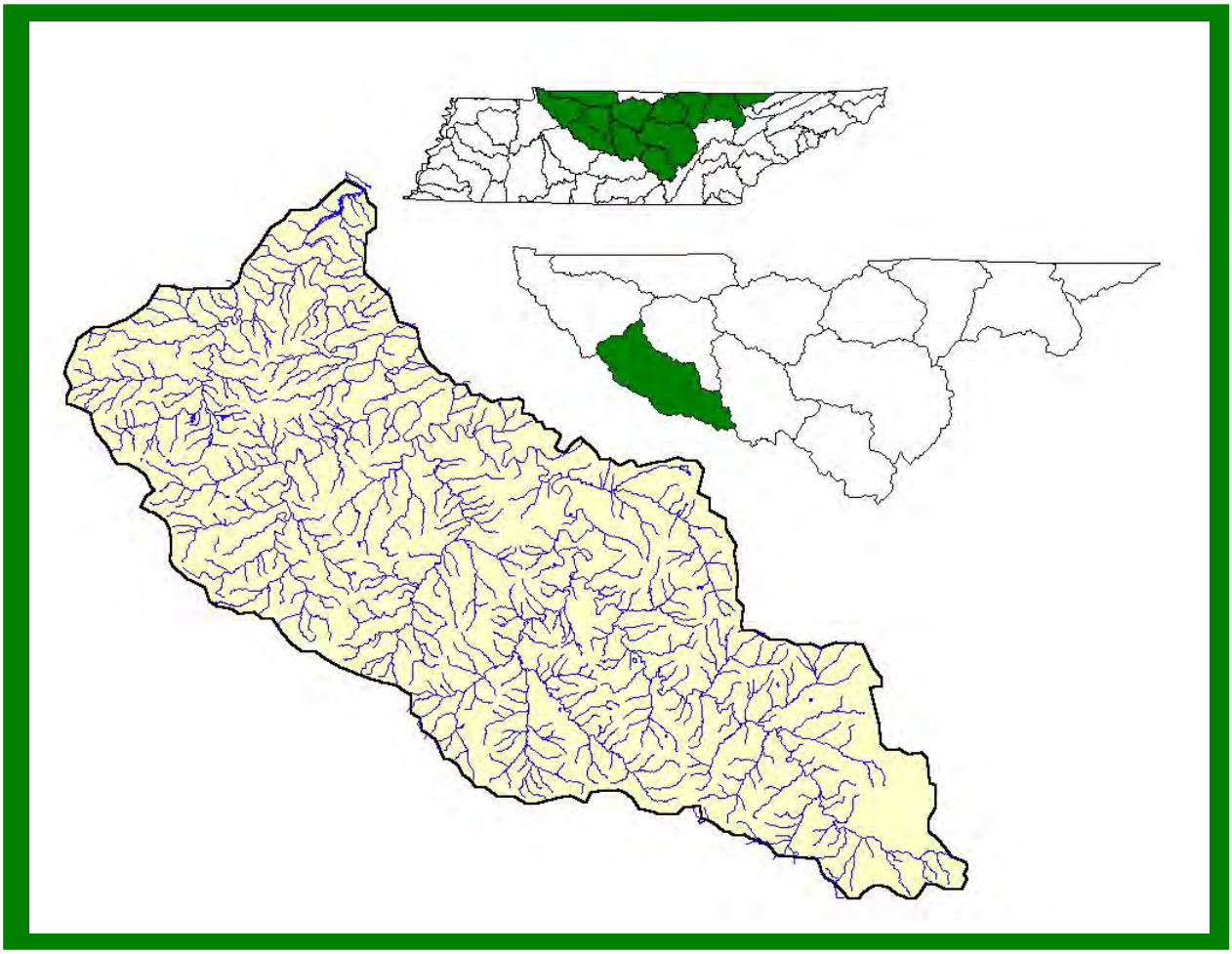
HARPETH RIVER WATERSHED (05130204) OF THE CUMBERLAND RIVER BASIN

WATER QUALITY MANAGEMENT PLAN



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

August 27, 2002

HARPETH RIVER WATERSHED
WATER QUALITY MANAGEMENT PLAN

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GLOSSARY

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

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

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

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

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

AFO. Animal Feeding Operation.

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

ARAP. Aquatic Resource Alteration Permit.

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

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

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

Benthic. Bottom dwelling.

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

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

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

CAFO. Concentrated Animal Feeding Operation.

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

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

DO. Dissolved oxygen.

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

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

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

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

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

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

MRLC. Multi-Resolution Land Classification.

MS4. Municipal Separate Storm Sewer System.

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

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

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

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

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

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

SBR. Sequential Batch Reactor.

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

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

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

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

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

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

TMSP. Tennessee Multi-Sector Permit.

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

WAS. Waste Activated Sludge.

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

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

WET. Whole Effluent Toxicity.

WWTP. Waste Water Treatment Plant

CHAPTER 1

WATERSHED APPROACH TO WATER QUALITY

1.1 BACKGROUND. 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.

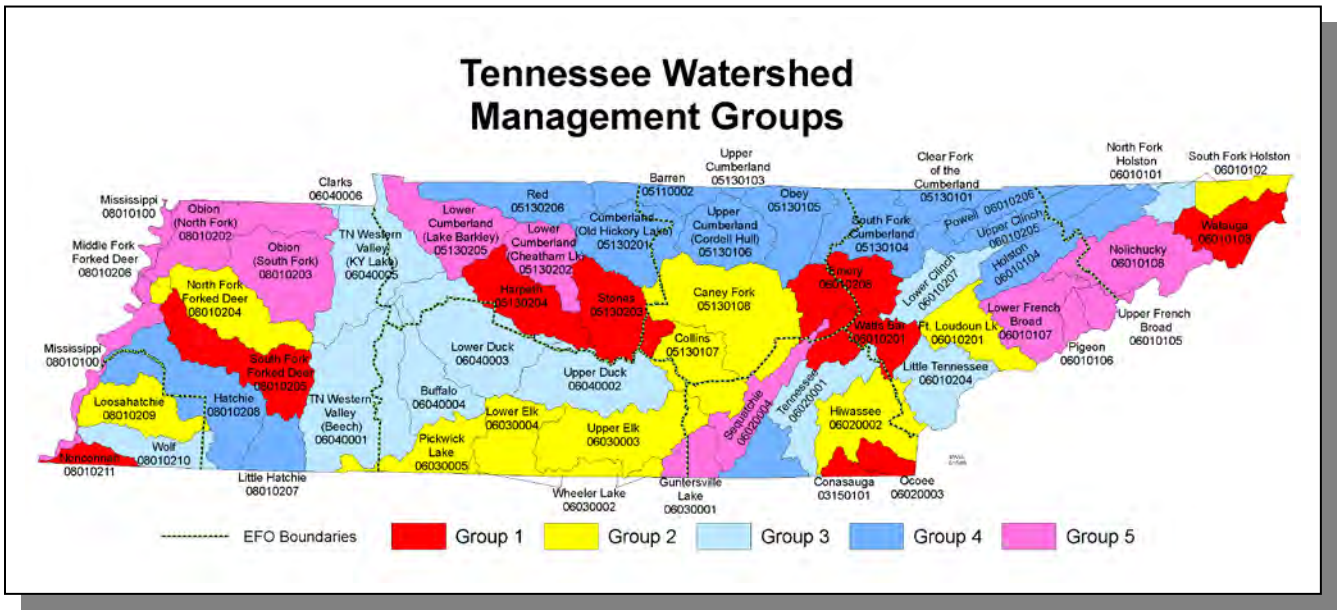


Figure 1-1. Watershed Groups in Tennessee's Watershed Approach to Water Quality.

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.

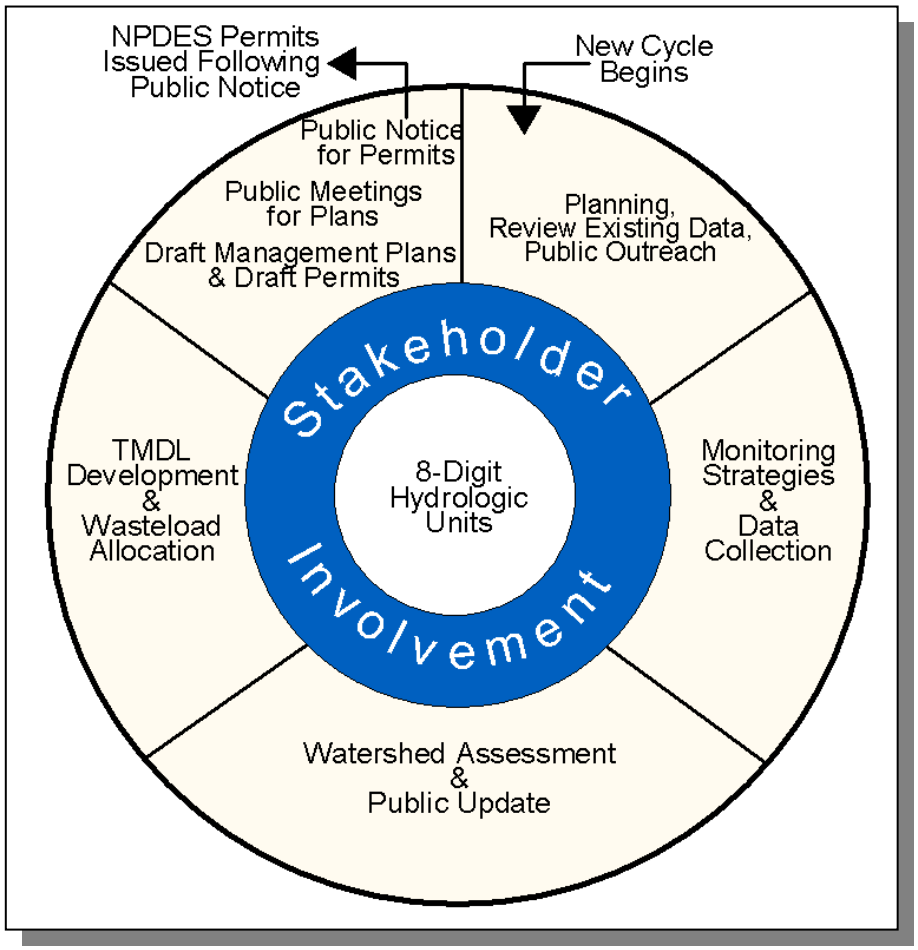


Figure 1-2. The Watershed Approach Cycle.

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 HARPETH RIVER WATERSHED

2.1 BACKGROUND. The origin of the name “Harpeth” is somewhat obscure. While stories abound about the marauding Harpath Brothers of Kentucky in the 1800’s, the name “Harpath” appears on maps as early as the 1780’s, thus making the family name an unlikely source of the area name. Information in Tennessee State Archives suggests that a Chinese legend describes Harpath as a man who dwelled in a bountiful valley and that early settlers, reading such legends, may have named their beautiful valley after Harpath (later changed to Harpeth).

The Harpeth River Watershed includes cool springs with moderate gradient originating in the Inner Nashville Basin and warm water streams with shallow gradient flowing over

exposed limestone in the Outer Nashville Basin. Even though the Harpeth River Watershed is mostly rural, a few urbanized areas are developing very rapidly.

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

2.2. DESCRIPTION OF THE WATERSHED.

2.2.A. General Location. The Harpeth River Watershed is located in Middle Tennessee and includes parts of Cheatham, Davidson, Dickson, Hickman, Rutherford, and Williamson Counties.

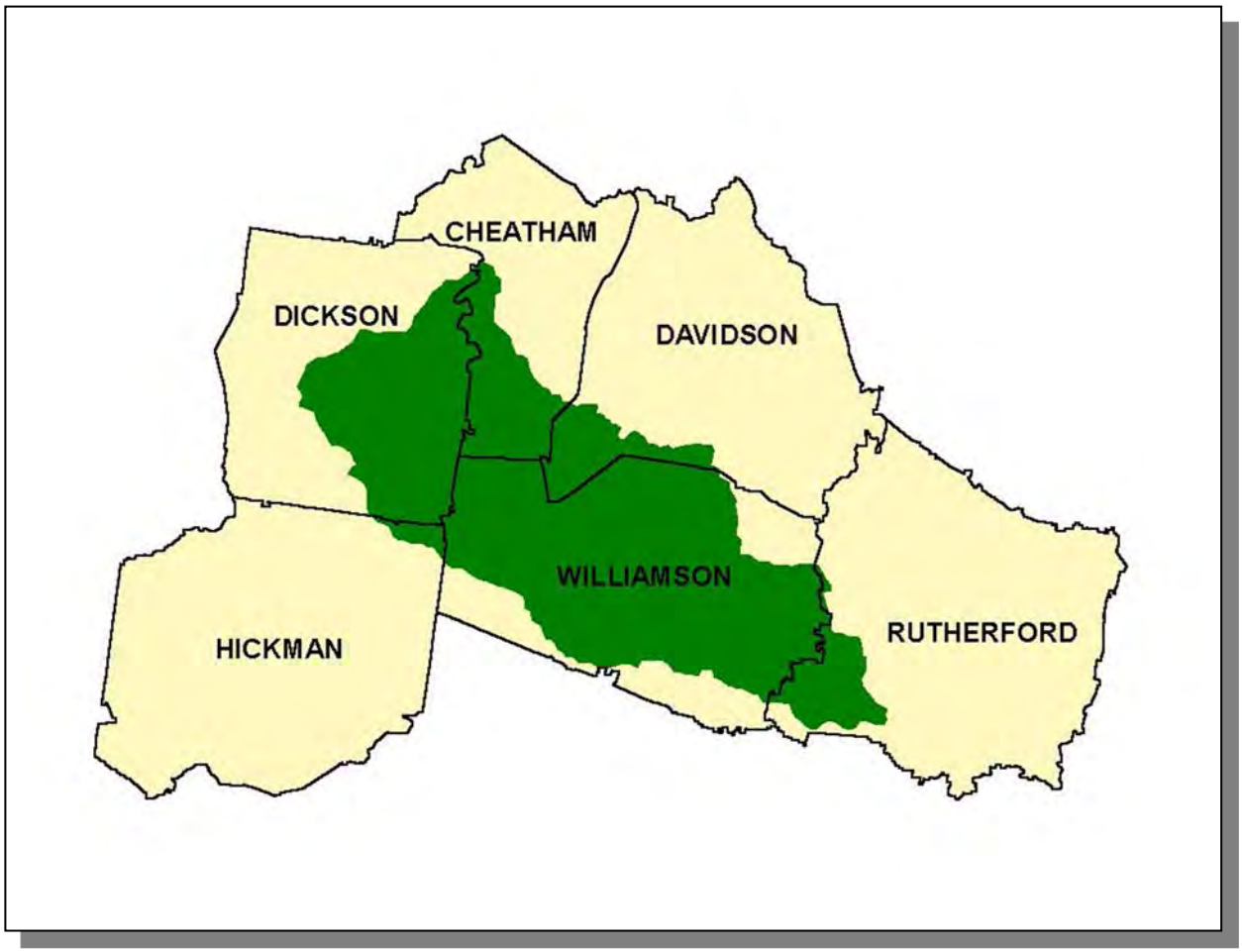


Figure 2-1. General Location of the Harpeth River Watershed.

COUNTY	% OF WATERSHED IN EACH COUNTY
Williamson	53.0
Dickson	23.5
Cheatham	10.0
Davidson	6.2
Rutherford	6.2
Hickman	1.1

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

2.2.B. Population Density Centers. Two interstates (I-40, I-65) and six state highways serve the major communities in the Harpeth River Watershed.

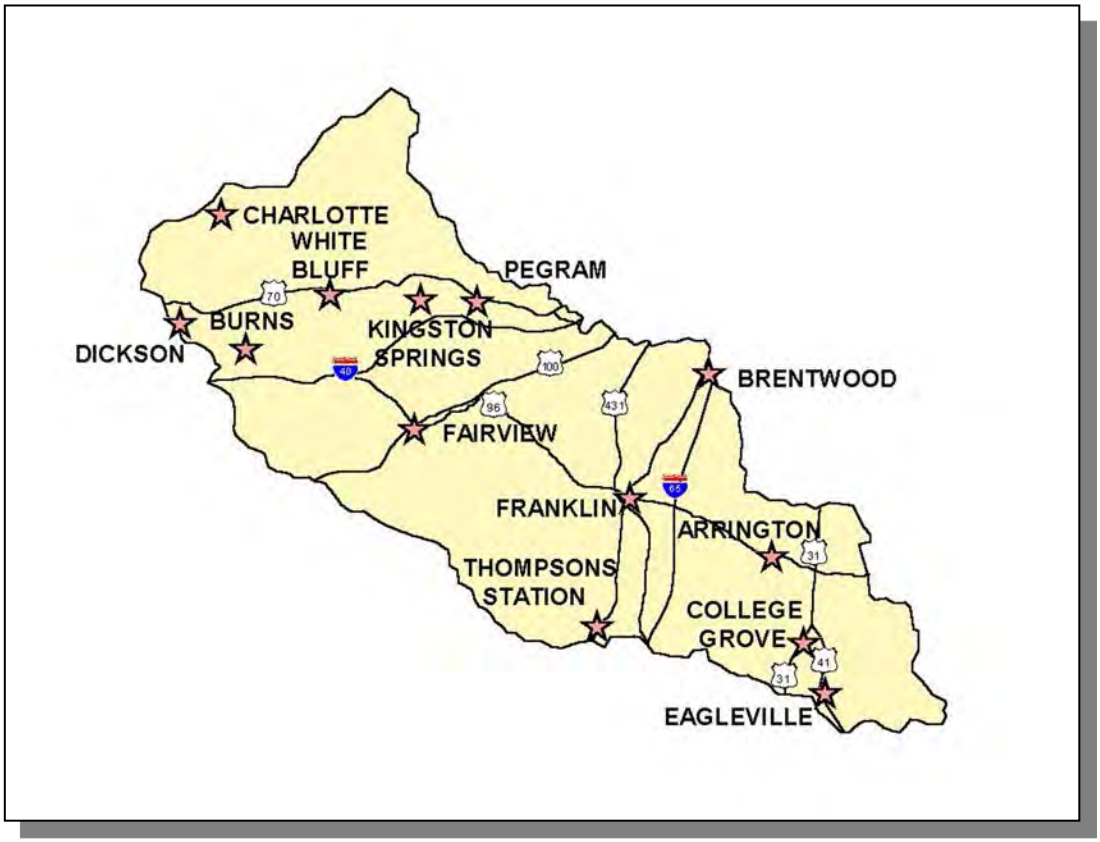


Figure 2-2. Municipalities and Roads in the Harpeth River Watershed.

MUNICIPALITY	POPULATION	COUNTY
Franklin*	20,098	Williamson
Brentwood	16,392	Williamson
Dickson	8,791	Dickson
Fairview	4,210	Williamson
White Bluff	1,988	Dickson
Kingston Springs	1,529	Cheatham
Pegram	1,371	Cheatham
Burns	1,127	Dickson
Charlotte*	854	Dickson
Thompsons Station	721	Williamson
Eagleville	462	Rutherford

Table 2-2. Municipalities in the Harpeth River Watershed. *Population based on 1990 census (Tennessee Blue Book). Asterisk (*) indicates county seat.*

2.3. GENERAL HYDROLOGIC DESCRIPTION.

2.3.A. Hydrology. The Harpeth River Watershed, designated the Hydrologic Unit Code 05130204 by the USGS, is approximately 863 square miles and drains to the Cumberland River. The mouth of the Harpeth River is at Cumberland River (Cheatham Lake) mile 152.9.

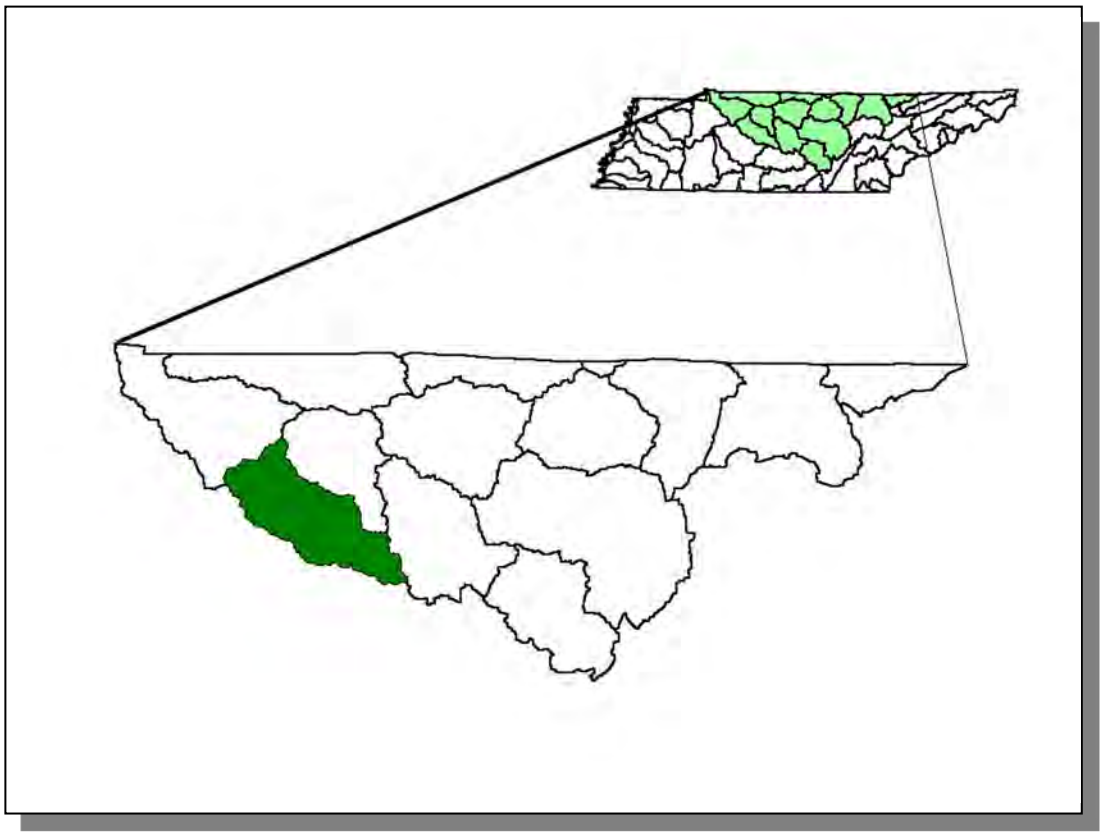


Figure 2-3. The Harpeth River Watershed is Part of the Cumberland River Basin.

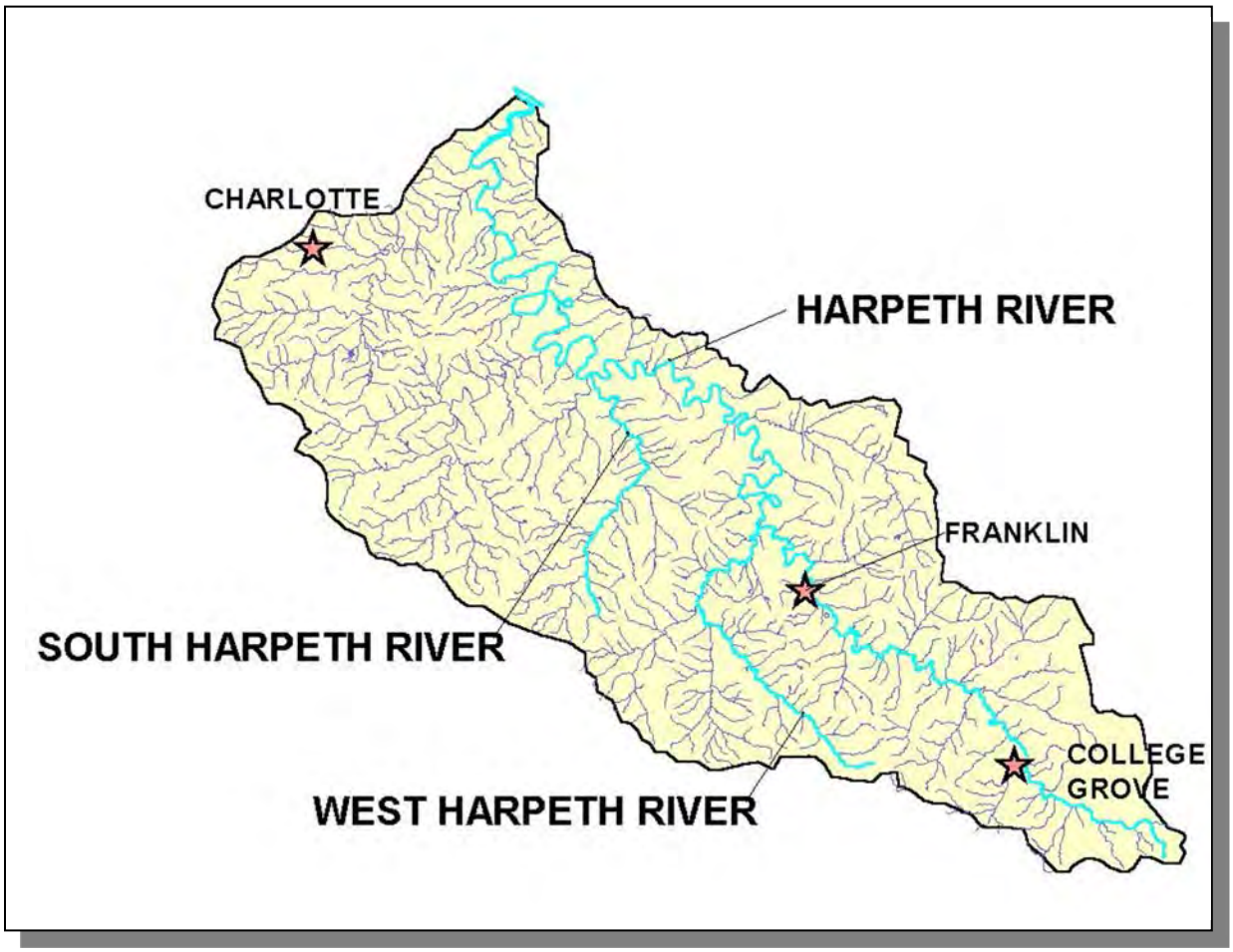


Figure 2-4. Hydrology in the Harpeth River Watershed. *There are 1,314 stream miles and 655 lake acres recorded in River Reach File 3 in the Harpeth River Watershed. Locations of the Harpeth, South Harpeth, and West Harpeth Rivers and the cities of Charlotte, Franklin, and College Grove are shown for reference.*

2.3.B. Dams. There are 53 dams inventoried by TDEC Division of Water Supply in the Harpeth River Watershed. These dams either retain at least 30 acre-feet of water or have structures at least 20 feet high. Additional dams may be found in the watershed.

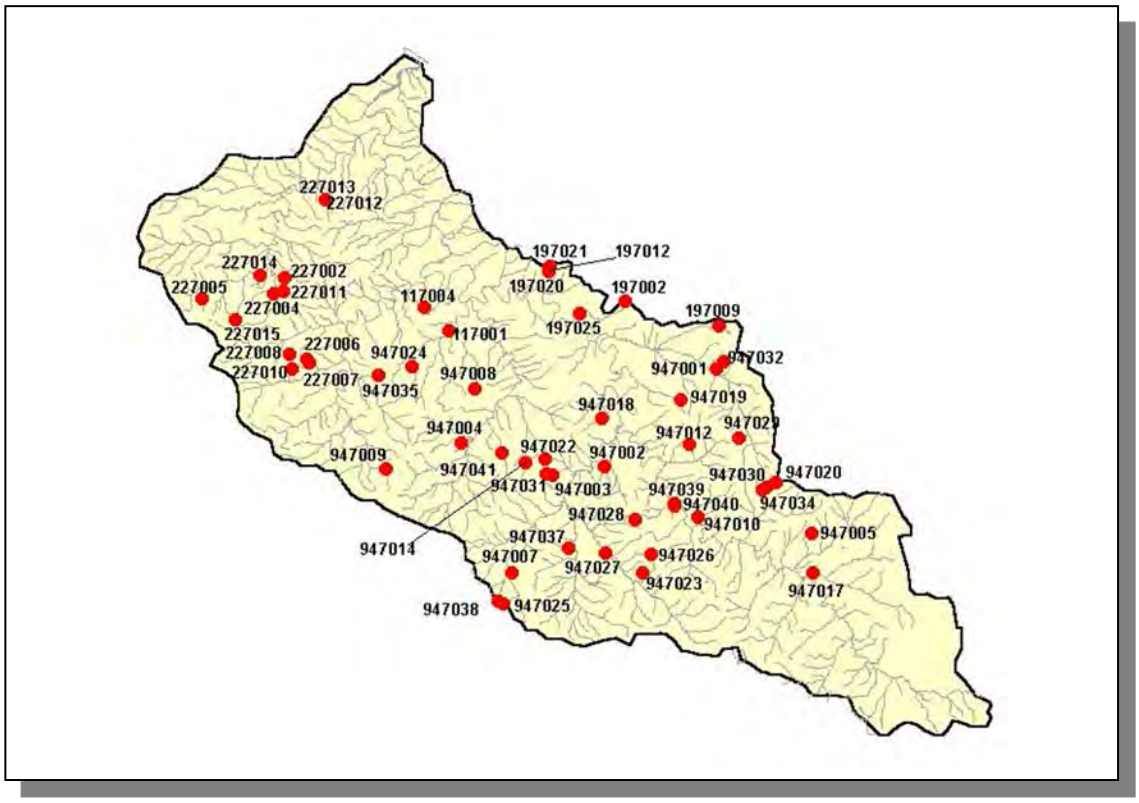


Figure 2-5. Location of Inventoried Dams in the Harpeth River Watershed. *More information is provided in Harpeth-Appendix II.*

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

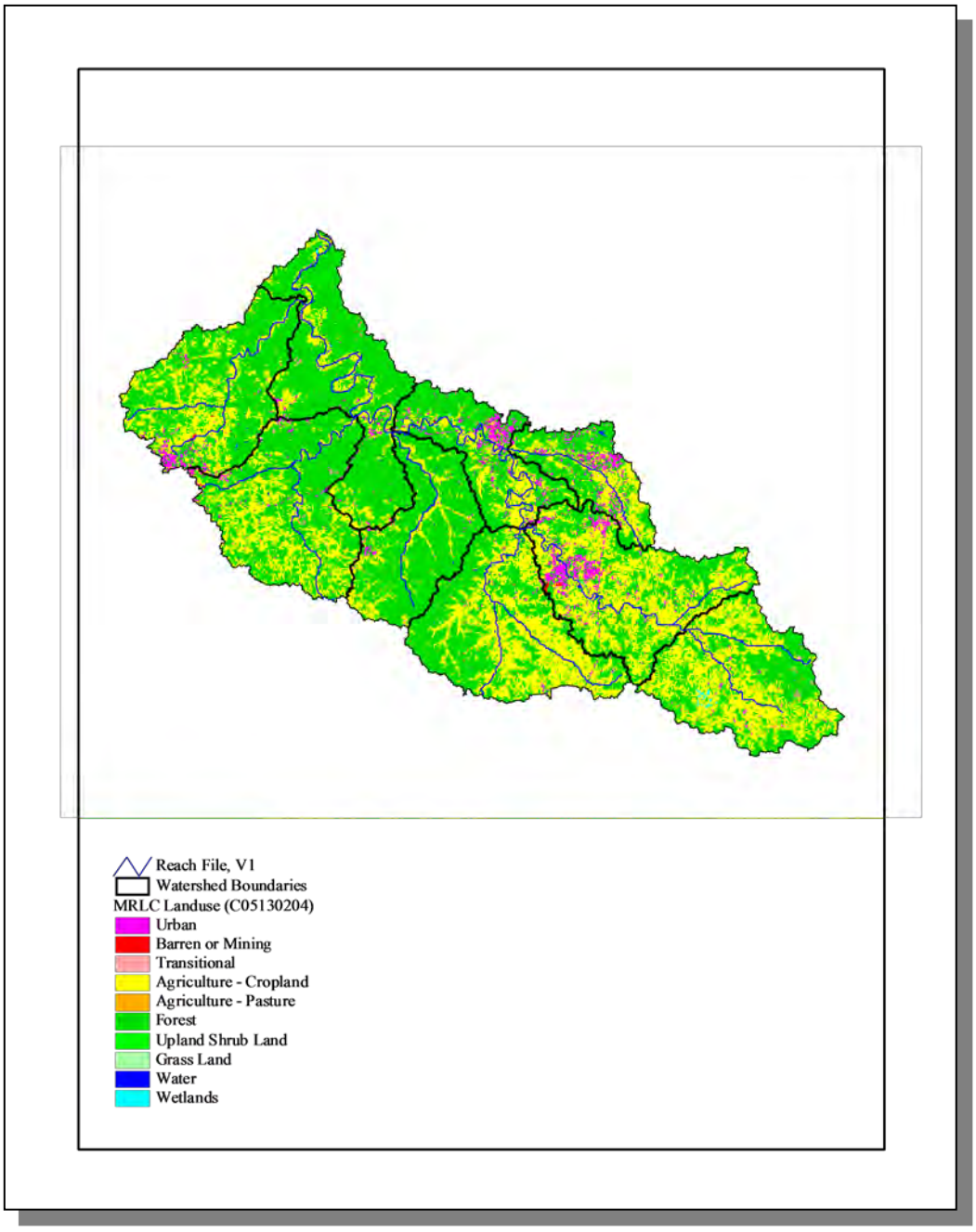


Figure 2-6. Illustration of Select Land Cover/Land Use Data from MRLC Satellite Imagery.

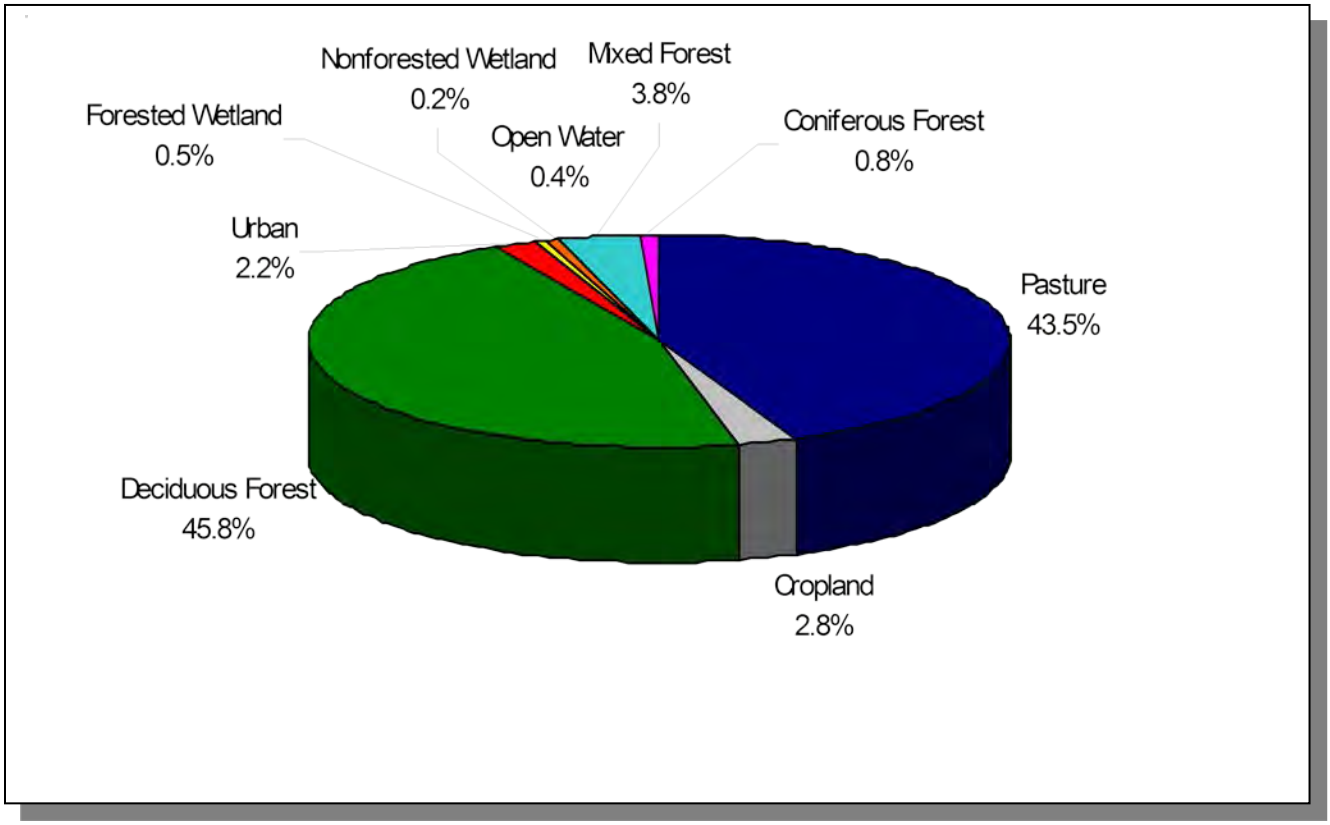


Figure 2-7. Land Use Distribution in the Harpeth River Watershed. *More information is provided in Harpeth-Appendix II.*

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

There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee. The Harpeth River Watershed lies within 1 Level III ecoregion (Interior Plateau) and contains 3 Level IV subecoregions (Griffen, Omernik, Azavedo, 1997):

- Western Highland Rim (71f) is characterized by dissected, rolling terrain of open hills, with elevations of 400 to 1000 feet. The geologic base of Mississippian-age limestone, chert, and shale is covered by soils that tend to be cherty, acidic and low to moderate in fertility. Streams are characterized by coarse chert gravel and sand substrates with areas of bedrock, moderate gradients, and relatively clear water. The oak-hickory natural vegetation was mostly deforested in the mid to late 1800's, in conjunction with the iron ore related mining and smelting of the mineral limonite, but now the region is again heavily forested. Some agriculture occurs on the flatter areas between streams and in the stream and river valleys: mostly hay, pasture, and cattle, with some cultivation of corn and tobacco.

- Outer Nashville Basin (71h) is a more heterogeneous region than the Inner Nashville Basin, with more rolling and hilly topography and slightly higher elevations. The region encompasses most all of the outer areas of the generally non-cherty Ordovician limestone bedrock. The higher hills and knobs are capped by the more cherty Mississippian-age formations, and some Devonian-age Chattanooga shale, remnants of the Highland Rim. The region's limestone rocks and soils are high in phosphorus, and commercial phosphate is mined. Deciduous forests with pasture and cropland are the dominant land covers. Streams are low to moderate gradient, with productive nutrient-rich waters, resulting in algae, rooted vegetation, and occasionally high densities of fish. The Nashville Basin as a whole has a distinctive fish fauna, notable for fish that avoid the region, as well as those that are present.

- Inner Nashville Basin (71i) is less hilly and lower than the Outer Nashville Basin. Outcrops of the Ordovician-age limestone are common, and the generally shallow soils are redder and lower in phosphorus than those of the Outer Basin. Streams are lower gradient than surrounding regions, often flowing over large expanses of limestone bedrock. The most characteristic hardwoods within the Inner Basin are a maple-oak-hickory-ash association. The limestone cedar glades of Tennessee, a unique mixed grassland/forest/cedar glades vegetation type with many endemic species, are located primarily on the limestone of the Inner Nashville Basin. The more xeric, open characteristics and shallow soils of the cedar glades also result in a distinct distribution of amphibian and reptile species.

