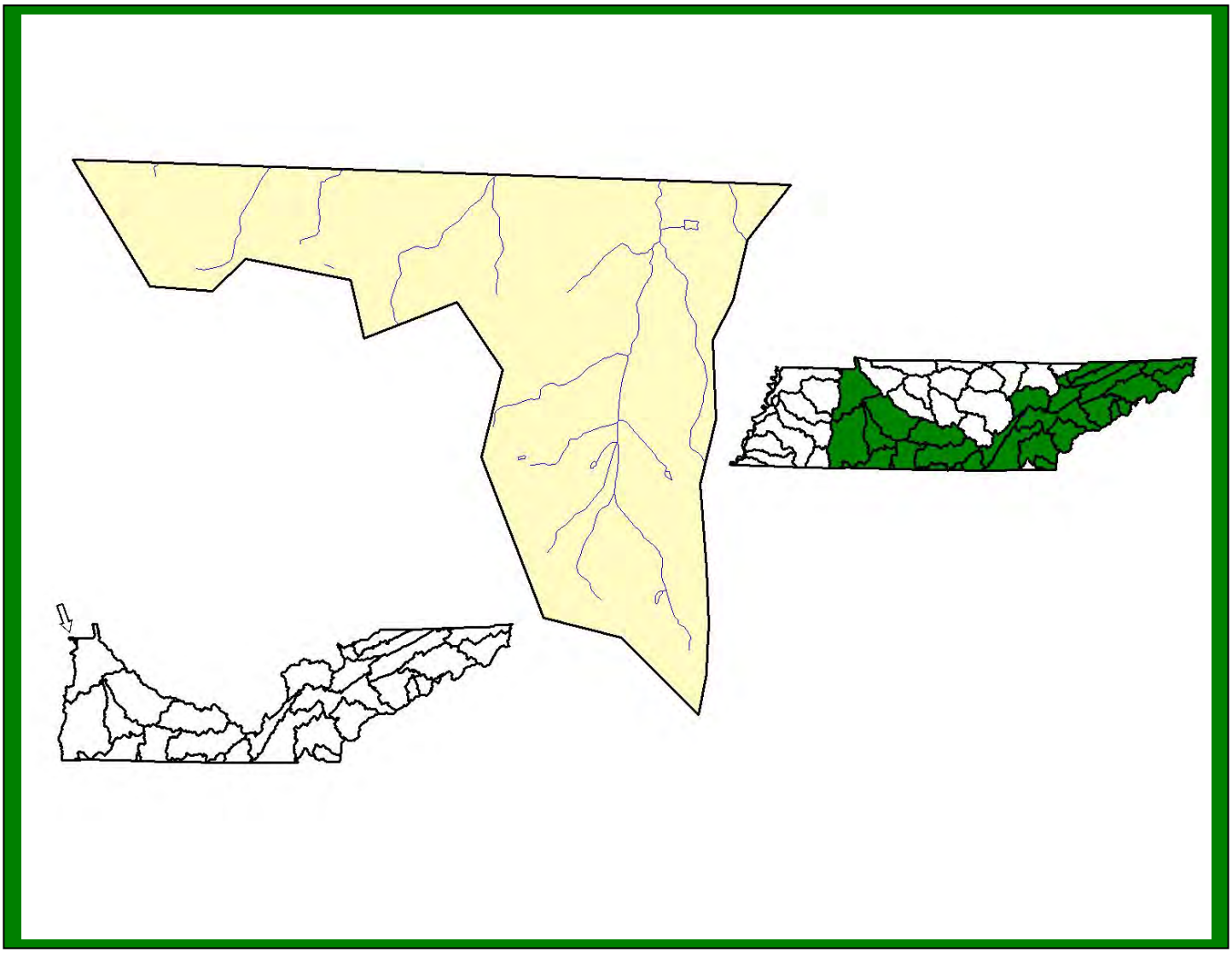
EAST FORK CLARK'S RIVER WATERSHED (06040006) OF THE TENNESSEE RIVER BASIN

WATERSHED WATER QUALITY MANAGEMENT PLAN



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

EAST FORK CLARK'S RIVER WATERSHED
WATER QUALITY MANAGEMENT PLAN

TABLE OF CONTENTS

GLOSSARY

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

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

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

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

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

AFO. Animal Feeding Operation.

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

ARAP. Aquatic Resource Alteration Permit.

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

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

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

Benthic. Bottom dwelling.

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

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

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

CAFO. Concentrated Animal Feeding Operation.

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

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

DO. Dissolved oxygen.

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

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

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

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

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

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

MRLC. Multi-Resolution Land Classification.

MS4. Municipal Separate Storm Sewer System.

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

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

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

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

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

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

SBR. Sequential Batch Reactor.

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

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

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

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

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

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

TMSP. Tennessee Multi-Sector Permit.

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

WAS. Waste Activated Sludge.

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

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

WET. Whole Effluent Toxicity.

WWTP. Waste Water Treatment Plant

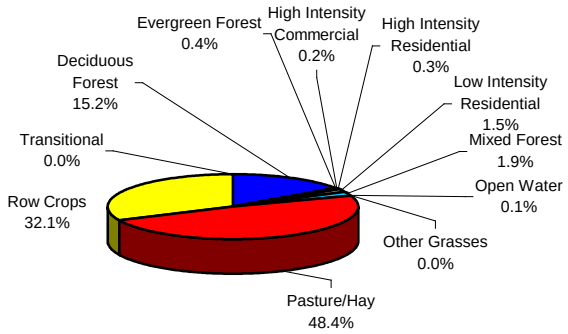
Summary – East Fork Clark's River

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.

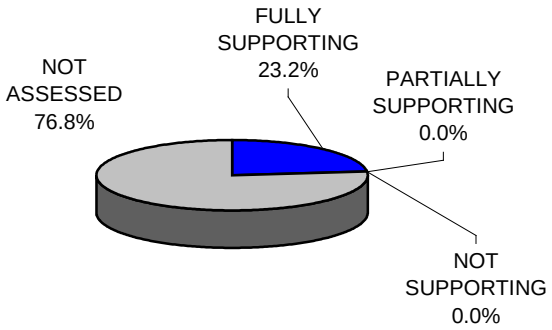
Chapter 1 of the East Fork Clark's River Watershed Water Quality Management Plan discusses the Watershed Approach and emphasizes that the Watershed Approach is not a regulatory program or an EPA mandate; rather it is a decision-making process that reflects a common strategy for information collection 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, to include information on location, population, hydrology, land use and natural and cultural resources. The Tennessee portion of the East Fork Clark's River Watershed is approximately 23 square miles and is found entirely in one West Tennessee county. A part of the Tennessee River drainage basin, the watershed has 25 stream miles in the Tennessee portion.



Land Use Distribution in the Tennessee Portion of the East Fork Clark's River Watershed.

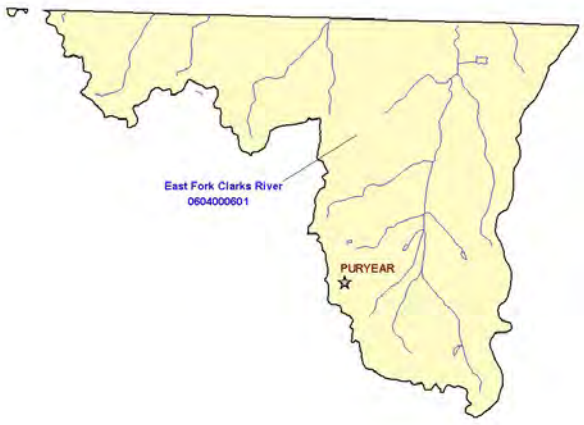
A review of water quality sampling and assessment is presented in Chapter 3. Monitoring results support the conclusion that 23.2% of total stream miles fully support designated uses.



Water Quality Assessment of Streams and Rivers in the Tennessee Portion of East Fork Clark's River Watershed. Assessment data are based on the 2002 Water Quality Assessment of 25.4 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. No streams in the Tennessee portion of the East Fork Clark's River Watershed have been assessed as impaired in the 2000 water quality assessment.

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 Tennessee Portion of the East Fork Clark's River Watershed is Composed of one USGS-Delineated Subwatershed (10-Digit Subwatersheds).

Point source contributions to the Tennessee portion of the Tennessee Western Valley (Beech River) Watershed consist of one Tennessee Multi-Sector Permit (TMSP). Agricultural operations include cattle, chicken, hog, and sheep farming. A map illustrating the location of the TMSP site is presented in the chapter.

Chapter 5 is entitled *Water Quality Partnerships in the Tennessee Western Valley (Beech 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, Tennessee Valley Authority, U.S. Fish and Wildlife Service and U.S. Geological Survey), and state agencies (TDEC Division of Community Assistance, TDEC Division of Water Supply, Tennessee Department of Agriculture and Kentucky Division of Water) are summarized.

Point and Nonpoint source approaches to water quality problems in the Tennessee portion of the East Fork Clark's 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 East Fork Clark's River Watershed Water Quality Management Plan can be found at: http://www.state.tn.us/environment/wpc/watershed/wsmplans/

CHAPTER 1

WATERSHED APPROACH TO WATER QUALITY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

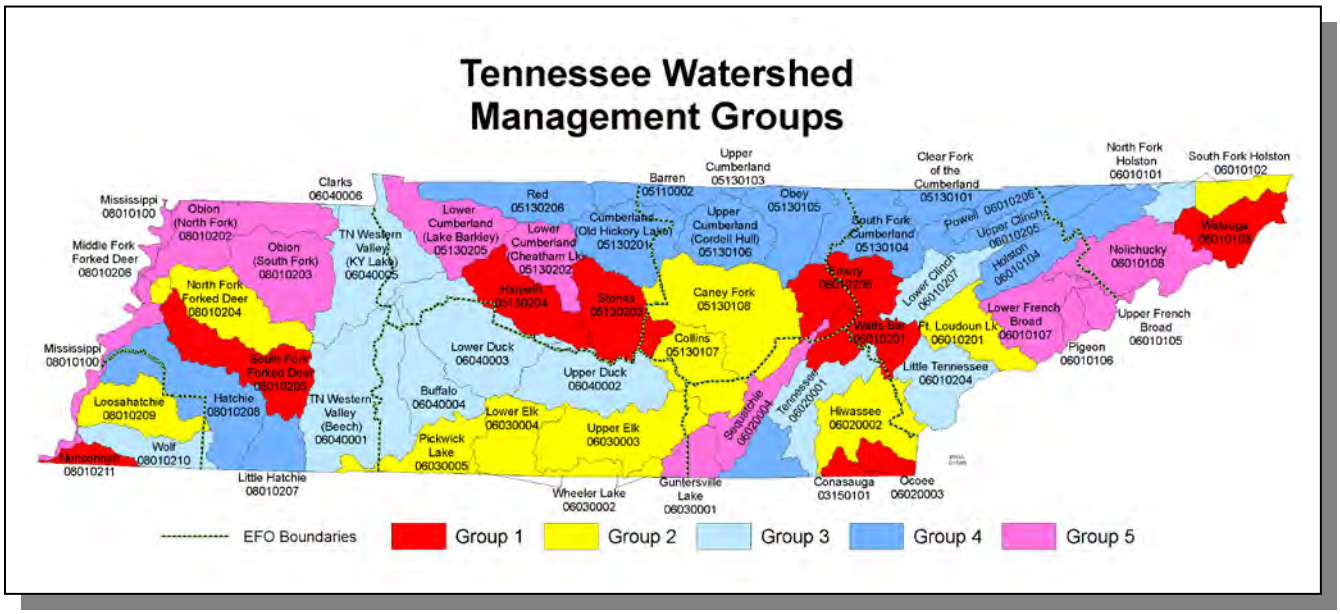


Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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

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

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

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

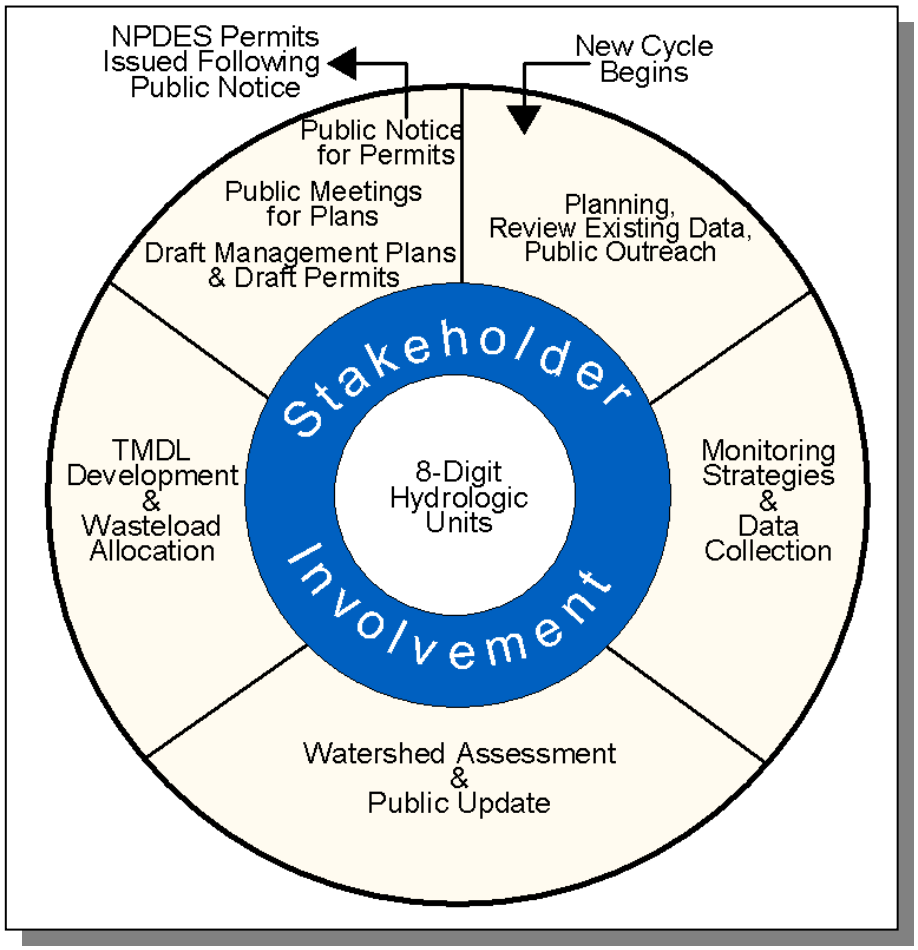


Figure 1-2. The Watershed Approach Cycle.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

CHAPTER 2

DESCRIPTION OF THE EAST FORK CLARK'S RIVER WATERSHED

2.1. BACKGROUND. The East Fork Clark's River and Watershed was named in honor of George Rogers Clark. Mr. Clark, a surveyor from Virginia, was instrumental in creating Kentucky County, VA. Capturing control of all territories north of the Ohio River, east of the Mississippi River, and west of the Appalachian Mountains from the British in the War of Independence, Clark later established a home on 37,000 acres awarded him by the Virginia legislature.

This Chapter describes the location and characteristics of the Tennessee portion of the East Fork Clark's River Watershed.

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The East Fork Clark's River Watershed is located in West Tennessee and Kentucky. The Tennessee portion (3.2% of the watershed) includes a part of Henry County.

Figure 2-1. General Location of the East Fork Clark's River Watershed*. Dark green, Tennessee portion (23 square miles); light green, Kentucky portion (681 square miles). The Tennessee portion of the watershed is entirely in Henry County.*

2.2.B. Population Density Centers. One state highway serves the communities in the Tennessee portion of East Fork Clark's River Watershed.