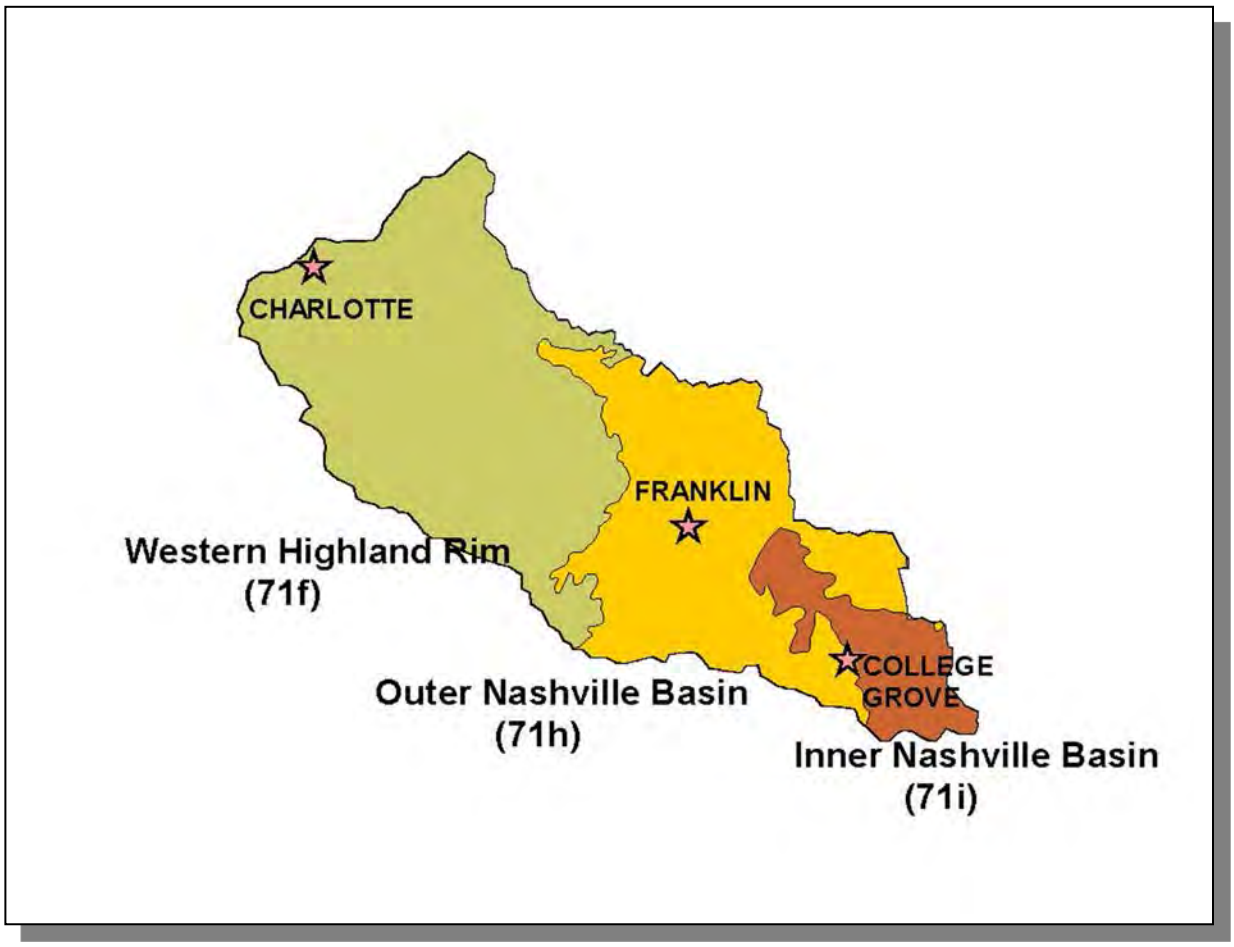


Figure 2-8. Level IV Ecoregions in the Harpeth River Watershed. *Locations of Charlotte, Franklin, and College Grove are shown for reference.*

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

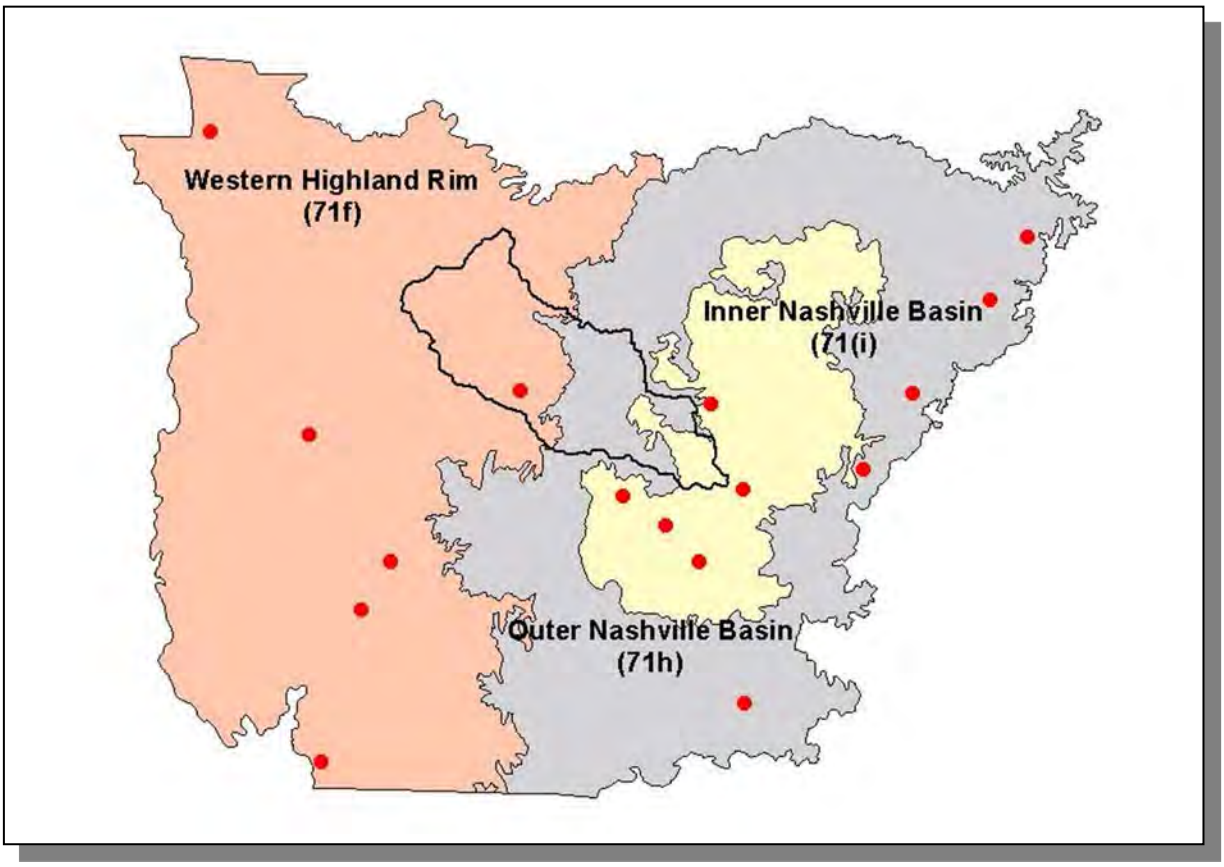


Figure 2-9. Ecoregion Monitoring Sites in Level IV Ecoregions 71f, 71h, and 71i. *The Harpeth River Watershed is shown for reference. More information is provided in Harpeth-Appendix II.*

2.6. NATURAL RESOURCES.

2.6.A. Designated State Natural Areas. The Natural Areas Program was established in 1971 with the passage of the Natural Areas Preservation Act. The Harpeth River Watershed has three Designated State Natural Areas:

Montgomery Bell Designated State Natural Area is an exemplary oak-hickory forest community of the Western Highland Rim (southern red oak-post oak-hickory, and white oak-southern red oak-hickory-tulip poplar).

Radnor Lake Designated State Natural Area is an 1100-acre area featuring an 85-acre lake. The site, one of Tennessee's first official state natural areas, has

some of the highest hills in the Nashville Basin. Radnor Lake is managed by Tennessee State Parks.

Sneed Road Cedar Glade Designated State Natural Area harbors a fairly extensive population of leafy prairie clover (*Dalea foliosa*), a rare plant in Tennessee.

Figure 2-10. There are Three Designated State Natural Areas in the Harpeth River Watershed.

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

GROUPING	NUMBER OF RARE SPECIES
Crustaceans	1
Insects	1
Mussels	3
Snails	2
Amphibians	1
Birds	6
Fish	3
Mammals	3
Reptiles	1
Plants	28
Total	**49**

Table 2-3. There are 49 Documented Rare Plant and Animal Species in the Harpeth River Watershed. Additional rare plant and animal species may be present.

Additionally, in the Harpeth River Watershed, there are three rare fish species, three rare snail species, two rare mussel species, and one rare crustacean species.

SCIENTIFIC NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS
Etheostoma microlepidum	Finescale darter		D
Etheostoma tippecanoe	Tippecanoe darter		D
Percina phoxocephala	Slenderhead darter		D
Lithasia duttoniana	Helmet rocksnail		
Lithasia geniculata	Ornate rocksnail		
Lithasia geniculata fulginosa	Geniculate river snail		
Dromas dromas	Dromedary pearlymussel	E	E
Epioblasma florentina walkeri	Tan riffleshell	E	E
Cambarus brachydactylus	Crayfish		

Table 2-4. Rare Aquatic Species in the Harpeth River Watershed. *Federal Status: E, Listed Endangered by the U.S. Fish and Wildlife Service. State Status: E, Listed Endangered by the Tennessee Wildlife Resources Agency; D, Deemed in Need of Management by the Tennessee Wildlife Resources Agency.*

2.6.C. Wetlands. The Division of Natural Heritage maintains a database of wetland records in Tennessee. These records are a compilation of field data from wetland sites inventoried by various state and federal agencies. Maintaining this database is part of Tennessee's Wetland Strategy, which is described at http://www.state.tn.us/environment/epo/wetlands/strategy.zip.

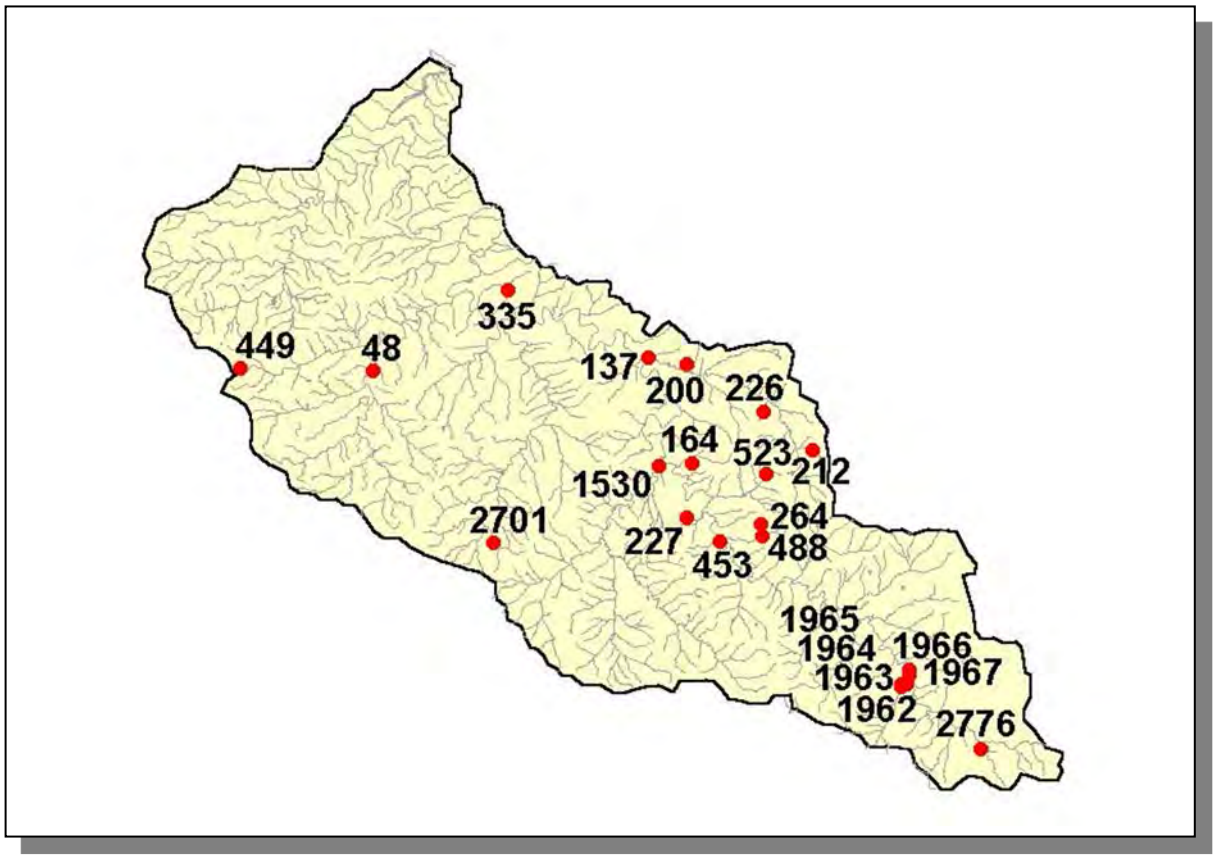


Figure 2-11. Location of Wetland Sites in TDEC Division of Natural Heritage Database in Harpeth River Watershed. *There may be additional wetland sites in the watershed. More information is provided in Harpeth-Appendix II.*

2.7. CULTURAL RESOURCES.

2.7.A. State Scenic River. A portion of the Harpeth River has been designated by the Legislature as a State Scenic River. Only the portion of the Harpeth River in Davidson County is designated: The segment from Interstate 40 downstream to the Davidson-Cheatham County line (6.0 miles) is designated Class II, and the segment from State Highway 100 downstream to Interstate 40 (8.5 miles) is designated Class III. The Tennessee Scenic Rivers Act of 1968 defines Class II as pastoral river areas and Class III as partially developed river areas.

Figure 2-12. A Portion of the Harpeth River in Davidson County (From Highway 100 to the Davidson/Cheatham County Line) is Designated as a State Scenic River*. Locations of Charlotte, Franklin, and College Grove are shown for reference.*

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

The most recent version of the Nationwide Rivers Inventory lists portions of four streams in the Harpeth River Watershed:

Big Turnbull Creek. Clear, small and very scenic forested stream with a forty-foot waterfall and numerous bluffs.

Harpeth River. Rich in history and of archeological significance; evidence of aboriginal towns; extraordinary tunnel at the Narrows; impressive carved bluffs, including Paint Rock which is adorned with petroglyphs.

Jones Creek. Narrow stream with frequent gravel bars; winds through picturesque valley; high, carved limestone bluffs.

South Harpeth River. High bluffs with extensive adjacent forested areas.

RIVER	SCENIC	RECREATION	GEOLOGIC	FISH	WILDLIFE	HISTORIC	CULTURAL
Big Turnbull Creek	X	X	X	X	X		
Harpeth River	X	X	X	X	X	X	X
Jones Creek	X	X	X	X	X		
South Harpeth River	X	X	X	X	X		

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

Additional information may be found online at http://www.ncrc.nps.gov/rtca/nri/tn.htm

2.7.C. Greenways. Several efforts are underway in Williamson County to develop a greenway system that would include sections along the Harpeth River. Bellevue (in Davidson County) already has a one-mile greenway complete along the Harpeth River.

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

- Hidden Lake, a mid 19th century quarry, later converted to a resort
- Montgomery Bell State Park, a 4500 acre state resort park
- Mound Bottom State Archaeological Area, the remains of a 13th century Native American village
- Newsom's Mill State Historic Area, an early 19th century grist mill
- Narrows of the Harpeth State Historic Area, the site of an early 19th century water tunnel that powered a mill
- Natchez Trace Parkway, a linear National Park interpreting the historic Natchez Trace

In addition, many local interpretive areas are common, most notably, Bowie Park in Fairview and Warner Park in Nashville.

2.7.E. Wildlife Management Area. The Tennessee Wildlife Resources Agency manages the 20,810-acre Cheatham Wildlife Management Area near Ashland City.

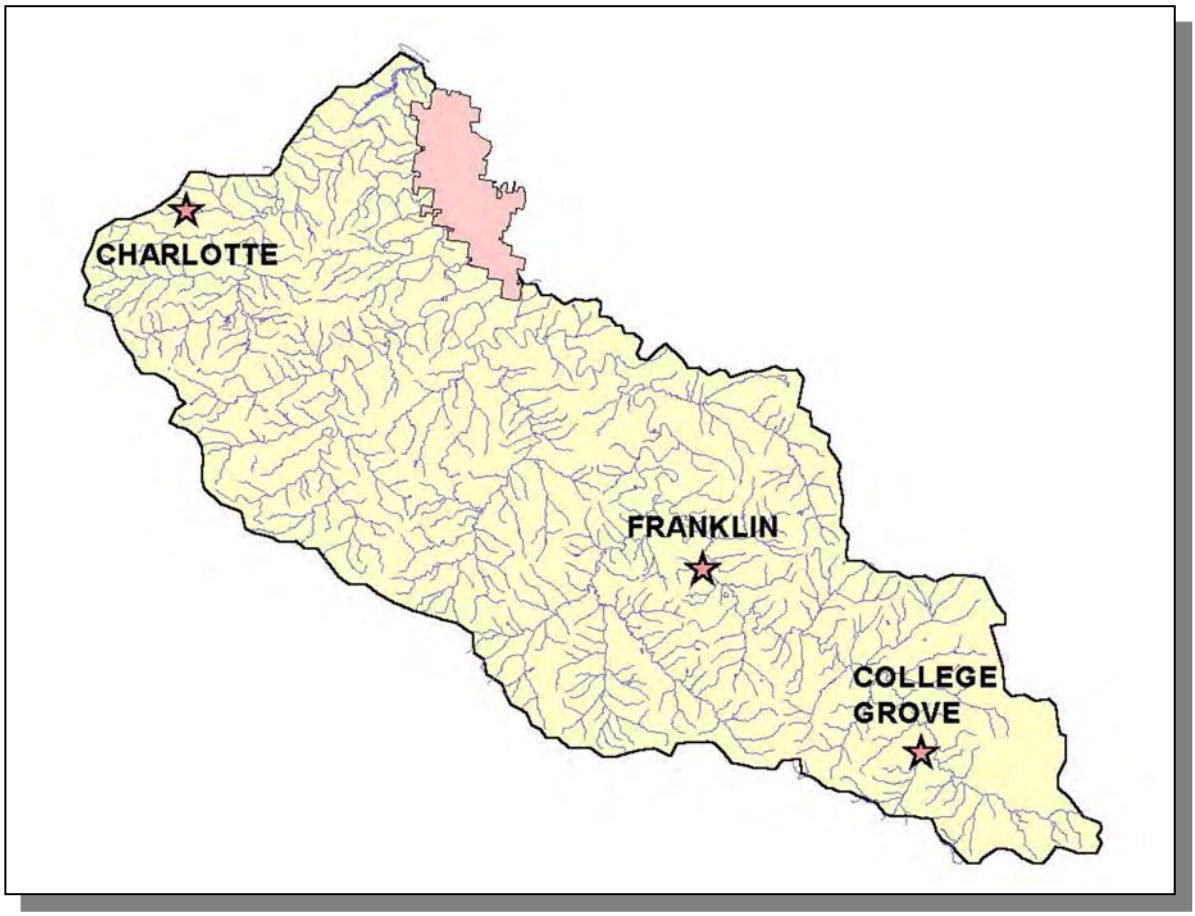


Figure 2-13. TWRA Manages Cheatham Wildlife Management Area in the Harpeth River Watershed. *Locations of Charlotte, Franklin and College Grove are shown for reference.*

2.8. TENNESSEE RIVERS ASSESSMENT PROJECT.

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

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

STREAM	NSQ	RB	RF	STREAM	NSQ	RB	RF
Arrington Creek	2			Little Harpeth River	2		
Beaverdam Creek	2	3		Little Jones Creek	2		
Brush Creek	2		2	Nails Creek	2		
East Fork Creek	3			Otter Creek	3		
Flatrock Branch Creek	2	3		South Harpeth Creek	3	3	
Harpeth River	1,2	1,2		Sulphur Fork Creek	3		
Jones Creek	2	2,3	1,2	Town Branch Jones Creek	2		
Leatherwood Creek	2			Turnbull Creek	1,2	3	
Leipers Fork							
West Harpeth River	2			West Harpeth River	2	2,3	

Table 2-6. Stream Scoring from the Tennessee Rivers Assessment Project.

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

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

CHAPTER 3

WATER QUALITY ASSESSMENT OF THE HARPETH 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, following one to two years of data collection. More information about the Watershed Approach may be found at http://www.state.tn.us/environment/wpc/wshed1.htm.

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 2000 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/OW/resources/9698/tn.html

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

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

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

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

3.2 DATA COLLECTION. Comprehensive water quality monitoring in the Harpeth River Watershed was conducted in 1997 and 1998. Data were collected from 98 sites and were from one of four types: 1)Ambient sites, 2)Ecoregion sites, 3)Watershed sites or 4)Aquatic Resources Alteration Permit (ARAP) inspection sites.

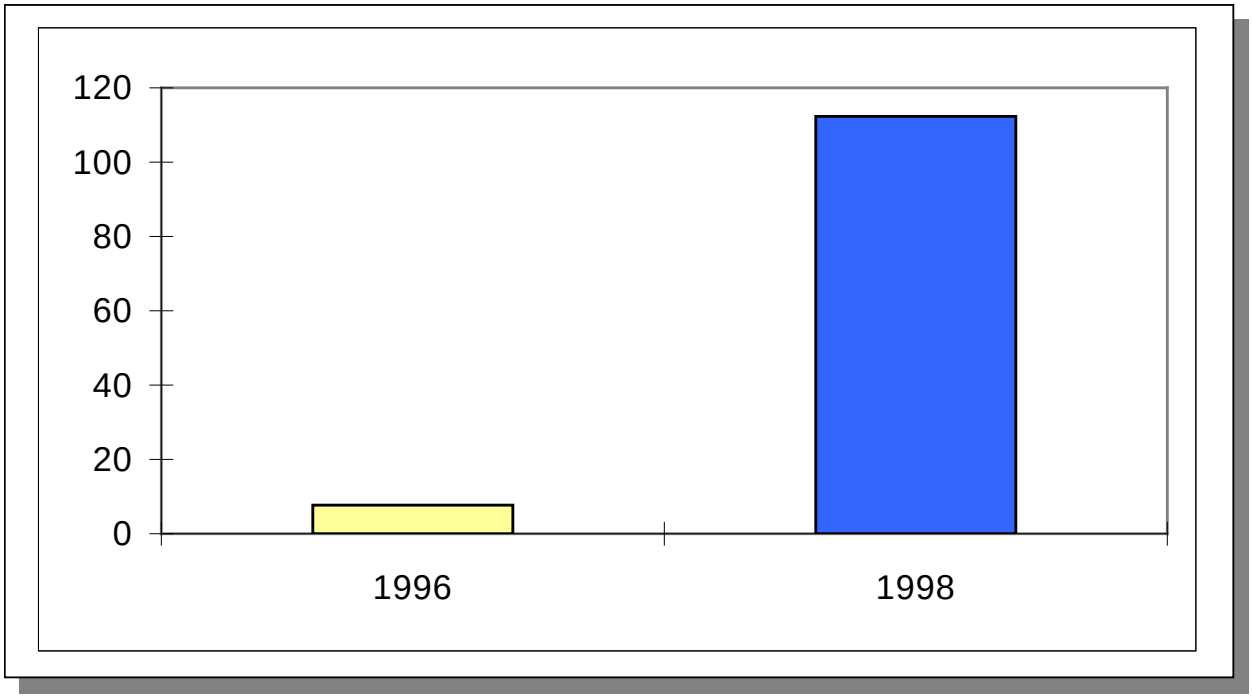


Figure 3-1. Number of Sampling Events Using the Traditional Approach (1996) and Watershed Approach (1998) in the Harpeth River Watershed.

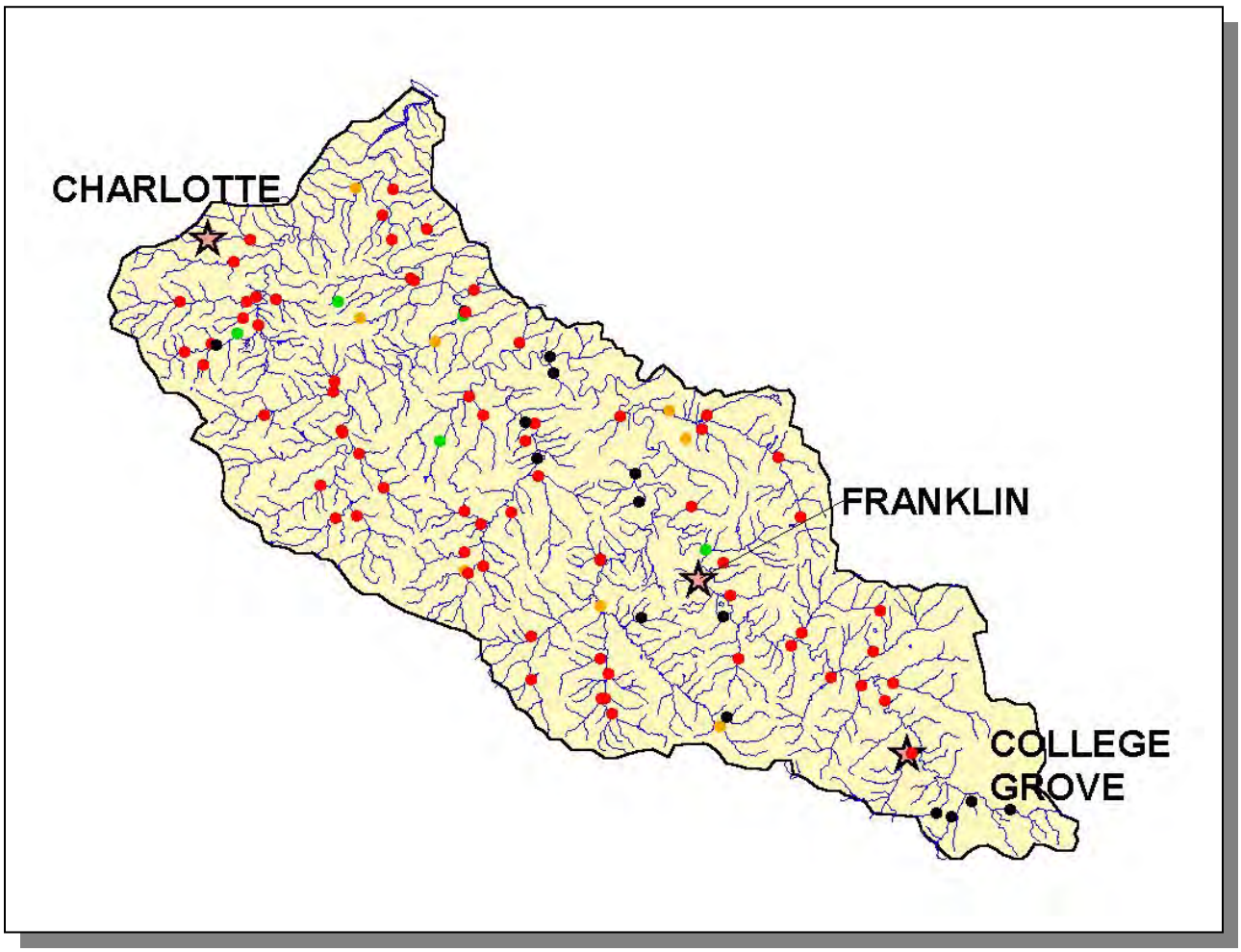


Figure 3-2. Location of Monitoring Sites in the Harpeth River Watershed. *Red, Watershed Monitoring Sites; Black, Observational Data Sites; Orange, Rapid Bioassessment Sites; Green, Ambient Monitoring Sites. Locations of Charlotte, Franklin, and College Grove are shown for reference.*

TYPE	NUMBER	TOTAL NUMBER OF SAMPLING EVENTS		
		CHEMICAL ONLY	BIOLOGICAL ONLY	BIOLOGICAL PLUS CHEMICAL (FIELD PARAMETERS)
Ambient	5	14		
Ecoregion	1	3		3
Watershed	88		9	79
ARAP Site Inspections	4		3	1
Totals	**98**	**17**	**12**	**83**

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

In addition to the 112 sampling events, over 60 citizen complaints, 3 occurrences involving dead fish (fish kills) and 5 responses to toxic spills were investigated.

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

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

3.2.B. Ecoregion Sites. Ecoregions are relatively homogeneous areas of similar geography, topography, climate and soils that support similar plants and animals. The delineation phase of the Tennessee Ecoregion Project was completed in 1997 when the ecoregions and subecoregions were mapped and summarized (EPA/600/R-97/022). There are eight Level III Ecoregions and twenty-five Level IV subecoregions in Tennessee (see Chapter 2 for more details). The Harpeth River Watershed lies within 1 Level III ecoregion (Interior Plateau) and contains 3 subecoregions (Level IV):

- Western Highland Rim (71f)
- Outer Nashville Basin (71h)
- Inner Nashville Basin (71i)

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

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

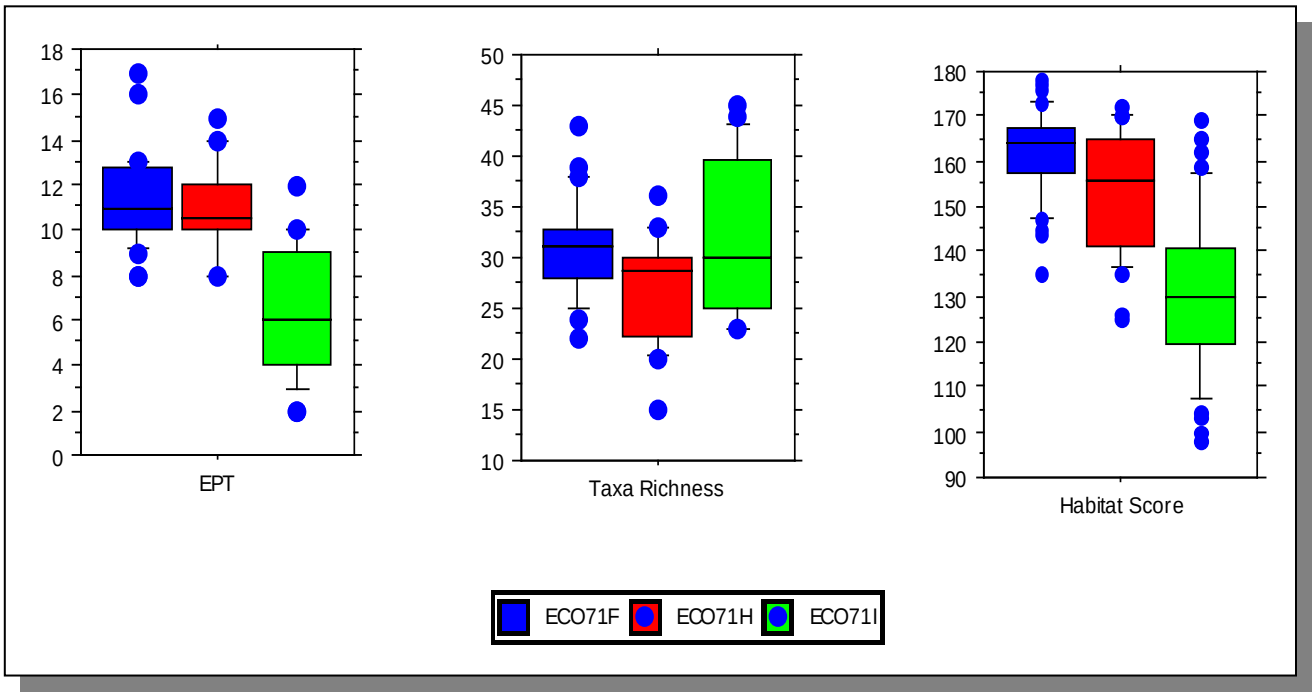


Figure 3-3. Benthic Macroinvertebrate and Habitat Scores for Harpeth River Ecoregion RBP III Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots. EPT and Taxa scores are number of genus observed; habitat score is calculated as described in EPA 841-D-97-002*

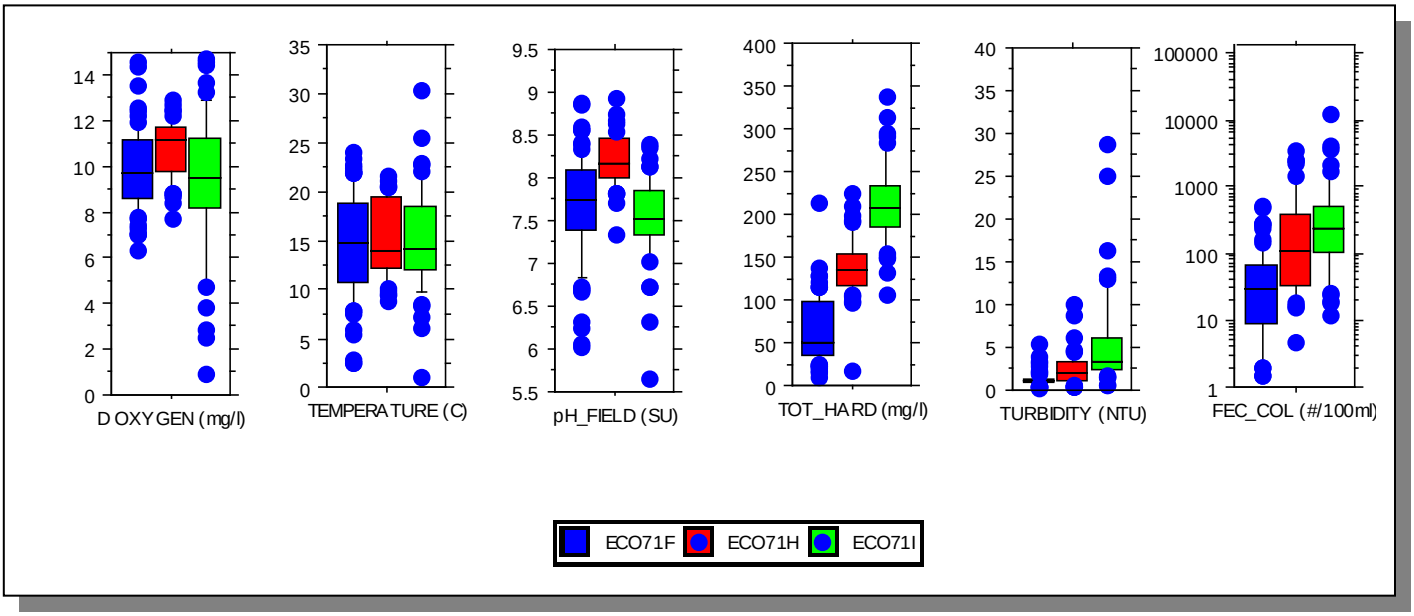


Figure 3-4. Select Chemical Data Collected in Harpeth River Watershed Ecoregion Sites. *Boxes and bars illustrate 10th, 25th, median, 75th, and 90th percentiles. Extreme values are also shown as dots.*

3.2.C. Watershed Sites. Activities that take place at watershed sites are benthic macroinvertebrate biological 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-11 maps (every HUC-11 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 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 include:

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

These special surveys are performed when needed.

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

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

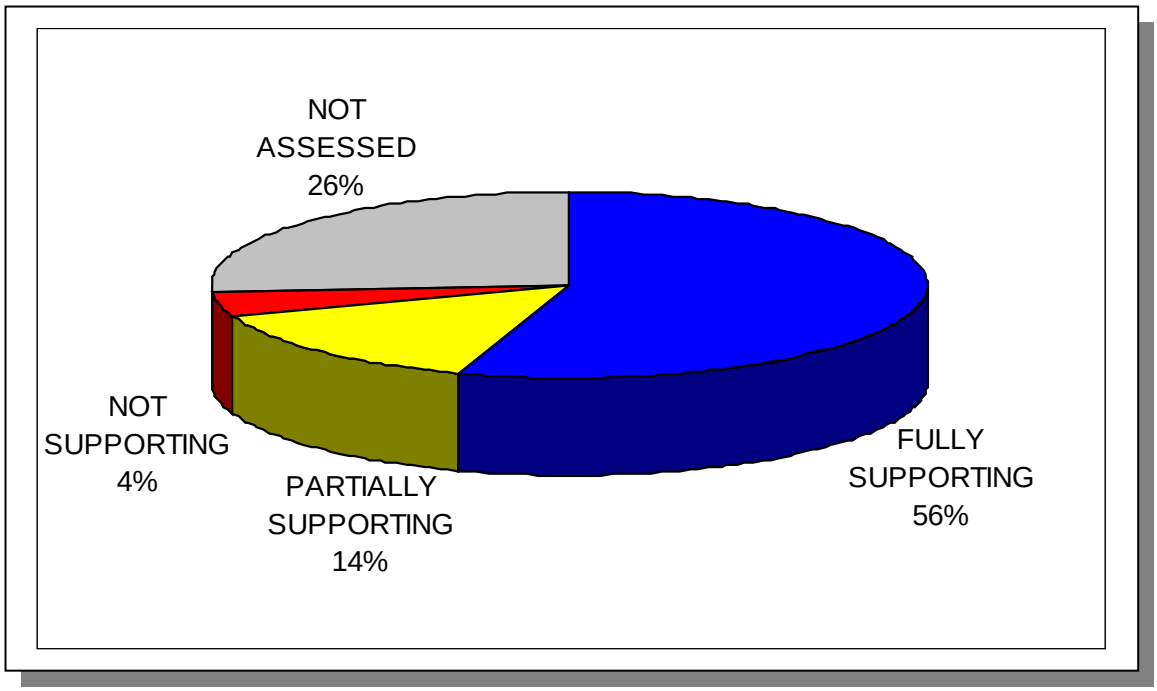


Figure 3-5. Water Quality Assessment for Streams and Rivers in the Harpeth River Watershed. *Assessment data (stream miles) are based on the 2000 Water Quality Assessment.*

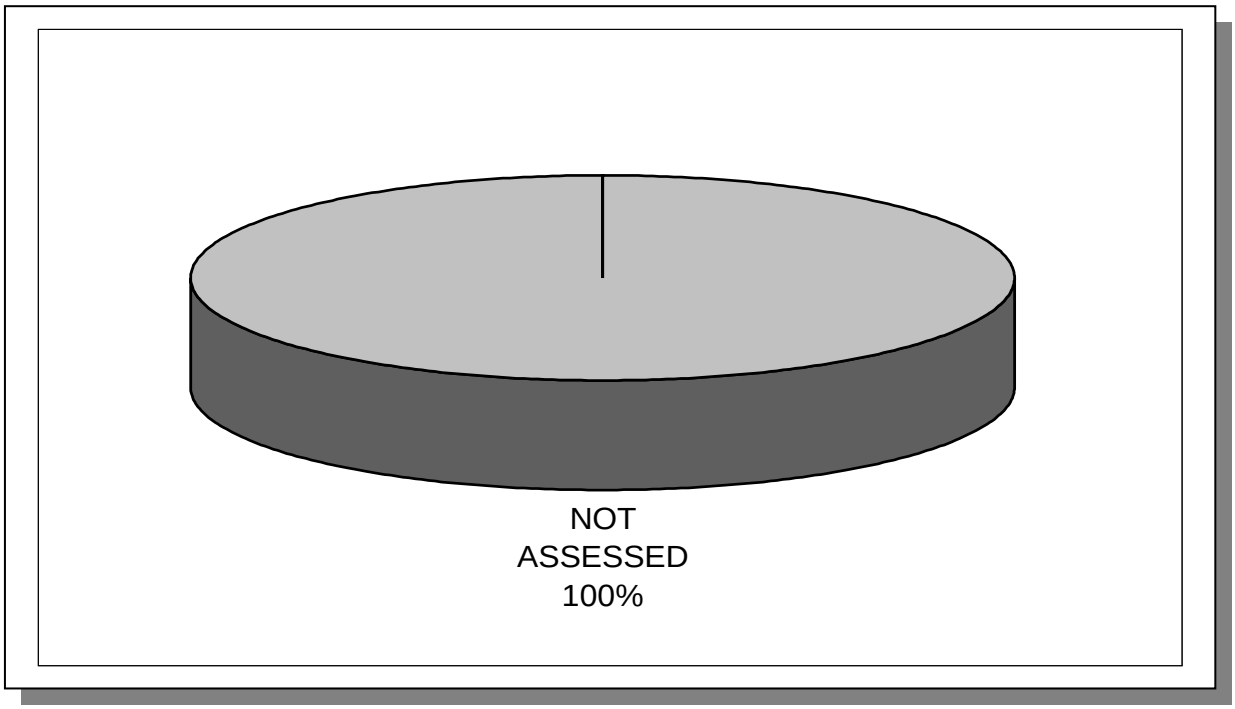


Figure 3-6. Water Quality Assessment for Lakes in the Harpeth River Watershed. *Assessment data (stream miles) are based on the 2000 Water Quality Assessment. More information is provided in Harpeth-Appendix III.*

3.3.A. Assessment Summary.