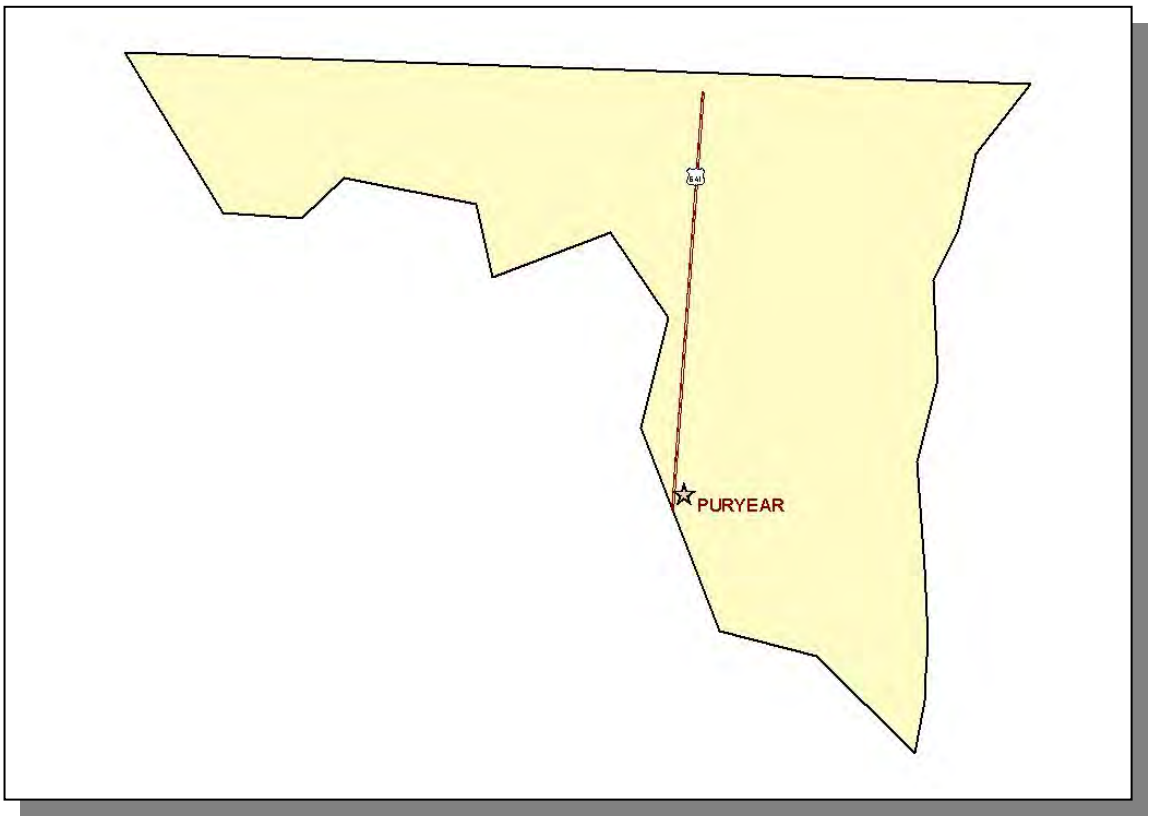


Figure 2-2. Municipalities and Roads in the Tennessee Portion of the East Fork Clark's River Watershed.

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The East Fork Clark's River Watershed, designated 06040006 by the USGS, drains approximately 704 square miles, 23 square miles of which are in Tennessee, and empties to the Tennessee River in Kentucky.

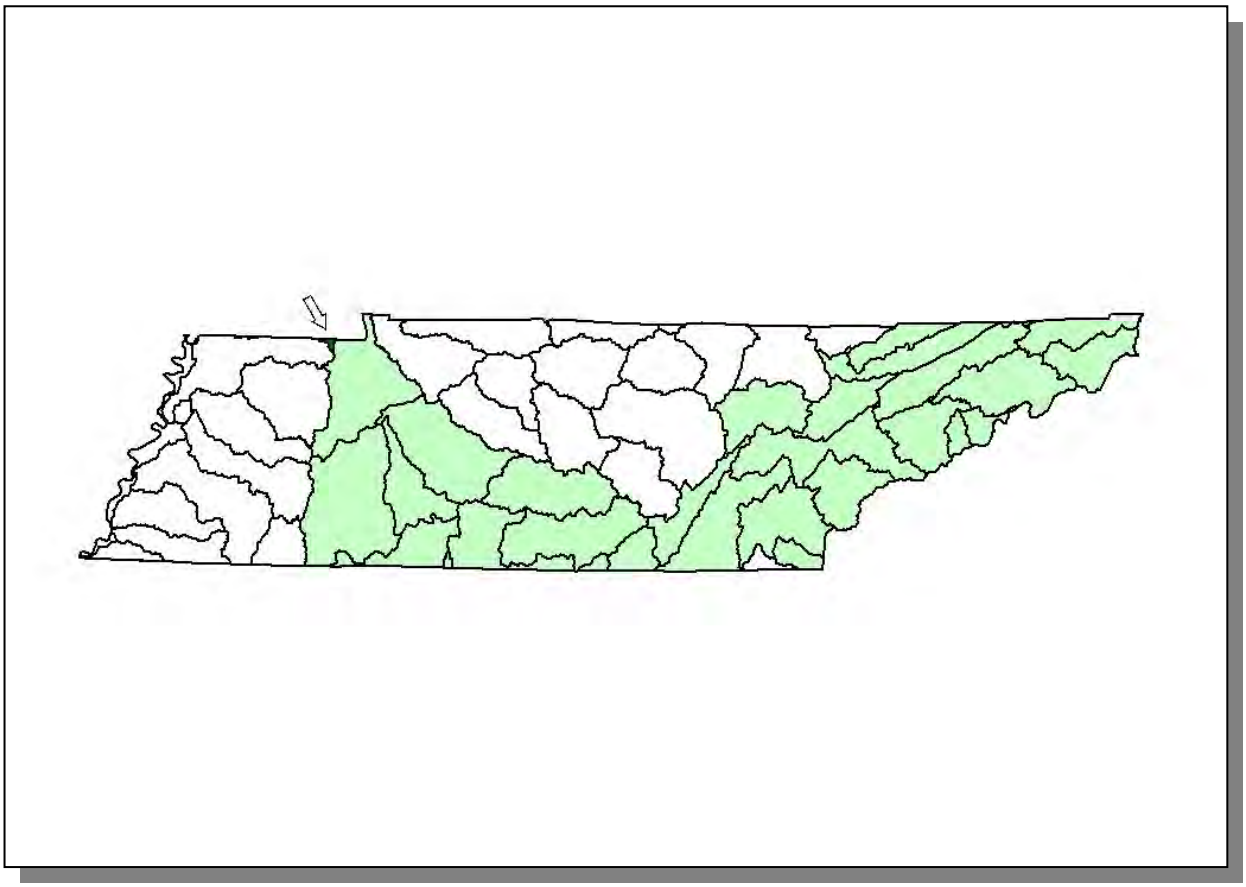


Figure 2-3. The East Fork Clark's River Watershed is Part of the Tennessee River Basin.

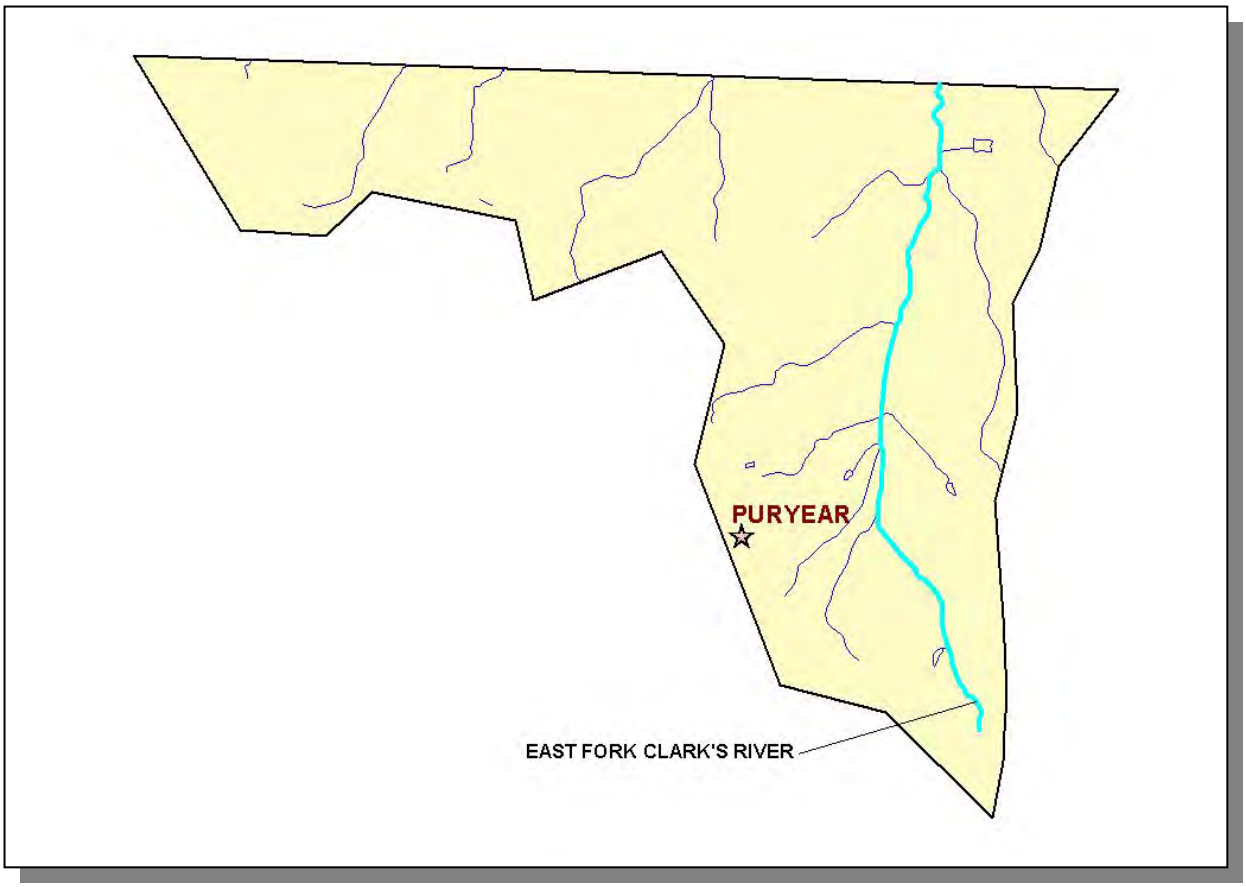


Figure 2-4. Hydrology in the Tennessee Portion of the East Fork Clark's River Watershed. *There are 25 stream miles in the Tennessee portion of the East Fork Clark's River Watershed as catalogued in the assessment database. An additional 1,146 stream miles are located in the Kentucky portion of the watershed as catalogued in the River Reach File 3 database. Location of Esat Fork Clark's River and the city of Puryear are shown for reference.*

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.

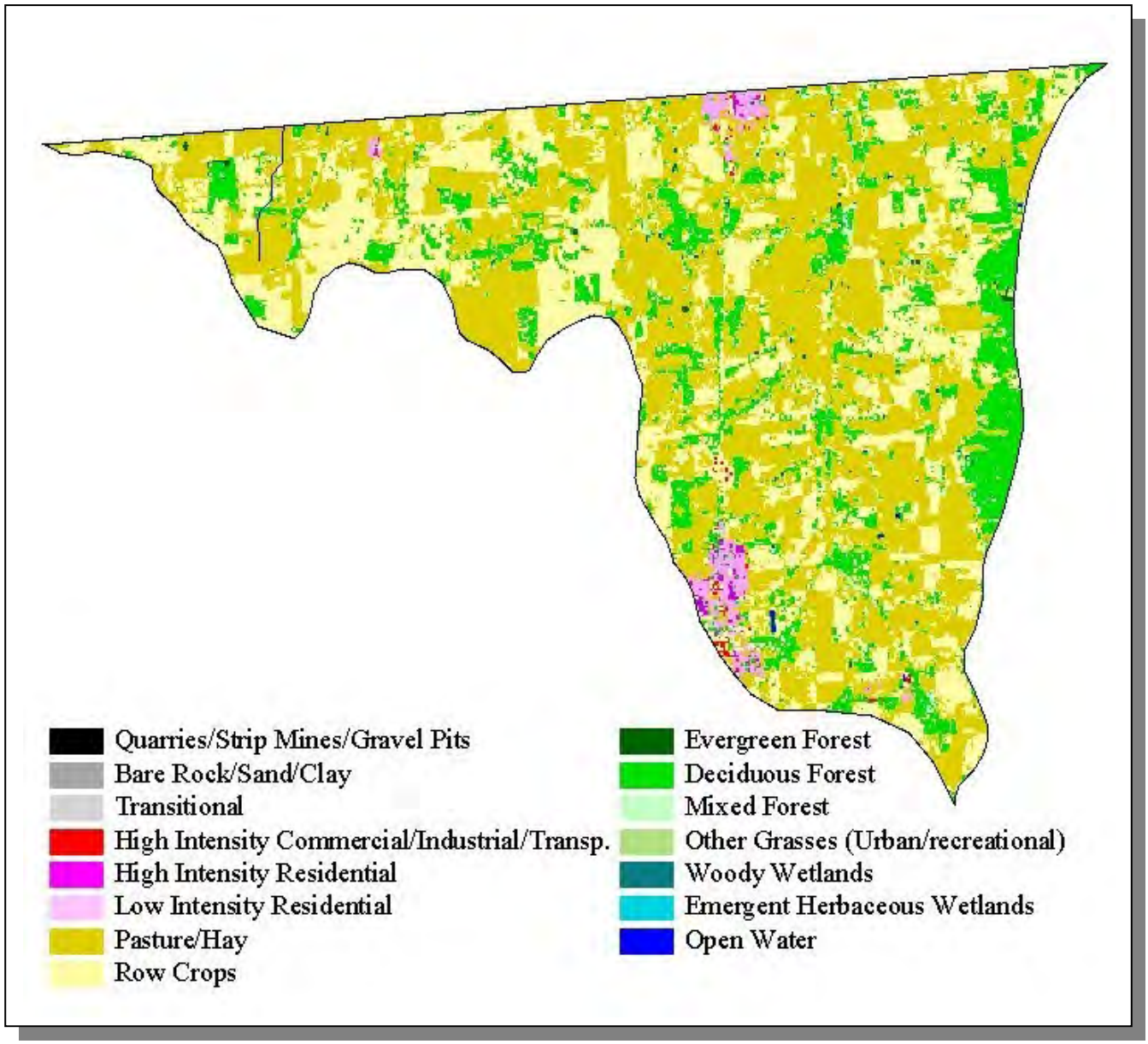


Figure 2-5. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery in the Tennessee Portion of the East Fork Clark's River Watershed.

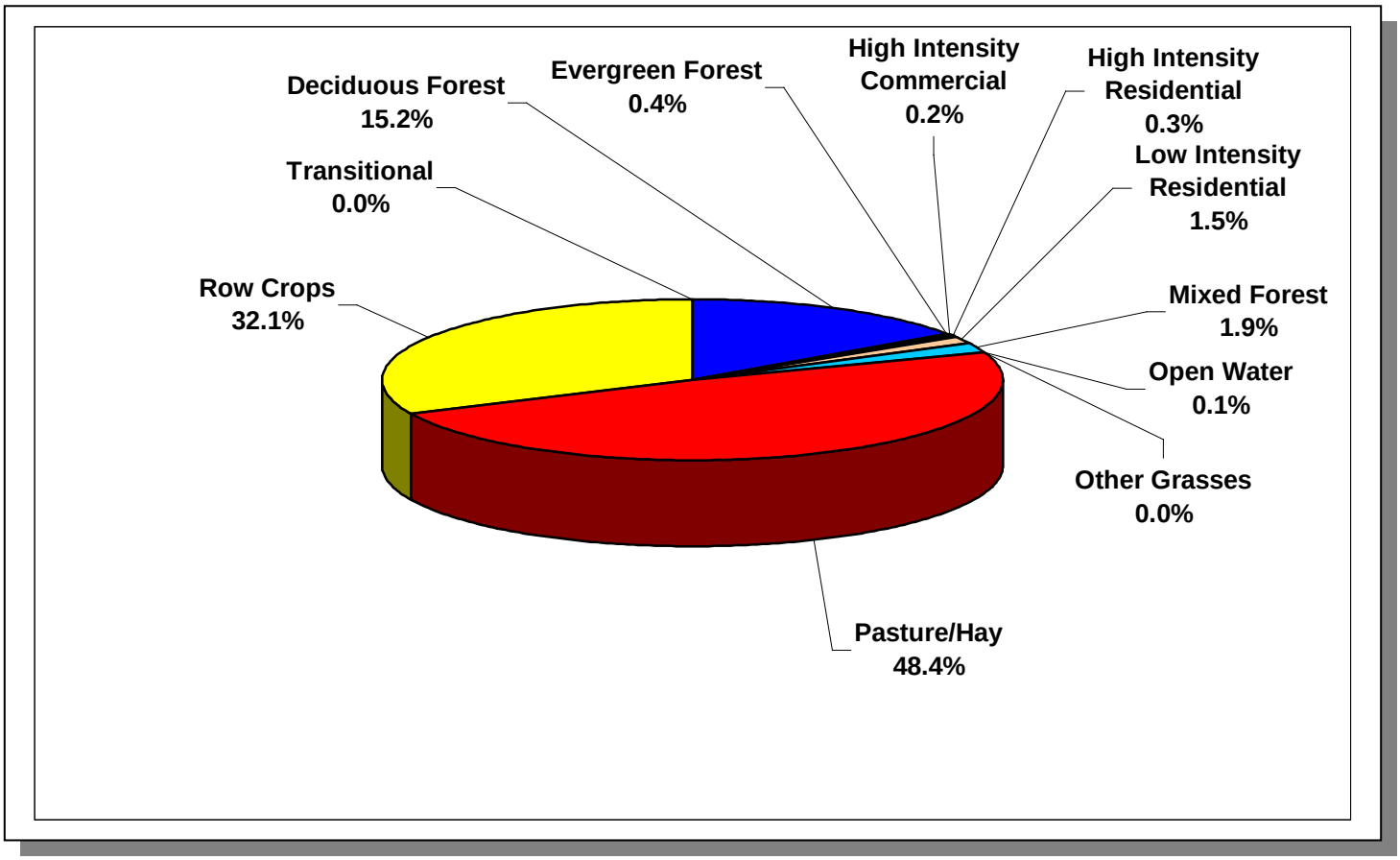


Figure 2-6. Land Use Distribution in the Tennessee Portion of the East Fork Clark's River Watershed. *More information is provided in Appendix II.*

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.

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 Tennessee portion of East Fork Clark's River Watershed lies within 2 Level III ecoregions (Southeastern Plains and Mississippi Valley Loess Plain) and contains 2 Level IV subecoregions:

- **Southeastern Plains and Hills (65e)** contain north-south trending bands of sand and clay formations. Tertiary-age sand, clay, and lignite are to the west, with Cretaceous fine sand, fossiliferous micaceous sand, and silty clays to the east. Elevations reach over 650 feet with more rolling topography and relief than the Loess Plains (74b) to the west. Streams have increased gradient, sandy substrates, and distinct faunal characteristics. Natural vegetation is oak-hickory forest, grading into oak-hickory-pine to the south.

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

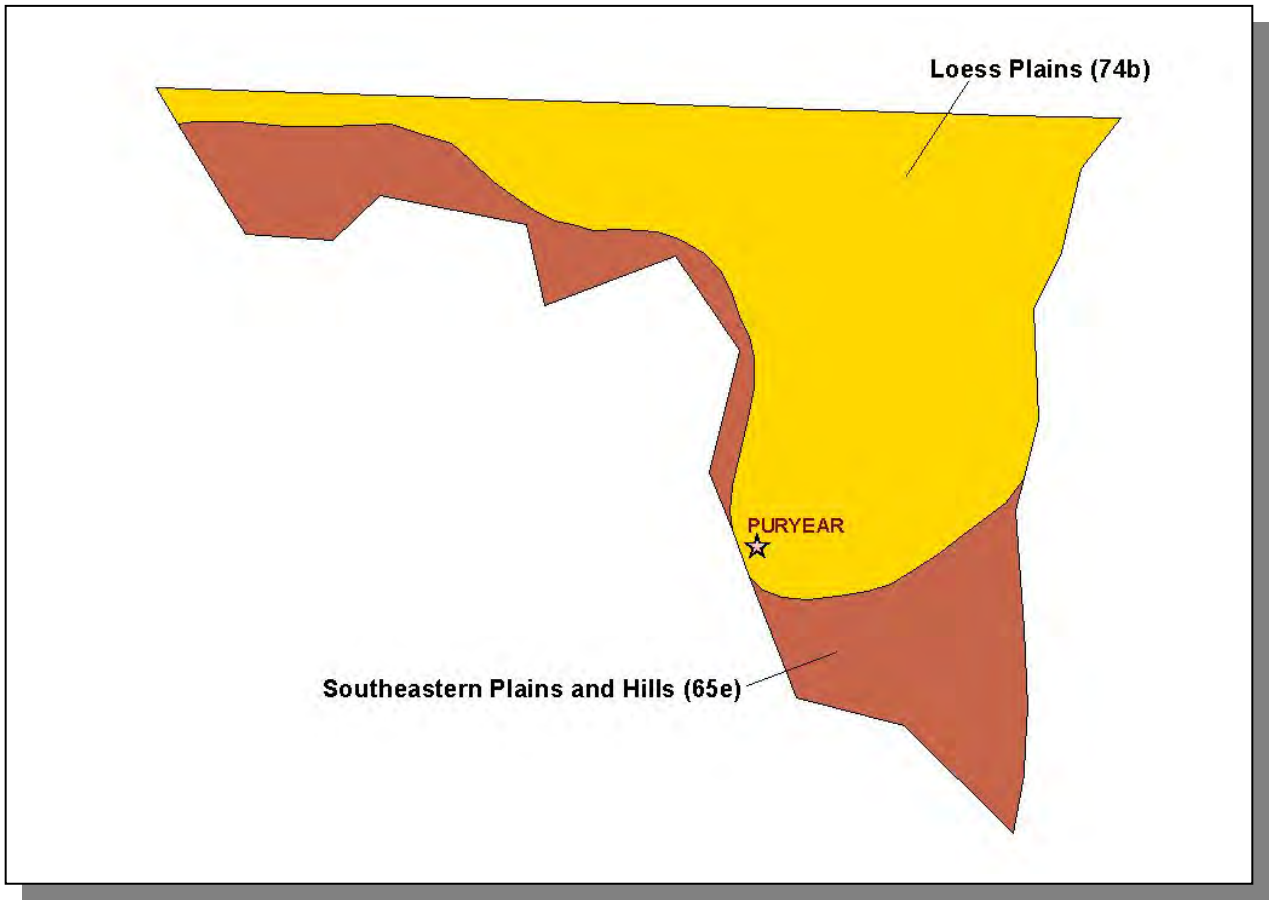


Figure 2-7. Level IV Ecoregions in the Tennessee Portion of the East Fork Clark's River Watershed. *Location of Puryear is shown for reference.*

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.

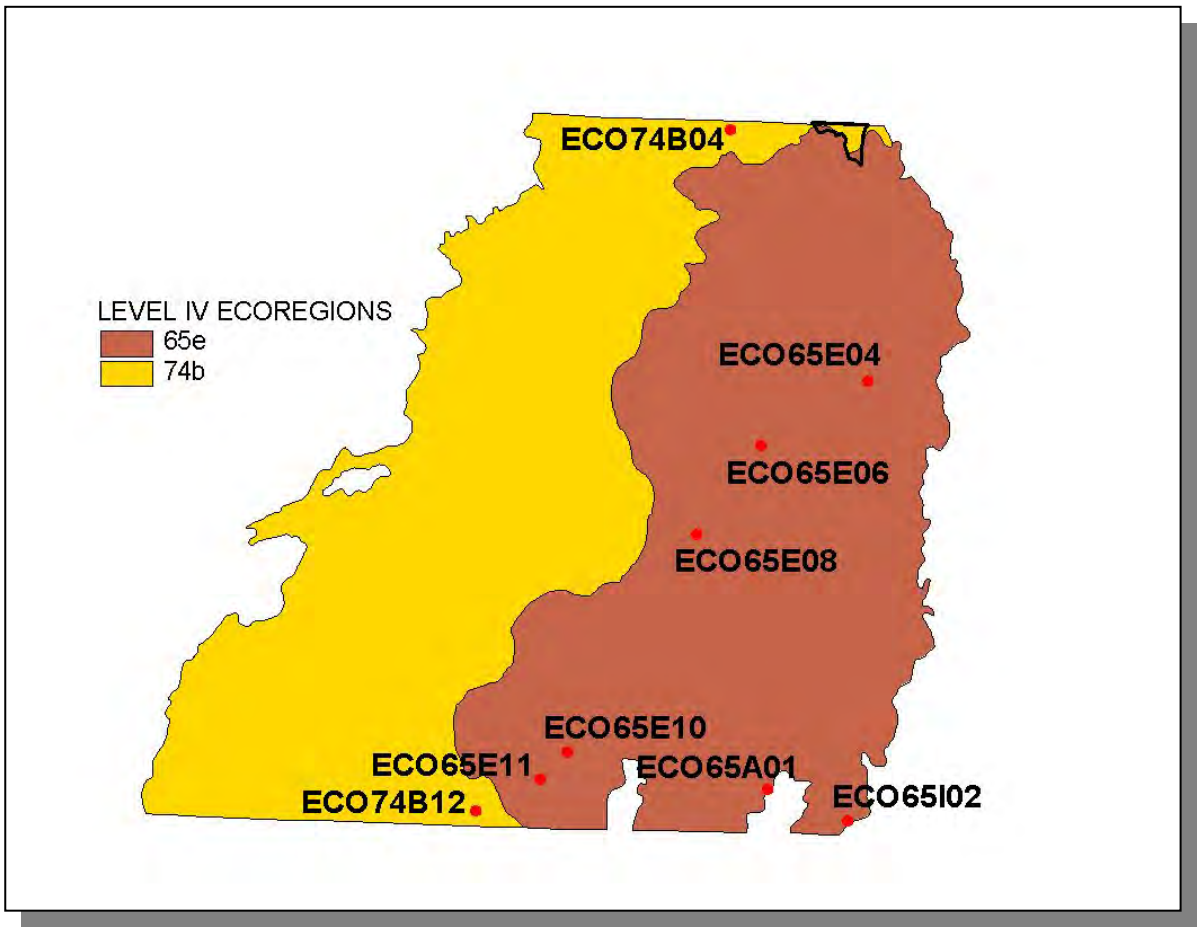


Figure 2-8. Ecoregion Monitoring Sites in Level IV Ecoregions 65e and 74b in Tennessee. *The East Fork Clark's River Watershed boundary is shown for reference. More information is provided in Appendix II.*

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
Plants	1

Table 2-1. There is 1 Known Rare Plant Species in the Tennessee Portion of the East Fork Clark's River Watershed. *More information may be found at http://www.state.tn.us/environment/nh/data.php.*

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

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

STREAM	NSQ	RB	RF
East Fork Clark's River	3		

Table 2-2. Stream Scoring from the Tennessee Rivers Assessment Project in the East Fork Clark's 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 EAST FORK CLARK'S RIVER WATERSHED

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

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

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

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

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

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

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

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

4. Highlight areas of improved water quality

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

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

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

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

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

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

This chapter provides a summary of water quality in the Tennessee portion of the East Fork Clark's River Watershed, summarizes data collection and assessment results, and describes impaired waters.

3.2. DATA COLLECTION.

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

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 Tennessee portion of the East Fork Clark's River Watershed lies within 2 Level III ecoregions (Southeastern Plains and Mississippi Valley Loess Plains) and contains 2 subecoregions (Level IV):

- Southeastern Plains and Hills (65e)
- Loess Plains (74b)

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

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

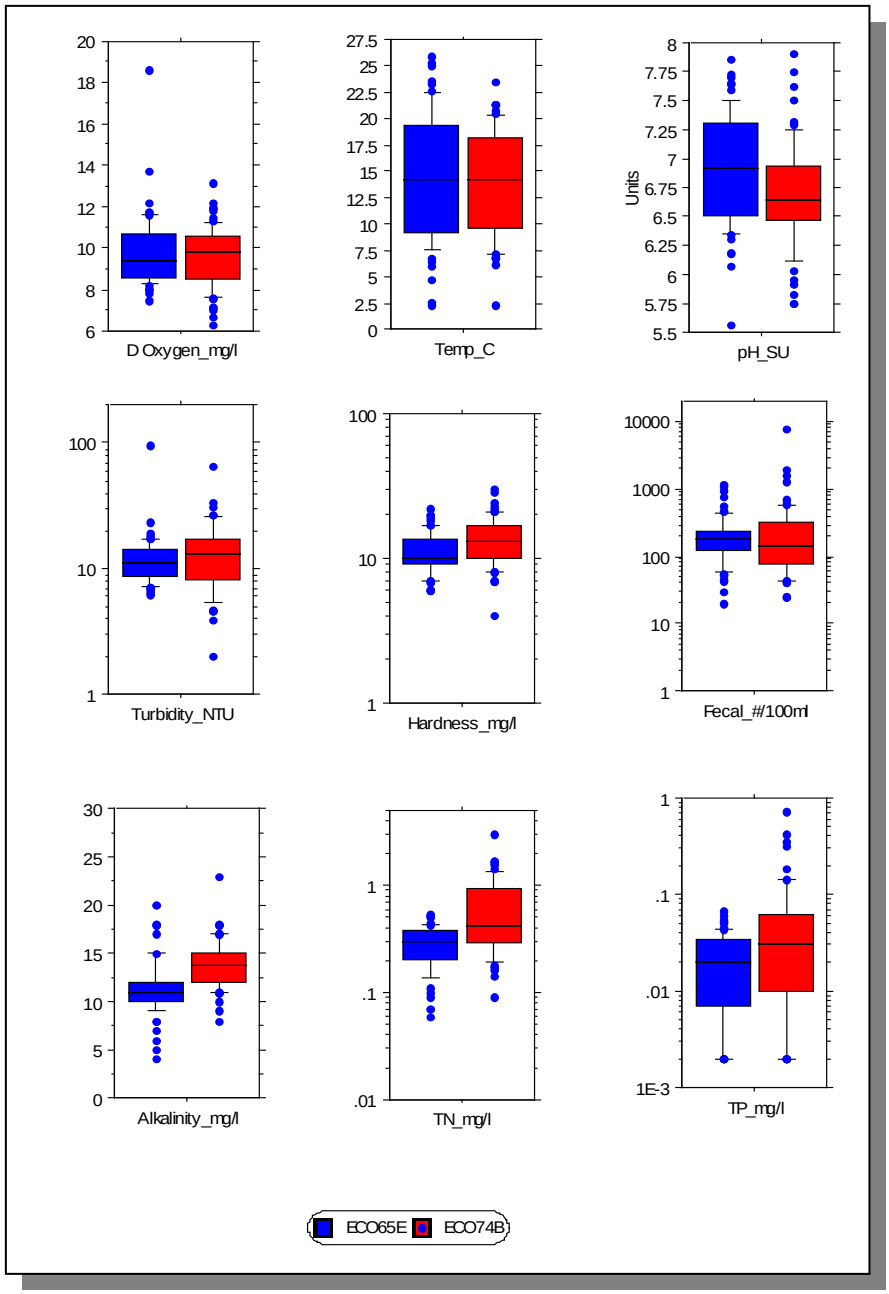


Figure 3-1. Select Chemical Data Collected in the Tennessee Portion of the East Fork Clark's River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. Fecal, fecal coliform bacteria; TN, Total Nitrogen; TP, Total Phosphorus.*

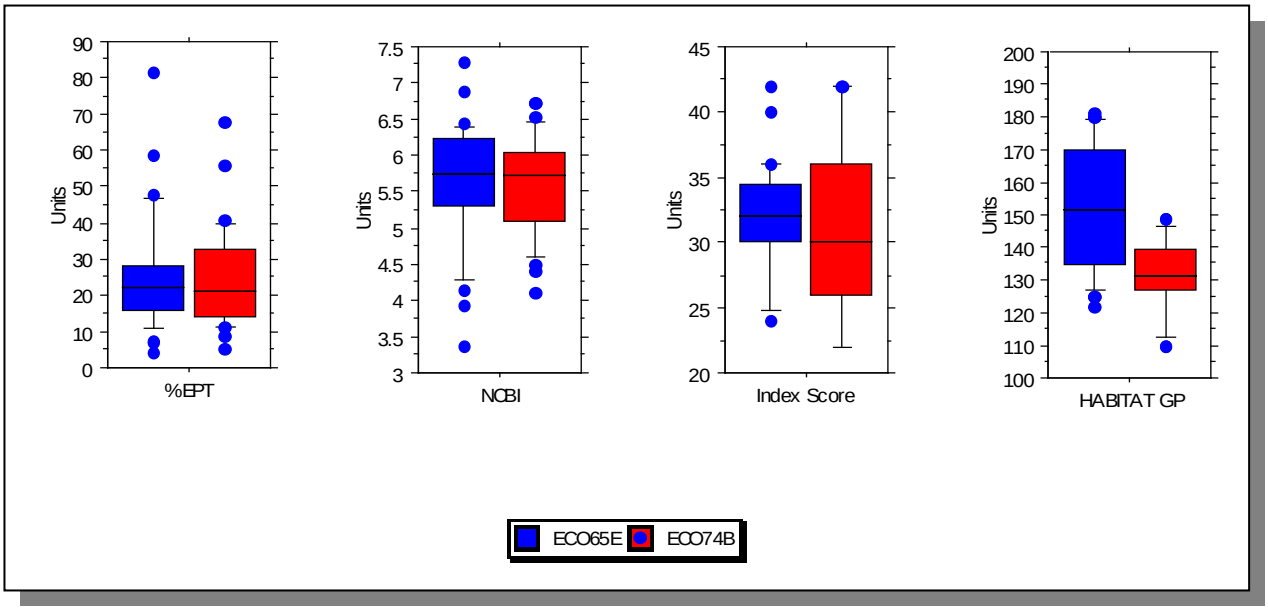


Figure 3-2. Benthic Macroinvertebrate and Habitat Scores for the Tennessee Portion of the East Fork Clark's River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. NCBI, North Carolina Biotic Index. Index Score 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.