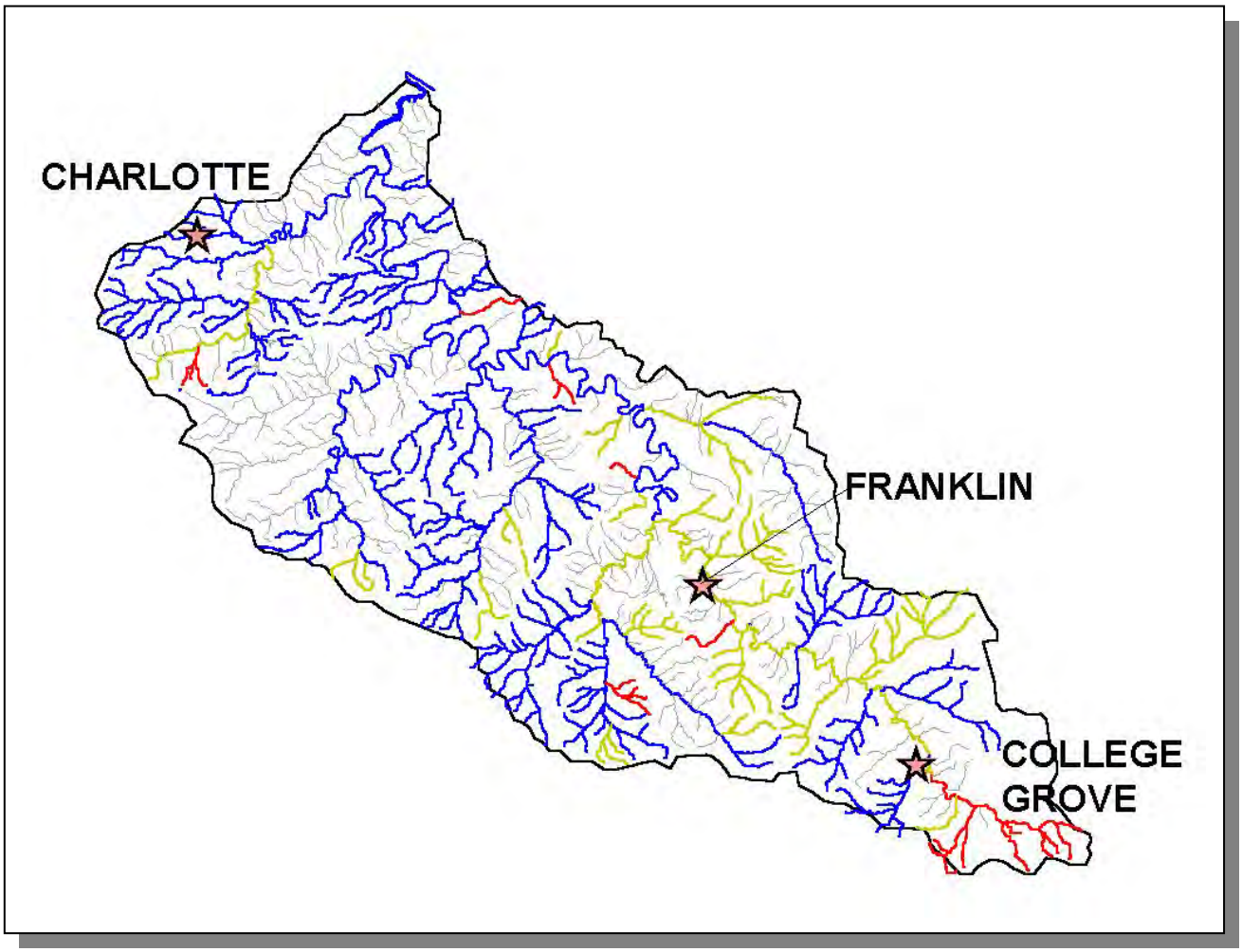


Figure 3-7a. Overall Use Support Attainment in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards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

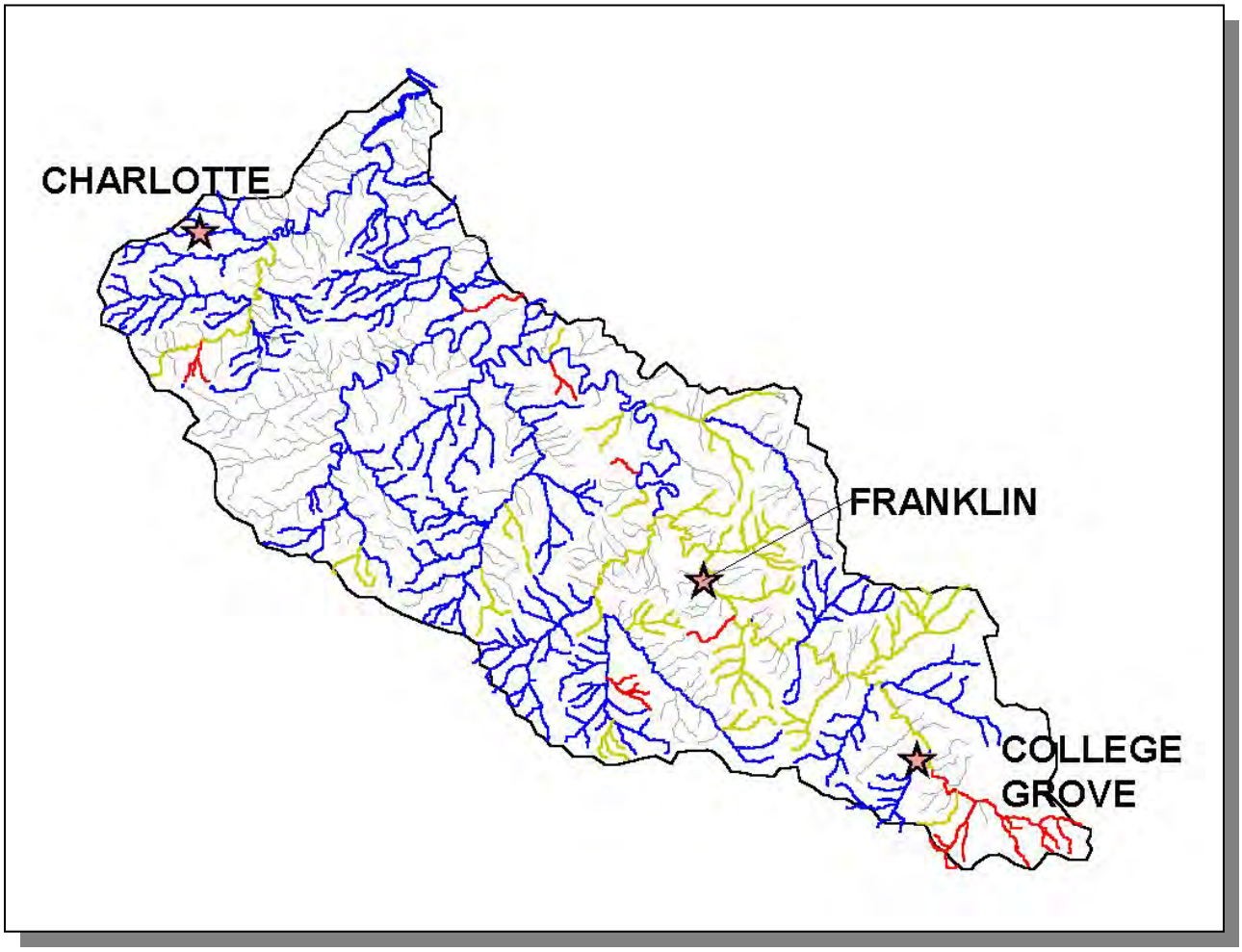


Figure 3-7b. Fish and Aquatic Life Use Support Attainment in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Gray, Not Assessed. Water Quality Standards are described at* http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm*. Charlotte, Franklin, and College Grove are shown for reference.*

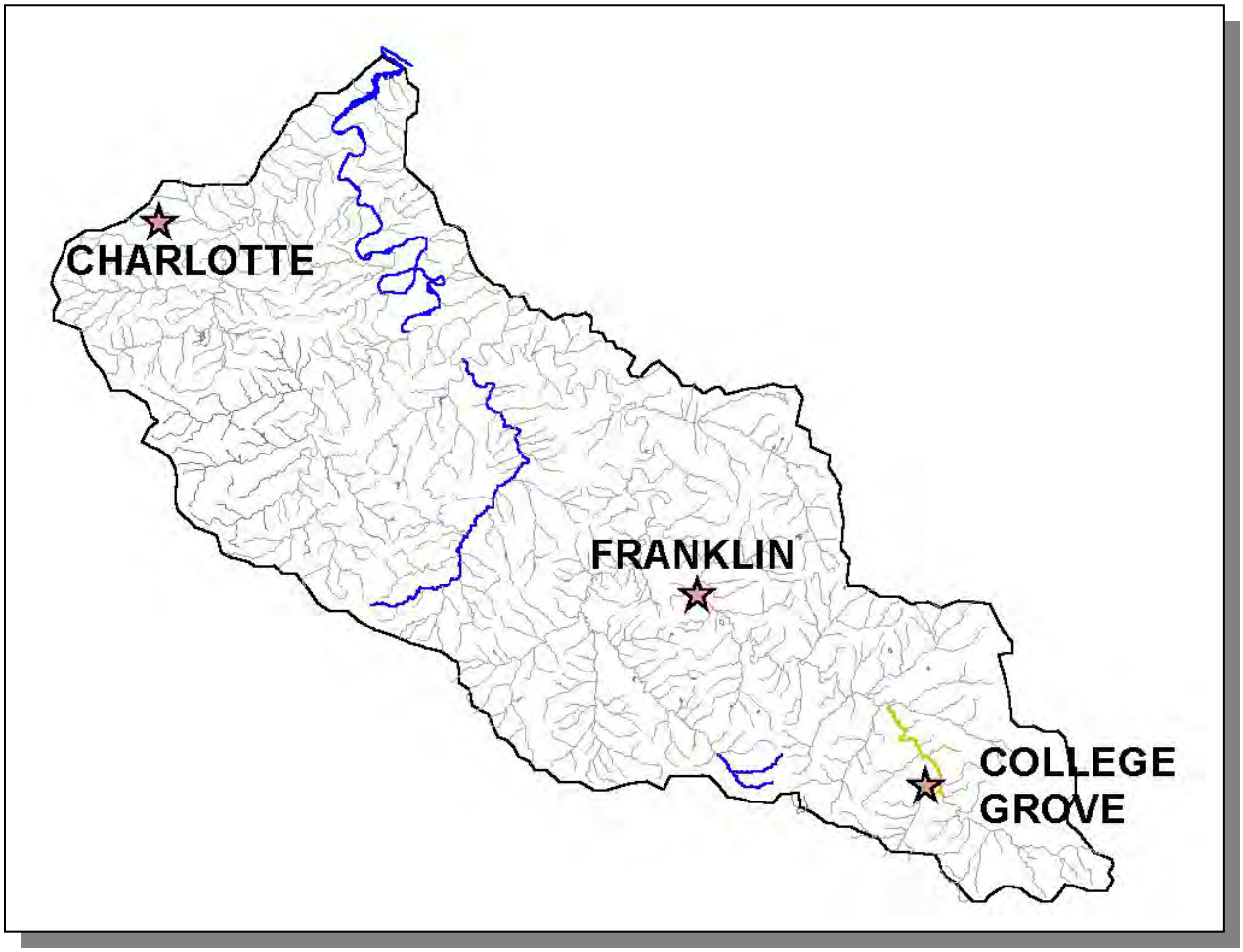


Figure 3-7c. Recreation Use Support Attainment in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Yellow, Partially Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at* http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm*. Charlotte, Franklin, and College Grove are shown for reference.*

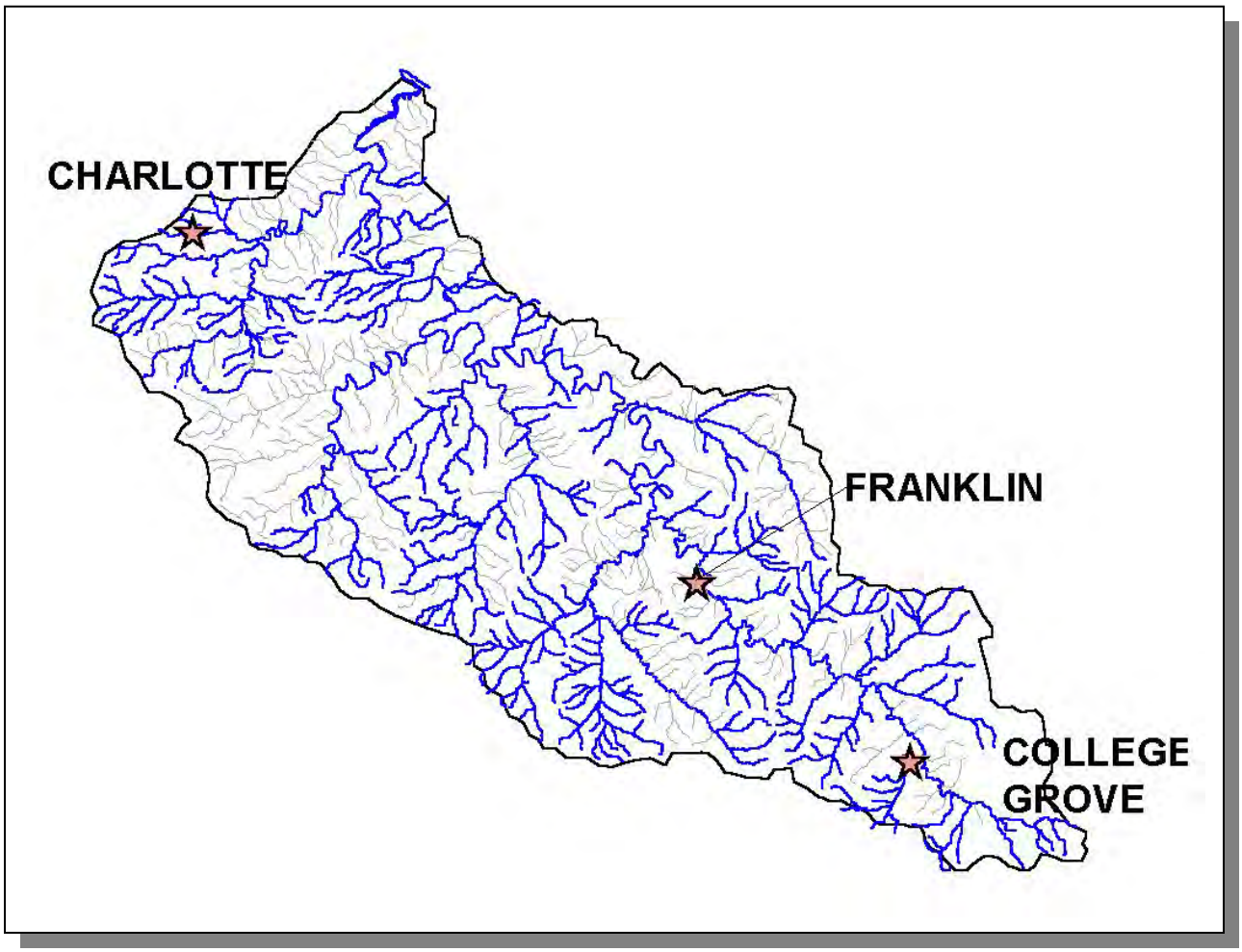


Figure 3-7d. Irrigation Use Support Attainment in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at* http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm*. Charlotte, Franklin, and College Grove are shown for reference.*

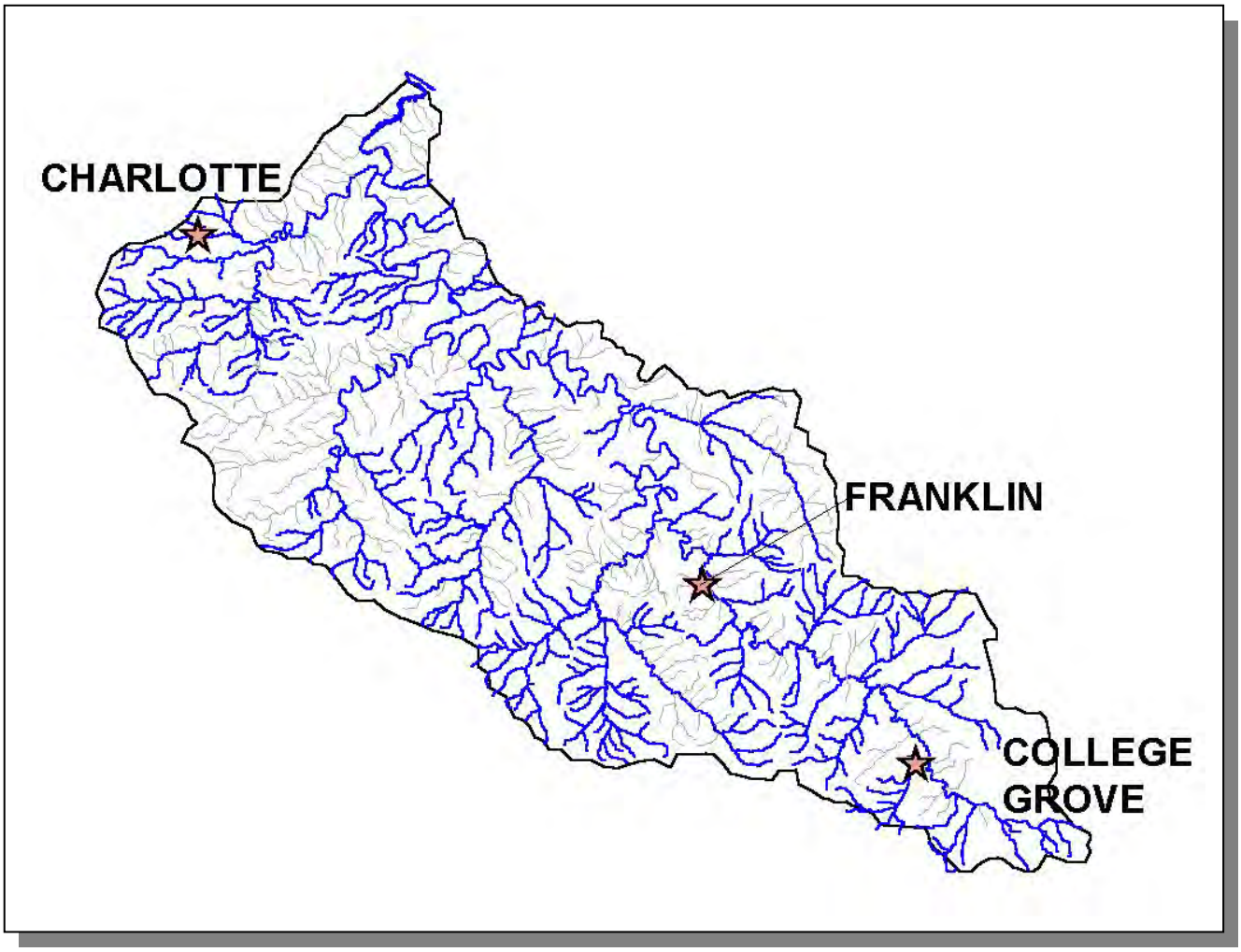


Figure 3-7e. Livestock Watering and Wildlife Use Support Attainment in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Blue, Fully Supports Designated Use; Gray, Not Assessed. Water Quality Standards are described at* http://www.state.tn.us/sos/rules/1200/1200-04/1200-04.htm*. Charlotte, Franklin, and College Grove are shown for reference.*

3.3.B. Use Impairment Summary.

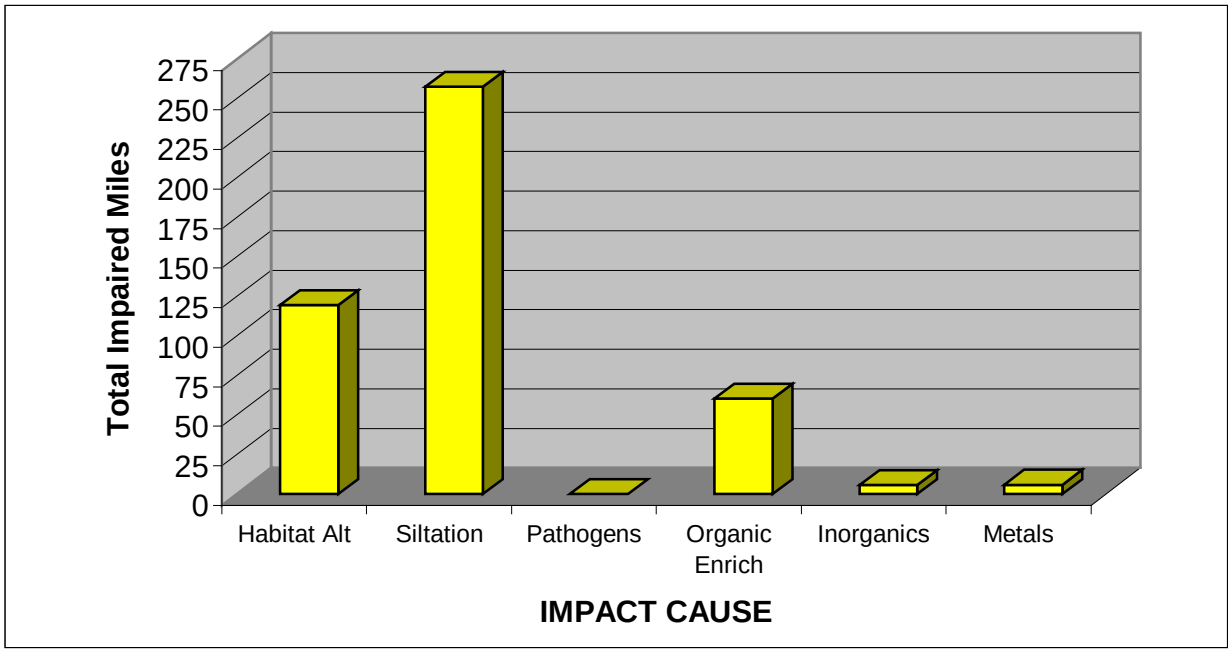


Figure 3-8. Total Impacted Miles by Cause in the Harpeth River Watershed. *Data are based on Year 2000 Water Quality Assessment.*

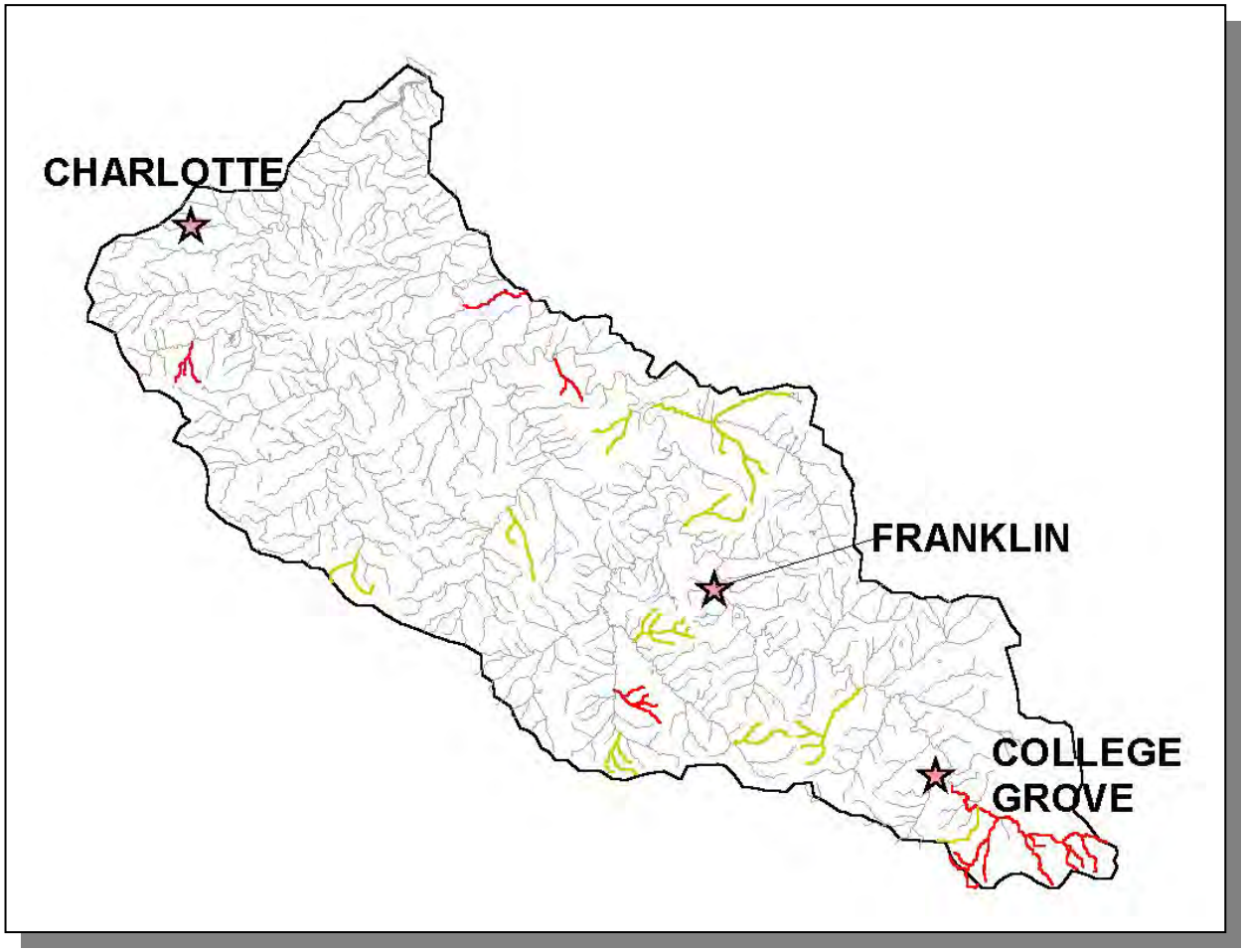


Figure 3-9a. Impaired Streams Due to Habitat Alteration in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment.; Yellow, Partially Supports designated Use; Red, Does Not Support Designated Use; Charlotte, Franklin, and College Grove are shown for reference. More information is provided in Harpeth-Appendix III.*

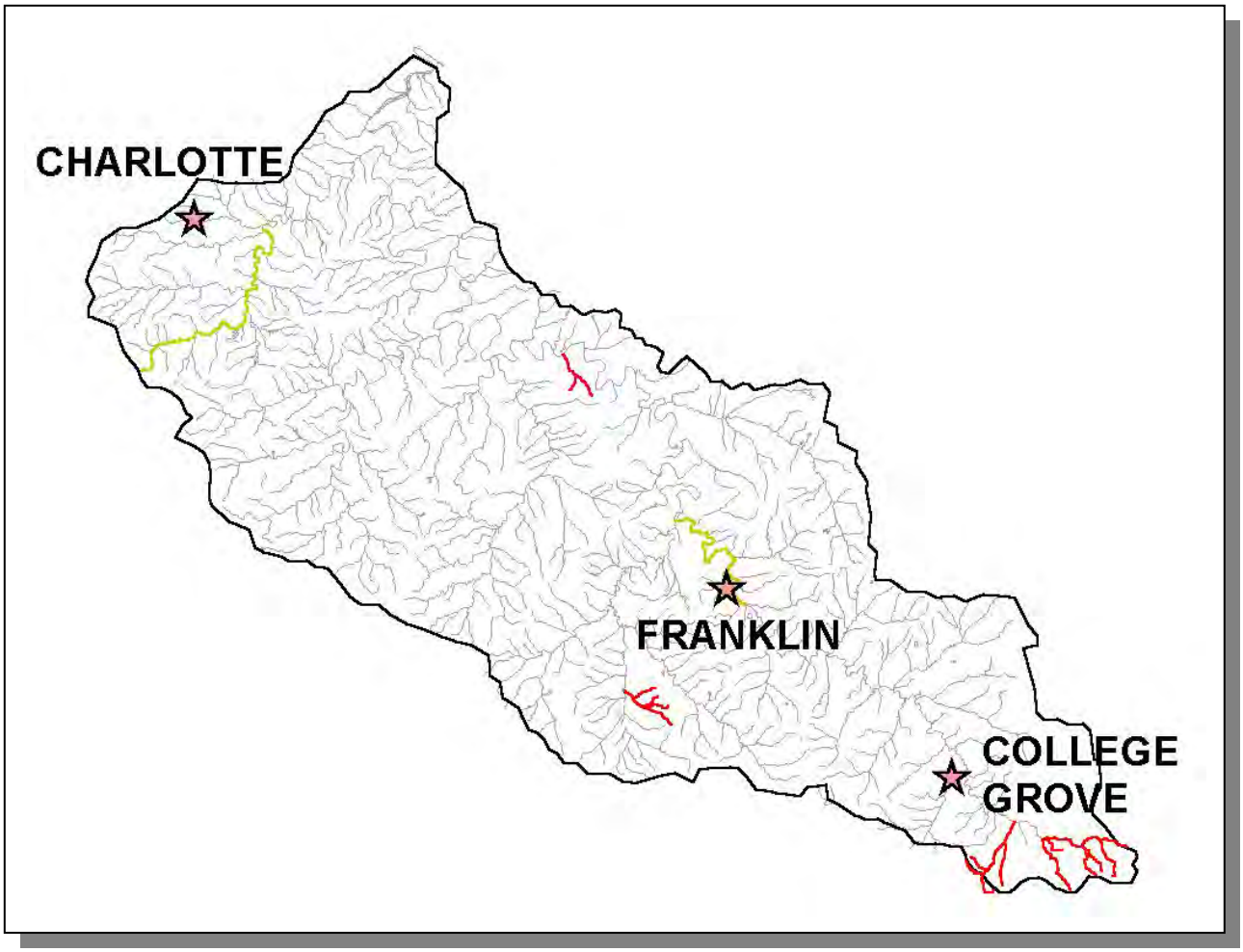


Figure 3-9b. Impaired Streams Due to Organic Enrichment/Low Dissolved Oxygen Levels in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports designated Use; Red, Does Not Support Designated Use; Charlotte, Franklin, and College Grove are shown for reference. More information is provided in Harpeth-Appendix III.*

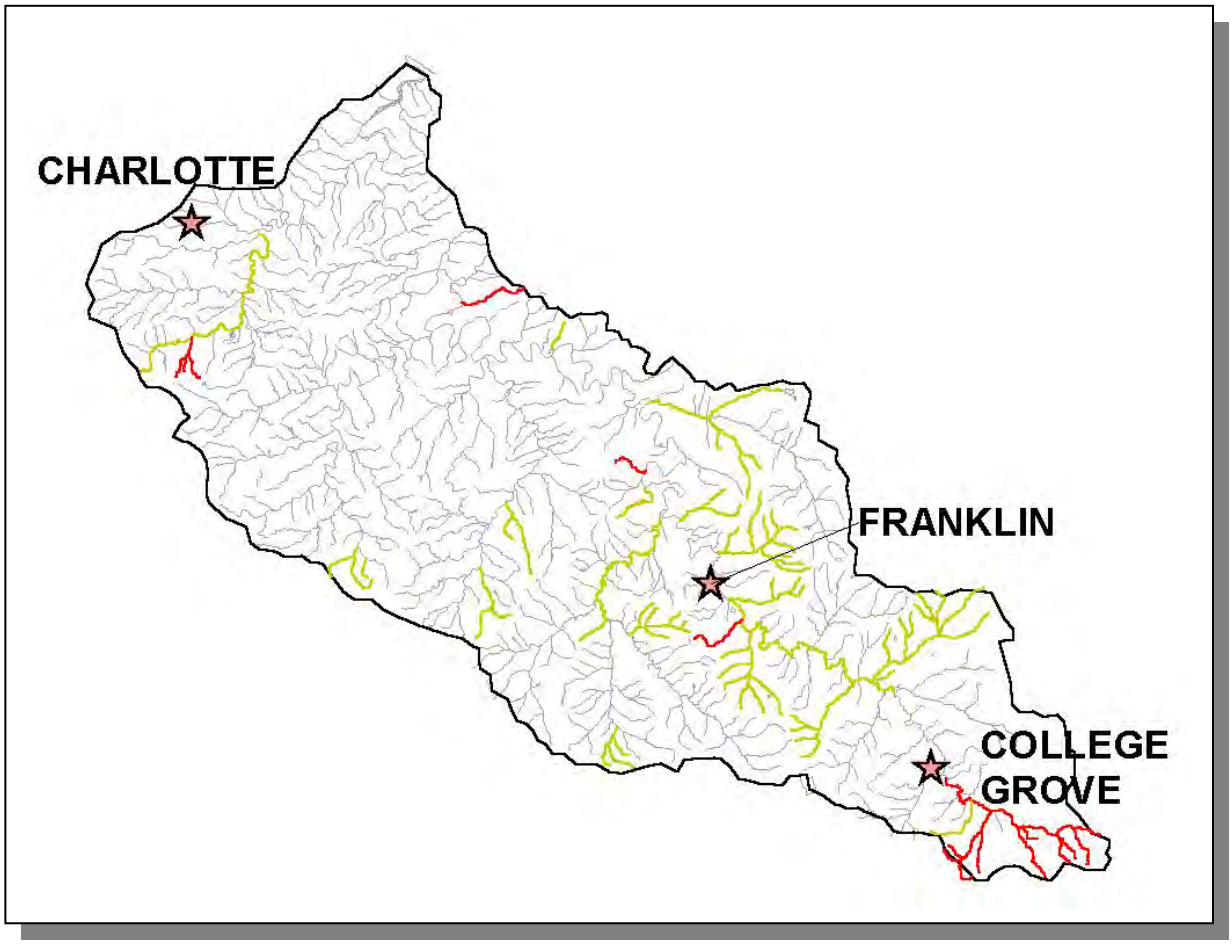


Figure 3-9c. Impaired Streams Due to Siltation in the Harpeth River Watershed. *Assessment data are based on the 2000 Water Quality Assessment. Yellow, Partially Supports Designated Use; Red, Does Not Support Designated Use; Charlotte, Franklin, and College Grove are shown for reference. More information is provided in Harpeth-Appendix III.*

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

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

meaningful comparison will be between assessments conducted in Year 3 of each succeeding five-year cycle.

3.4. FLUVIAL GEOMORPHOLOGY. Stream width, depth, and cross-sectional dimensions at bankful discharge are key parameters used in characterizing the shape and stability of rivers. Characterization of streams using the fluvial geomorphic stream classification system, which allows prediction of stream stability and physical evolution, is a valuable management tool (Rosgen, 1996).

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

There are several benefits to using regional curves:

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

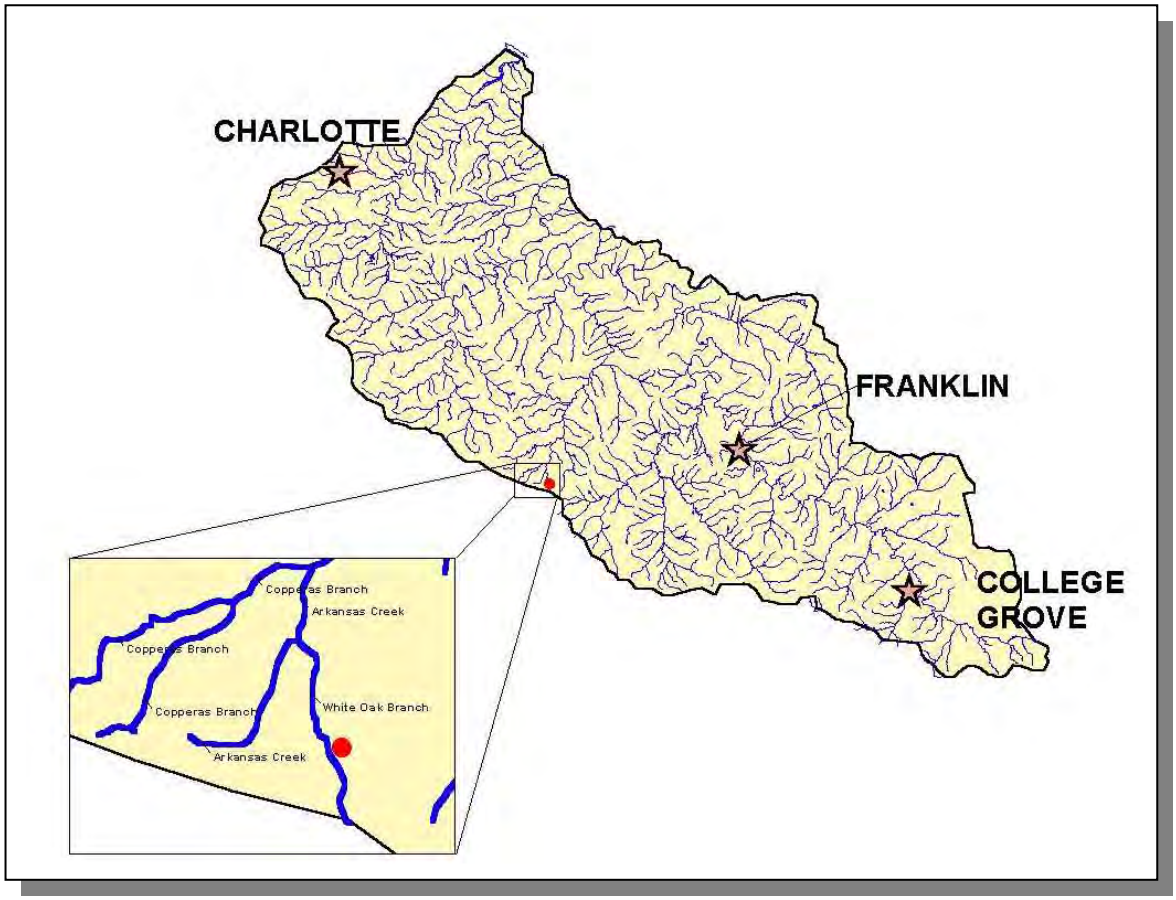


Figure 3-10. Sampling Site in the South Harpeth River for Construction of Fluvial Regional Curve. *Sampling site is at Pewit Road upstream of Kelly Creek (35° 52' 70" N, 87° 05' 39" W). The site was determined to be C4 (sinuous with moderate to high width/depth ratio and gravel bottom) according to the fluvial geomorphic stream classification system (Rosgen, 1996). Charlotte, Franklin and College Grove are shown for reference.*

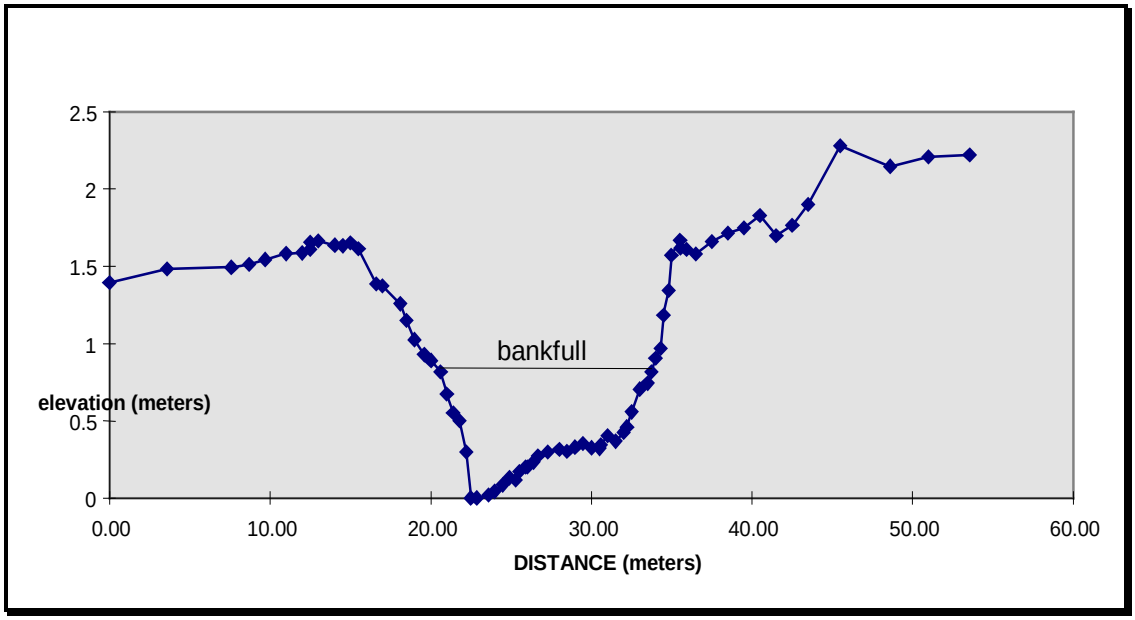
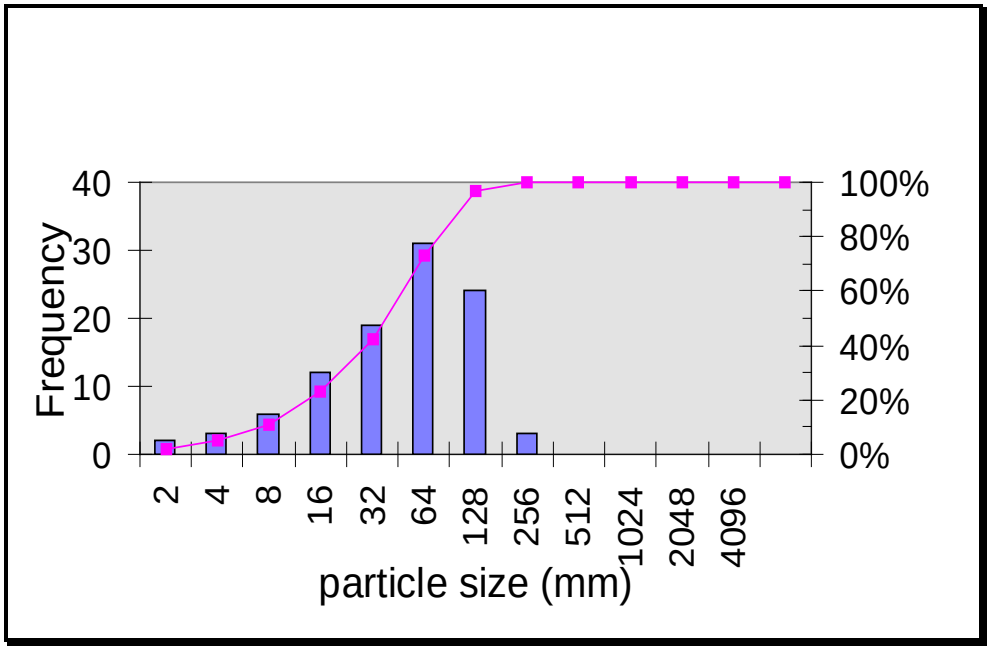


Figure 3-11a. Cross-sectional Data for South Harpeth River Fluvial Site. *Data are from survey of 2/10/98.*

Figure 3-11b. Particle Count Histogram and Cumulative Frequency Plot for South Harpeth



River Fluvial Site. *D_{50} = 32 mm. Data are from survey of 2/10/98.*

Ultimately, a regional curve will be created that illustrates the relationship between bankful width and drainage area.