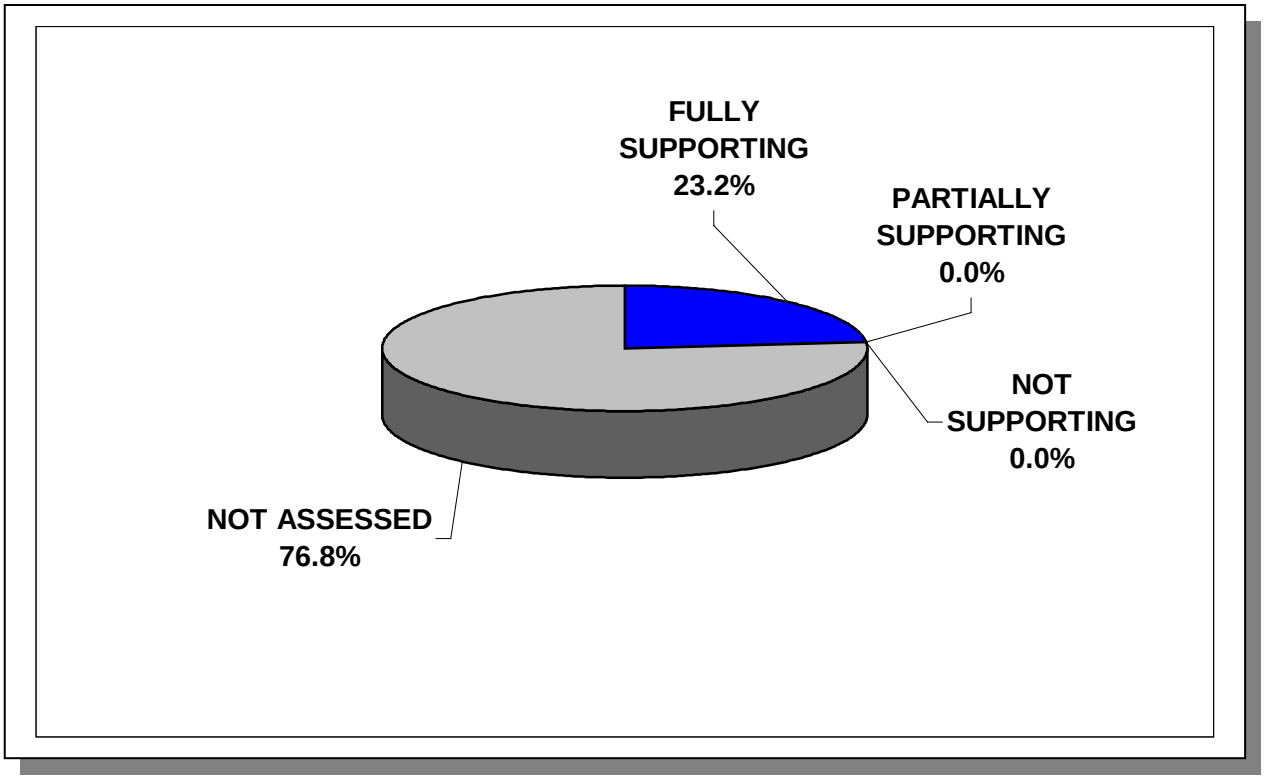


Figure 3-3. Water Quality Assessment of Streams and Rivers in the Tennessee Portion of East Fork Clark's River Watershed. *Assessment data are based on the 2002 Water Quality Assessment of 25.4 miles in the watershed. More information is provided in Appendix III.*

3.3.A. Assessment Summary.

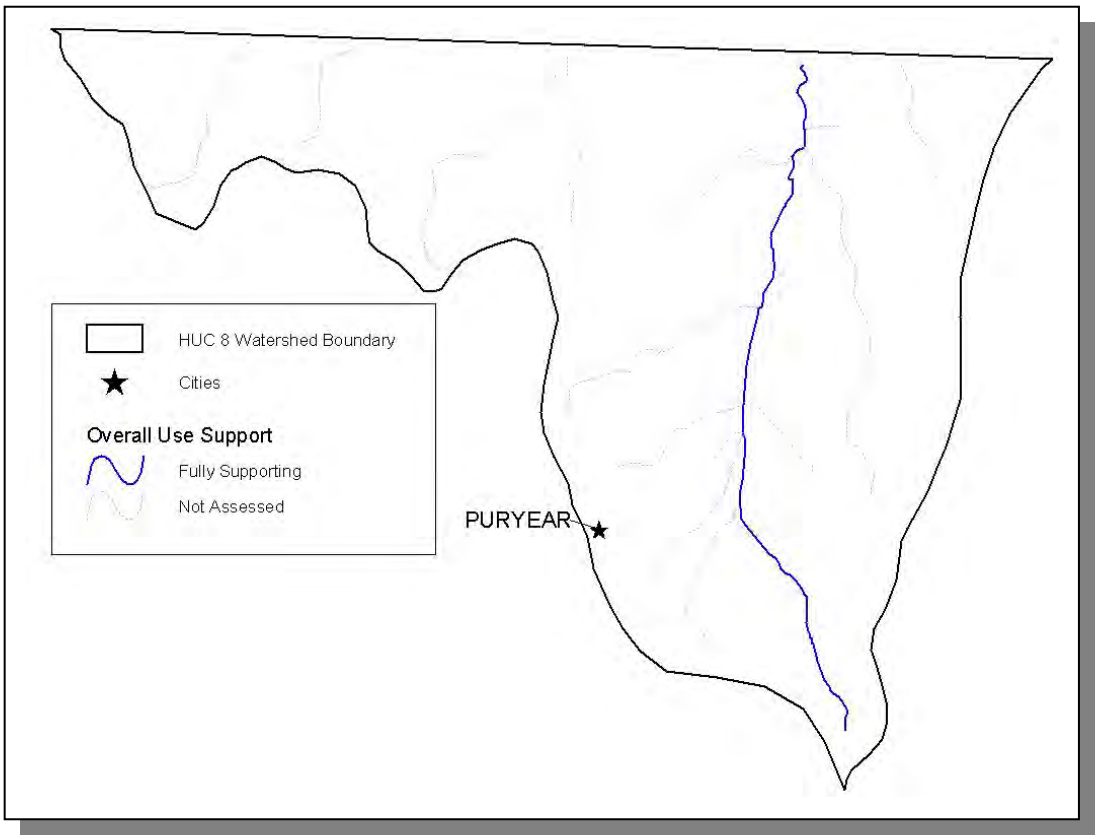


Figure 3-4a. Overall Use Support Attainment in the Tennessee Portion of the East Fork Clark's River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Location of Puryear is shown for reference. More information is provided in Appendix III.*

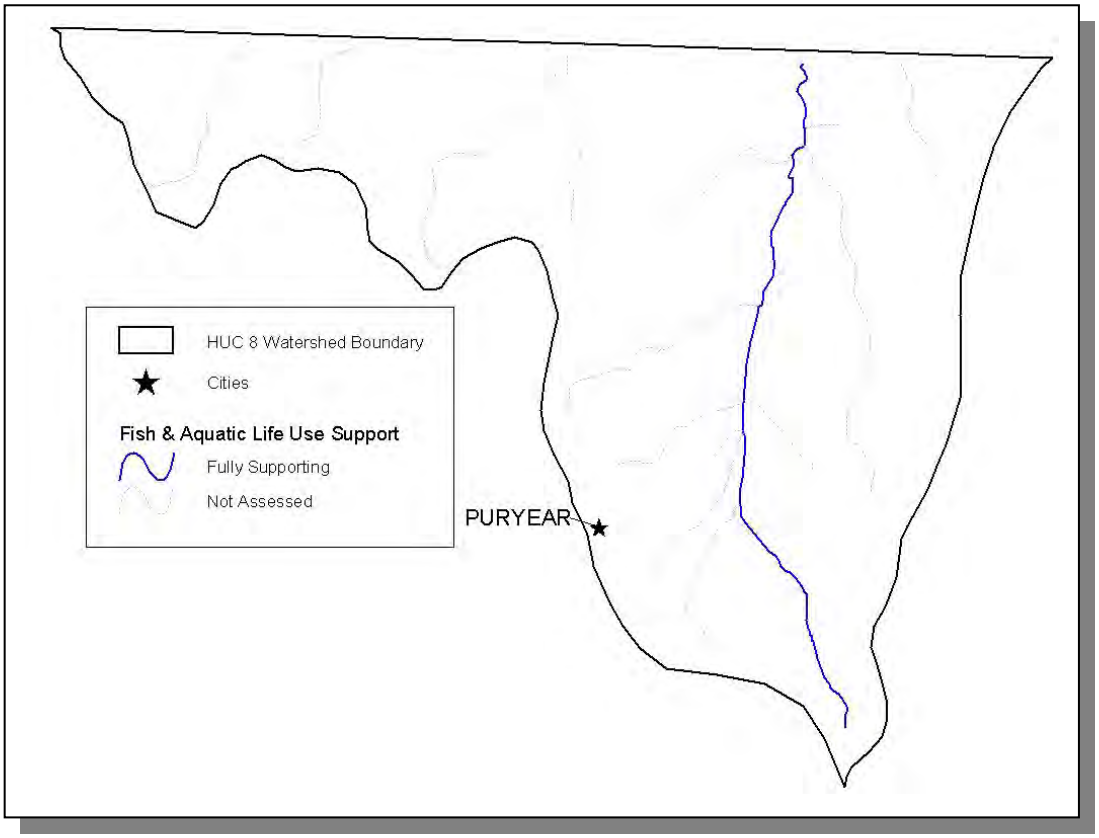


Figure 3-4b. Fish and Aquatic Life Use Support Attainment in the Tennessee Portion of the East Fork Clark's River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Location of Puryear is shown for reference. More information is provided in Appendix III.*

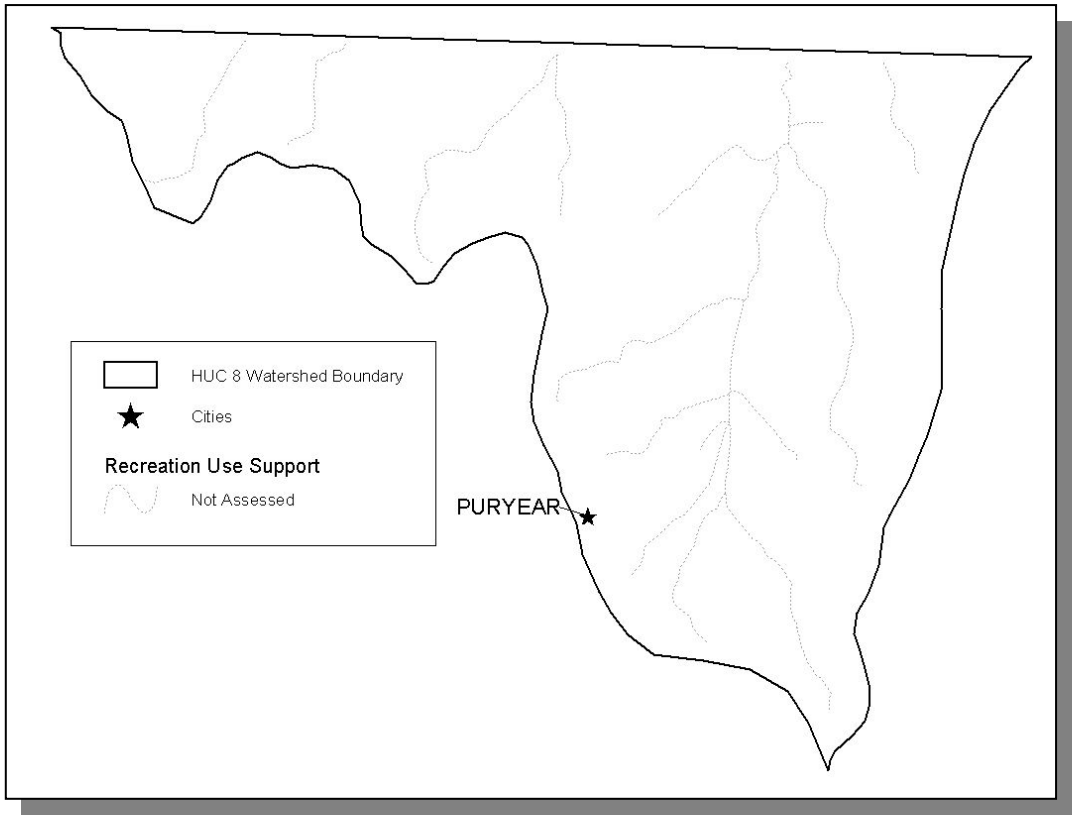


Figure 3-4c. Recreation Use Support Attainment in the Tennessee Portion of the East Fork Clark's River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Location of Puryear is shown for reference. More information is provided in Appendix III.*

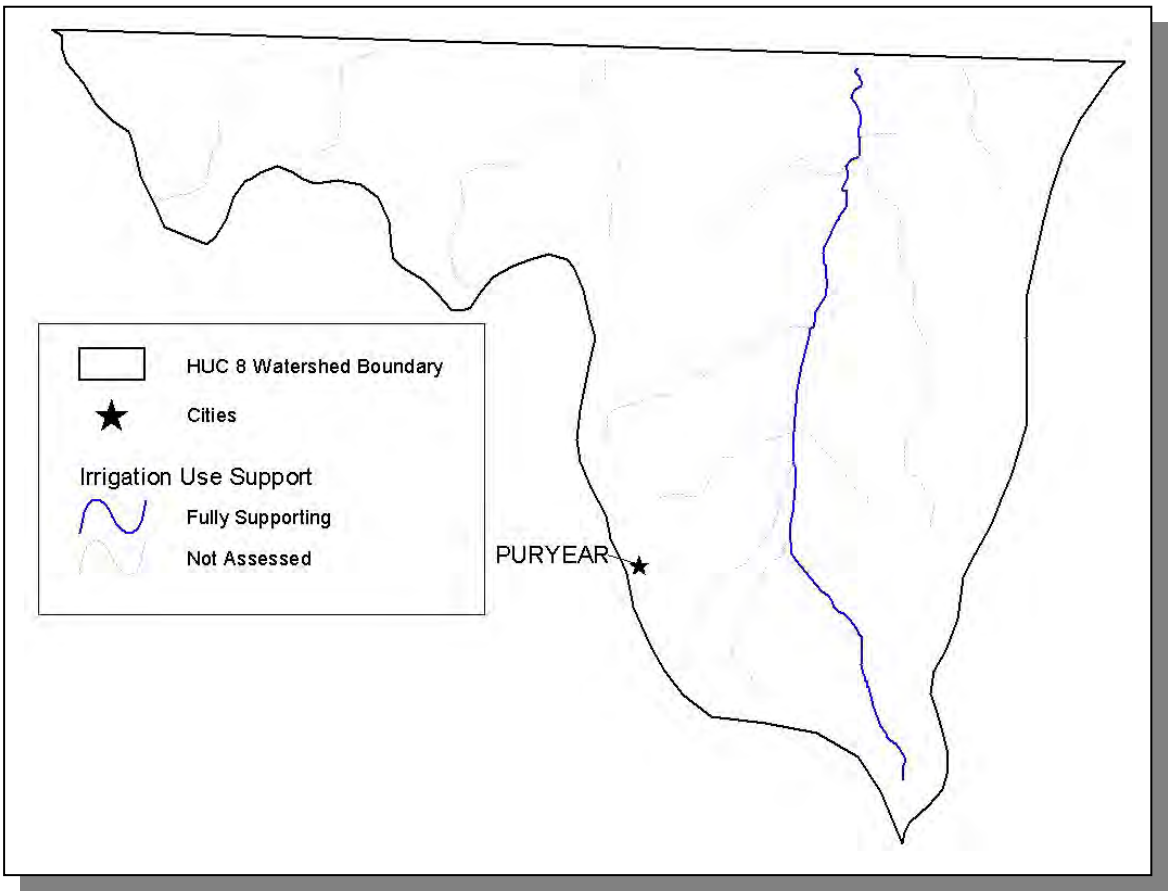


Figure 3-4d. Irrigation Use Support Attainment in the Tennessee Portion of the East Fork Clark's River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Location of Puryear is shown for reference. More information is provided in Appendix III.*

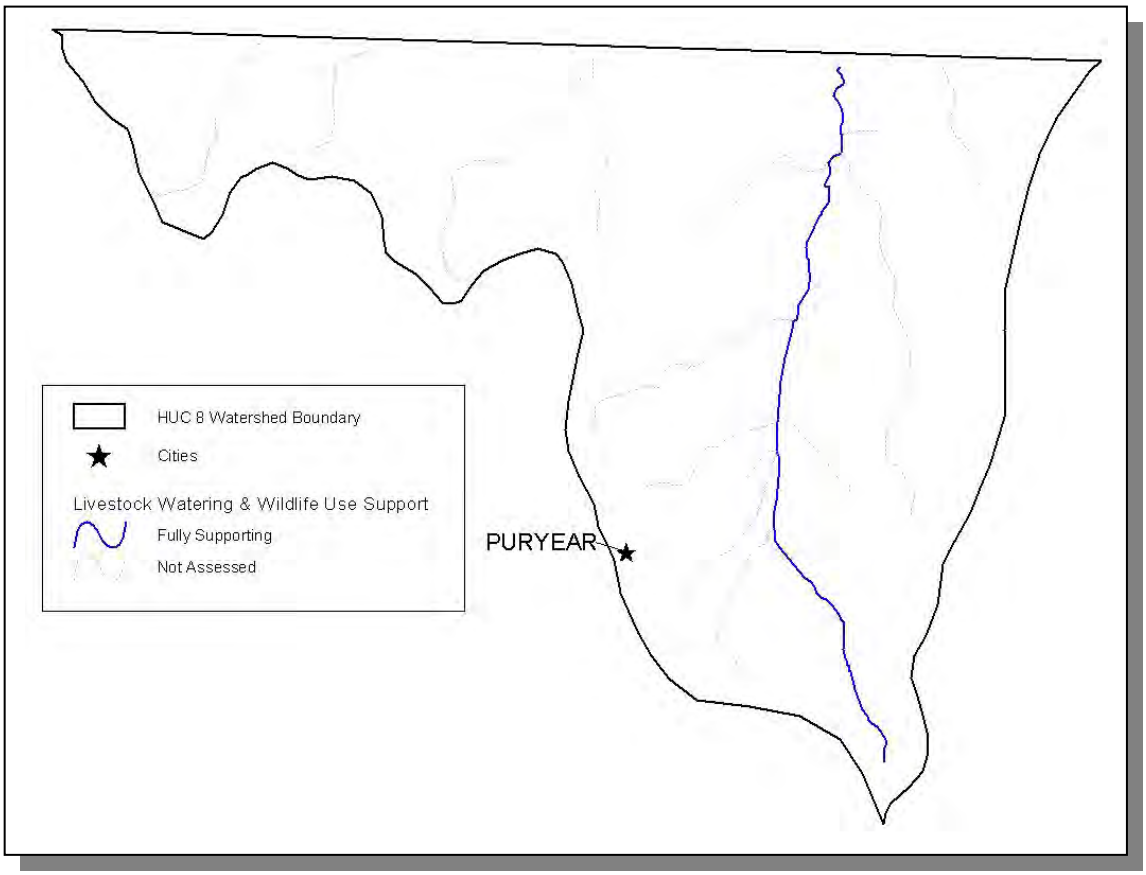


Figure 3-4e. Livestock Watering and Wildlife Use Support Attainment in the Tennessee Portion of the East Fork Clark's River Watershed. *Assessment data are based on the 2002 Water Quality Assessment. Water Quality Standards are described at http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm. Location of Puryear is shown for reference. More information is provided in Appendix III.*

3.3.B. Use Impairment Summary.

No streams in the Tennessee portion of the East Fork Clark's River Watershed have been assessed as impaired in the 2002 water quality assessment.

CHAPTER 4

POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE EAST FORK CLARK'S RIVER WATERSHED

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

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

There is one HUC 10-digit subwatershed in the Tennessee portion of the East Fork Clark's River Watershed (HUC 06040006).

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.

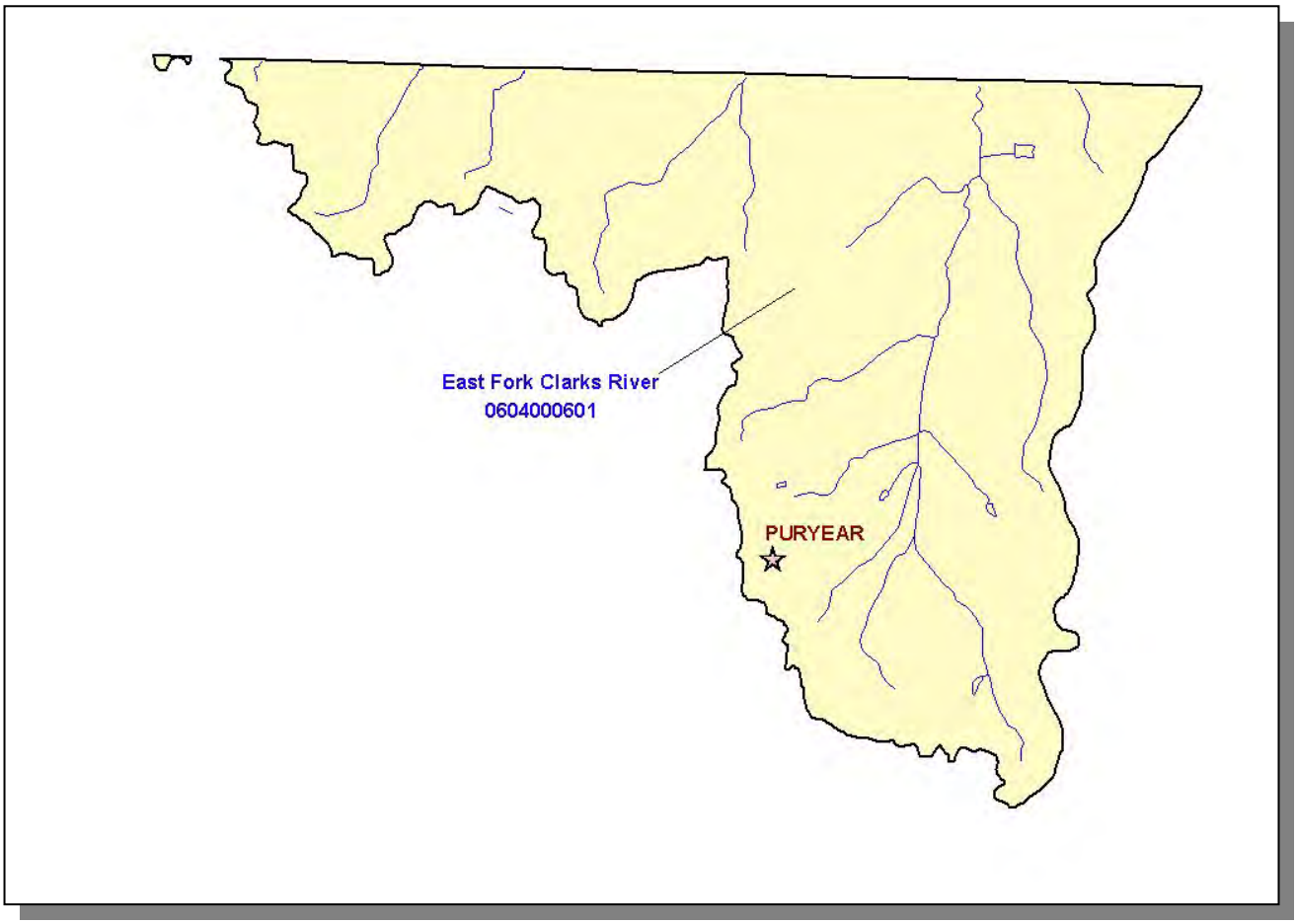


Figure 4-1. The Tennessee Portion of the East Fork Clark's River Watershed is Composed of one USGS-Delineated Subwatershed (10-Digit Subwatersheds). *Location of Puryear is shown for reference.*

4.2. CHARACTERIZATION OF HUC-10 SUBWATERSHEDS. The Watershed Characterization System (WCS) software and data sets provided by EPA Region IV were used to characterize the Tennessee portion of the East Fork Clark's River Watershed.

HUC-10	HUC-12
0604000601	060400060101 (East Fork Clark's River)

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

4.2.A. 0604000601 (East Fork Clark's River).

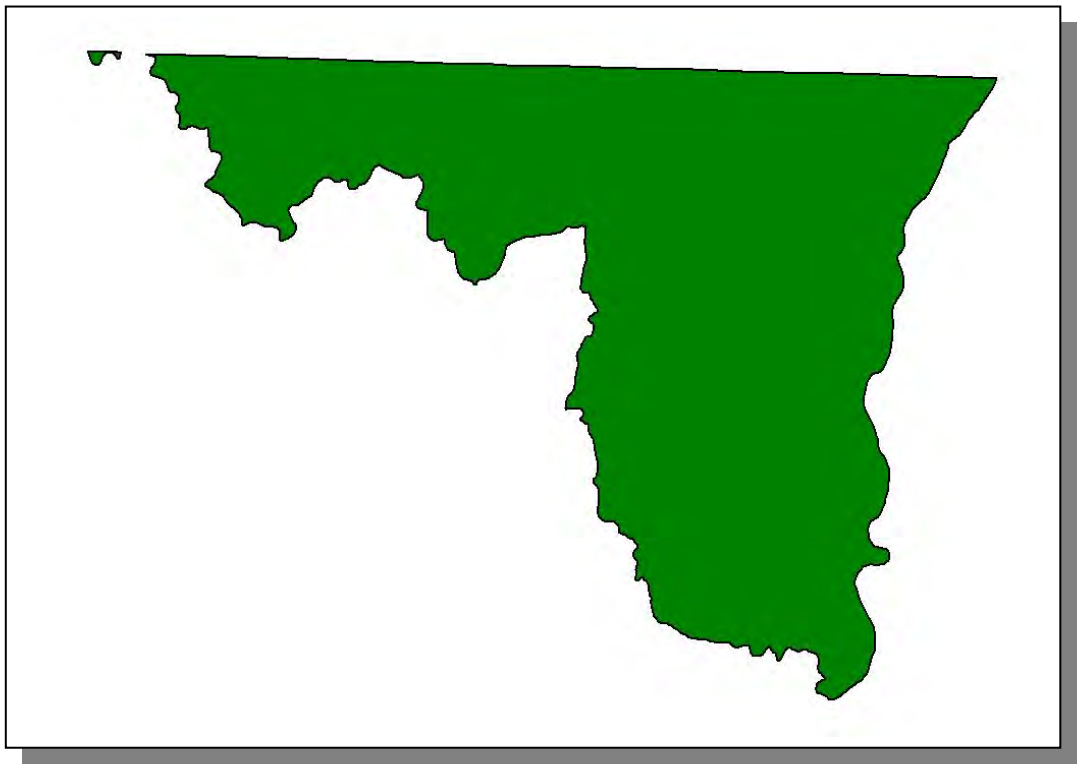


Figure 4-2. Location of Subwatershed 0604000601. *The Tennessee portion of East Fork Clark's River Watershed is composed of one HUC-10 subwatershed.*

4.2.A.i. General Description.

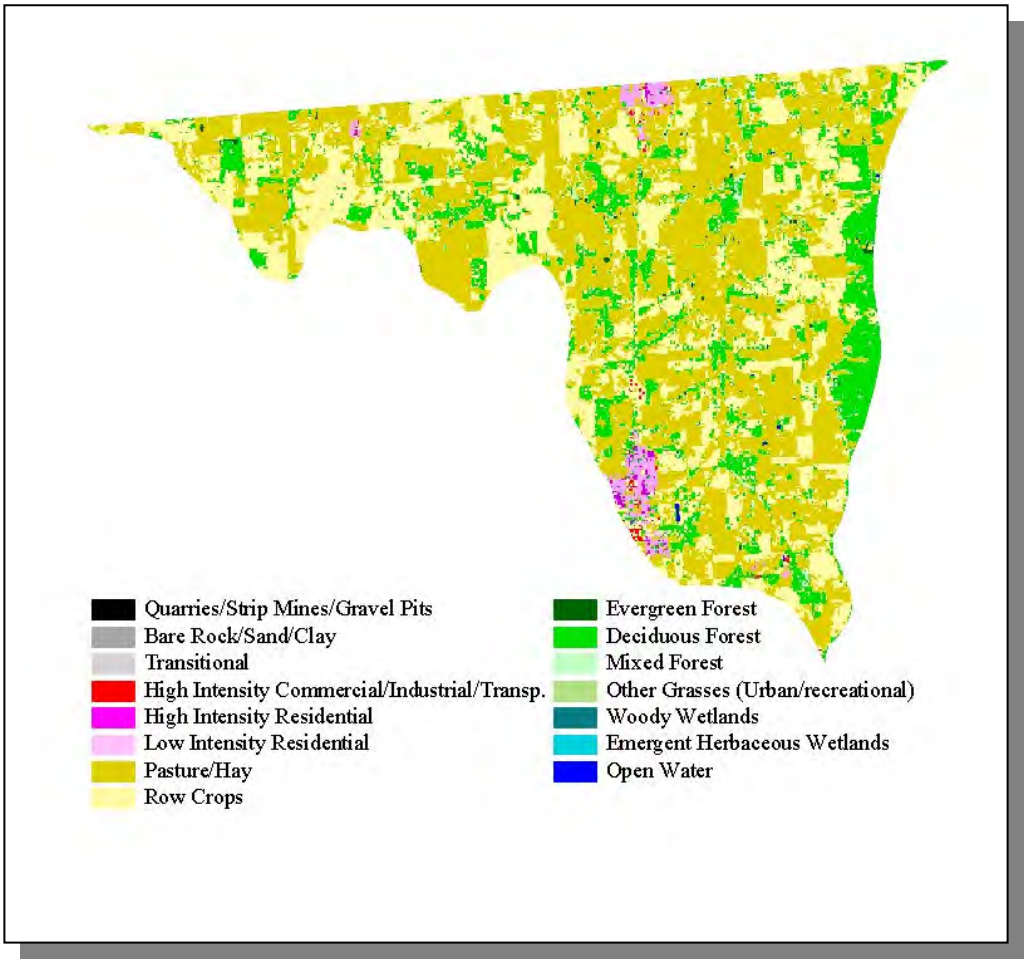


Figure 4-3. Illustration of Land Use Distribution in Subwatershed 0604000601.