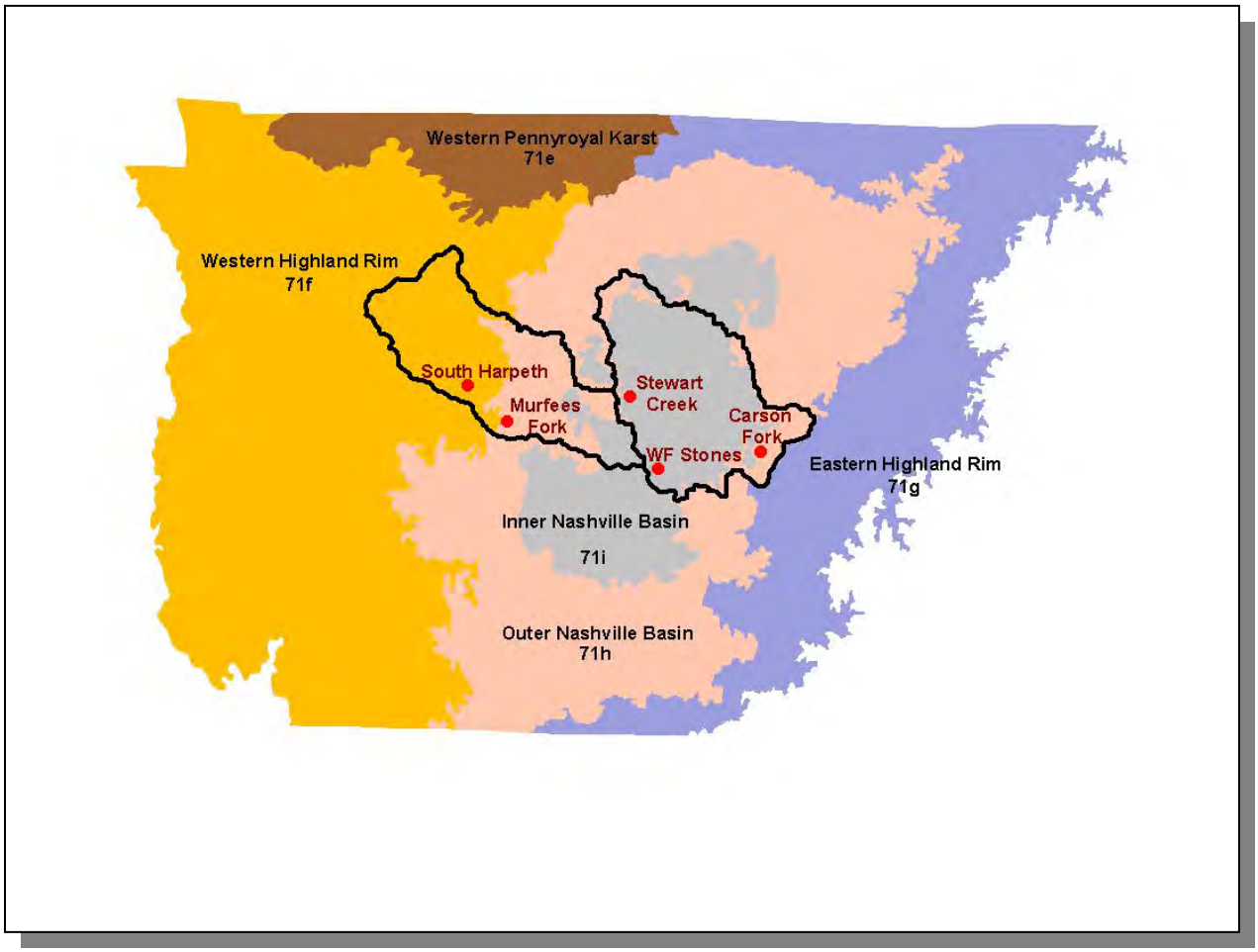


Figure 3-12. Particle Count Sampling Sites in Ecoregion 71. *Harpeth and Stones River Watershed boundaries are shown for reference.*

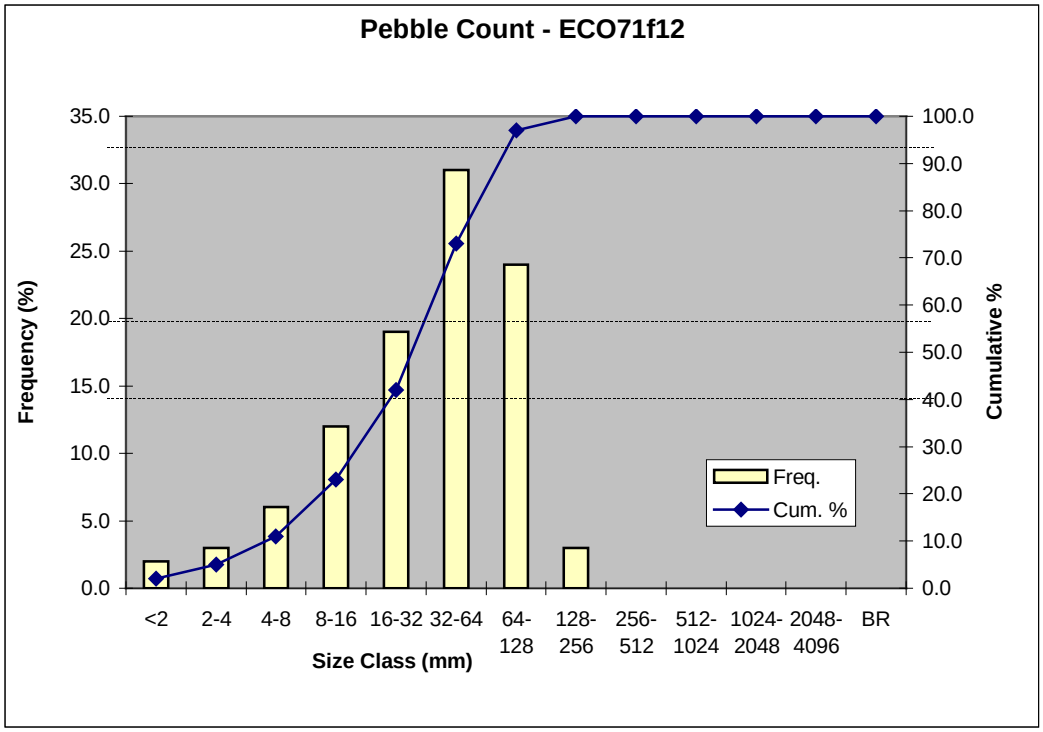


Figure 3-13a. Particle Count Histogram and Cummulative Frequencey Plot for South Harpeth River Fluvial Sampling Site (River Mile 16.9). *BR, Bed Rock. Data were collected on Feb 10, 1998.*

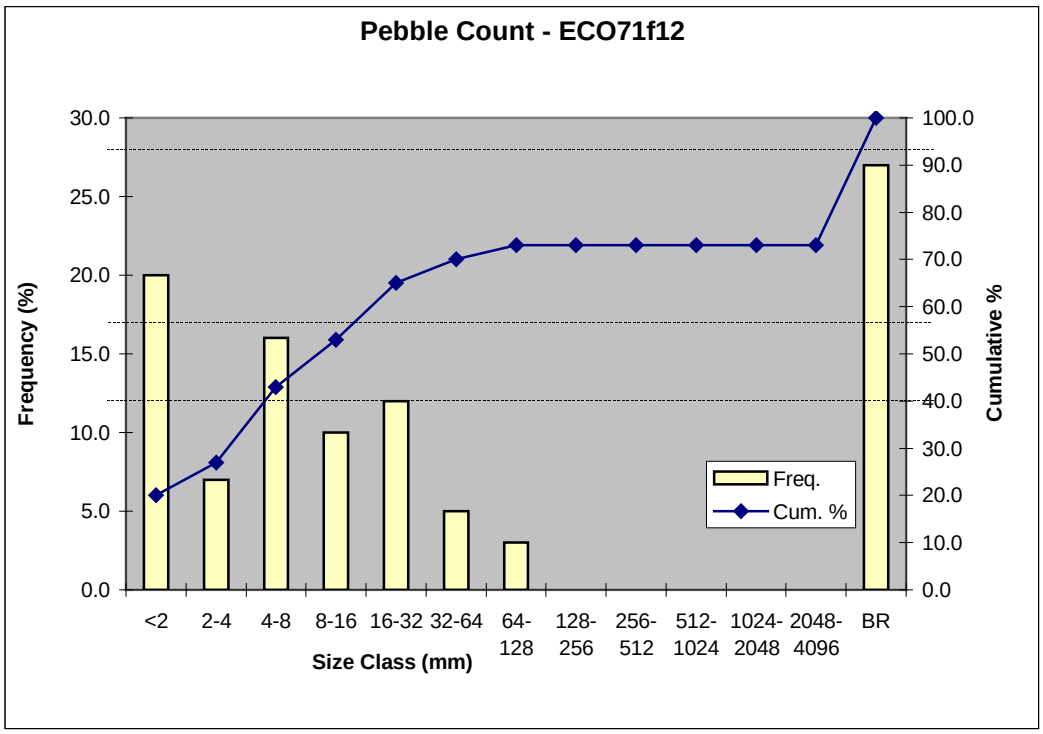


Figure 3-13b. Particle Count Histogram and Cummulative Frequencey Plot for South Harpeth River Fluvial Sampling Site (River Mile 16.9). *BR, Bed Rock. Data were collected on November 9, 1998.*

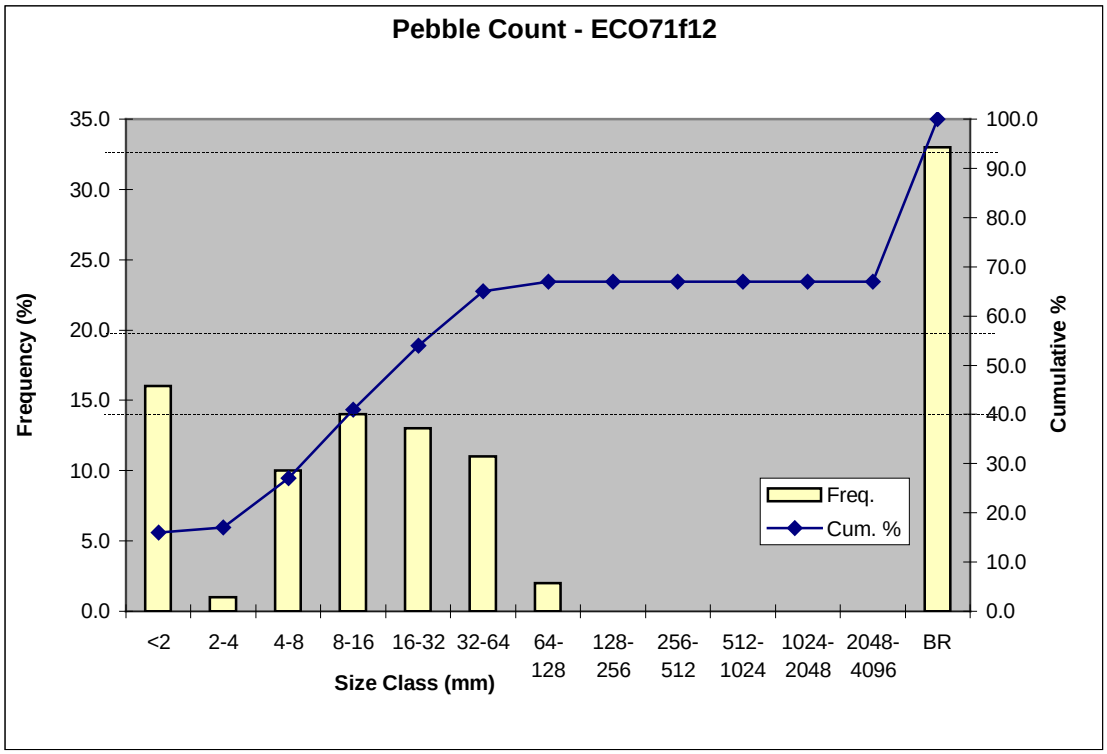


Figure 3-13c. Particle Count Histogram and Cummulative Frequencey Plot for South Harpeth River Fluvial Sampling Site (River Mile 16.9). *BR, Bed Rock. Data were collected on May 10, 1999.*

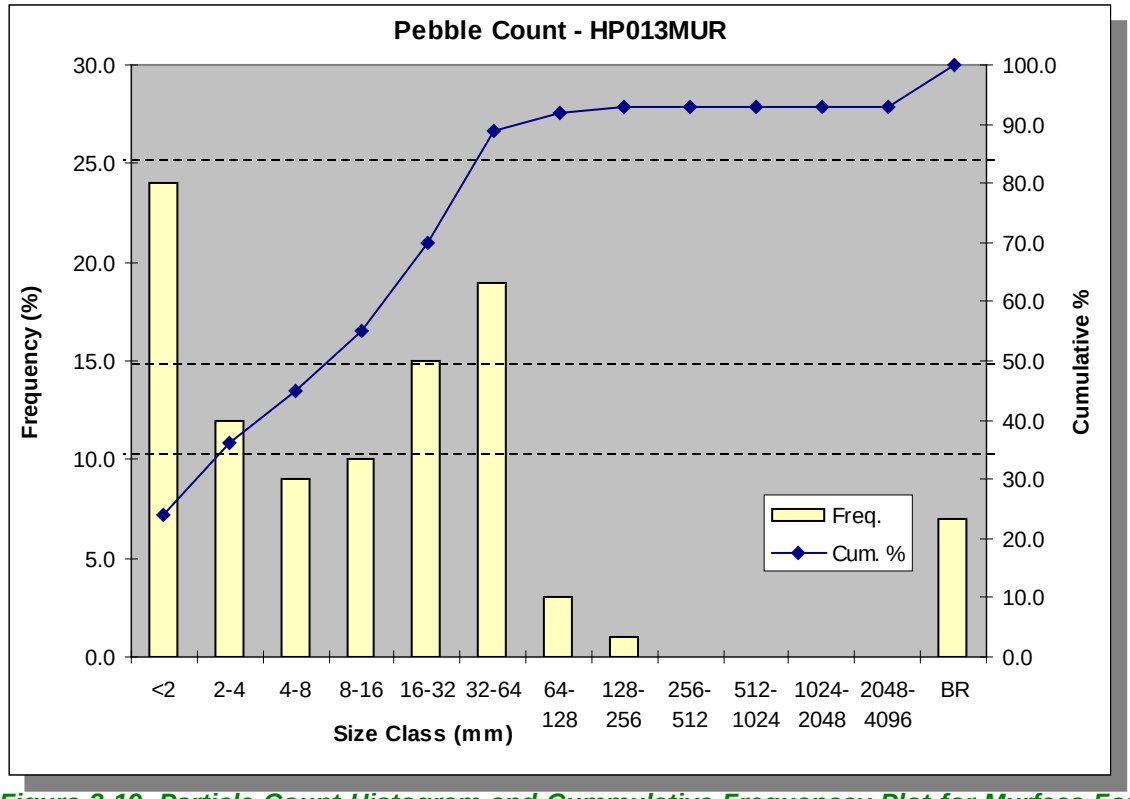


Figure 3-19. Particle Count Histogram and Cummulative Frequencey Plot for Murfees Fork Fluvial Sampling Site (River Mile 5.2). *BR, Bed Rock. Data were collected on June 22, 2001.*

CHAPTER 4

POINT AND NONPOINT SOURCE CHARACTERIZATION OF THE HARPETH RIVER WATERSHED

4.1 BACKGROUND. This chapter is organized by HUC-11 subwatershed, and the description of each subwatershed is divided into four parts:

i. General description of the subwatershed
ii. Description of point source contributions
ii.a. Description of facilities discharging to water bodies listed on the 1998 303(d) list
iii. Description of nonpoint source contributions

The Harpeth River Watershed (HUC 05130204) has been delineated into nine HUC 11-digit subwatersheds.

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

WCS integrates with ArcView® v3.1 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.

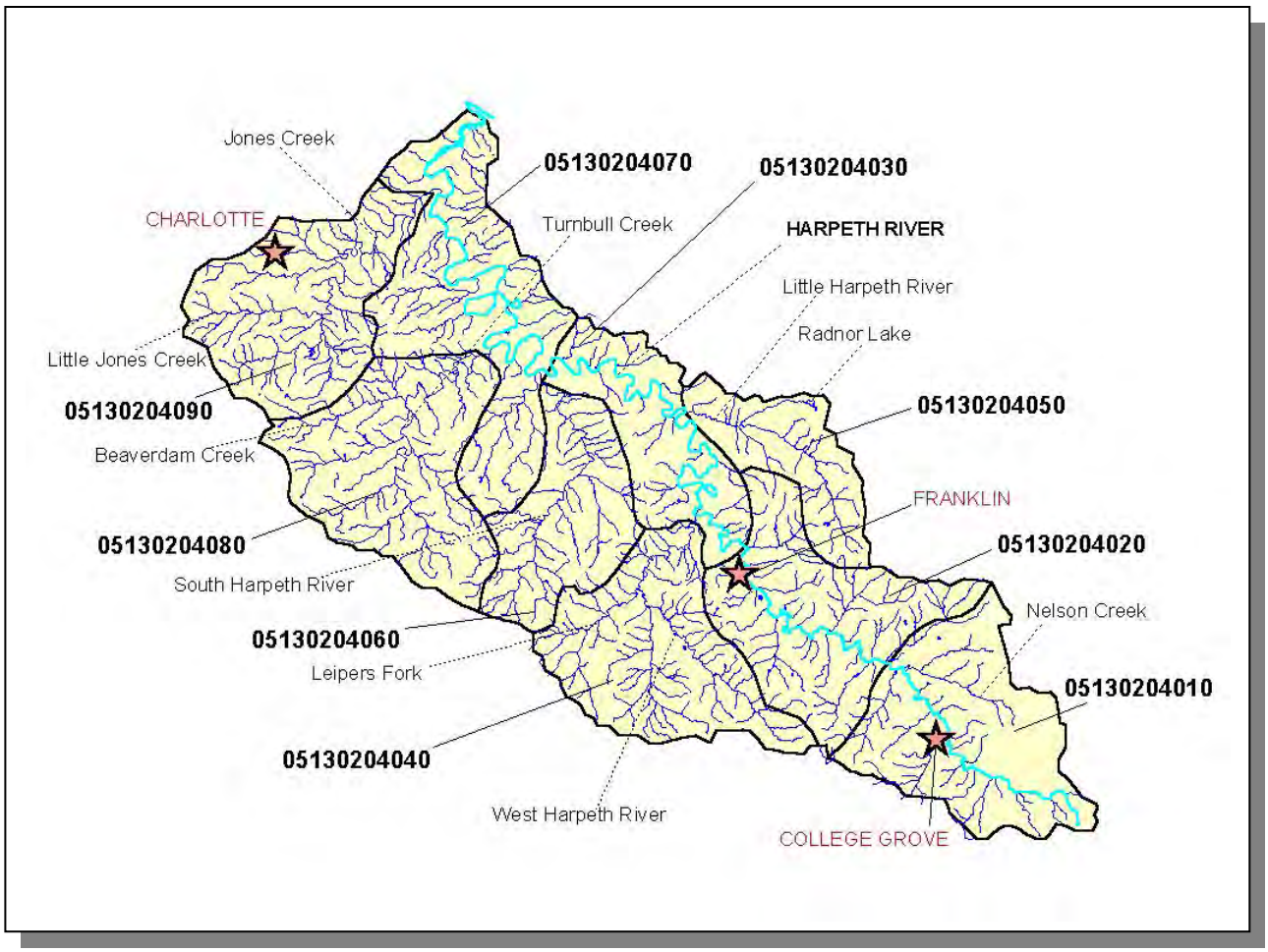


Figure 4-1. The Harpeth River Watershed is Composed of Nine USGS-Delineated Subwatersheds (11-Digit Subwatersheds). *Locations of Harpeth River, Charlotte, Franklin, and College Grove are shown for reference.*

4.2. CHARACTERIZATION OF HUC-11 SUBWATERSHEDS. The Watershed Characterization System (WCS) software and data sets provided by EPA Region IV were used to characterize each subwatershed in the Harpeth River Watershed. HUC-14 polygons were aggregated to form the HUC-11 boundaries for data analysis.

HUC-11	HUC-14
05130204010	05130204010010 (Harpeth River) 05130204010020 (Harpeth River) 05130204010030 (Harpeth River)
05130204020	05130204010040 (Harpeth River) 05130204010050 (Harpeth River)
05130204030	05130204030010 (Harpeth River)
05130204040	05130204020010 (West Harpeth River) 05130204020020 (Murphree Creek) 05130204020030 (Leipers Fork Creek) 05130204020040 (West Harpeth River)
05130204050	05130204030020 (Little Harpeth River)
05130204060	05130204040010 (South Harpeth River) 05130204040020 (South Harpeth River)
05130204070	05130204030030 (Brush Creek) 05130204030040 (Harpeth River) 05130204030050 (Harpeth River)
05130204080	05130204050010 (Turnbull Creek) 05130204050020 (Turnbull Creek)
05130204090	05130204060010 (Jones Creek) 05130204060020 (Little Jones Creek) 05130204060030 (Sulphur Fork Creek) 05130204060040 (Jones Creek)

Table 4-1. HUC-14 Drainage Areas are Nested Within HUC-11 Drainages. *USGS delineated the HUC-11 drainage areas. NRCS inventories and manages the physical database for HUC-14 drainage areas.*

4.2.A. 05130204010.

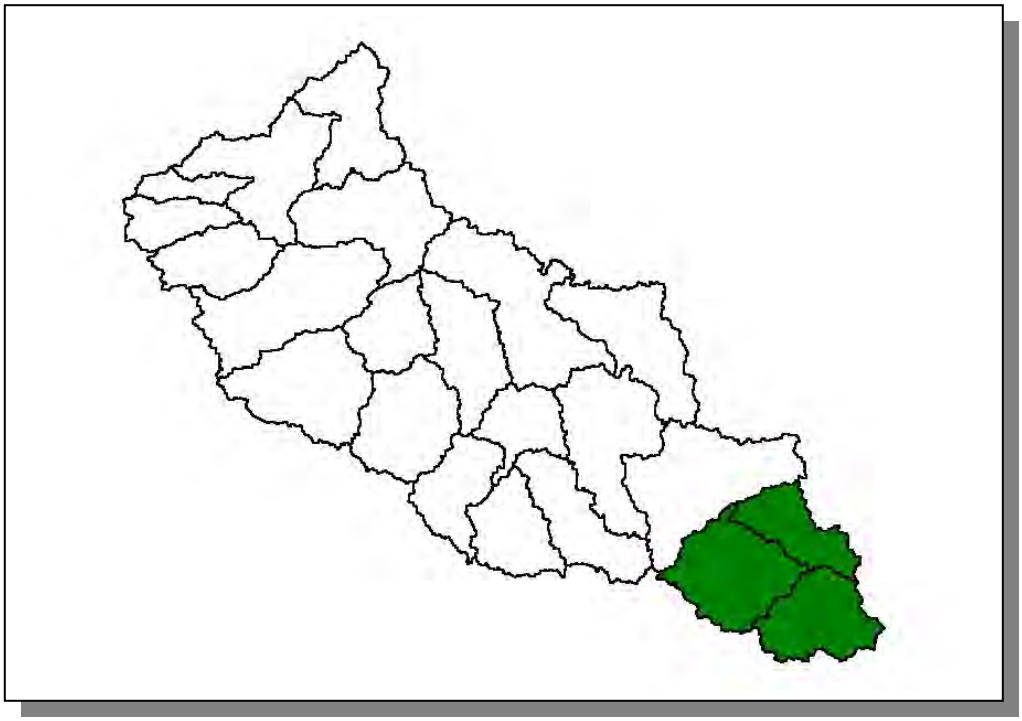


Figure 4-2. Location of Subwatershed 05130204010. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.A.i. General Description.

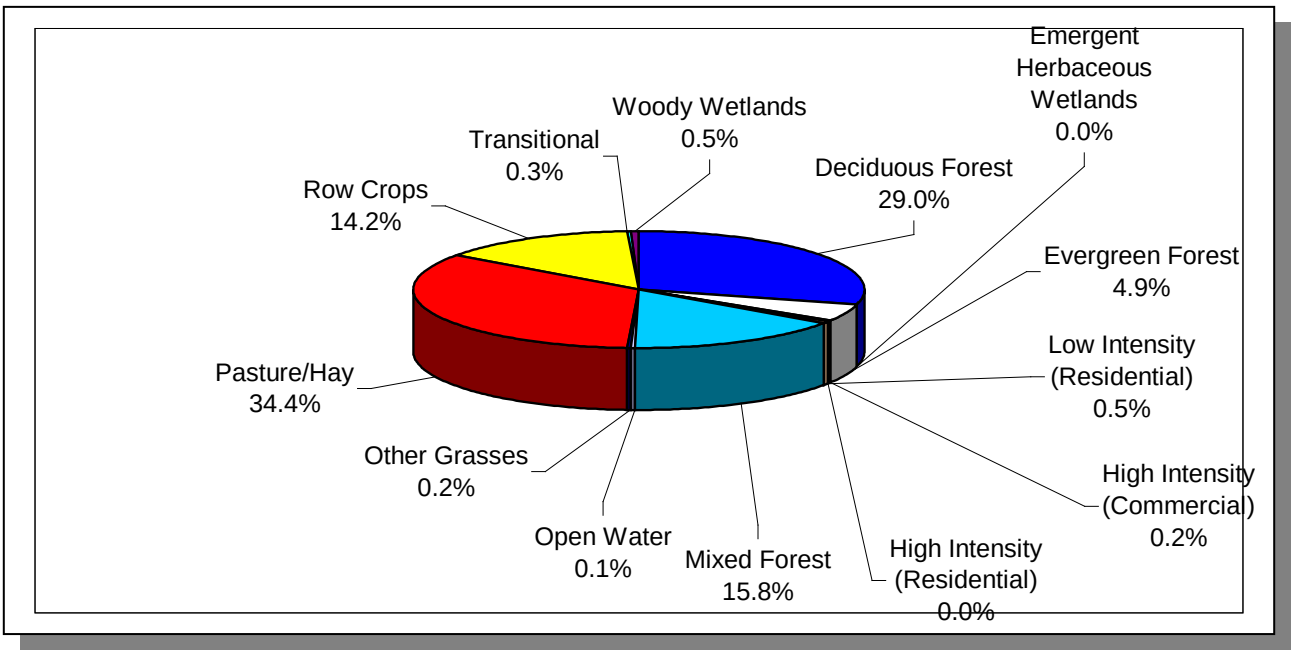


Figure 4-3. Land Use Distribution in Subwatershed 05130204010. *More information is provided in Harpeth-Appendix IV.*

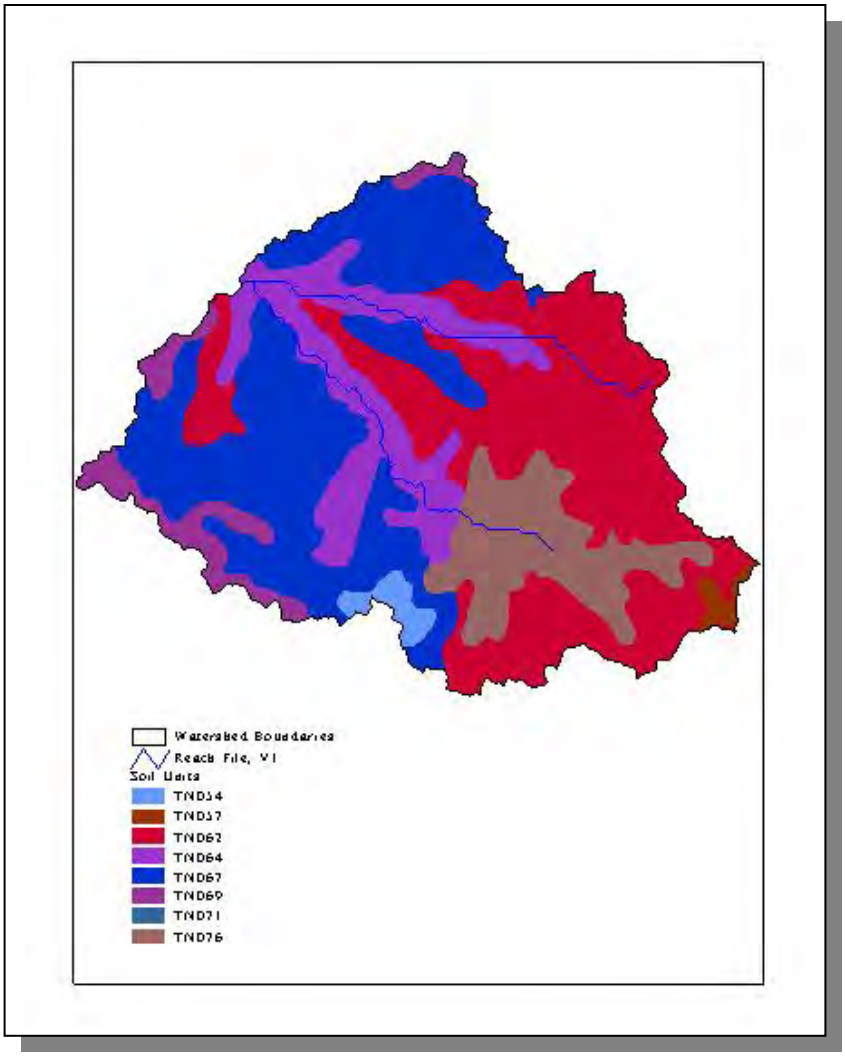


Figure 4-4. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204010.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN054	0.00	C	3.04	4.84	Loam	0.32
TN057	0.00	C	1.14	5.01	Clayey Loam	0.33
TN062	0.00	C	0.98	4.40	Clayey Loam	0.26
TN064	7.00	C	1.19	5.82	Silty Loam	0.37
TN067	2.00	C	2.69	5.51	Silty Loam	0.35
TN069	0.00	C	2.06	5.36	Loam	0.34
TN071	0.00	C	2.37	5.70	Silty Loam	0.33
TN076	28.00	C	0.73	6.26	Silty Clayey Loam	0.33

Table 4-2. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204010. *More details are provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Bedford	30,411	34,203	0.1	29	33	13.8
Rutherford	118,570	159,987	7.97	9,450	12,751	34.9
Williamson	81,021	111,453	9.71	7,869	10,824	37.6
Totals	**230,002**	**305,643**		**17,348**	**23,608**	**36.1**

Table 4-3. Population Estimates in Subwatershed 05130204010.

			NUMBER OF HOUSING UNITS			
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Eagleville	Rutherford	491	220	5	211	4

Table 4-4. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204010.

4.2.A.ii Point Source Contributions.

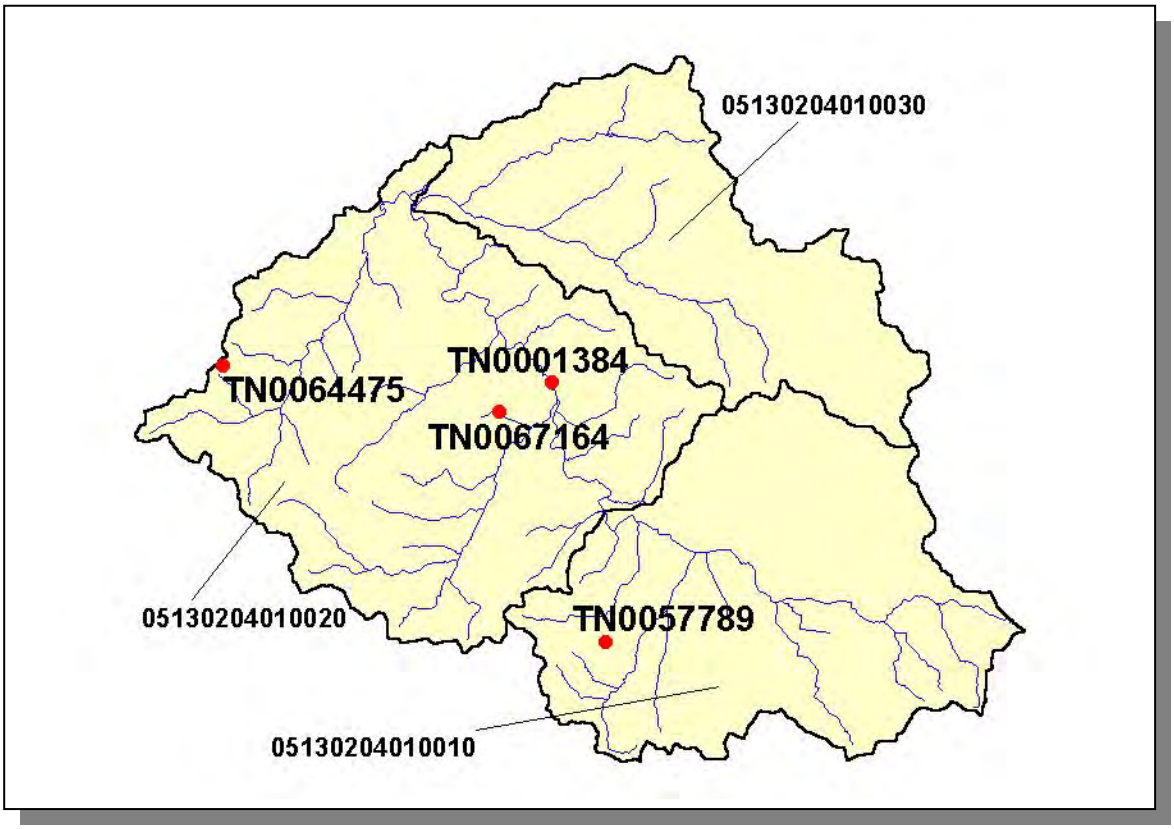


Figure 4-5. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130204010. *Subwatershed 05130204010010, 05130204010020, and 05130204010030 boundaries are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

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

There are two NPDES facilities discharging to water bodies listed on the 1998 303(d) list in Subwatershed 05130204010:

- TN0001384 discharges to the Harpeth River at RM 110.3
- TN0057789 discharges to Cheatham Branch at RM 1.9

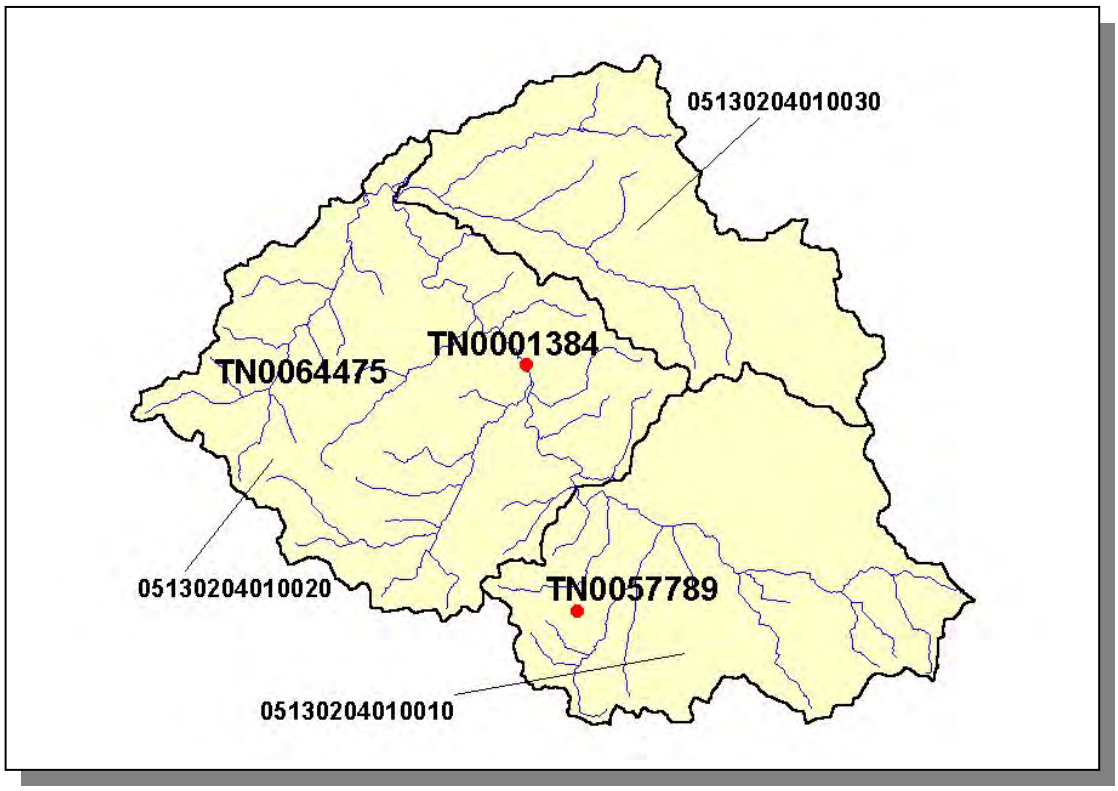


Figure 4-6. Location of NPDES Dischargers to Water Bodies Listed on the 1998 303(d) List in Subwatershed 05130204010. *Subwatershed 05130204010010, 05130204010020, and 05130204010030 boundaries are shown for reference. The names of facilities are provided in Harpeth-Appendix IV.*

PERMIT #	7Q10	1Q20	30Q2	QDESIGN	QLTA
TN0001384	0	0	3.517		0.027
TN0057789	0	0	0	0.018	

Table 4-5. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130204010. *Data are in million gallons per day (MGD). 30Q2 data were calculated using the equation method (TN0001384) or using data in Flow Duration and Low Flows of Tennessee Streams Through 1992 (TN0057789).*

PERMIT #	$CBOD_5$	NH_3	FECAL	METAL	WET
TN0001384	X	X		X	X
TN0057787	X	X	X		

Table 4-6. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130204010.

PERMIT #	As	Zn	Sb	Pb	TSS	NH_3 (Summer)	NH_3 (Winter)	CBOD
TN0001384 TN0057787	X	X	X	X	X	X	X	X

Table 4-7. Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130204010.

PERMIT #	Sb	Zn	Pb
TN0001384	3	3	1

Table 4-8. Number of Permit Violations Based on DMR Data (10/31/95-07/31/97) for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130204010.