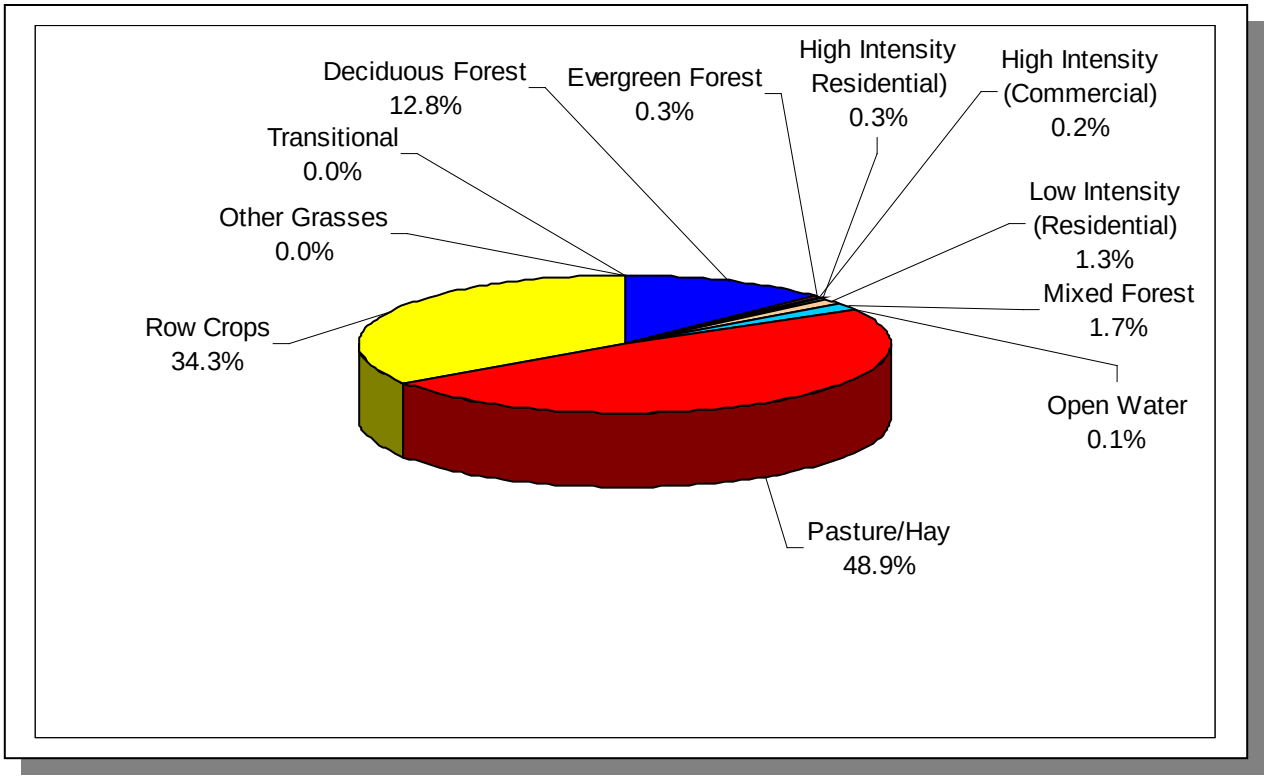


Figure 4-4. Land Use Distribution in Subwatershed 0604000601. *More information is provided in Appendix IV.*

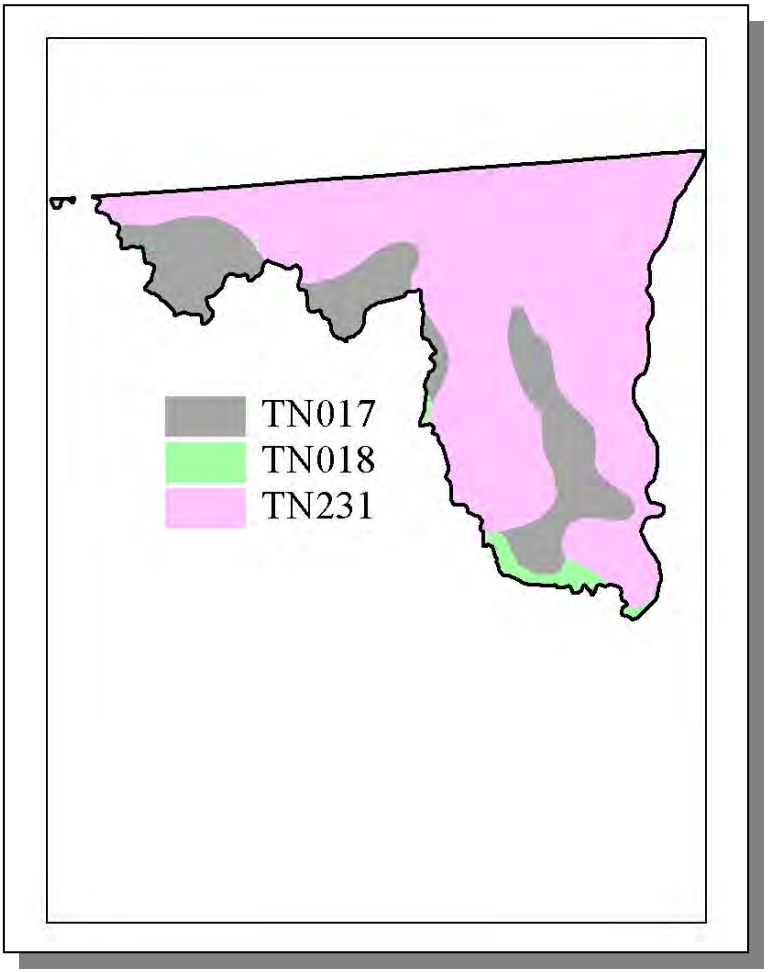


Figure 4-5. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000601.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN017	0.00	B	1.81	5.26	Silty Loam	0.45
TN018	8.00	B	2.62	5.10	Loam	0.38
TN231	16.00	C	1.30	5.21	Silty Loam	0.48

Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 0604000601. *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)
Henry	27,888	29,830	31,115	3.31	922	987	1,029	11.6

Table 4-3. Population Estimates in Subwatershed 0604000601.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Puryear	Henry	602	285	285	0	0

Table 4-4. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 0604000601.

4.2.A.ii Point Source Contributions.

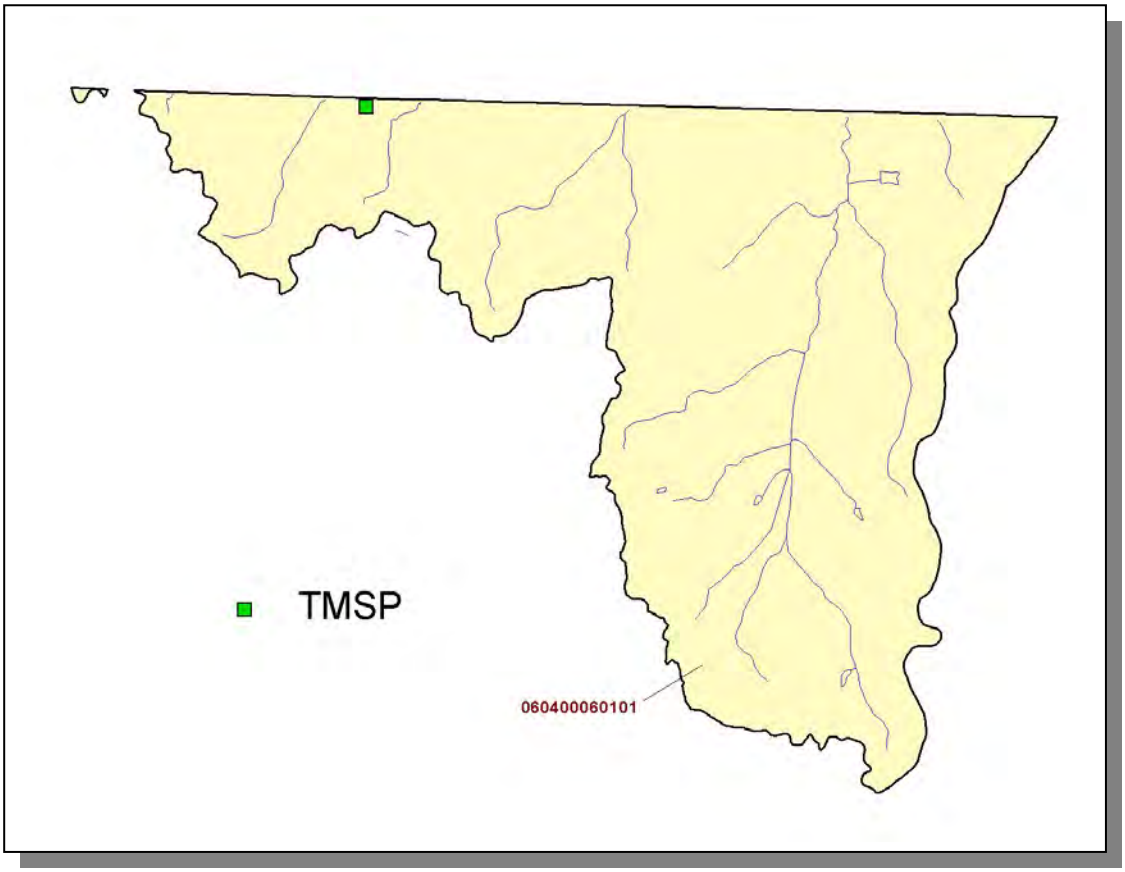


Figure 4-6. Location of Active Point Source Facilities in Subwatershed 0604000601. *060400060101 is the only HUC-12 subwatershed. More information, including the names of facilities, is provided in Appendix IV.*

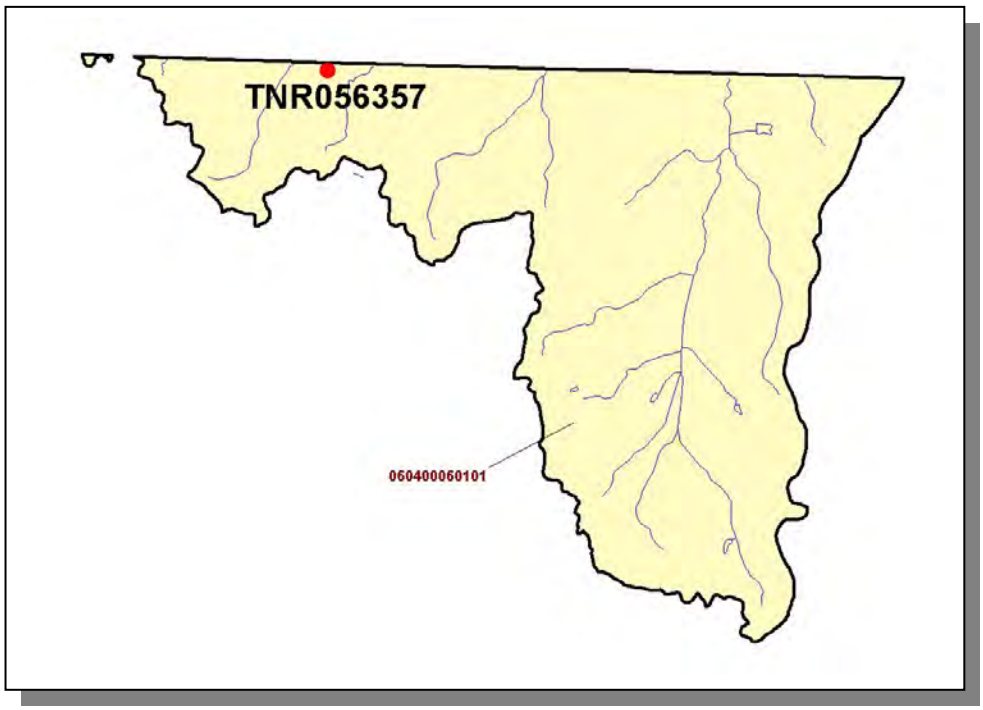


Figure 4-7. Location of TMSP Facilities in Subwatershed 0604000601. *060400060101 is the only HUC-12 subwatershed. More information, including the names of facilities, is provided in Appendix IV.*

4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	Cattle	Milk Cow	Chickens (Layers)	Chickens Sold	Hogs	Sheep
1,410	3,346	296	5	<5	5,967	15

Table 4-5. Summary of Livestock Count Estimates in Subwatershed 0604000601. *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)
Henry	176.1	176.1	1.9	7.1

Table 4-6. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 0604000601.

CROPS	TONS/ACRE/YEAR
Grass (Pastureland)	0.25
Grass (Hayland)	0.25
Legumes, Grass (Hayland)	0.11
Grass, Forbs, Legumes (Mixed Pasture)	0.52
Forest Land (Not Grazed)	0.00
Forest Land (Grazed)	0.00
Corn (Row Crops)	7.72
Soybeans (Row Crops)	6.38
Wheat (Close-Grown Cropland)	6.02
Other (Horticultural)	16.41
Other Cropland not Planted	2.61
Conservation Reserve Program Lands	0.57
Non-Agricultural Land Use	0.00
Farmsteads and Ranch Headquarters	0.10

Table 4-7. Annual Estimated Total Soil Loss in Subwatershed 0604000601.

CHAPTER 5

WATER QUALITY PARTNERSHIPS IN THE EAST FORK CLARK'S RIVER WATERSHED

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

- Partnerships between agencies
- Partnerships between agencies and landowners

This chapter describes both types of partnerships in the Tennessee portion of the East Fork Clark's 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.

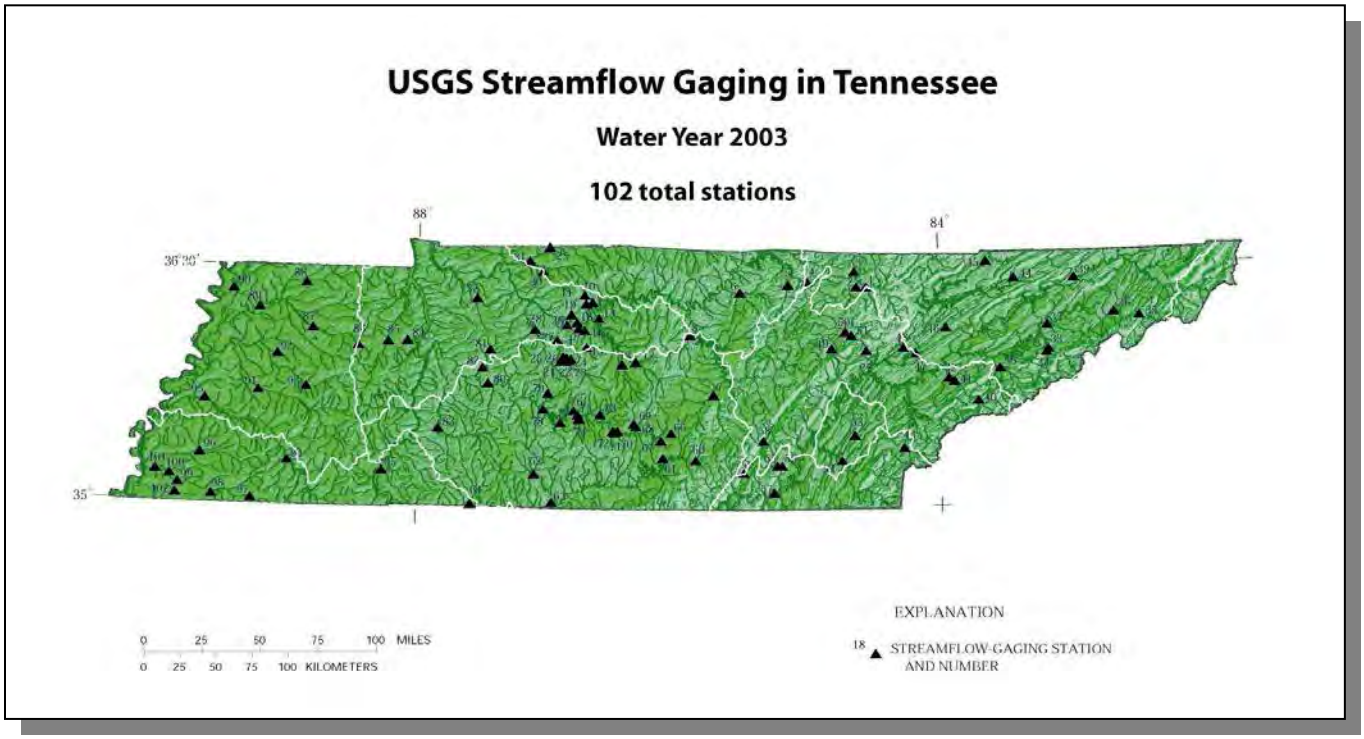
Performance Results System (PRS) is a Web-based database application providing USDA Natural Resources Conservation Service, conservation partners, and the public fast and easy access to accomplishments and progress toward strategies and performance. The PRS may be viewed at http://prms.nrcs.usda.gov/prs. 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.