4.2.A.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	**Cattle**	**Milk Cow**	**Chickens**	**Chickens Sold**	**Hogs**	**Sheep**
7,030	14,160	754	19	91,480	563	172

Table 4-9. Summary of Livestock Count Estimates in Subwatershed 05130204010. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	**Forest Land (thousand acres)**	**Timber Land (thousand acres)**	**Growing Stock (million cubic feet)**	**Sawtimber (million board feet)**
Bedford	74.6	74.6	0.5	1.3
Rutherford	155.7	155.7	0.4	0.9
Williamson	142.0	142.0	1.0	3.3
Totals	**372.3**	**372.3**	**1.9**	**5.5**

Table 4-10. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 05130204010.

CROPS	TONS/ACRE/YEAR
Non Agricultural Land Use	0.00
Berry (Horticultural)	0.47
Corn (Row Crops)	4.57
Soybeans (Row Crops)	3.11
Cotton (Row Crops)	4.79
Grass (Hayland)	0.16
Legume (Hayland)	0.67
Legume/Grass (Hayland)	0.31
Grass (Pastureland)	0.72
Legume (Pastureland)	0.23
Grass,Forbs, Legumes (Mixed Pasture)	0.48
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	0.39
Conservation Reserve Program Land	0.19
Tobacco (Row Crops)	6.75
Wheat (Close Grown Cropland)	1.28
Other Cropland (Not Planted)	6.46
Other Land in Farms	0.12
Summer Fallow (Other Cropland)	4.60

Table 4-11. Annual Estimated Total Soil Loss in Subwatershed 05130204010.

4.2.B. 05130204020.

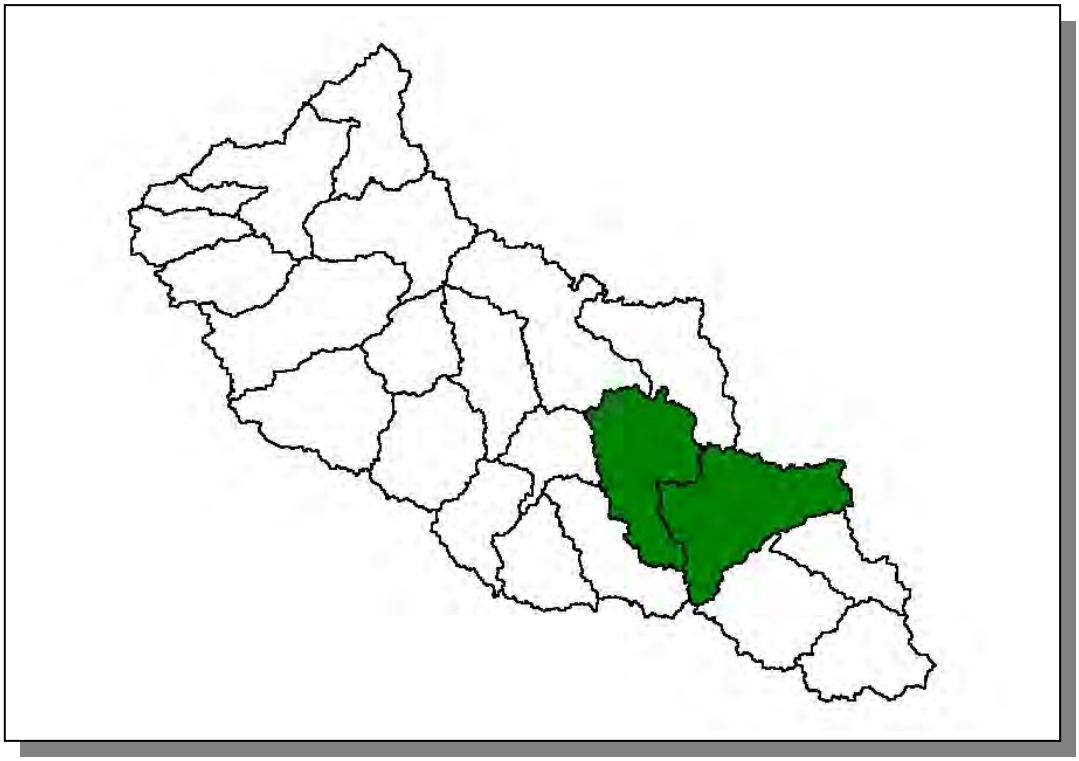


Figure 4-7. Location of Subwatershed 05130204020. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.B.i. General Description.

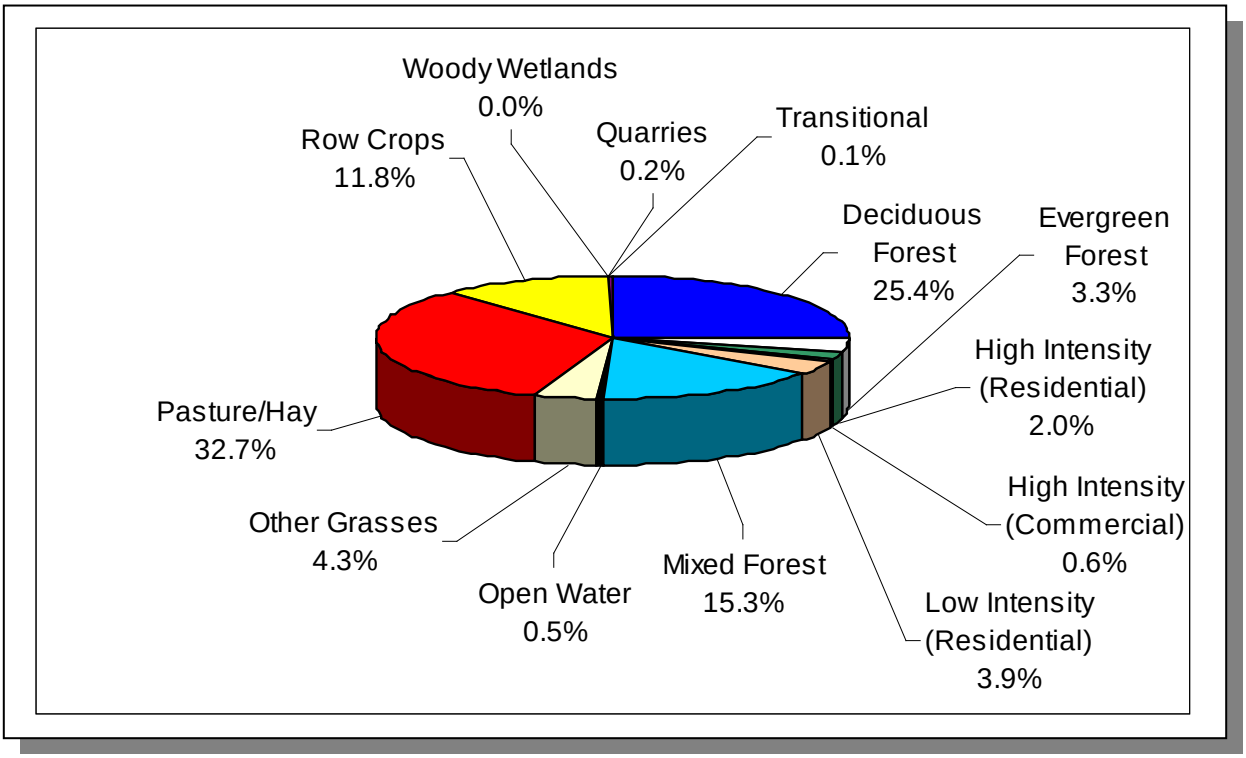


Figure 4-8. Land Use Distribution in Subwatershed 05130204020. *More information is provided in Harpeth-Appendix IV.*

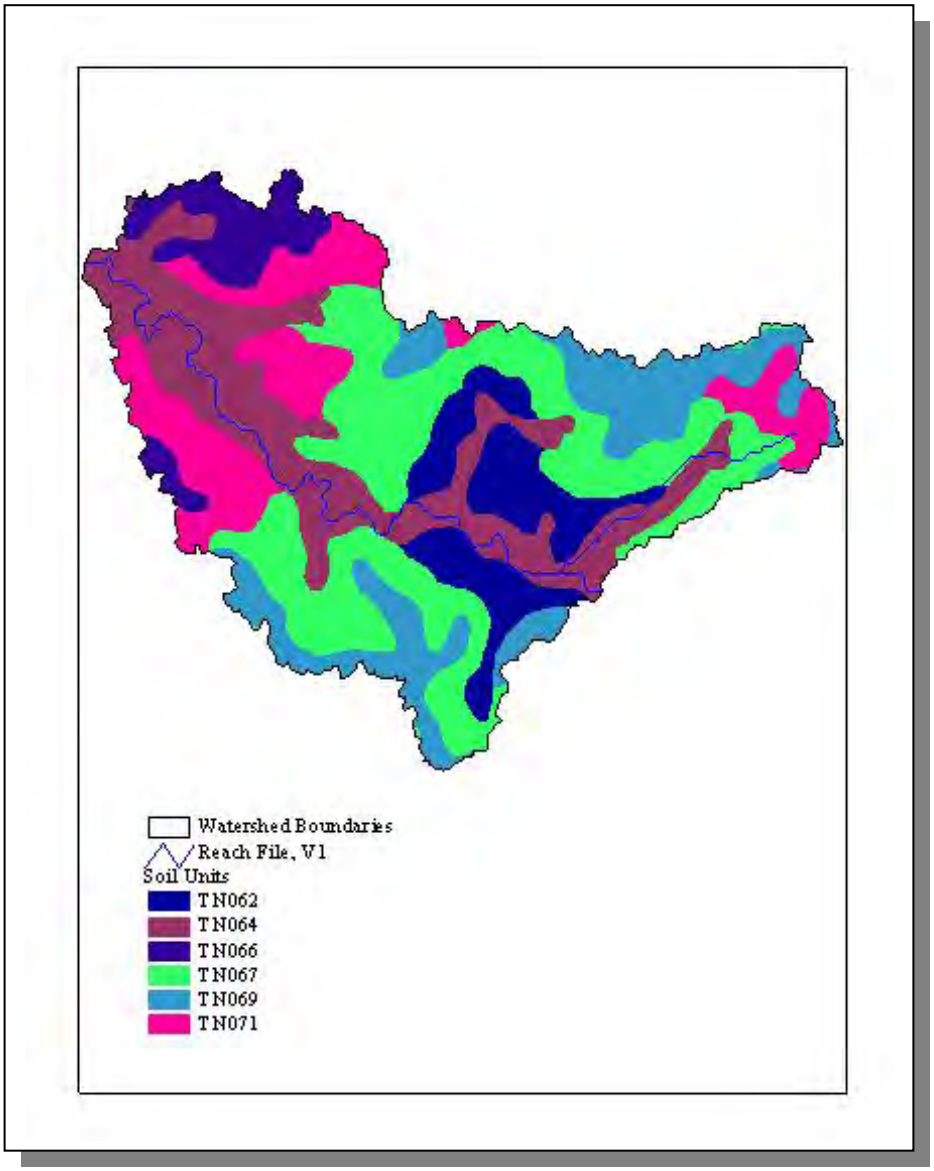


Figure 4-9. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204020.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN062	0.00	C	0.98	4.40	Clayey Loam	0.26
TN064	7.00	C	1.19	5.82	Silty Loam	0.37
TN066	0.00	B	2.62	4.75	Loam	0.28
TN067	2.00	C	2.69	5.51	Silty Loam	0.35
TN069	0.00	C	2.06	5.36	Loam	0.34
TN071	0.00	C	2.37	5.70	Silty Loam	0.33

Table 4-12. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204020. *More information is provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	1990	1997 Est.	Portion of Watershed (%)	1990	1997	
Williamson	81,021	111,453	19.75	16,005	22,016	37.6

Table 4-13. Population Estimates in Subwatershed 05130204020.

			NUMBER OF HOUSING UNITS			
Populated Place	County	Population	Total	Public Sewer	Septic Tank	Other
Brentwood	Williamson	16,392	5,514	3,195	2,319	0
Franklin	Williamson	20,098	8,748	8,458	282	8
Totals		**36,490**	**14,262**	**11,653**	**2,601**	**8**

Table 4-14. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204020.

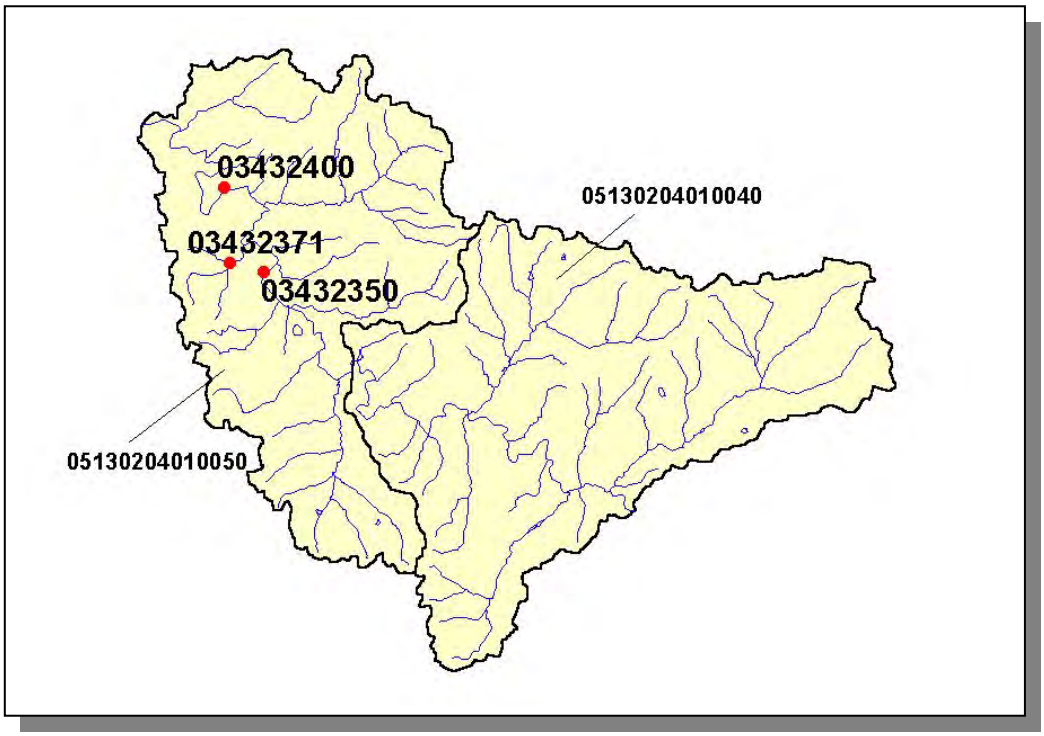


Figure 4-10. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204020. Subwatershed 05130204010040 and 05130204010050 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.

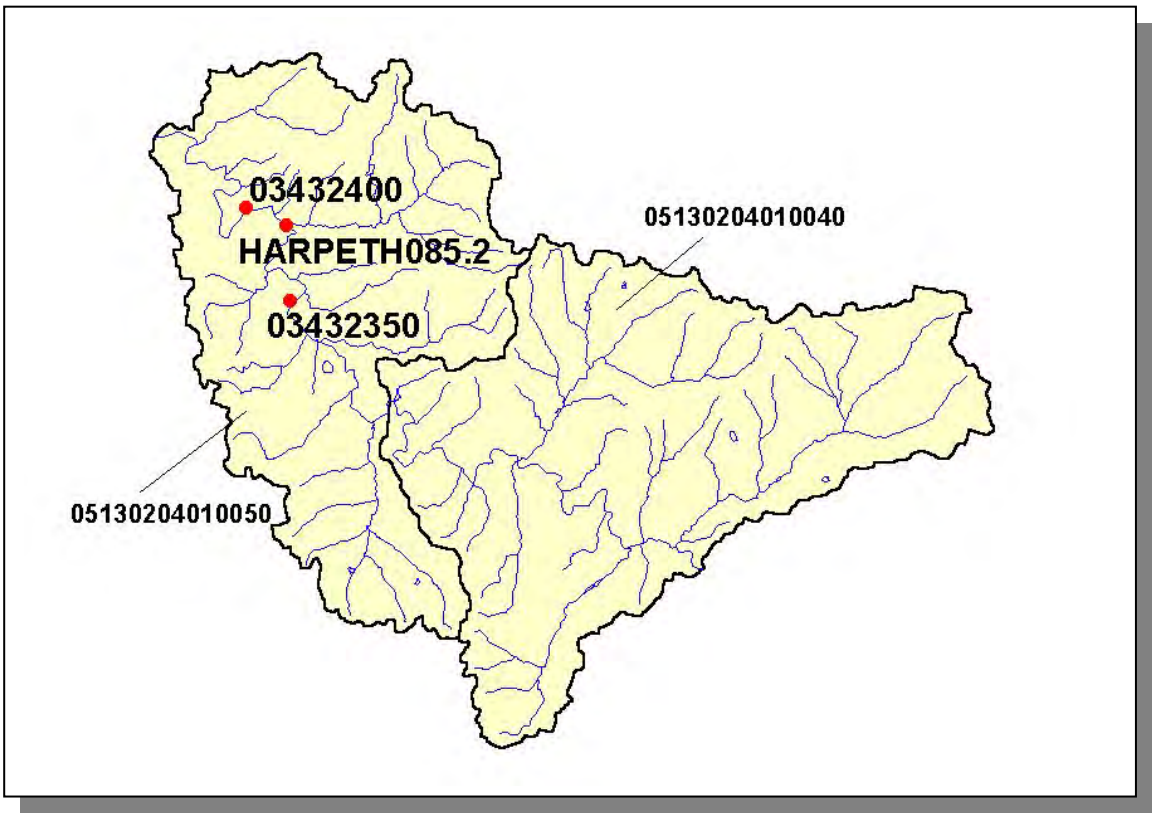


Figure 4-11. Location of STORET Monitoring Sites in Subwatershed 05130204020. *Subwatershed 05130204010040 and 05130204010050 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.B.ii. Point Source Contributions.

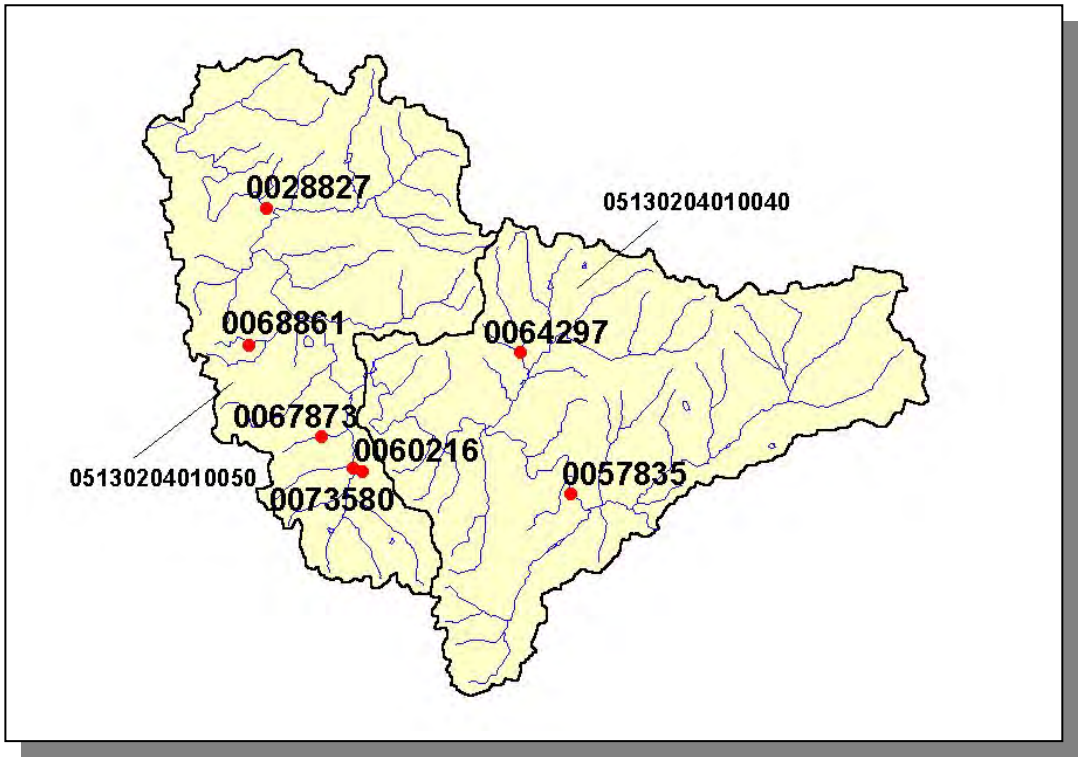


Figure 4-12. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130204020. *Subwatershed 05130204010040, and 05130204010050 boundaries are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

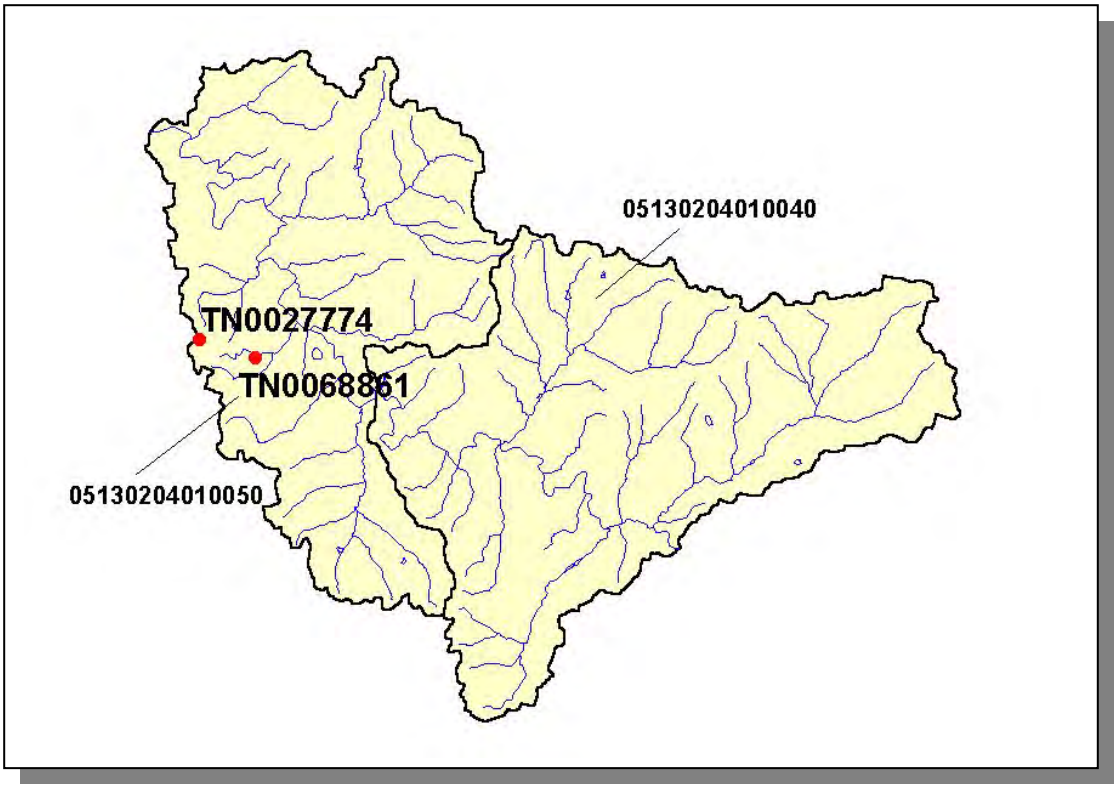


Figure 4-13. Location of Active Mining Sites in Subwatershed 05130204020. *Subwatersheds 05130204010040 and 05130204010050 are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

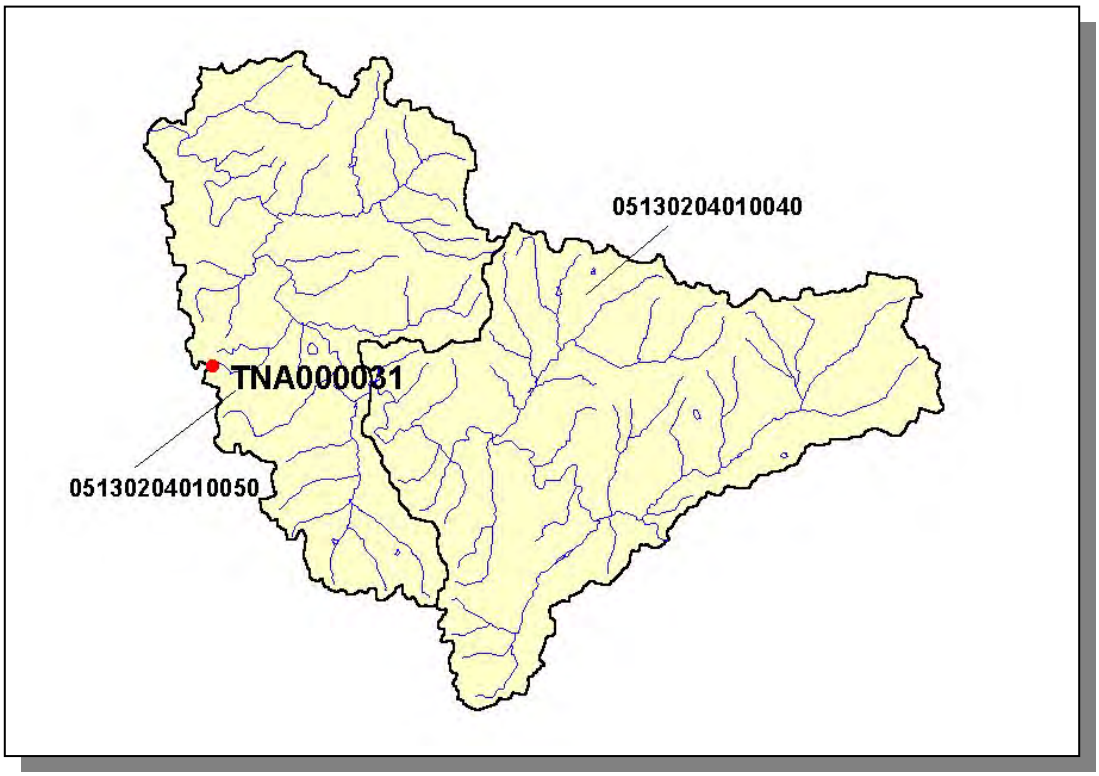


Figure 4-14. Location of Concentrated Animal Feeding Operation (CAFO) Sites in Subwatershed 05130204020. *Subwatersheds 05130204010040 and 05130204010050 are shown for reference. More information is provided in Harpeth-Appendix IV.*

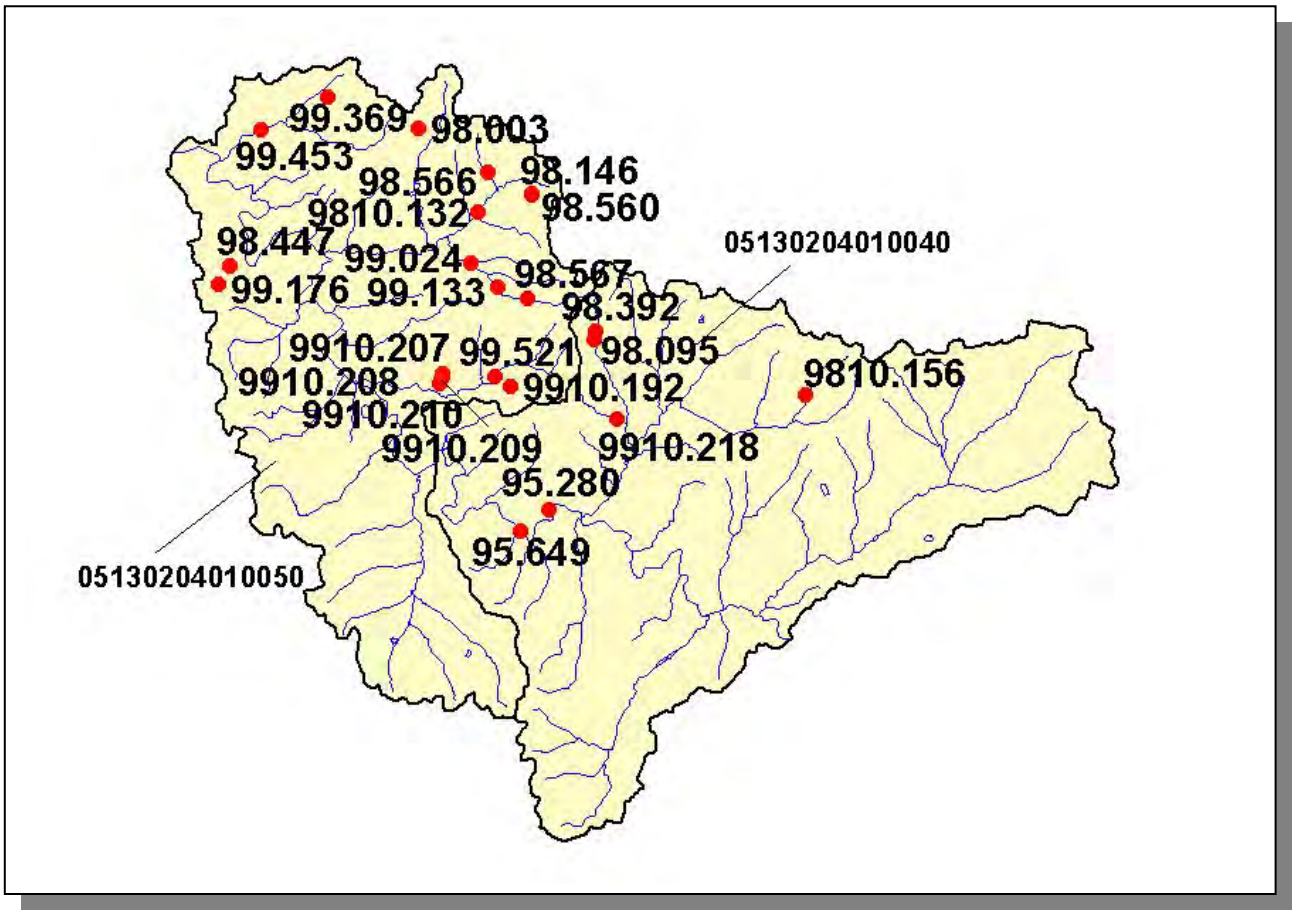


Figure 4-15. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204020. *Subwatershed 05130204010040 and 05130204010050 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

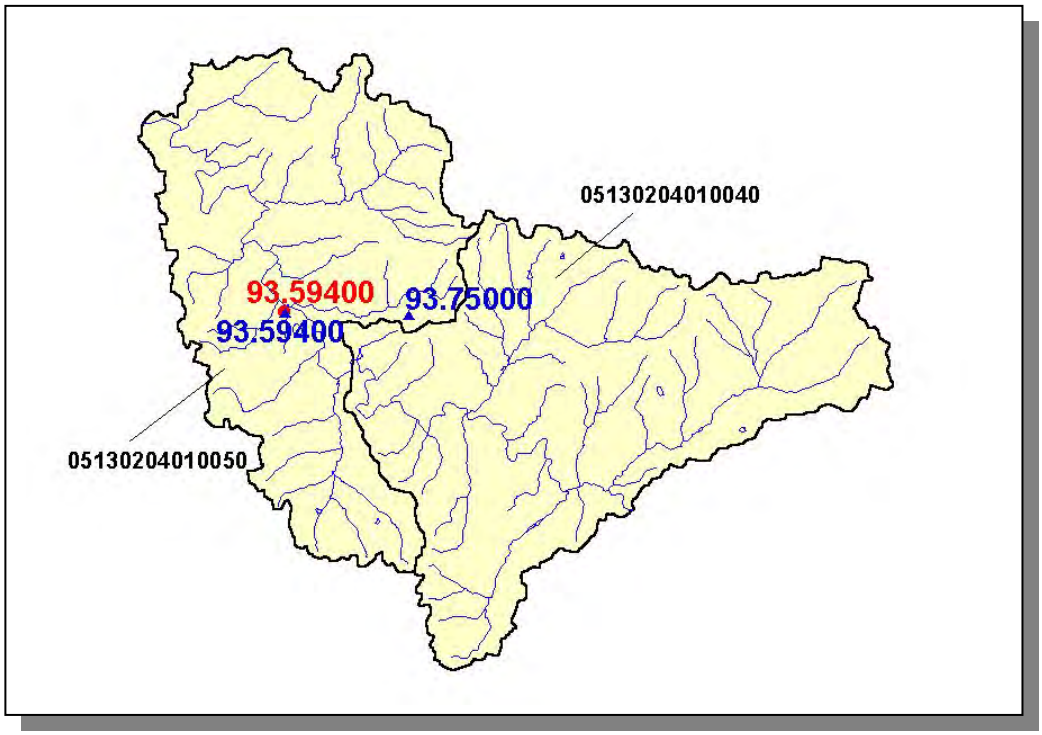


Figure 4-16. Location of Wetland Impact and Mitigation Sites in Subwatershed 05130204020. *Impact (Blue Triangle) and mitigation (Red Circle) sites are from ARAP database. Subwatershed 05130204010040 and 05130204010050 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.B.ii.a. Dischargers to Waterbodies Listed on the 1998 303(d) List.

There are four NPDES facilities discharging to water bodies listed on the 1998 303(d) list in Subwatershed 05130204020:

- TN0028827 discharges to the Harpeth River @ RM 85.2
- TN0057835 discharges to the Harpeth River
- TN0060216 discharges to Fivemile Creek @ RM 5.2
- TN0067873 discharges to an Unnamed Tributary of Fivemile Creek @RM 1.1
- TN0073580 discharges to Fivemile Creek @ RM 2.2

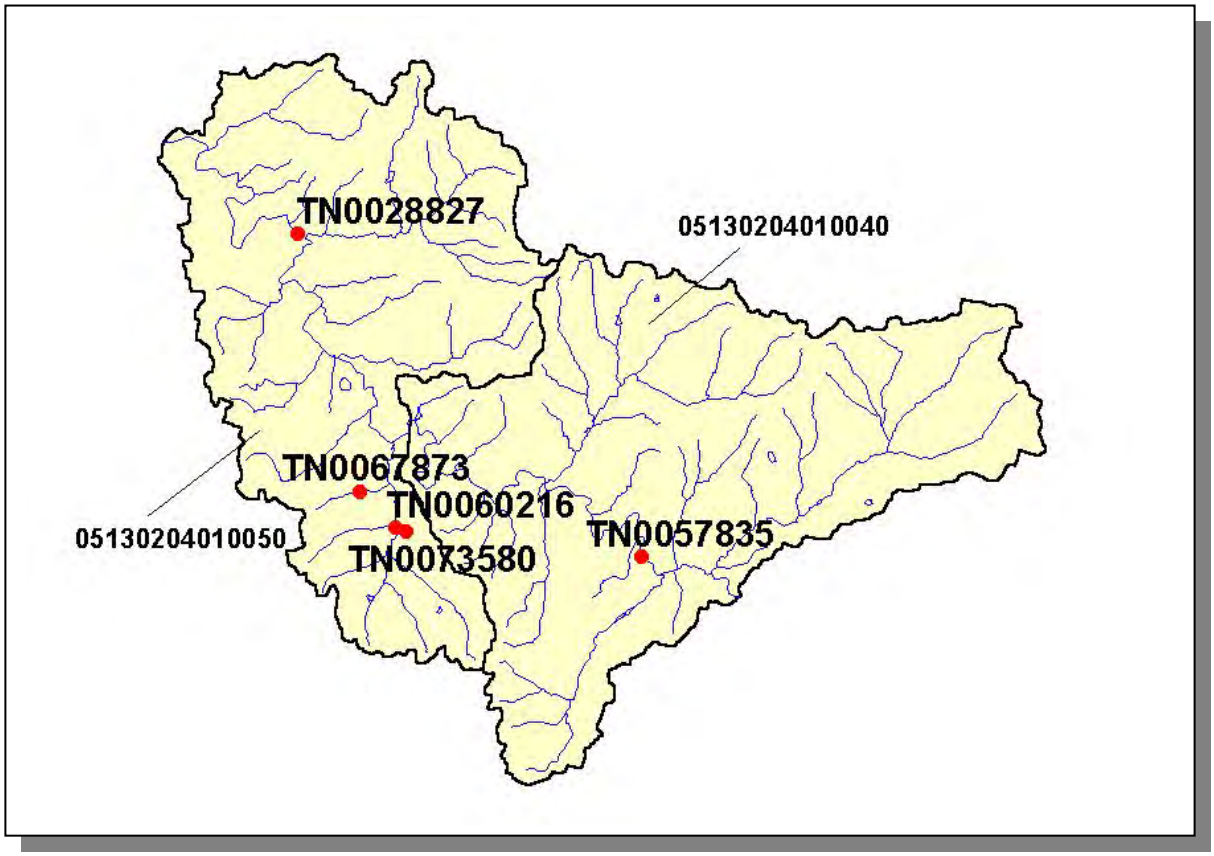


Figure 4-17. Location of NPDES Dischargers to Water Bodies Listed on the 1998 303(d) List in Subwatershed 05130204020. *Subwatershed 05130204010040 and 05130204010050 boundaries are shown for reference. The names of facilities are provided in Harpeth-Appendix IV.*

PERMIT #	7Q10	1Q20	30Q2	QDESIGN	QLTA
TN0028827	0	0	0.81	5.5	4.61
TN0057835	0	0	0	0.02	
TN0060216	0	0	0	0.03	
TN0067873	0	0	0	0.01	
TN0073580	0	0	0		0.00028

Table 4-15. Receiving Stream Flow Information for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130204020. *Data are in million gallons per day (MGD). 30Q2 data were calculated using the equation method (TN0028827) or using data in Flow Duration and Low Flows of Tennessee Streams Through 1992 (TN0057835, TN0060216, TN 0067873, and TN0073580).*

PERMIT #	$CBOD_5$	NH_3	FECAL	METAL	WET	STREAM SAMPLE
TN0028827	X	X	X		X	X
TN0057835	X	X	X			
TN0060216	X	X	X		X	
TN0067873	X	X	X			
TN0073580			X	X		

Table 4-16. Monitoring Requirements for NPDES Dischargers to Waterbodies Listed on the 1998 303(d) List in Subwatershed 05130204020.

PERMIT #	BENZENE	Cd	Pb
TN0073580	Report	Report	0.1

Table 4-17. Parameters Monitored for Daily Maximum (mg/L) Limits for NPDES Dischargers to Waterbodies on the 1998 303(d) List in Subwatershed 05130204020.

4.2.B.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)					
Beef Cow	**Cattle**	**Milk Cow**	**Chickens**	**Hogs**	**Sheep**
5,448	10,518	457	11	600	153

Table 4-18. Summary of Livestock Count Estimates in Subwatershed 05130204020. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	**Forest Land (thousand acres)**	**Timber Land (thousand acres)**	**Growing Stock (million cubic feet)**	**Sawtimber (million board feet)**
Williamson	142	142	1	3.3

Table 4-19. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130204020.

CROPS	TONS/ACRE/YEAR
Legume Grass (Hayland)	0.14
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	0.31
Non Agricultural Land Use	0.00
Corn (Row Crops)	5.39
Soybeans (Row Crops)	3.34
Tobacco (Row Crops)	6.75
Wheat (Close Grown Cropland)	1.27
Grass (Hayland)	0.11
Legume (Hayland)	0.98
Other Cropland not Planted	6.46
Grass (Pastureland)	0.58
Grass, Forbs, Legumes (Mixed Pasture)	0.42
Other Land in Farms	0.12
Conservation Reserve Program Land	0.12
Legume (Pastureland)	0.33

Table 4-20. Annual Estimated Total Soil Loss in Subwatershed 05130204020.

4.2.C. 05130204030.