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. 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.

HOW TO PARTICIPATE

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

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

5.2.D. Tennessee Valley Authority (TVA). 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.

Further information on TVA's activities in the Tennessee Western valley (KY Lake) Watershed can be obtained by writing the Kentucky Watershed Team at 202 West Blythe St., Paris, TN 38242 or by calling (731)-641-2000.

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.

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.

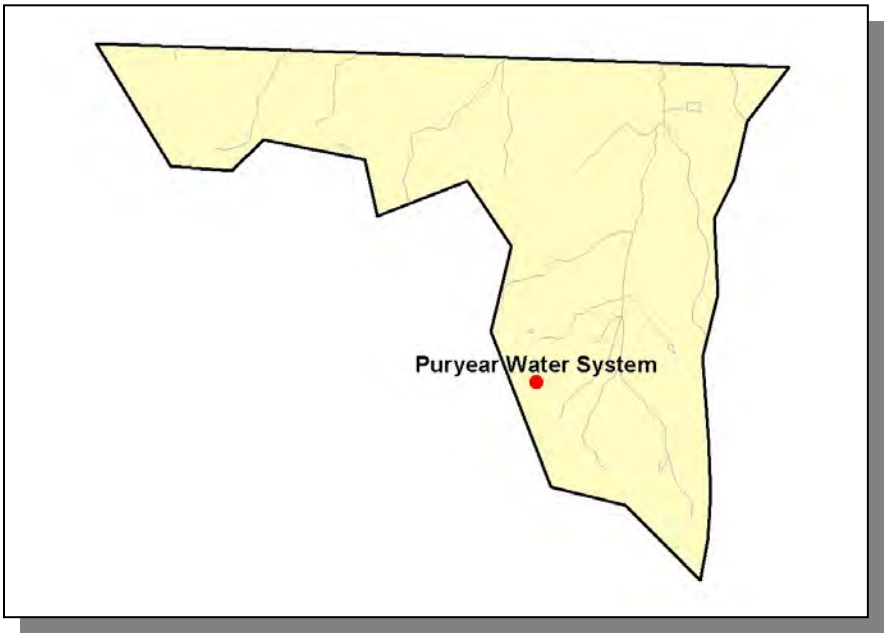


Figure 5-1. Locations of Community and Public Groundwater Supply Intakes in the Tennessee Portion of the East Fork Clark's River Watershed.

5.3.B. 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.

- 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.

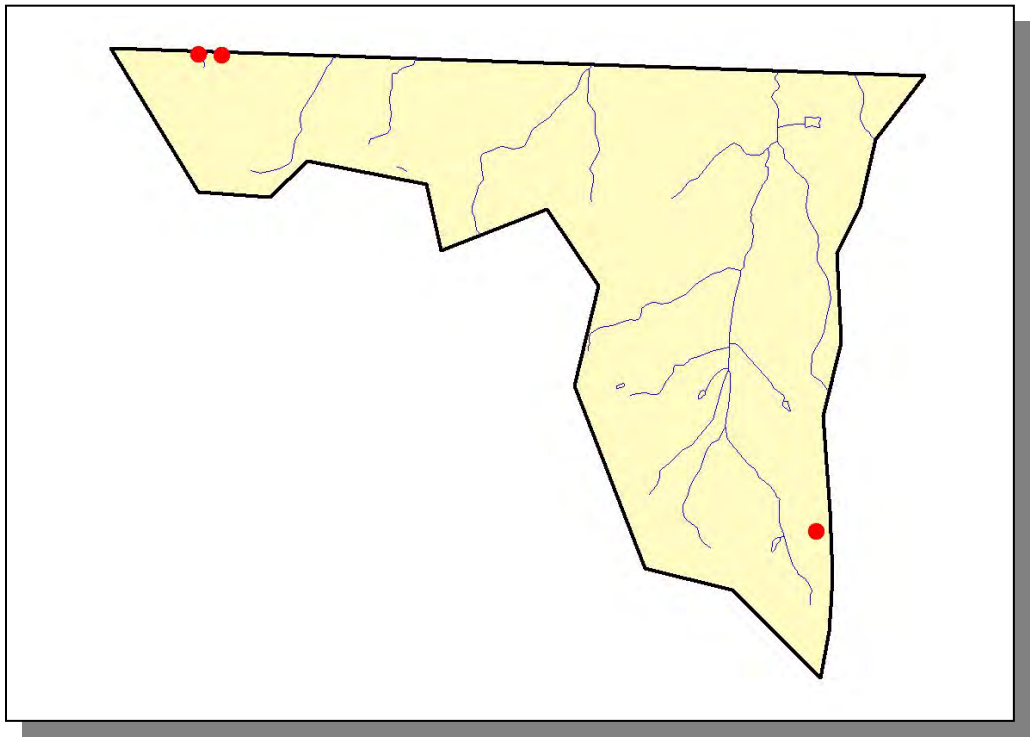


Figure 5-2. Location of BMPs installed from 1999 through 2003 in the Tennessee Portion of the East Fork Clark's River Watershed with Financial Assistance from the Tennessee Department of Agriculture's Nonpoint Source and Agricultural Resources Conservation Fund Grant Programs. *More information is provided in Appendix V.*

5.3.C. Kentucky Division of Water. The Kentucky Watershed Management Framework is a dynamic, flexible structure for coordinating watershed management across the Commonwealth of Kentucky. The Watershed Management Framework is not a new program, but rather a way of coordinating existing programs and building new partnerships that will result in more effective and efficient management of the state's land and water resources. Inherent in the design of the Framework is the belief that many stakeholder groups and individuals must have ongoing opportunities to participate in the process of managing the abundant natural resources that characterize Kentucky's watersheds.

Benefits to the people of Kentucky include:

- Better information for decision making
- Increased ability to resolve complex water resources problems
- Improved coordination among government agencies
- More opportunities for citizens to get involved
- Increased ability to demonstrate results and benefits of environmental management
- More cost effective use of public and private funds

Each major river basin in Kentucky is staffed with a Basin Coordinator. Basin Coordinators are staff assigned to serve as a liaison in a given basin management unit among the agencies, the local interests, and the resources concerns. Their job is to specialize in their watershed, to know what resources might be available to address the concerns, and facilitate the watershed process to implement plans that address the problems.

For more information about the KY Watershed Management Framework visit our website at http://www.watersheds.ky.gov/

Watershed Framework activities in the Clark's River Watershed are coordinated through the Four Rivers Basin Team. The Four River Basin Team is a multi-agency task force that meets regularly to help in development of monitoring strategies, education and outreach, prioritization of issues and watersheds within the basin, planning, and networking among technical staff and local leaders to apply agency resources to implement fixes. For more info about the Four Rivers Basin Team contact:

Bob Wise
Four Rivers Basin Coordinator
(270)-554-1022
robert.wise@jpf.org.

The web address is http://www.watersheds.ky.gov/basins/four_rivers/

The Clark's River was one of three HUC 11 watersheds identified by the Four River's Basin Team as a priority watershed for watershed planning in the first cycle of the KY Watershed Management Framework. The Basin Team recently applied for 319h funding

through KY's Nonpoint Source Pollution program to develop a Watershed Based Plan for a portion of the watershed. The area affected would be in the upper portion of the watershed from about Murray, KY upstream to the headwaters in Tennessee.

There are a number of other federal and state agency projects in the watershed including the Clark's River National Wildlife Refuge.

The Clarks River arises in Henry County, Tennessee and flows north through Calloway, Marshall and McCracken Counties in Kentucky before reaching the Tennessee River near Paducah. The watershed terrain has wide valleys rising to ridges that are mostly wide but occasionally narrow. Elevations vary 150 feet or less between valleys and ridge tops. The ridges are underlain by unconsolidated Mesozoic and Cenozoic sand, gravel and clay. The valley bottoms are underlain by Quaternary alluvium.

Waterways. This watershed drains over 303 square miles and contains about 888 total stream miles. The major tributary is the West Fork of the Clarks River, which is discussed as a separate hydrologic unit. Smaller tributaries include Middle Fork of Clarks River, Clayton Creek, Bee Creek, Rockhouse Creek, Wades Creek, East Fork of Clarks River, Ellison Creek, Beaverdam Slough, Elizabeth Creek, Middle Fork Creek, Chestnut Creek, Lick Creek, Elender Creek and numerous others. In many places the stream is split into multiple channels. There are several small impoundments on the tributaries but none on the main stem. Wastewater facilities discharge effluent into the Clarks River at Murray, Hardin and Benton. There are 17 active KPDES permits recorded for this watershed including wastewater facilities at Benton, Murray and Hardin.

Land cover/land use. The watershed is dominated by agricultural production of row crops, poultry and beef cattle. Large residential areas have been developed around the cities of Murray, Benton, Reidland and Paducah. Commercial and industrial developments also exist in and around these cities. Downstream of Highway 80 there are large tracts of wetlands along the main stem of the Clarks River. Much of this wetland area lies within the 18,000-acre Clarks River National Wildlife Refuge project boundary. Currently the US Fish and Wildlife Service owns about 8,000 acres inside the refuge boundary There are scattered areas of deciduous forest areas along ridges and around the wetlands. There are three surface mine quarries in the watershed. There are two active state Superfund sites near the city of Murray.

Agency Data Assessment. During the 2000 water quality assessment the Clarks River watershed was officially assessed in 22 segments for a total of 74.3 miles. The main stem of the Clarks River was assessed in 8 eight segments. A 7.7-mile segment below the West Fork was assessed for fish and was judged partially supporting for aquatic life. Five segments upstream of the West Fork assessed for a total of 27.1 miles. All of these segments were judged fully supporting for aquatic life, primary contact recreation and fish consumption. A 2.6-mile segment from milepoint 58.3 up to the Middle Fork of the Clarks River was assessed for fish and fecal coliform bacteria. This segment was judged partially supporting for aquatic life and primary contact recreation.

Two segments of the Middle Fork of Clarks River were assessed for a total of 4.9 miles. A 2.7-mile segment from the mouth up to Fraley Branch was assessed for fish, macroinvertebrates and fecal coliform bacteria. The segment was judged partially supporting for aquatic life and not supporting for primary contact recreation. The next

segment is from Fraley Branch upstream 2.2 miles to an unnamed tributary. This segment was assessed for macroinvertebrates and was judged partially supporting for aquatic life.

Two segments of the East Fork of Clarks River were assessed for a total of 3.7 miles. A 2.7-mile segment from the mouth to a point upstream was assessed for fish and macroinvertebrates and was judged fully supporting. A one mile segment below the South 641 sewage treatment plant was assessed using Discharge Monitoring Report data and was judged partially supporting for primary contact recreation.

Two segments of Clayton Creek were assessed for a total of 6.3 miles. A 2.5-mile segment from East Fork up to an unnamed tributary was assessed for macroinvertebrates and was judged partially supporting for aquatic life. An aquatic and riparian habitat survey yielded a score in the partially supporting range due to poor bank stability and sediment deposition. The remaining 3.8 miles upstream were assessed for fecal coliform bacteria and were judged not supporting for primary contact recreation.

- A 6.4-mile segment of Middle Fork Creek from Burkholder Deadening up to the reservoir was assessed for macroinvertebrates and fecal coliform bacteria. The segment was judged partially supporting for aquatic life and not supporting for primary contact recreation. An aquatic and riparian habitat survey yielded a score in the not supporting range due to poor bank stability and heavy sediment deposition.

- A 3.0-mile segment of Chestnut Creek from the mouth up to the reservoir was assessed for macroinvertebrates and fecal coliform bacteria. This segment was judged partially supporting for aquatic life and primary contact recreation. An aquatic and riparian habitat survey yielded a score in the not supporting range due to poor riparian vegetation, poor bank stability and sediment deposition.

- A 4.9-mile segment of Rockhouse Creek was assessed for fish and macroinvertebrates. This segment was judged fully supporting for aquatic life.

- A 3.8-mile segment of Wades Creek was assessed for fish and macroinvertebrates. This segment was judged fully supporting for aquatic life.

- A 1.8-mile segment of Bee Creek was assessed for fecal coliform bacteria and was judged not supporting for primary contact recreation.

- A 0.5-mile segment of an unnamed tributary to Old Beaver Dam Slough was assessed for macroinvertebrates and was judged not supporting for aquatic life.

- A 0.9-mile segment of Martin Creek was assessed using Discharge Monitoring Report (DMR) data from Hardin sewage treatment plant. The segment was judged partially supporting for aquatic life and primary contact recreation.

- A 0.7-mile segment of an unnamed tributary to Chestnut Creek was assessed using Discharge Monitoring Report (DMRs) data from Draffenville sewage

treatment plant. The segment was judged partially supporting for aquatic life and primary contact recreation.

Watershed Ranking. The data-driven ranking process for the 4 Rivers region unit indicated the watershed as an overall high priority with a high need for restoration and a very high concern for potential impacts. The main factor driving the need for restoration is observed impacts that indicate 50.3 miles of streams are impaired for their designated use. There are also a very high number of contamination sites in the watershed. Potential impact factors include a high number of KDPES discharges, a high potential for erosion from agricultural practices, a very high number of potential contamination sites and a very high number of discharge violations.

Other Data. A stream flow gauge is maintained on the Clarks River near the community of Almo.

West Fork of the Clarks River (06040006050)

Geography. The West Fork of the Clarks River arises in west central Calloway County and flows generally northward through Marshall and Graves Counties before entering McCracken County where it meets the Clarks River. The watershed terrain has wide valleys rising to ridges that are mostly wide but occasionally narrow. The most rugged areas exist between Highway 212 and Highway 58/80. Elevations vary 150 feet or less between valleys and ridge tops. The ridges are underlain by unconsolidated Mesozoic and Cenozoic sand, gravel and clay. The valley bottoms are underlain by Quaternary alluvium.

Waterways. This watershed drains over 222 square miles and contains about 691 total stream miles. Tributaries include Darnell Creek, Sand Lick Branch, Watson Creek, Edwards Creek, Damon Creek, Duncan Creek, Soldier Creek, Panther Creek, Trace Creek, Spring Creek, Tucker Creek, Sugar Creek, Hodge Creek, Bear Creek and Camp Creek. There are several small impoundments on tributaries but none on the main stem. A significant stretch of the West Fork has been straightened to improve drainage. This section is located between Highway 58/80 and Highway 348. As a result the stream is split into multiple channels along much of this stretch. There are 6 KPDES permits recorded for this watershed, including the Murray Landfill and Symsonia wastewater treatment facility.