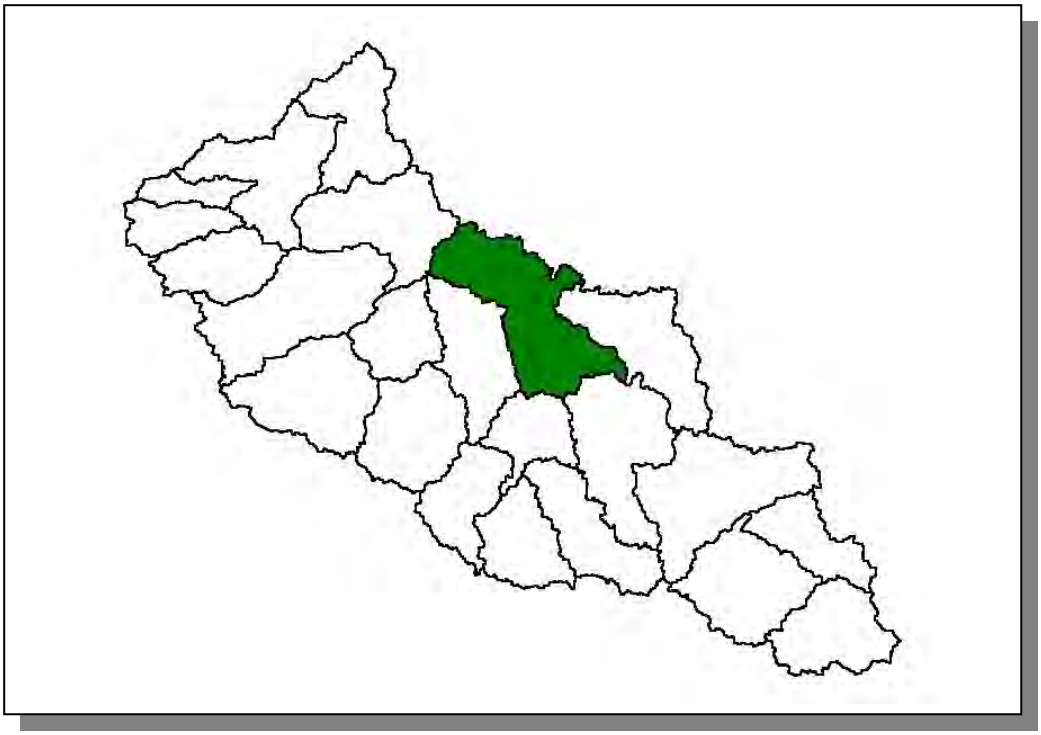


Figure 4-18. Location of Subwatershed 05130204030. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.C.i. General Description.

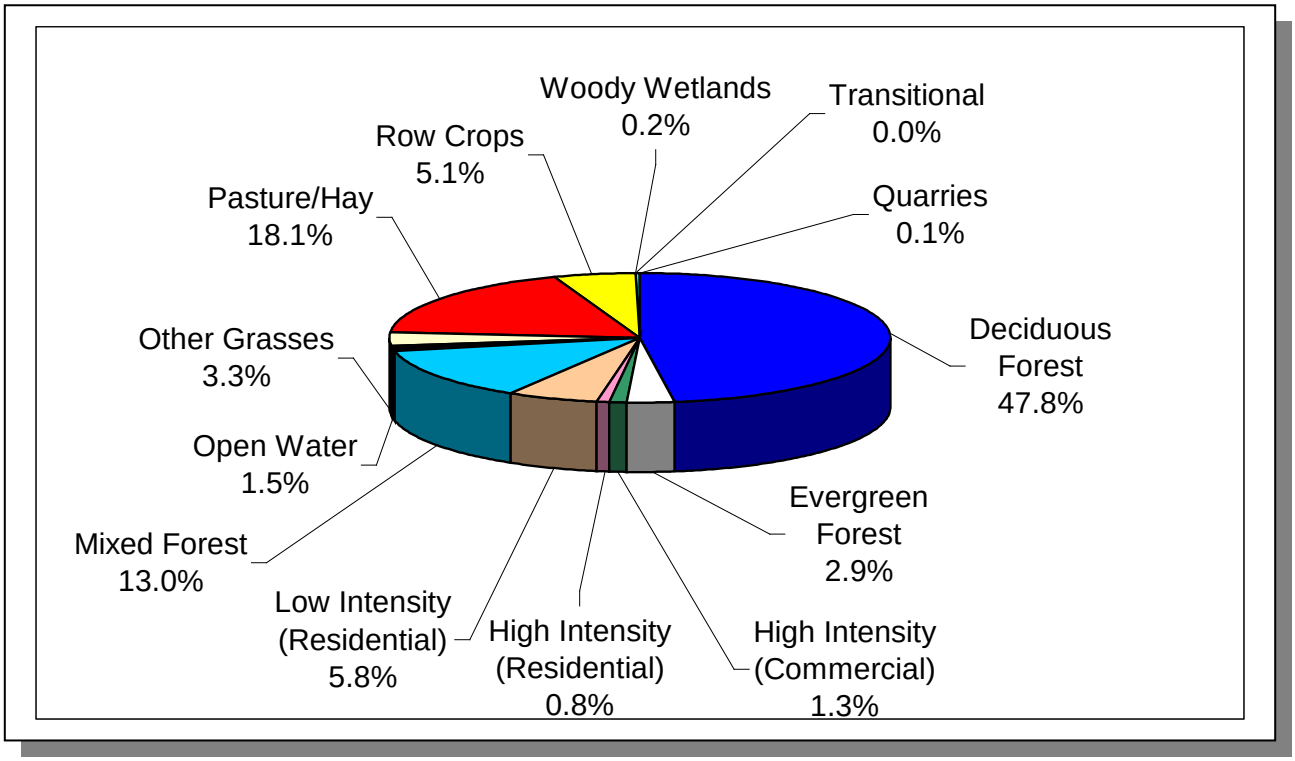


Figure 4-19. Land Use Distribution in Subwatershed 05130204030. *More information is provided in Harpeth-Appendix IV.*

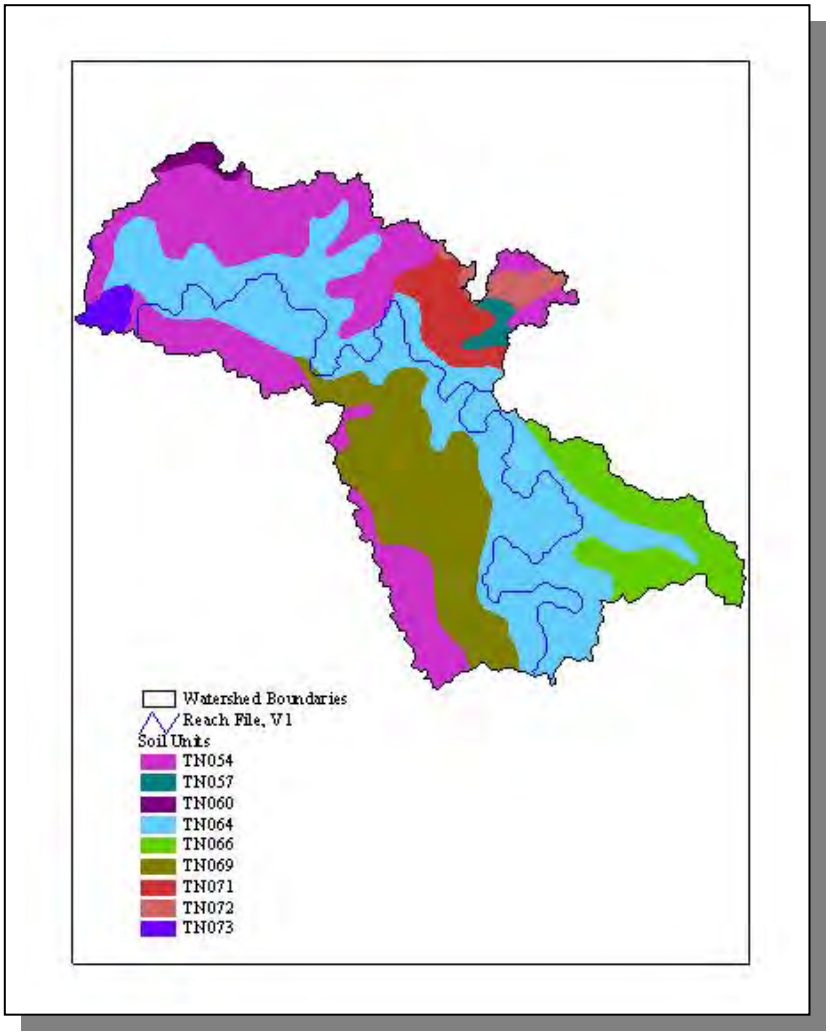


Figure 4-20. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204030.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN054	0.00	C	3.04	4.84	Loam	0.32
TN057	0.00	C	1.14	5.01	Clayey Loam	0.33
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN064	7.00	C	1.19	5.82	Silty Loam	0.37
TN066	0.00	B	2.62	4.75	Loam	0.28
TN069	0.00	C	2.06	5.36	Loam	0.34
TN071	0.00	C	2.37	5.70	Silty Loam	0.33
TN072	0.00	B	3.70	5.57	Loam	0.31
TN073	0.00	B	2.97	5.21	Loam	0.34

Table 4-21. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204030. *More information is provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Cheatham	27,140	34,402	2.64	717	909	26.8
Davidson	510,784	535,032	5.55	28,351	29,697	4.7
Williamson	81,021	111,453	4.51	3,655	5,028	37.6
Totals	**618,945**	**680,887**		**32,723**	**35,634**	**8.9**

Table 4-22. Population Estimates in Subwatershed 05130204030.

			NUMBER OF HOUSING UNITS			
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Nashville-Davidson Co.	Davidson	488,518	219,521	203,640	15,576	305
Pegram	Cheatham	1,371	535	20	510	5
Totals		**489,889**	**220,056**	**203,660**	**16,086**	**310**

Table 4-23. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204030.

Figure 4-21. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204030. *More information is provided in Harpeth-Appendix IV.*

4.2.C.ii. Point Source Contributions.

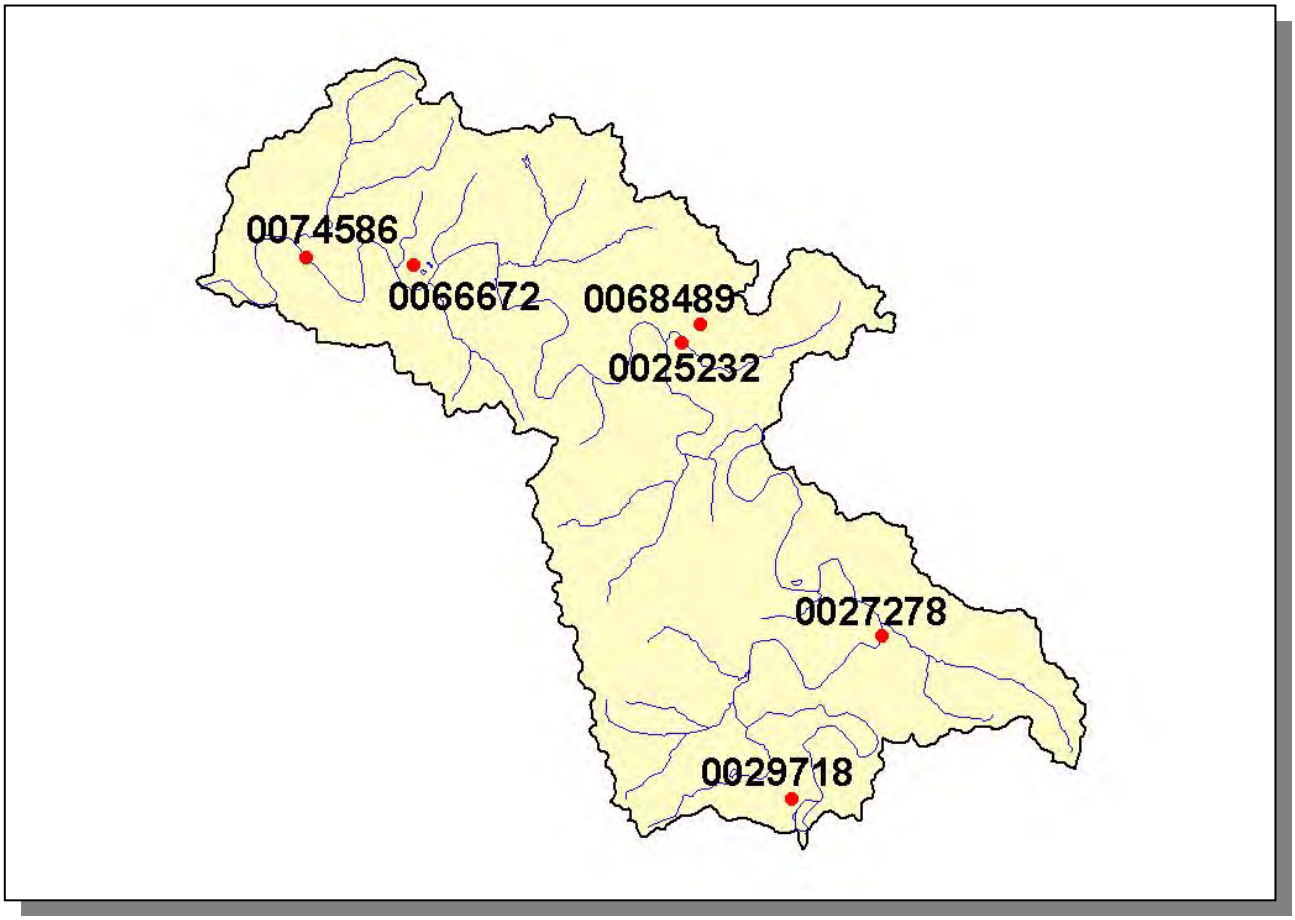


Figure 4-22. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130204030. *More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

Figure 4-23. Location of Active Mining Sites in Subwatershed 05130204030. *More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

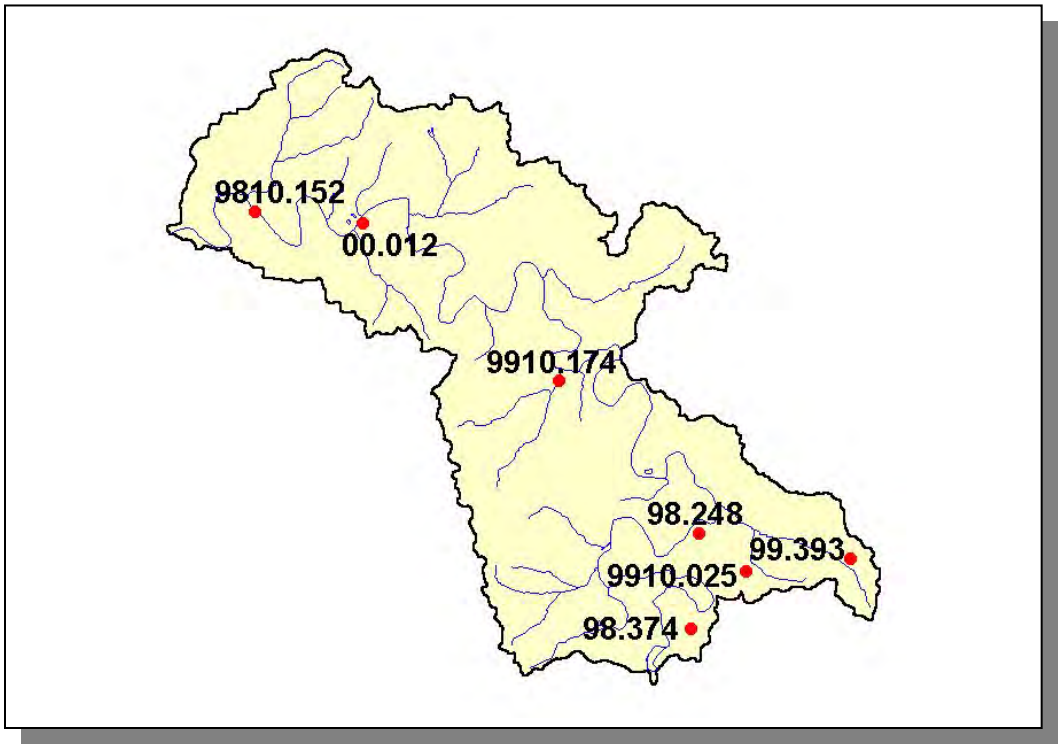


Figure 4-24. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204030. *More information is provided in Harpeth-Appendix IV.*

4.2.C.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)					
Beef Cow	**Cattle**	**Milk Cow**	**Chickens**	**Hogs**	**Sheep**
1,108	3,020	93	<5	146	31

Table 4-24. Summary of Livestock Count Estimates in Subwatershed 05130204030. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	**Forest Land (thousand acres)**	**Timber Land (thousand acres)**	**Growing Stock (million cubic feet)**	**Sawtimber (million board feet)**
Cheatham	118.2	118.2	2.3	8.4
Davidson	108.7	108.1	2.3	9.7
Williamson	142.0	142	1	3.3
Totals	**368.9**	**368.3**	**5.6**	**21.4**

Table 4-25. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130204030.

CROPS	TONS/ACRE/YEAR
Soybeans (Row Crops)	9.50
Grass (Hayland)	0.14
Legume (Hayland)	0.84
Grass (Pastureland)	0.53
Grass, Forbs, Legumes (Mixed Pasture)	0.53
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	0.31
Corn (Row Crops)	6.14
Other Cropland Not Planted	5.05
Legume Grass (Hayland)	0.18
All Other Close Grown Cropland	2.26
Tobacco (Row Crops)	6.75
Wheat (Close Grown Cropland)	1.27
Other Land in Farms	0.12
Conservation Reserve Program Land	0.12
Legume (Pastureland)	0.33

Table 4-26. Annual Estimated Total Soil Loss in Subwatershed 05130204030.

4.2.D. 05130204040.

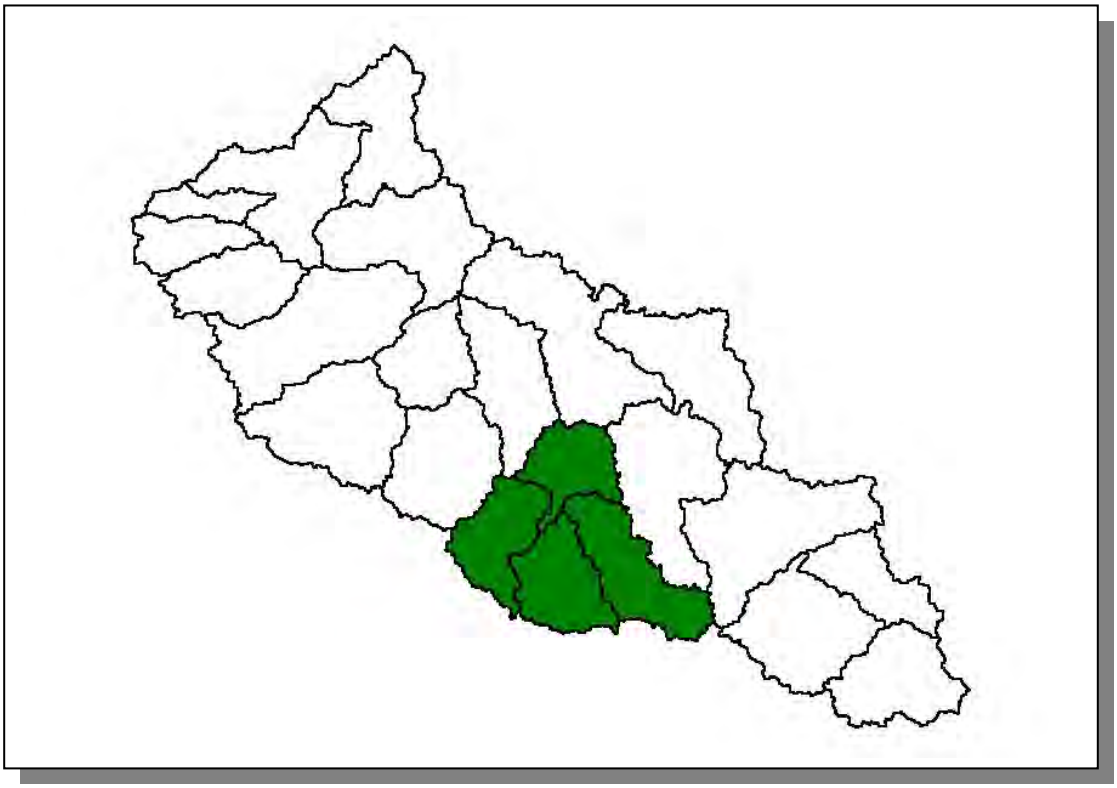


Figure 4-25. Location of Subwatershed 05130204040. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.D.i. General Description.

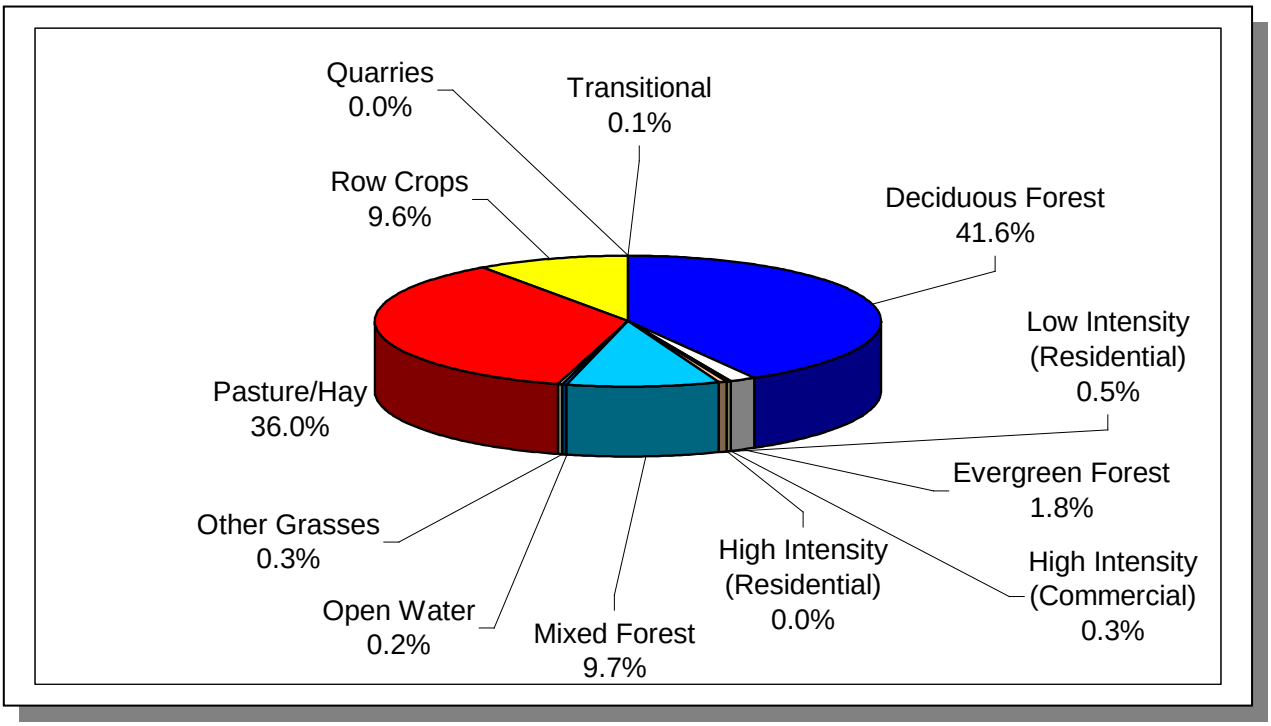


Figure 4-26. Land Use Distribution in Subwatershed 05130204040. *More information is provided in Harpeth-Appendix IV.*

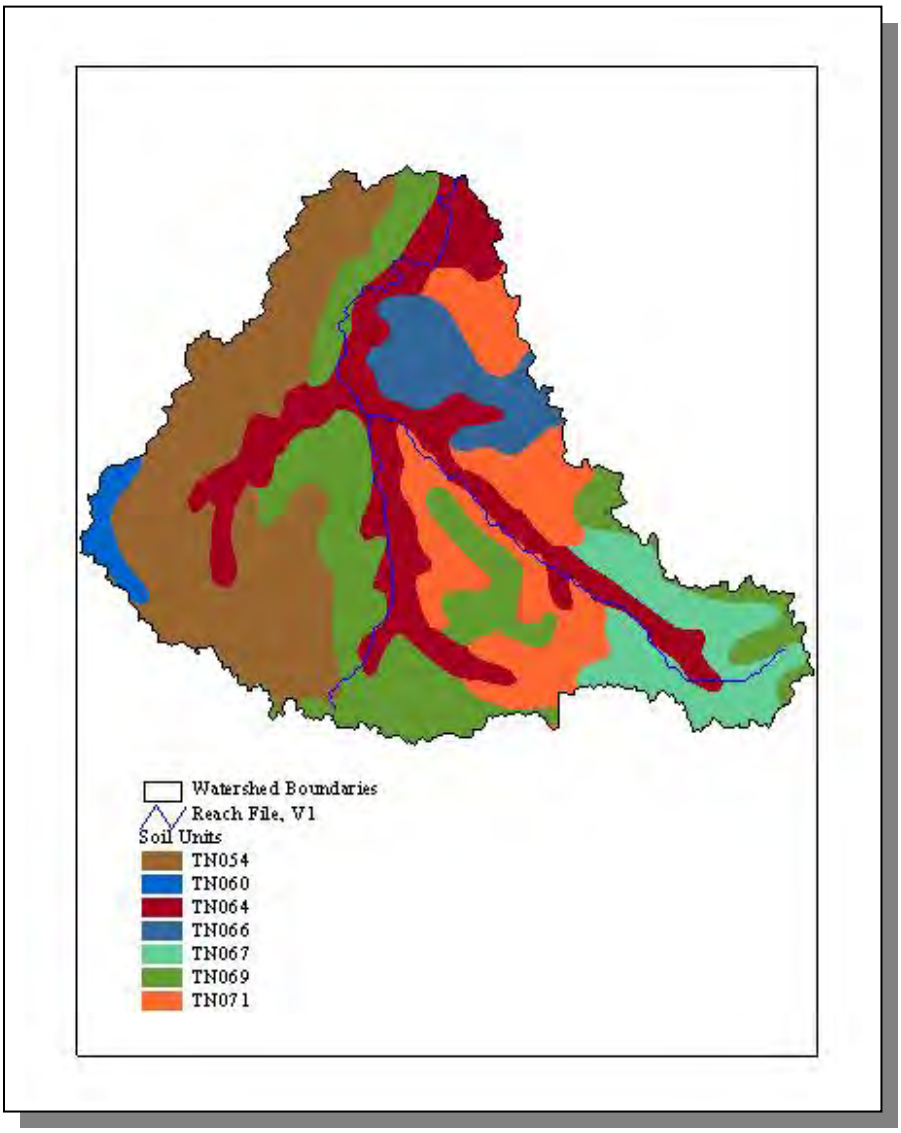


Figure 4-27. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204040.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN064	7.00	C	1.19	5.82	Silty Loam	0.37
TN066	0.00	B	2.62	4.75	Loam	0.28
TN067	2.00	C	2.69	5.51	Silty Loam	0.35
TN069	0.00	C	2.06	5.36	Loam	0.34
TN071	0.00	C	2.37	5.70	Silty Loam	0.33

Table 4-27. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204040. *More information is provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Maury	54,812	68,268	0.02	13	17	30.8
Williamson	81,021	111,453	20.21	16,374	22,524	37.6
Totals	**135,833**	**179,721**		**16,387**	**22,541**	**37.6**

Table 4-28. Population Estimates in Subwatershed 05130204040.

			NUMBER OF HOUSING UNITS			
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Franklin	Williamson	20,098	8,748	8,458	282.0	8.0
Spring Hill	Williamson	1,458	578	351	222.0	5.0
Totals		**21,556**	**9,326**	**8,809**	**504.0**	**13.0**

Table 4-29. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204040.

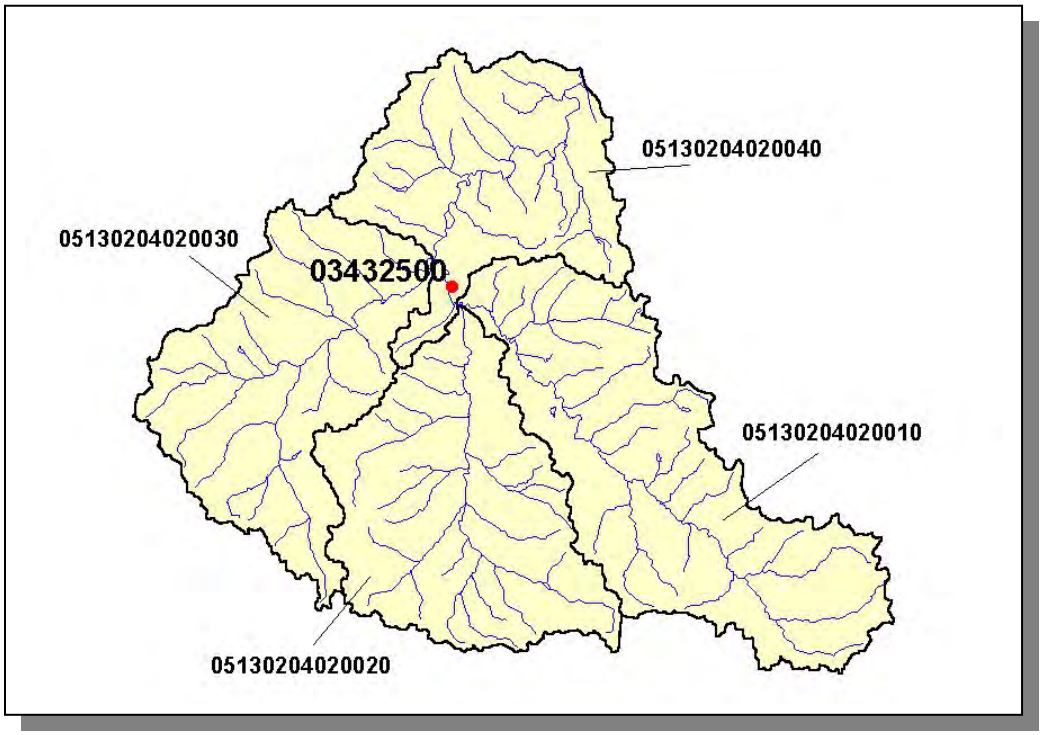


Figure 4-28. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204040. *Subwatershed 05130204020010, 05130204020020, 05130204020030, and 05130204020040 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

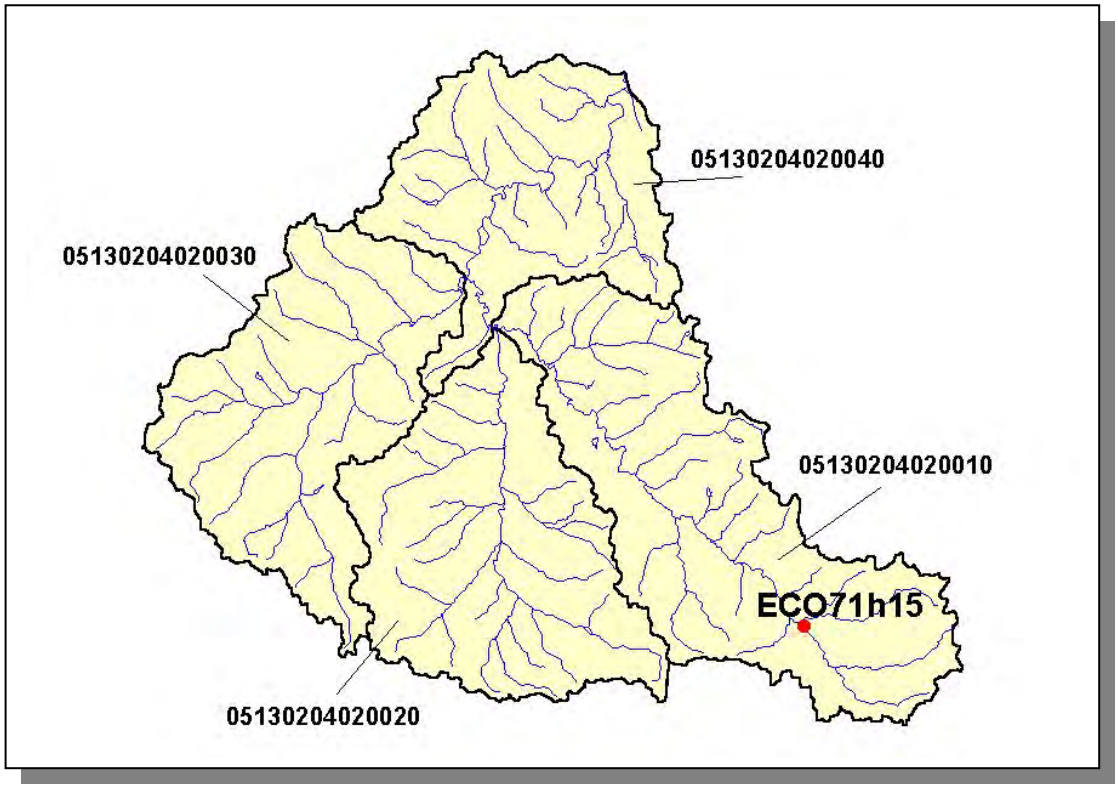


Figure 4-29. Location of STORET Monitoring Sites in Subwatershed 05130204040. *Subwatershed 05130204020010, 05130204020020, 05130204020030, and 05130204020040 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.D.ii. Point Source Contributions.

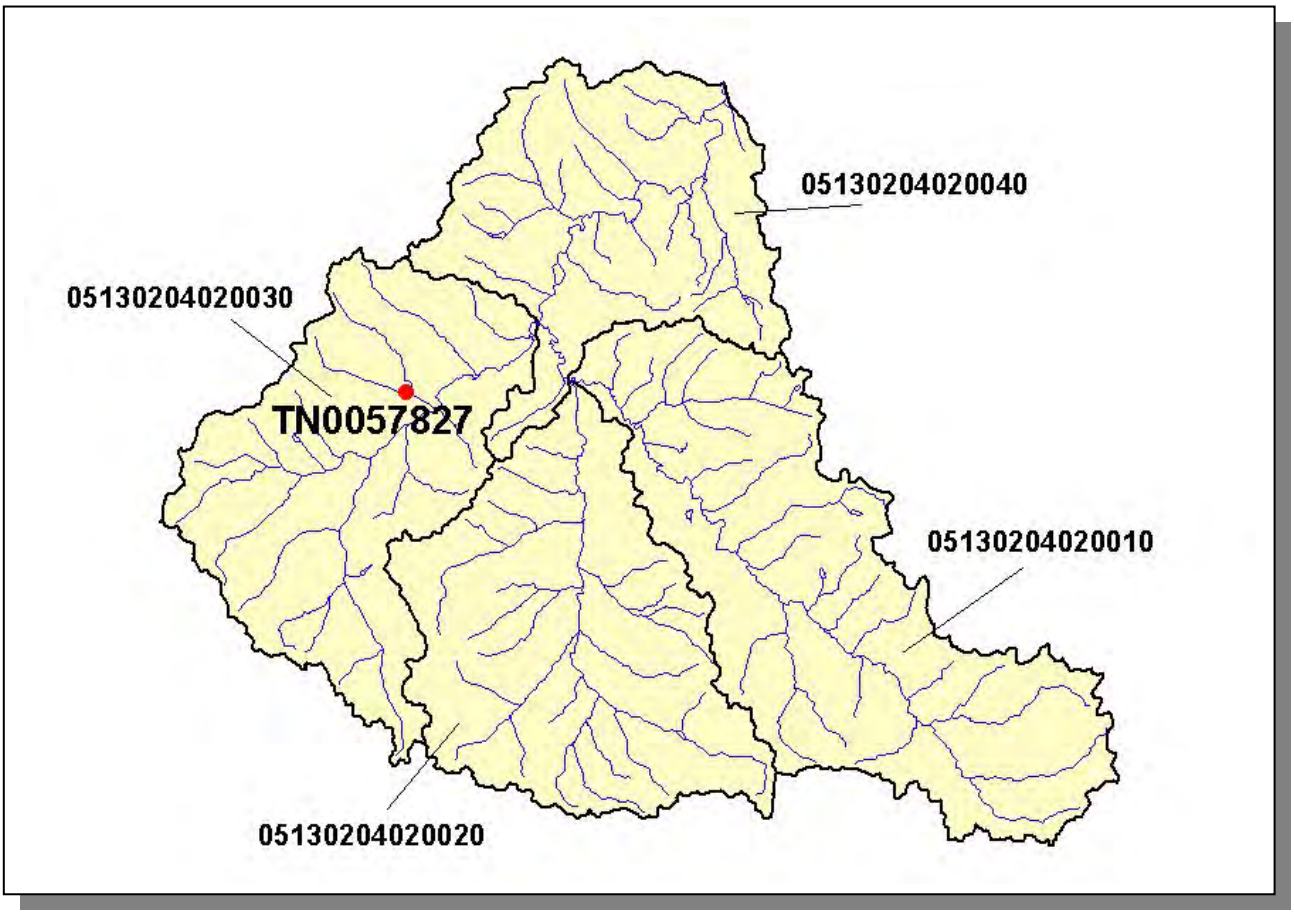


Table 4-30. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130204040. *Subwatershed 05130204020010, 05130204020020, 05130204020030, and 05130204020040 boundaries are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

Figure 4-30. Location of Active Mining Sites in Subwatershed 05130204040. *Subwatersheds 05130204020010, 05130204020020, 05130204020030, and 05130204020040 are shown for reference More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

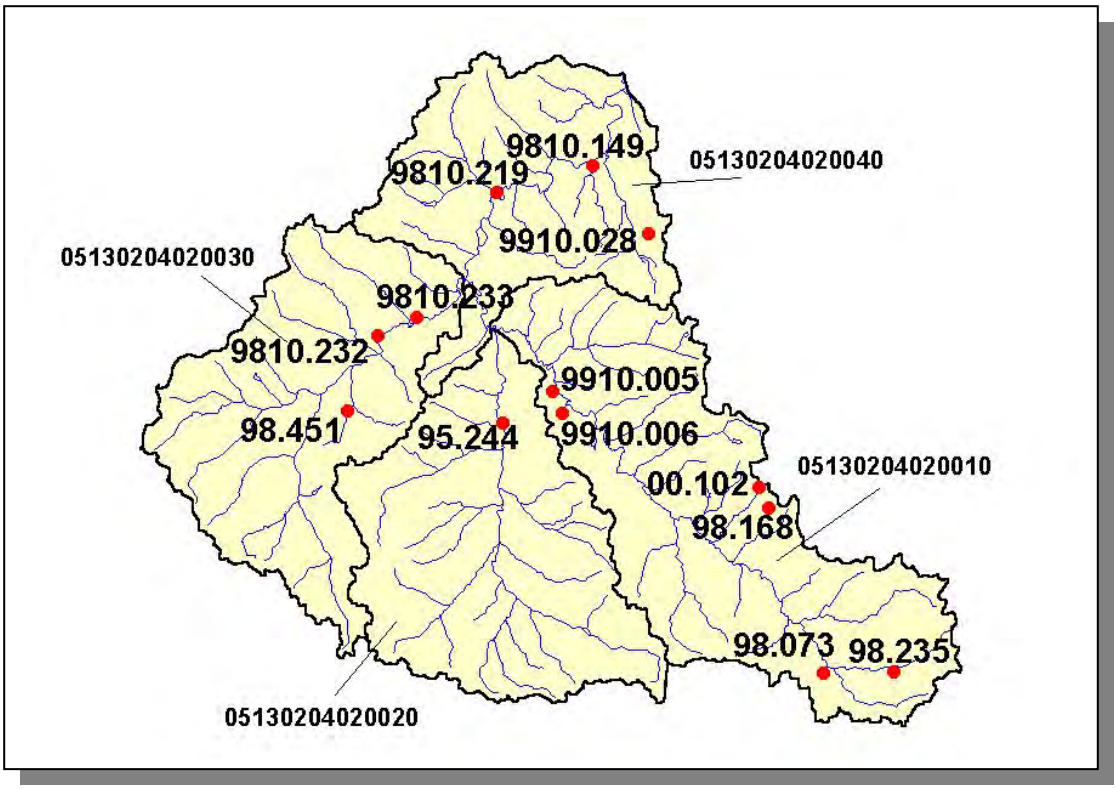


Figure 4-31. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204040. *Subwatershed 05130204020010, 05130204020020, 05130204020030, and 05130204020040 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.D.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)					
Beef Cow	**Milk Cow**	**Cattle**	**Chickens**	**Hogs**	**Sheep**
6,148	516	11,871	12	677	172

Table 4-31. Summary of Livestock Count Estimates in Subwatershed 05130204040. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	**Forest Land (thousand acres)**	**Timber Land (thousand acres)**	**Growing Stock (million cubic feet)**	**Sawtimber (million board feet)**
Williamson	142	142	1	3.3

Table 4-32. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130204040.