Land cover/land use. The watershed is dominated by agricultural production of row crops, poultry, swine, dairy and beef cattle. Deciduous forest remains on the more rugged terrain in the central portion of the watershed. There are extensive wetlands around the main stem of the West Fork, downstream of the Purchase Parkway. Included in this area is the 1700 acre Kaler Bottoms Wildlife Management Area. The Murray landfill is located in the upper portion of the watershed near Coldwater. There are two surface mine quarries located in the watershed. There are no significant residential, industrial or commercial developments in this watershed.

Agency Data Assessment

During the 2000 water quality assessment the main stem of the West Fork of the Clarks River was assessed in six segments for a total of 22.1 miles. A 7.5-mile segment was

assessed for macroinvertebrates and fecal coliform bacteria. The segment was judged fully supporting for aquatic life but only partially supporting for primary contact recreation. A 4.0-mile segment below Panther Creek was assessed for macroinvertebrates and fecal coliform bacteria. The segment was judged fully supporting for aquatic life but not supporting for primary contact recreation. A 2.9-mile segment between Panther Creek and Soldier Creek was assessed for macroinvertebrates and was judged fully supporting for aquatic life. A 3.0-mile segment between Soldier Creek and Duncan Creek was assessed for fish, macroinvertebrates, algae and fish tissue. The segment was judged fully supporting for aquatic life but only partially supporting for fish tissue consumption. A 4.6-mile segment from Duncan Creek to Watson Creek was assessed for fecal coliform bacteria and was judged partially supporting for aquatic life. A 4.1-mile segment from Darnell Creek up to the headwaters was assessed for macroinvertebrates and was judged partially supporting for aquatic life. A 13.8-mile segment of a channelized section of the West Fork was assessed for fish and was judged partially supporting for aquatic life.

The lower 3.7 miles of Blizzard Pond was assessed for macroinvertebrates and fecal coliform bacteria. The segment was judged not supporting for primary contact recreation, but the macroinvertebrate data was judged inconclusive for support of aquatic life. A 1.0-mile segment below Great Oaks Subdivision sewage treatment plant was assessed using discharge monitoring reports (DMRs). The segment was judged partially supporting for aquatic life and primary contact recreation.

- A 5.4-mile segment of Camp Creek was assessed for macroinvertebrates and fecal coliform bacteria. The segment was judged partially supporting for both aquatic life and primary contact recreation.

- A 1.8-mile segment of Duncan Creek below a reservoir was assessed for macroinvertebrates and fecal coliform bacteria. The segment was judged not supporting for aquatic life, but fecal coliform data collected was inconclusive for support of primary contact recreation. This stream will be revisited during the next monitoring cycle.

- A 1.8-mile segment of Spring Creek was assessed for fish and was judged partially supporting for aquatic life.

- A 0.3-mile segment Reeves Branch was assessed for macroinvertebrates and was judged partially supporting for aquatic life.

- The tributaries of Duncan Creek, Panther Creek, Pryor Branch, Soldier Creek, Sugar Creek and Trace Creek were assessed and judged fully supporting for aquatic life. Panther Creek was also determined to be fully supporting for primary contact recreation.

Watershed Rankings. The data-driven ranking process for the 4 Rivers region indicated the watershed as an overall medium priority.

Cypress Creek (06040006020)

Geography. Cypress Creek arises in central Marshall County and flows north to Gilbertsville where it turns to the west and flows into the Tennessee River. Upstream of Highway 62 the terrain is fairly rugged with wide valleys that rise 50-100 feet to narrow ridges. Downstream of Highway 62 the terrain becomes more gently rolling with elevation variances of less than 50 feet.

Waterways. This watershed drains about 61 square miles and contains about 192 total stream miles. Tributaries include Bloodyshin Branch, Stice Creek, Little John Creek, Camp Creek and Little Cypress Creek. There is a large wetland area along the upper portion of the main stem as well as some smaller wetlands in the lower portion. There are 18 active KPDES permits recorded for this watershed.

Land cover/land use. Industrial and commercial are the major land uses in the watershed, especially around Calvert City. There are 5 active state Superfund sites located at Calvert City. Commercial areas are also located along the Highway 68, Highway 62 and Interstate 24 corridors. There are 3 small surface mines for sand, gravel or clay. There is some agriculture production including row crops and a couple of large poultry operation. Residential areas are located at Gilbertsville, Calvert City and along the highway corridors. There are wooded areas around the wetlands and on the more rugged ridges.

Agency Data Assessment. During the 2000 water quality assessment the main stem of Cypress Creek was assessed in two segments for a total of 7.0 miles. The lower segment was assessed for water quality and fecal coliform bacteria. This segment was judged fully supporting for aquatic life and primary contact recreation. The upper segment is located above Camp Creek and was assessed for macroinvertebrates. This segment was judged not supporting for aquatic life.

Little Cypress Creek was assessed in two segments for a total of 6.0 miles. The lower segment was assessed for macroinvertebrates and fecal coliform bacteria. This segment was judged partially supporting for primary contact recreation and not supporting for aquatic life. The upper segment was assessed for macroinvertebrates and was judged not supporting for aquatic life.

A 0.7-mile segment of Angle Creek, from the mouth up to Barrett Creek, was assessed for macroinvertebrates and fecal coliform bacteria. This segment was judged partially supporting for aquatic life and not supporting for primary contact recreation.

Watershed Rankings. The data-driven ranking process for the 4 Rivers region indicated the watershed as an overall high priority due to a high need for restoration, protection and a high concern for potential impacts. The main factor for restoration is observed impacts that indicate 8.1 miles of streams not fully supporting their designated uses. The main factor for protection is the watershed's location within the Paducah source

water protection area. Potential impacts include a high number of permitted discharges and a high toxic release inventory score.

Tennessee River, Below Cooper Creek (06040006010)

Geography. This hydrologic unit represents the Tennessee River from a small tributary just below Kentucky Dam downstream to the mouth of the Clarks River. The eastern side of the watershed drains an area known as "the land between the rivers" because it is located between the Cumberland and Tennessee Rivers. The upper portion of this area around Guess Creek is rugged with narrow valleys that rise quickly 100-200 feet to narrow ridges. The lower portion is less rugged and resembles the western side of the watershed. This area has gradual slopes that vary less than 50 feet between the river valley and wide ridge tops.

Waterways. This hydrologic unit drains about 56 square miles and contains about 170 total stream miles. Tributaries include Guess Creek, Yancy Creek, Lee Creek, Mud Creek and Oak Creek. Cypress Creek is a major tributary to this segment and is discussed as a separate hydrologic unit. The Tennessee River from Kentucky Dam downstream 10.4 miles is Outstanding Resource Water due to the presence of federally endangered orangefoot pimpleback mussel (*Plethobasus cooporianus*), rink pink mussel (*Obovaria retusa*) and pink mucket mussel (*Lampsilis abrupta*). There are 17 active KPDES permits recorded for this hydrologic unit.

Land cover/land use. On the eastern side of the river agricultural production of row crops and poultry is common. There are deciduous forest areas along the steeper slopes and narrow ridges. On the western side of the river around Calvert City the land is used heavily for industrial purposes. Around Reidland the land is a mix of residential and commercial. There are 5 active state Superfund sites in the watershed (mostly Coast Guard stations). There are 2 small surface mine quarries in the watershed.

Agency Data Assessment. During the 2000 water quality assessment the main stem of the Tennessee River was assessed for 5.8 miles upstream of the mouth of the Clarks River. This segment was assessed for water quality parameters and was judged fully supporting for aquatic life. A 7.5-mile segment below Kentucky Dam was assessed for fish and was judged fully supporting for aquatic life.

- A 1.0-mile segment of Little White Oak Creek was assessed using water quality and fecal coliform bacteria from Discharge Monitoring Reports (DMR) from Oak View Nursing Home. This segment was judged partially supporting for aquatic life and primary contact recreation.

- A 2.6-mile segment of Guess Creek from the mouth to Dry Creek was assessed for fish and macroinvertebrates. This segment was judged partially supporting for aquatic life.

Watershed Ranking. The data-driven ranking process for the 4 Rivers region unit indicated the watershed as an overall high priority with a very high need for protection. The need for protection is due to the entire watershed being located in the Paducah Source Water Protection Area. The watershed also ranks high for potential impacts due

to a very high number of KPDES permits and associated violations. The watershed also has a fairly high toxic release inventory score.

For more info about the KY Watershed Initiative, or for more info about each basin, go to http://www.watersheds.ky.gov/Default.htm. At this site you can also link to a watershed viewer that offers narratives containing basic info such as land use, geography, permits, etc. for each HUC 11.

CHAPTER 6

RESTORATION PRIORITIES IN THE EAST FORK CLARK'S RIVER WATERSHED

6.1. BACKGROUND.

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

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

6.2.C. Year 5 Public Meeting. The third scheduled East Fork Clark's River Watershed public meeting was held October 18, 2005 at the Nathan Bedford Forrest State Park Museum. The meeting was held jointly with the Tennessee Western Valley (KY Lake) Watershed and the meeting featured six educational components:

- Overview of draft Watershed Water Quality Management Plan slide show
- Benthic macroinvertebrate samples and interpretation
- SmartBoard™ with interactive GIS maps
- "How We Monitor Streams" self-guided slide show
- "Why We Do Biological Sampling" self-guided slide show
- TVA display

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

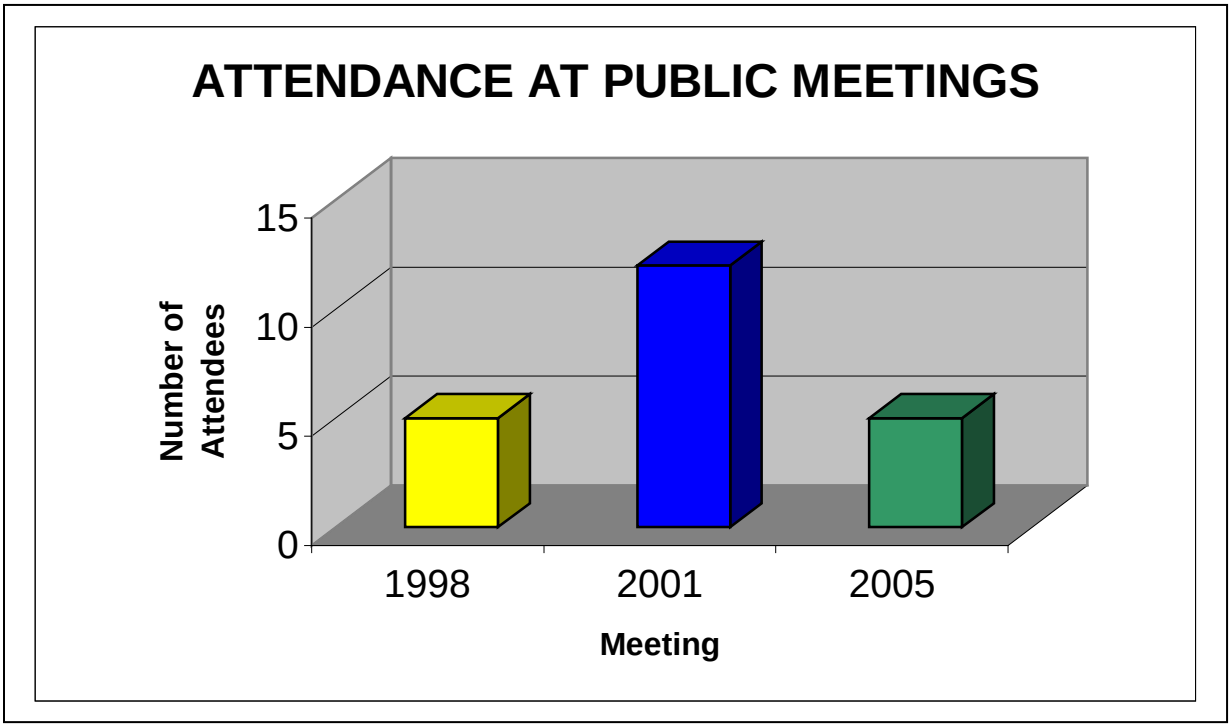


Figure 6-1. Attendance at Public Meetings in the East Fork Clark's River Watershed. *1998 attendance numbers represent Tennessee Western Valley (Beech River and KY Lake) Watersheds and East Fork Clark's River Watersheds joint meeting; 2005 meeting attendance number represents Tennessee Western Valley (KY Lake) and East Fork Clark's River Watersheds joint meeting. Attendance numbers do not include TDEC personnel.*

Figure 6-2. The Watershed Meeting Comes to Order as Pat Patrick, Manager of the Jackson Environmental Field Office, Welcomes Participants.

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

APPENDIX II

LAND COVER/LAND USE	ACRES	% OF WATERSHED
Open Water	10	0.07
Other Grasses	1	0.01
Pasture/Hay	6,992	48.41
Row Crops	4,630	32.05
Woody Wetlands	0	0.00
Emergent Herbaceous Wetlands	0	0.00
Deciduous Forest	2,191	15.17
Mixed Forest	277	1.92
Evergreen Forest	52	0.36
High Intensity: Commercial/Industrial	29	0.20
High Intensity: Residential	40	0.28
Low Intensity: Residential	219	1.52
Quarries/Strip Mines/Gravel Pits	0	0.00
Bare Rock/Sand/Clay	0	0.00
Transitional	3	0.02
Total	**14,444**	**100.00**

Table A2-1. Land Use Distribution in the Tennessee Portion of the East Fork Clark's Fork 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)	
Blackland Prairie (65a)	Unnamed Trib to Muddy Creek (65A01)	Little Hatchie River	08010207
Southeastern Plains and Hills (65e)	Blunt Creek (65E04)	TWV-KY Lake	06040005
	Griffin Creek (65E06)	NF Forked Deer River	08010204
	Harris Creek (65E08)	SF Forked Deer River	08010205
	Marshall Creek (65E10)	Hatchie River	08010208
	West Fork Spring Creek (65E11)	Hatchie River	08010208
Fall Line Hills (65i)	Battles Branch (65I02)	TWV-Beech River	06040001
Loess Plains (74b)	Powell Creek (74B04)	Obion River	08010202
	Wolf River (74B12)	Wolf River	08010210

Table A2-2. Ecoregion Monitoring Sites in Ecoregions 65a, 65e, 65i, and 74b.

APPENDIX III

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
East Fork Clarks River	TN06040006014_1000	5.9

Table A3-1a. Streams Fully Supporting Designated Uses in the Tennessee portion of the East Fork Clark's River Watershed.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Dry Creek	TN06040006014_0100	4.9
Tribs to East Fork Clarks River	TN06040006014_0999	14.6

Table A3-1b. Streams Not Assessed in the Tennessee Portion of the East Fork Clark's River Watershed.

APPENDIX IV

LAND USE/LAND COVER	AREAS IN HUC-10 SUBWATERSHEDS (ACRES)
	01
Deciduous Forest	1,612
Evergreen Forest	39
High Intensity: Commercial/Industrial/Transportation	25
High Intensity: Residential	36
Low Intensity: Residential	169
Mixed Forest	217
Open Water	9
Other Grasses: Urban/Recreational	2
Pasture/Hay	6,170
Row Crops	4,326
Transitional	3
Total	**12,608**

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

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

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

FACILITY NUMBER	FACILITY NAME	SECTOR	RECEIVING STREAM	AREA*	HUC-10
TNR056357	Alfred E. Craig Sawmill	A	Brushy Creek	11	0604000601

Table A4-3. Active Permitted TMSP Facilities in the Tennessee Portion of the East Fork Clark's River Watershed. *Area, acres of property associated with industrial activity. Sector details may be found in Table A4-4.*

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 A4-4. TMSP Sectors and Descriptions.

APPENDIX V

PRACTICE	NRCS CODE	NUMBER OF BMPs
Grade Stabilization Structure	410	3

Table A5-1. Best Management Practices Installed by Tennessee Department of Agriculture and Partners in the Tennessee Portion of the East Fork Clark's River Watershed.