CROPS	TONS/ACRE/YEAR
Legume Grass (Hayland)	0.14
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	0.31
Non Agricultural Land Use	0.00
Corn (Row Crops)	5.39
Soybeans (Row Crops)	3.35
Tobacco (Row Crops)	6.75
Wheat (Close Grown Cropland)	1.27
Grass (Hayland)	0.11
Legume (Hayland)	0.98
Other Cropland not Planted	6.46
Grass (Pastureland)	0.58
Grass, Forbs, Legumes (Mixed Pasture)	0.42
Other Land in Farms	0.12
Conservation Reserve Program Land	0.12
Legume (Pastureland)	0.33
All Other Row Crops	11.45

Table 4-33. Annual Soil Loss in Subwatershed 05130204040.

4.2.E. 05130204050.

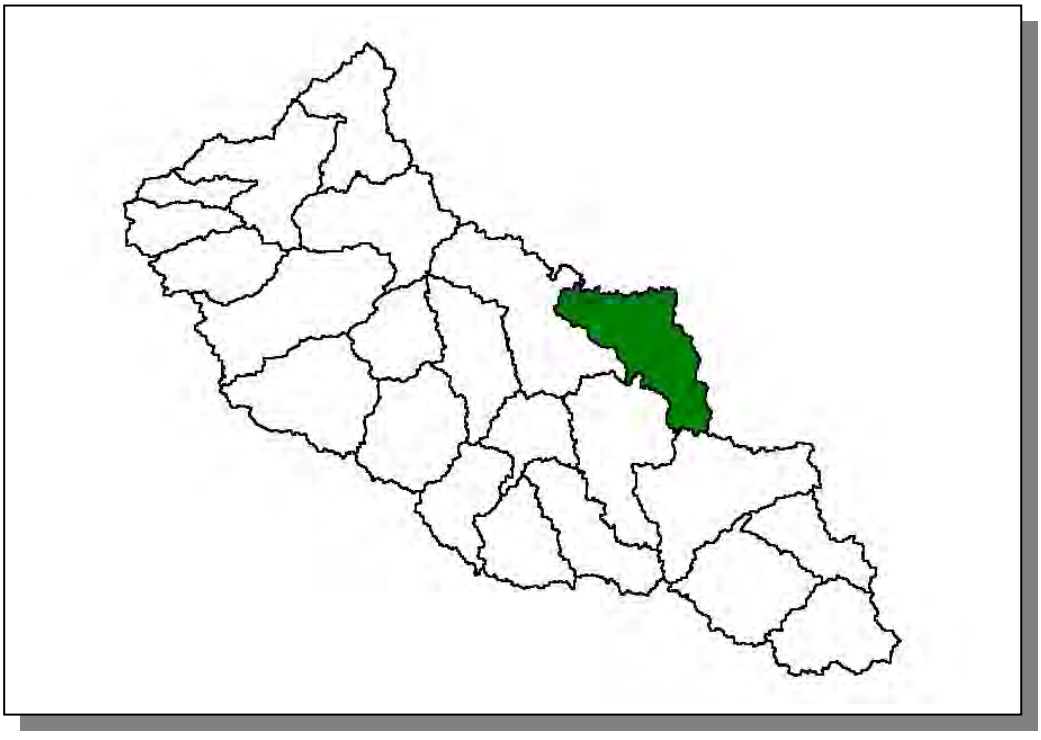


Figure 4-32. Location of Subwatershed 05130204050. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.E.i. General Description.

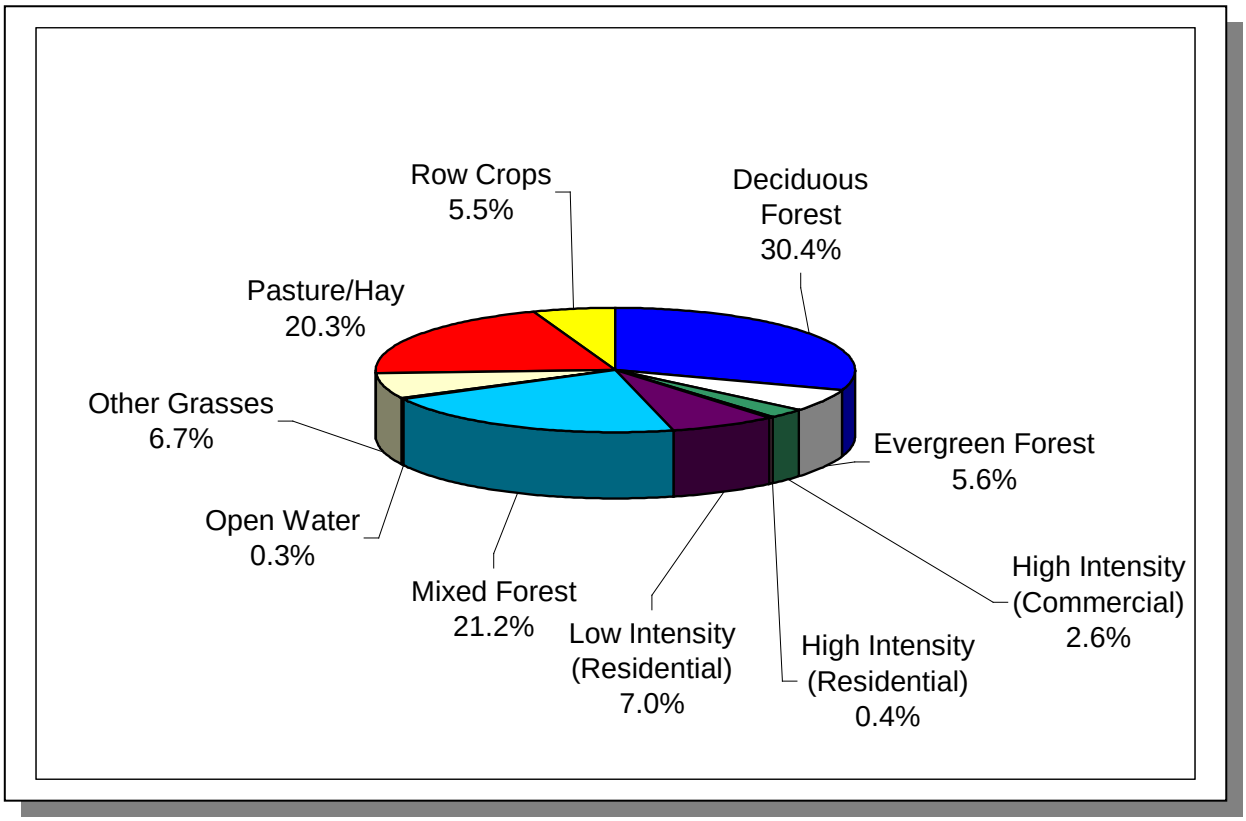


Figure 4-33. Land Use Distribution in Subwatershed 05130204050. *More information is provided in Harpeth-Appendix IV.*

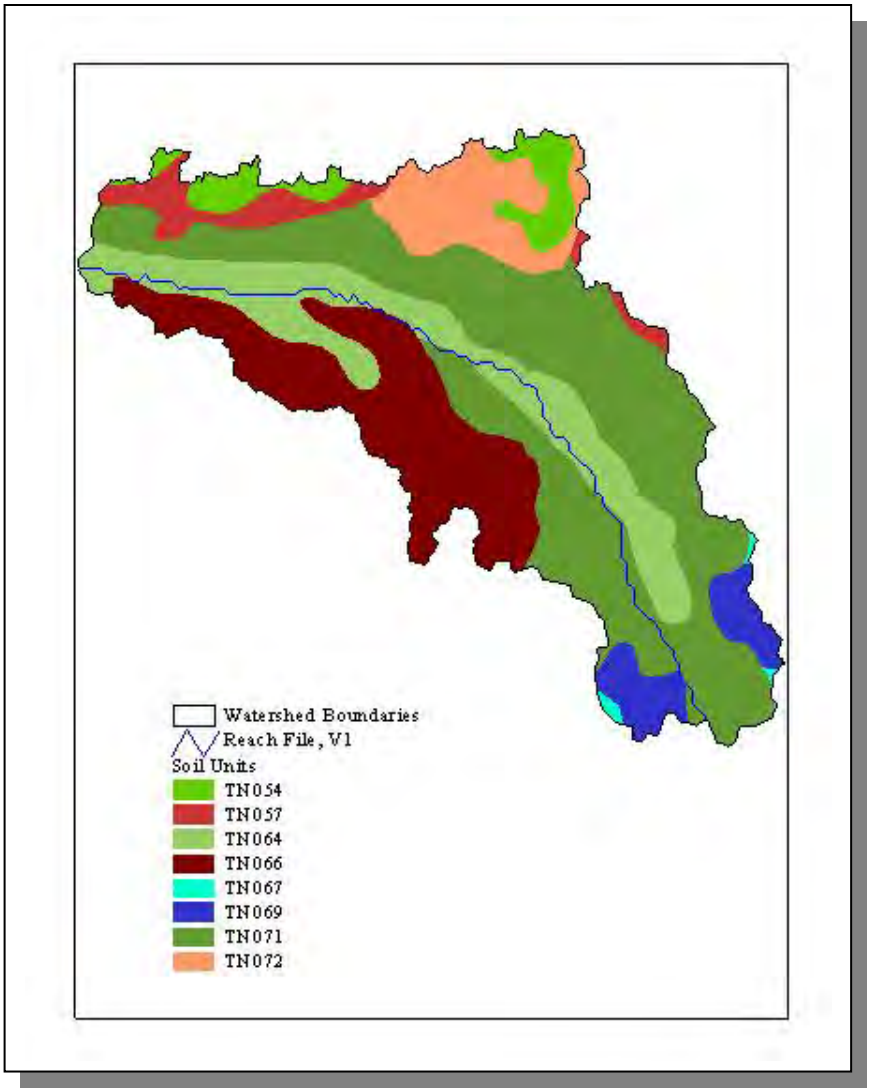


Figure 4-34. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204050.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN054	0.00	C	3.04	4.84	Loam	0.32
TN057	0.00	C	1.14	5.01	Clayey Loam	0.33
TN064	7.00	C	1.19	5.82	Silty Loam	0.37
TN066	0.00	B	2.62	4.75	Loam	0.28
TN067	2.00	C	2.69	5.51	Silty Loam	0.35
TN069	0.00	C	2.06	5.36	Loam	0.34
TN071	0.00	C	2.37	5.70	Silty Loam	0.33
TN072	0.00	B	3.70	5.57	Loam	0.31

Table 4-34. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204050. *More information is provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Davidson	510,784	535,032	2.39	12,222	12,802	4.7
Williamson	81,021	111,453	5.95	4,817	6,626	37.6
Totals	**591,805**	**646,485**		**17,039**	**19,428**	**14.0**

Table 4-35. Population Estimates in Subwatershed 05130204050.

			NUMBER OF HOUSING UNITS			
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Brentwood	Williamson	16,392	5,514	3,195	2,319	0
Franklin	Williamson	20,098	8,748	8,458	282	8
Forest Hills	Davidson	4,240	1,601	625	976	0
Nashville-Davidson	Davidson	488,518	219,521	203,640	15,576	305
Oak Hill	Davidson	4,301	1,788	990	798	0
Totals		**533,549**	**237,172**	**216,908**	**19,951**	**313**

Table 4-36. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204050.

Figure 4-35. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204050. *More information is provided in Harpeth-Appendix IV.*

4.2.E.ii. Point Source Contributions.

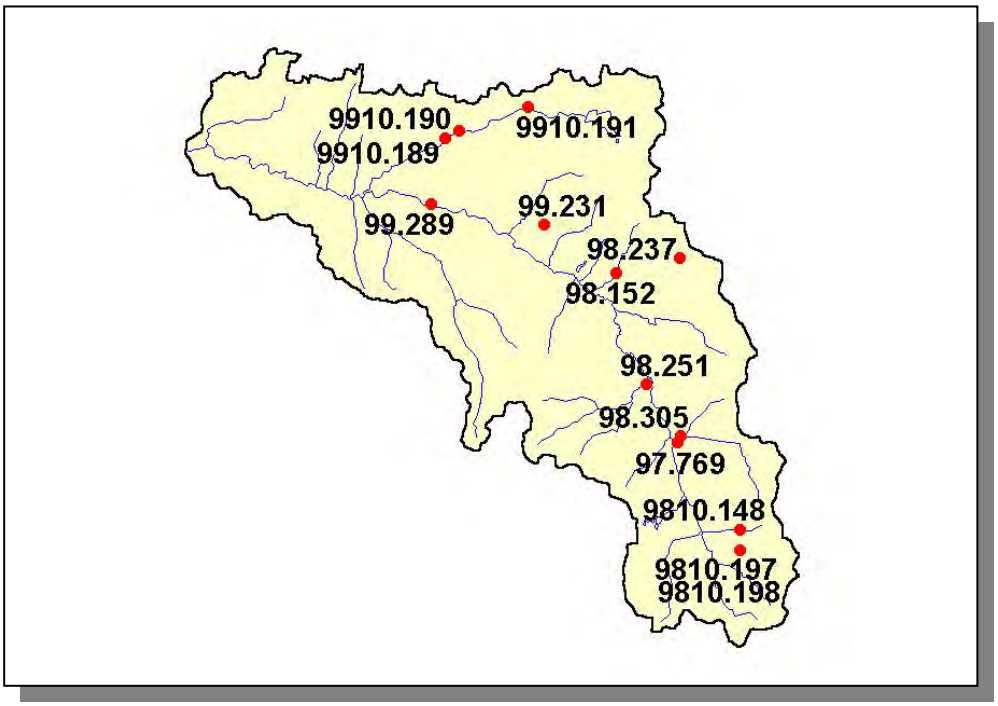


Figure 4-36. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204050. *More information is provided in Harpeth-Appendix IV.*

4.2.E.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)					
Beef Cow	**Milk Cow**	**Cattle**	**Chickens**	**Hogs**	**Sheep**
1,219	102	2,599	<5	136	34

Table 4-37. Summary of Livestock Count Estimates in Subwatershed 05130204050. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	**Forest Land (thousand acres)**	**Timber Land (thousand acres)**	**Growing Stock (million cubic feet)**	**Sawtimber (million board feet)**
Davidson	108.7	108.1	2.3	9.7
Williamson	142.0	142.0	1.0	3.3
Totals	**250.7**	**250.1**	**3.3**	**13.0**

Table 4-38. Forest Acreage and Annual Removal Rates (1987-1994) in Subwatershed 05130204050.

CROPS	TONS/ACRE/YEAR
Soybeans (Row Crops)	6.46
Grass (Pastureland)	0.54
Non Agricultural Land Use	0.00
All Other Close Grown Cropland	2.26
Grass (Hayland)	0.10
Grass, Forbs, Legumes (Mixed Pasture)	0.45
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	0.32
Legume Grass (Hayland)	0.14
Forest Land (Grazed)	0.00
Corn (Row Crops)	5.39
Tobacco (Row Crops)	6.75
Wheat (Close Grown Cropland)	1.27
Legume (Hayland)	0.98
Other Cropland not Planted	6.46
Other Land in Farms	0.12
Conservation Reserve Program Land	0.12
Legume (Pastureland)	0.33

Table 4-39. Annual Estimated Soil Loss in Subwatershed 05130204050.

4.2.F. 05130204060

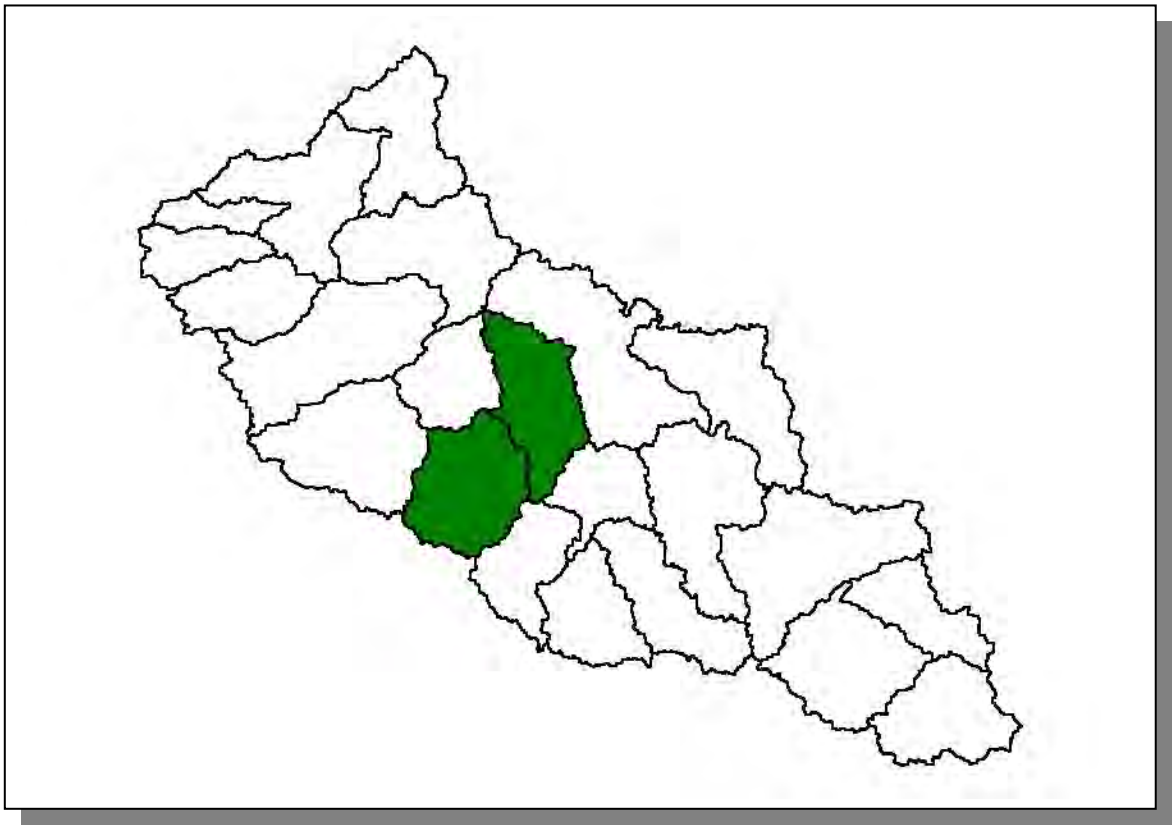


Figure 4-37. Location of Subwatershed 05130204060. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.F.i. General Description.

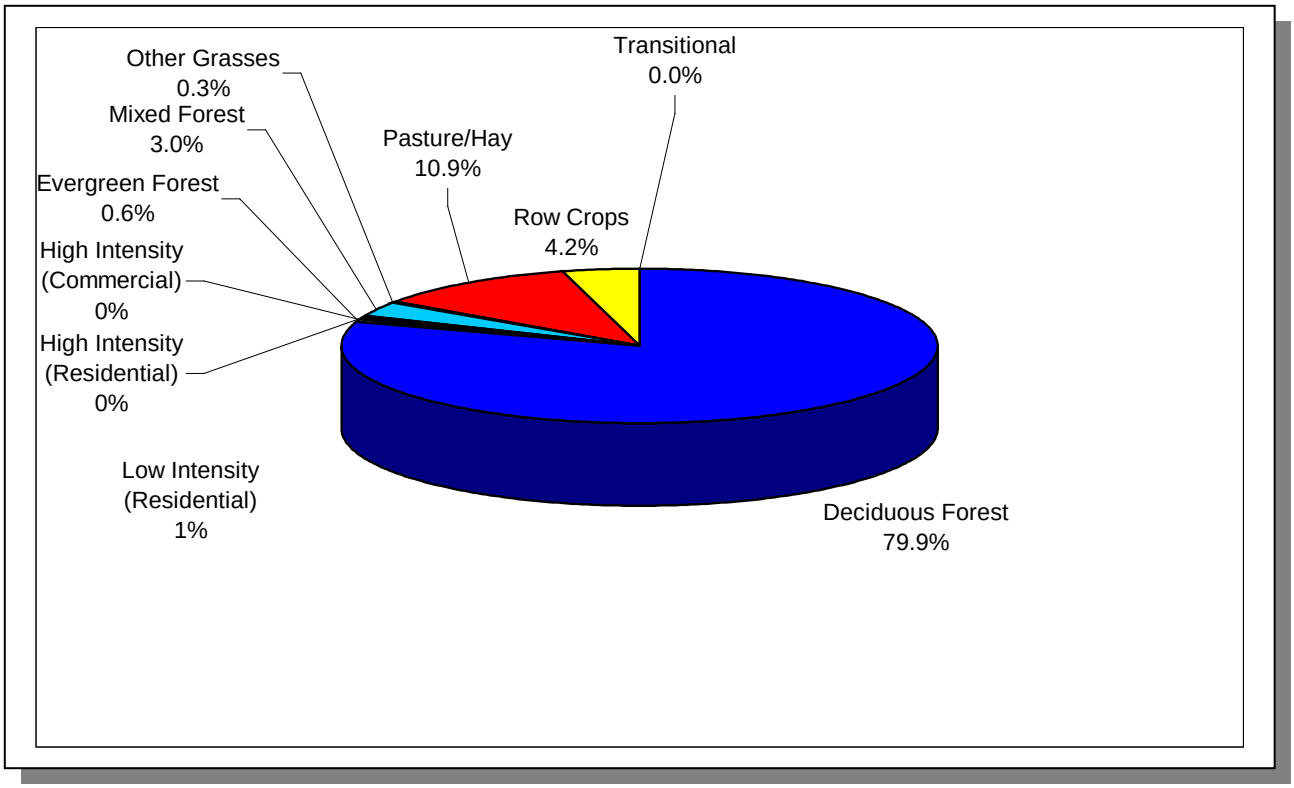


Figure 4-38. Land Use Distribution in Subwatershed 05130204060. *More information is provided in Harpeth-Appendix IV.*

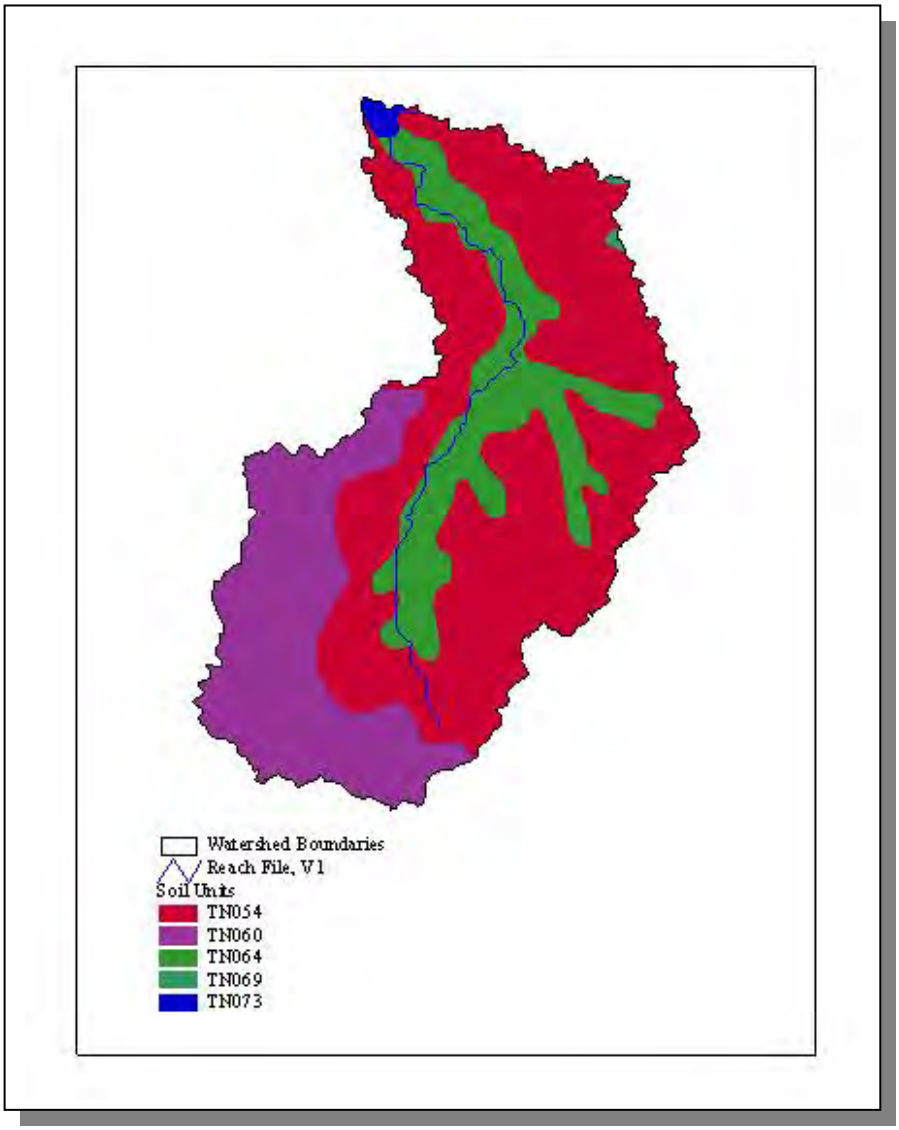


Figure 4-39. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204060.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN064	7.00	C	1.19	5.82	Silty Loam	0.37
TN069	0.00	C	2.06	5.36	Loam	0.34
TN073	0.00	B	2.97	5.21	Loam	0.34

Table 4-40. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204060. *More information is provided in Harpeth-Appendix IV.*

	TOTAL COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		PERCENT CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Cheatham	27,140	34,402	1.46	397	503	26.7
Davidson	510,784	535,032	2.59	13,232	13,860	4.7
Williamson	81,021	111,453	10.87	8,805	12,112	37.6
Totals	**618,945**	**680,887**		**22,434**	**26,475**	**18.0**

Table 4-41. Population Estimates in Subwatershed 05130204060.

			NUMBER OF HOUSING UNITS			
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Fairview	Williamson	4,210	1,479	833	640	6
Nashville-Davidson	Davidson	488,518	219,521	203,640	15,576	305
Pegram	Cheatham	1,371	535	20	510	5
Totals		**494,099**	**211,535**	**204,493**	**16,726**	**316**

Table 4-42. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204060.

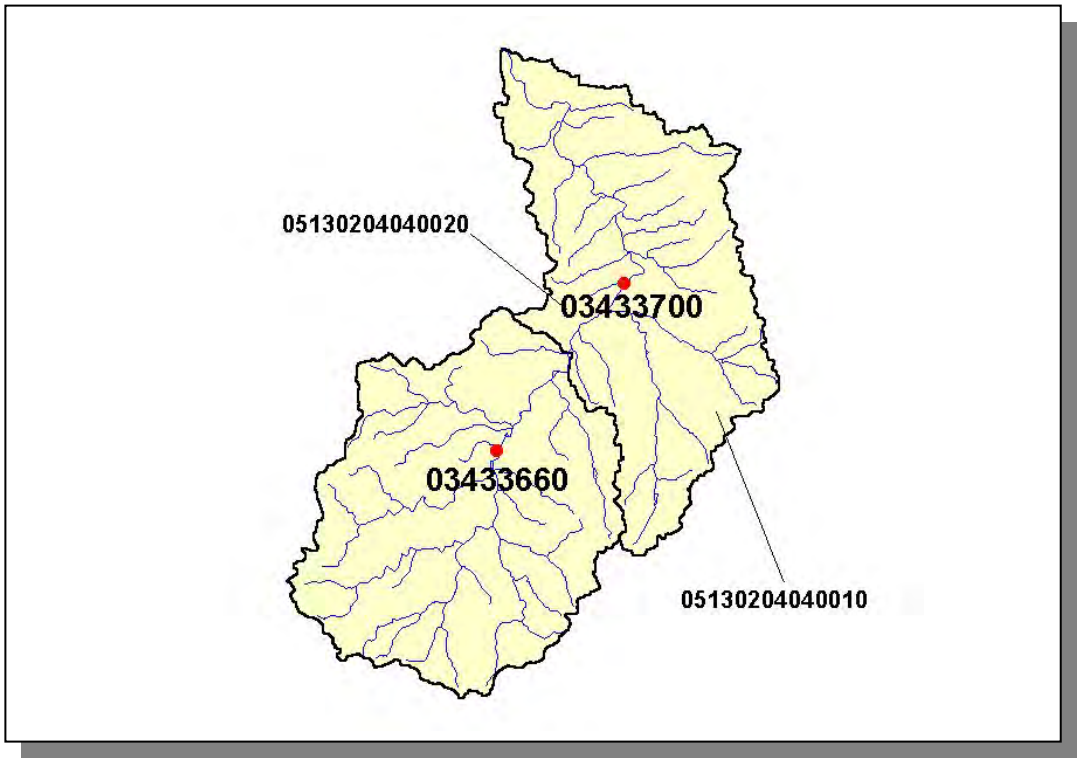


Figure 4-40. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204060. *Subwatershed 05130204040010 and 05130204040020 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

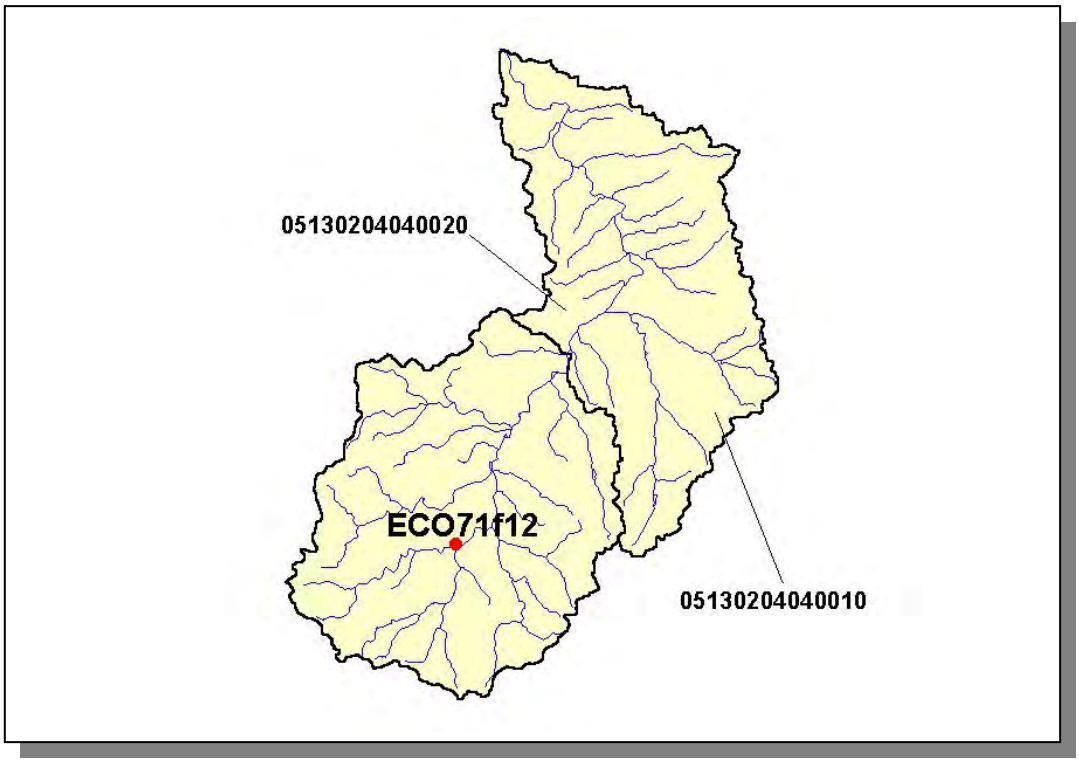


Figure 4-41. Location of STORET Monitoring Sites in Subwatershed 05130204060. *Subwatershed 05130204040010 and 05130204040020 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.F.ii. Point Source Contributions.

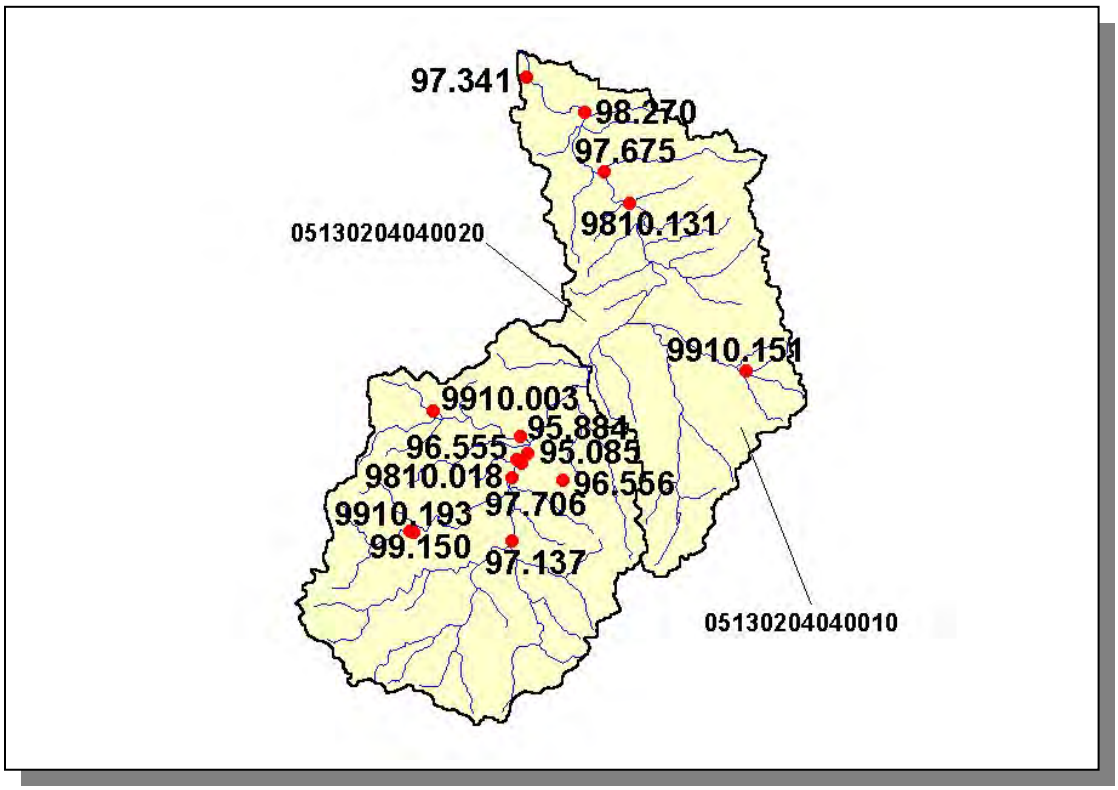


Figure 4-42. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204060. *Subwatershed 05130204040010 and 05130204040020 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.F.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)					
Beef Cow	**Milk Cow**	**Cattle**	**Chickens**	**Hogs**	**Sheep**
947	79	2,422	<5	133	27

Table 4-43. Summary of Livestock Count Estimates in Subwatershed 05130204060. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Cheatham	118.2	118.2	2.3	8.4
Davidson	108.7	108.1	2.3	9.7
Williamson	142.0	142.0	1.0	3.3
Totals	**368.9**	**368.3**	**5.6**	**21.4**

Table 4-44. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130204060.

CROPS	TONS/ACRE/YEAR
Non Agricultural Land Use	0.00
Soybeans (Row Crops)	5.64
Grass (Hayland)	0.13
Legume (Hayland)	0.94
Grass (Pastureland)	0.56
Grass, Forbs, Legumes (Mixed (Pasture)	0.46
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	0.31
Corn (Row Crops)	5.60
Other Cropland not Planted	6.07
Legume Grass (Hayland)	0.15
All Other Close Grown Cropland	2.26
Tobacco (Row Crops)	6.75
Wheat (Close Grown Cropland)	1.27
Other Land in Farms	0.12
Conservation Reserve Program Land	0.12
Legume (Pastureland)	0.33

Table 4-45. Annual Estimated Total Soil Loss in Subwatershed 05130204060.

4.2.G. 05130204070.

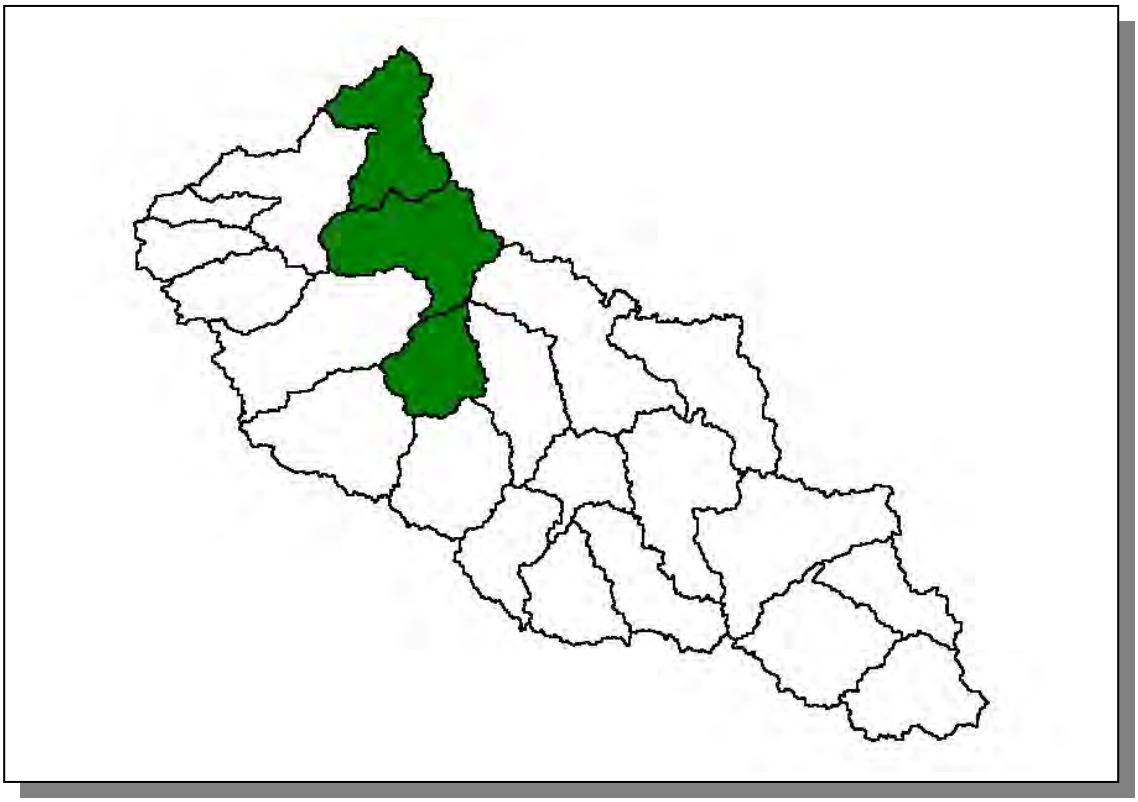


Figure 4-43. Location of Subwatershed 05130204070. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.G.i. General Description.

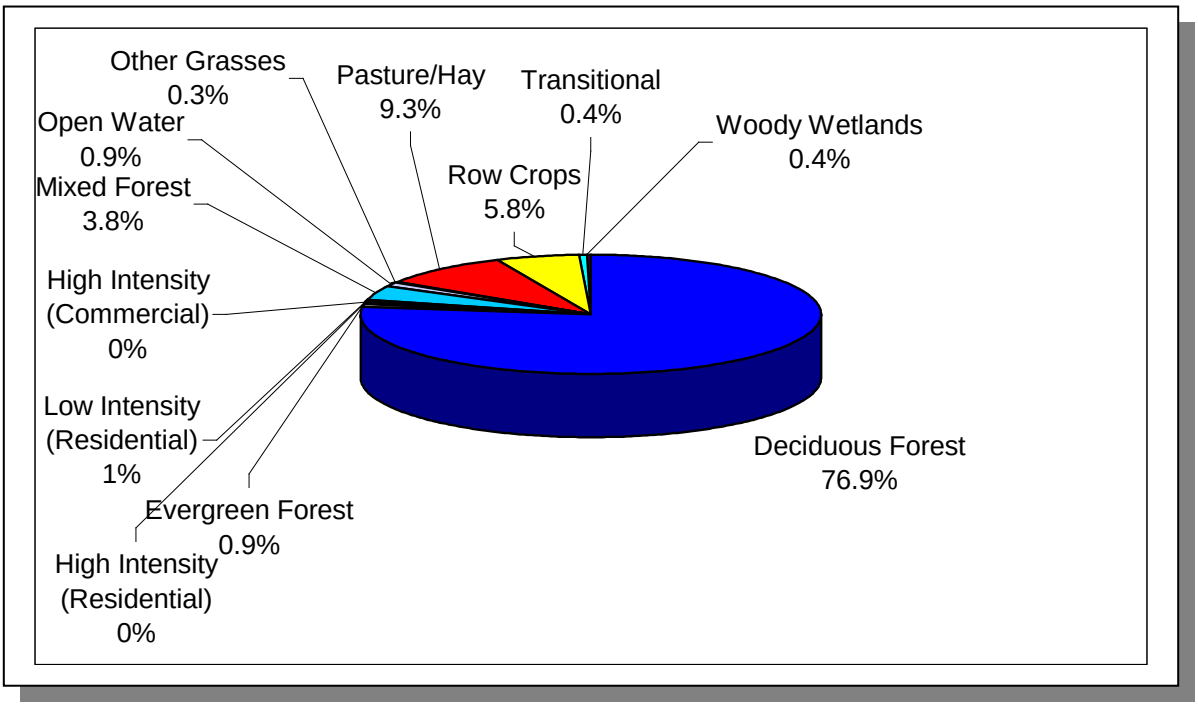


Figure 4-44. Land Use Distribution in Subwatershed 05130204070. *More information is provided in Harpeth-Appendix IV.*

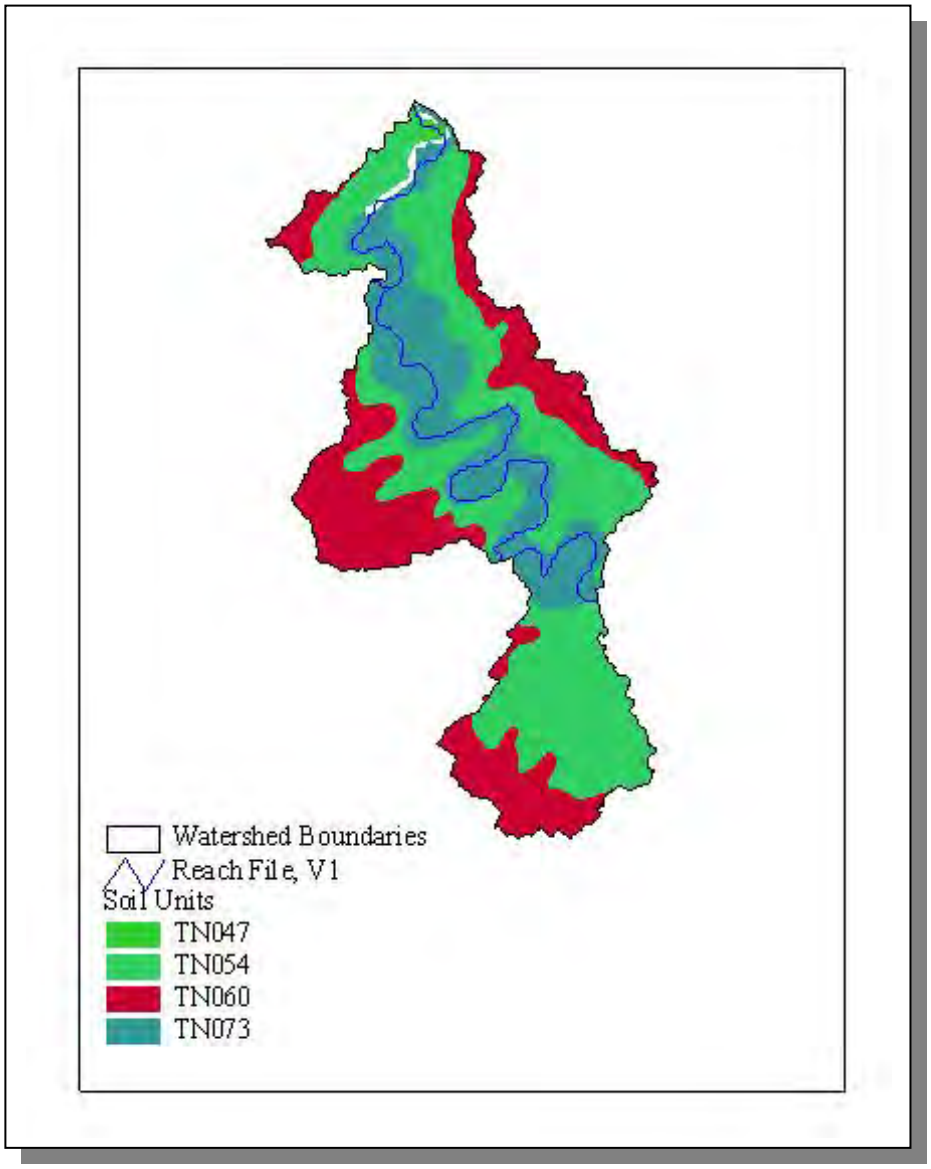


Figure 4-45. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204070.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hr)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN047	21.00	C	1.62	5.73	Silty Loam	0.37
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN073	0.00	B	2.97	5.21	Loam	0.34

Table 4-46. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204070. *More information is provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Cheatham	27,140	34,402	19.14	5,195	6,585	26.8
Dickson	35,061	40,937	6.95	2,437	2,845	16.7
Williamson	81,021	111,453	3.92	3,176	4,369	37.6
Totals	**143,222**	**186,792**		**10,808**	**13,799**	**27.7**

Table 4-47. Population Estimates in Subwatershed 05130204070.

NUMBER OF HOUSING UNITS						
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Fairview	Williamson	4,210	1,479	833	640	6
White Bluff	Dickson	1,979	820	596	224	0
Kingston Springs	Cheatham	1,529	519	450	65	4
Pegram	Cheatham	1,371	535	20	510	5
Totals		**9,089**	**3,353**	**1,899**	**1,439**	**15**

Table 4-48. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204070.

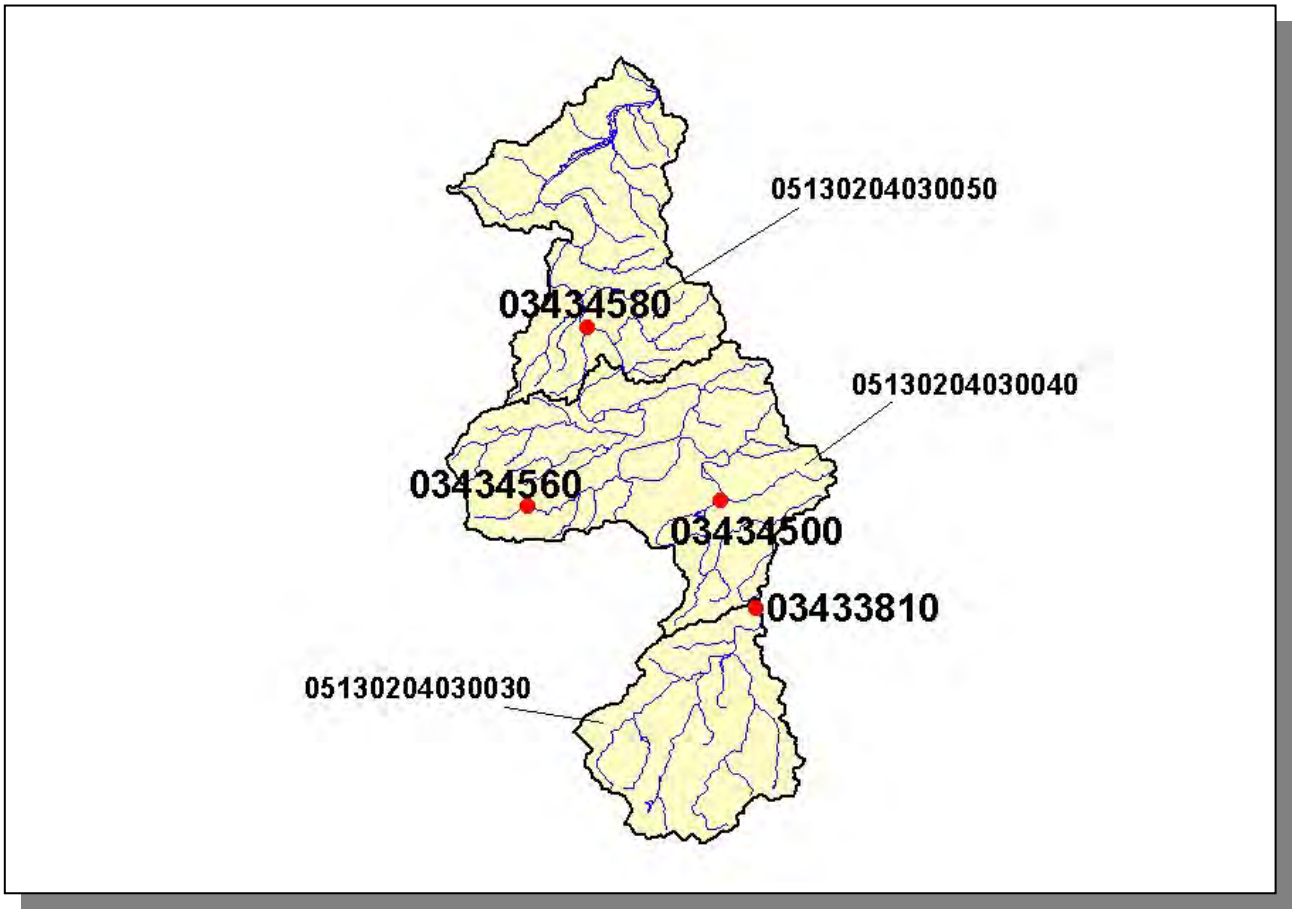


Figure 4-46. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204070. *Subwatershed 05130204030030, 05130204030040, and 05130204030050 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

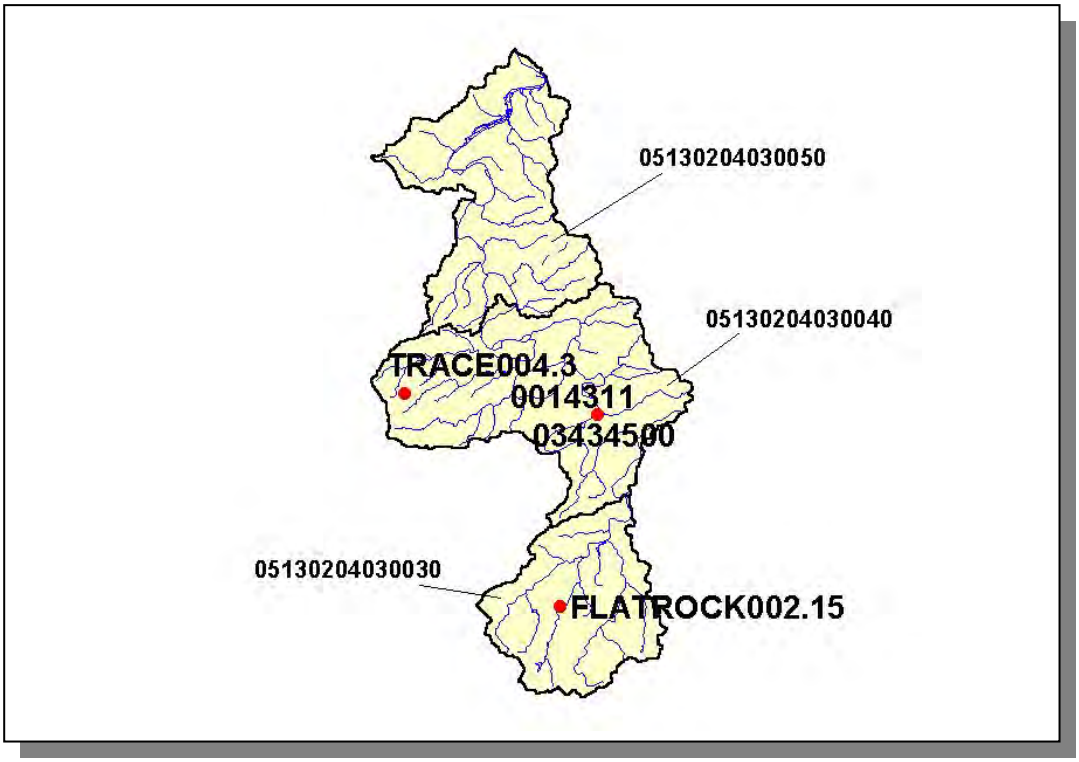


Figure 4-47. Location of STORET Monitoring Sites in Subwatershed 05130204070. *Subwatershed 05130204030030, 05130204030040, and 05130204030050 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.G.ii. Point Source Contributions.

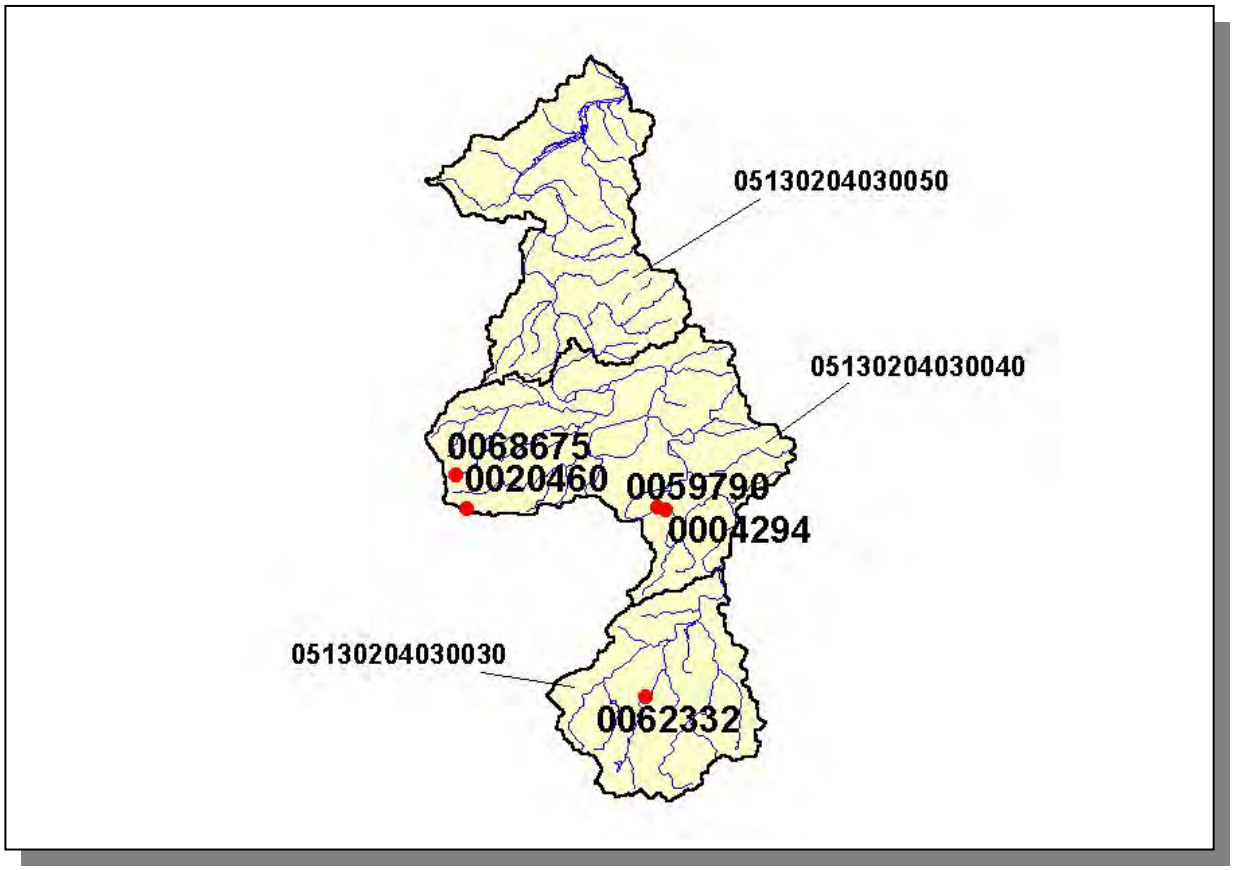


Figure 4-48. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130204070. *Subwatershed 05130204030030, 05130204030040, and 05130204030050 boundaries are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

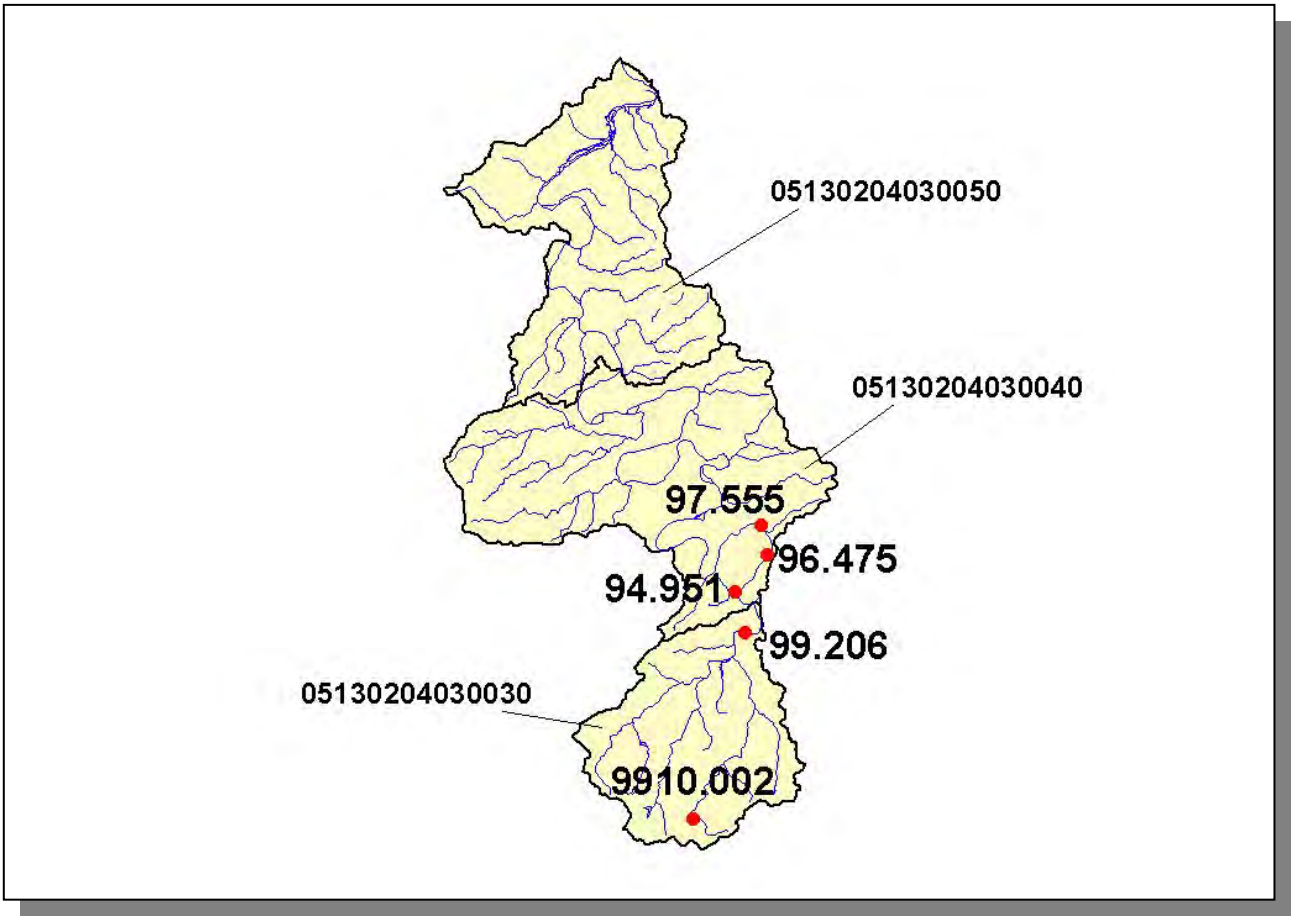


Figure 4-49. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204070. *Subwatershed 05130204030030, 05130204030040 and 05130204030050 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.G.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	**Cattle**	**Milk Cow**	**Chickens**	**Chickens Sold**	**Hogs**	**Sheep**
321	3,931	27	5	17	332	11

Table 4-49. Summary of Livestock Count Estimates in Subwatershed 05130204070. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Cheatham	118.2	118.2	2.3	8.4
Dickson	174.3	174.3	1.8	7.7
Williamson	142.0	142.0	1.0	3.3
Totals	**434.5**	**434.5**	**5.1**	**19.4**

Table 4-50. Forest Acreage and Average Removal Rates (1987-1994) in Subwatershed 05130204070.

CROPS	TONS/ACRE/YEAR
Soybeans (Row Crops)	7.79
Grass (Hayland)	0.42
Legume (Hayland)	0.55
Grass (Pastureland)	0.64
Grass, Forbs, Legumes (Mixed Pasture)	0.73
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	1.27
Corn (Row Crops)	6.27
Other Cropland not Planted	2.18
Legume Grass (Hayland)	0.35
Vineyard (Horticultural)	1.05
Other Vegetable and Truck Crops	7.71
Conservation Reserve Program Land	0.09
Tobacco (Row Crops)	6.75
Wheat (Close Grown Cropland)	1.27
Other Land in Farms	0.12
Legume (Pastureland)	0.33

Table 4-51. Annual Estimated Total Soil Loss in Subwatershed 05130204070.

4.2.H. 05130204080.

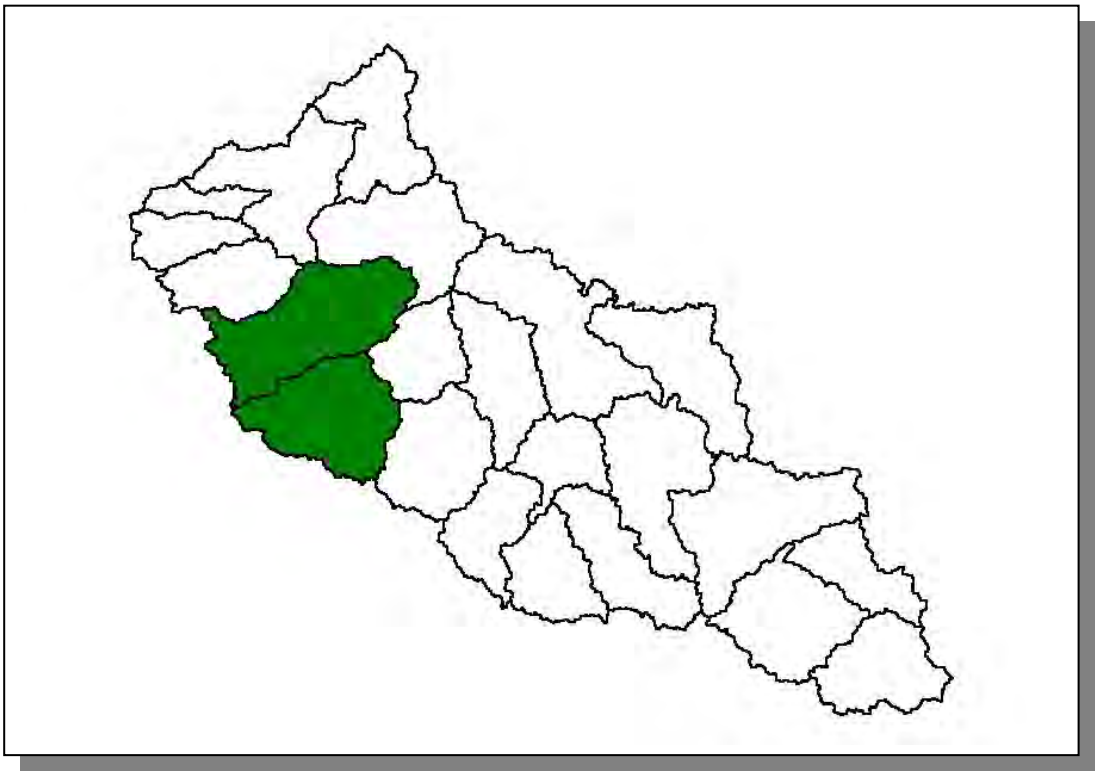


Figure 4-50. Location of Subwatershed 05130204080. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.H.i. General Description.

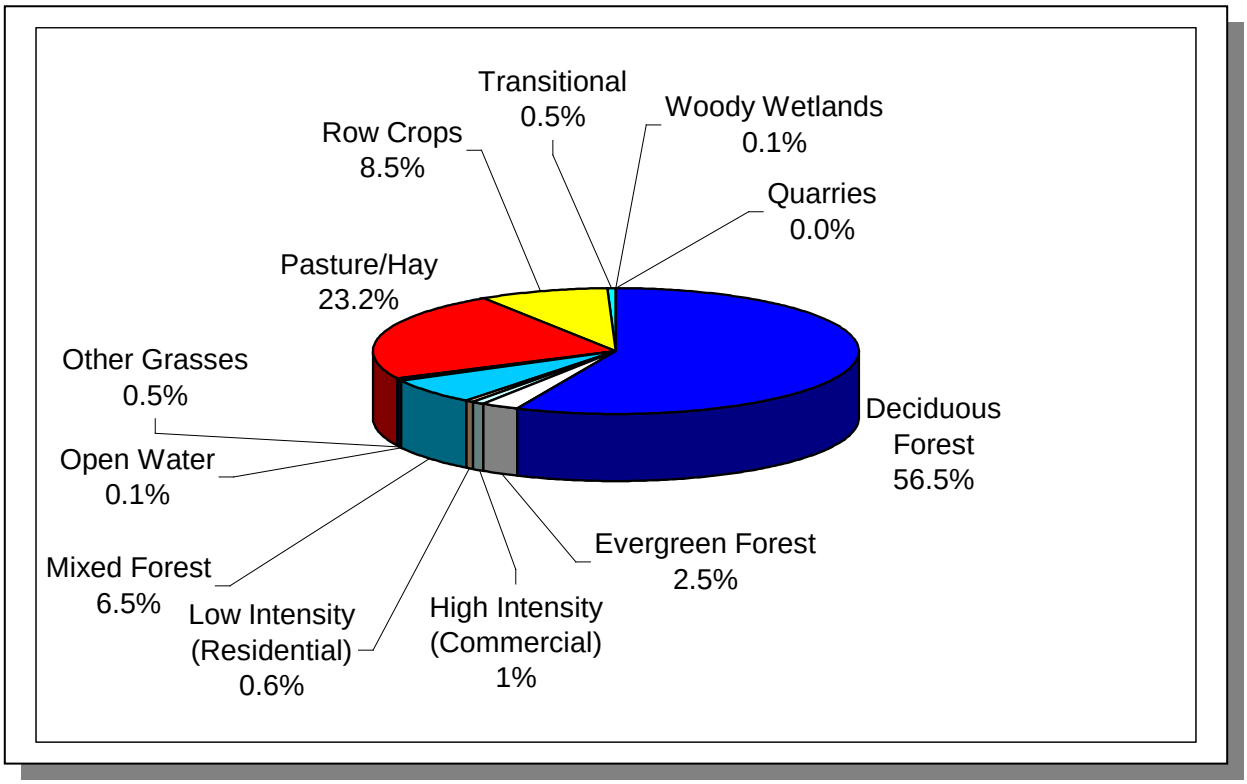


Figure 4-51. Land Use Distribution in Subwatershed 05130204080. More information is provided in Harpeth-Appendix IV.

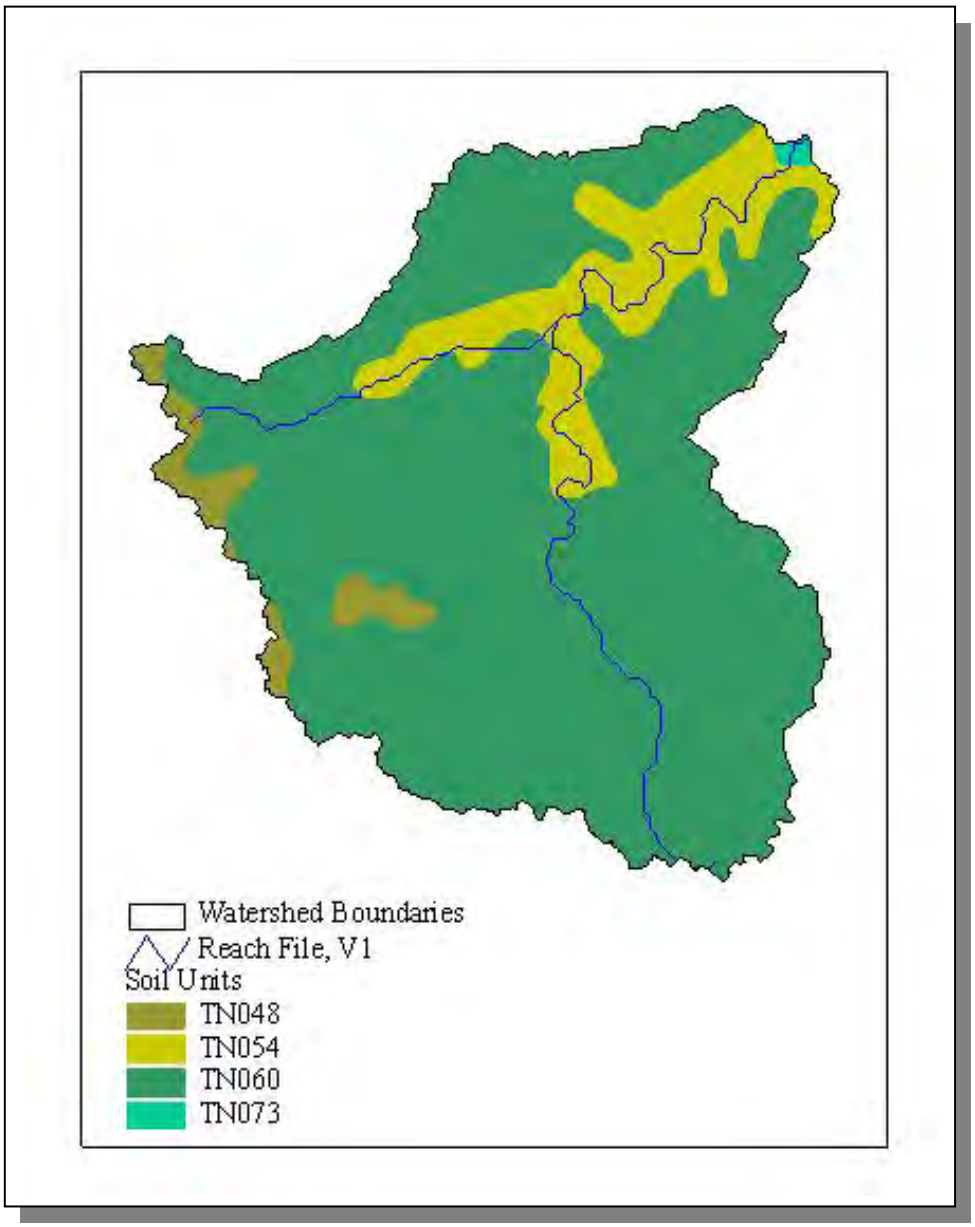


Figure 4-52. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204080.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN048	8.00	C	13.8	5.06	Silty Loam	0.42
TN054	0.00	C	30.4	4.84	Loam	0.32
TN060	5.00	B	13.0	5.32	Silty Loam	0.39
TN073	0.00	B	2.97	5.21	Loam	0.34

Table 4-52. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204080. *More information is provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Cheatham	27,140	34,402	3.32	900	1,141	26.8
Dickson	35,061	40,937	13.36	4,685	5,470	16.8
Hickman	16,754	19,926	2.4	403	479	18.9
Williamson	81,021	111,453	4.32	3,503	4,819	37.6
Totals	**159,976**	**206,718**		**9,491**	**11,909**	**25.5**

Table 4-53. Population Estimates in Subwatershed 05130204080.

			NUMBER OF HOUSING UNITS			
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Fairview	Williamson	4,210	1,479	833	640	6
Burns	Dickson	1,127	440	53	384	3
Dickson	Dickson	8,791	3,818	3,268	540	10
White Bluff	Dickson	1,979	820	596	224	0
Kingston Springs	Cheatham	1,529	519	450	65	4
Totals		**17,636**	**7,076**	**5,200**	**1,853**	**23**

Table 4-54. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204080.

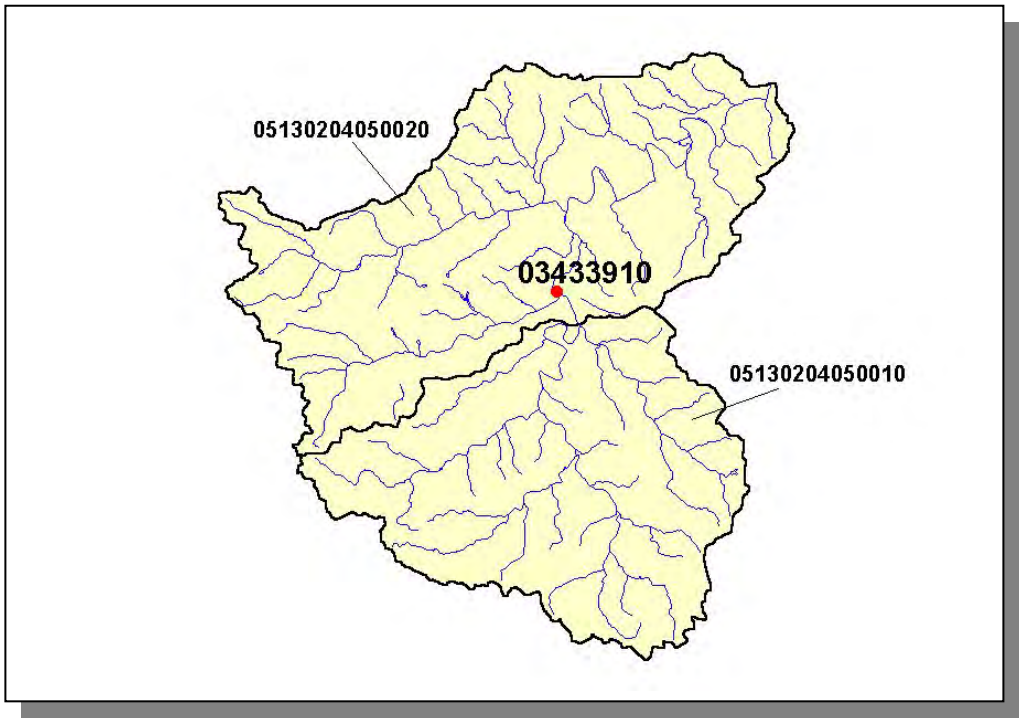


Figure 4-53. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204080. *Subwatershed 05130204050010 and 05130204040020 boundaries are shown for reference. More information may be found in Harpeth-Appendix IV.*

4.2.H.ii. Point Source Contributions.

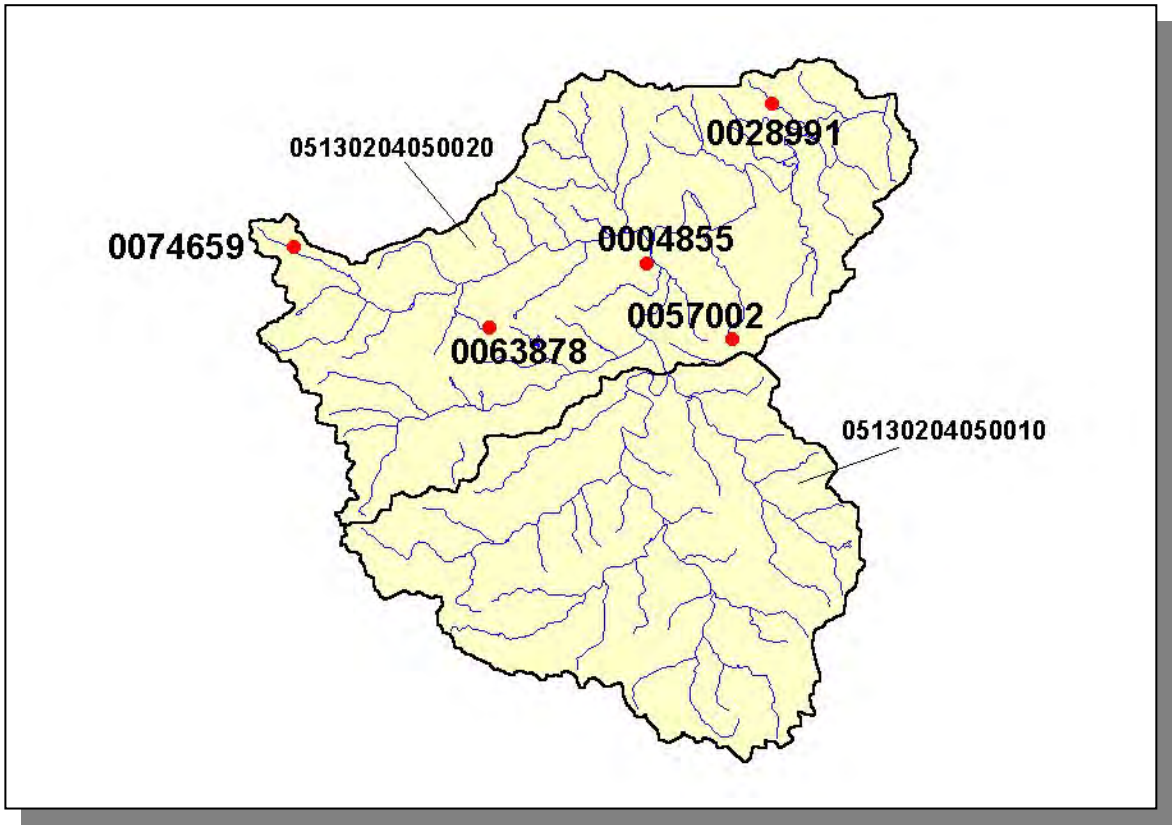


Figure 4-54. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130204080. *Subwatershed 05130204050010 and 05130204040020 boundaries are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

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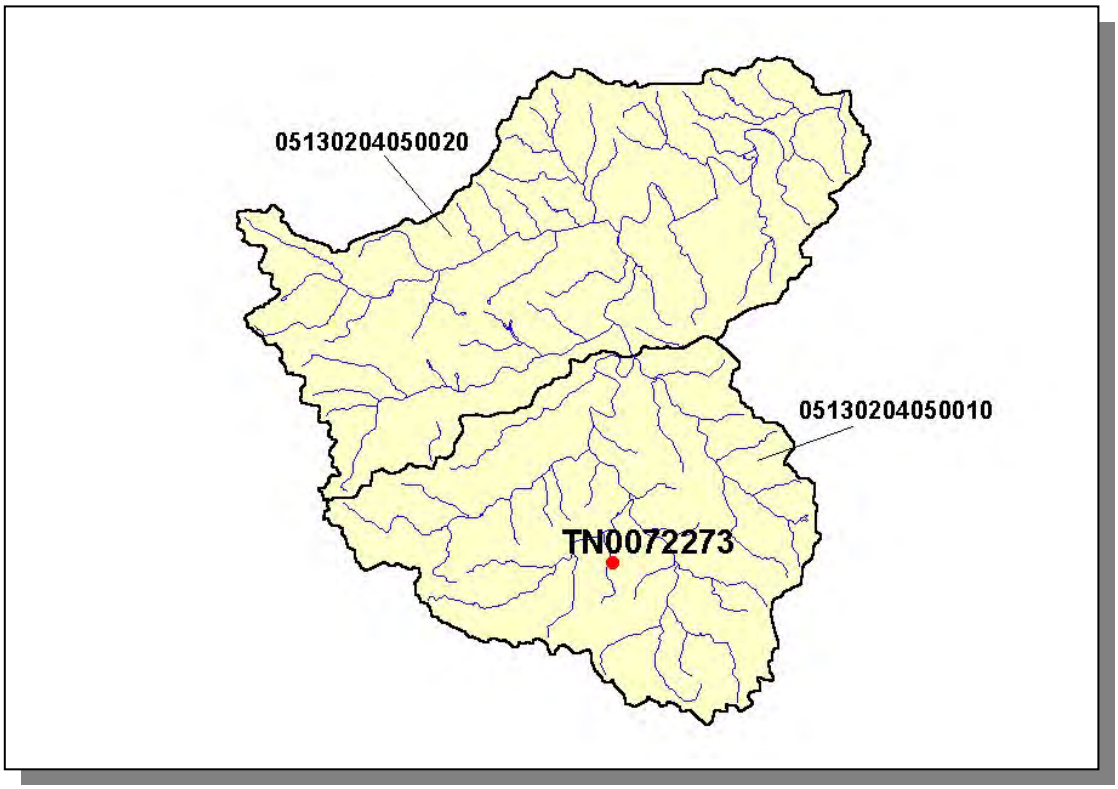

Figure 4-55. Location of Active Mining Sites in Subwatershed 05130204080. *Subwatersheds 05130204050010 and 05130204050020 are shown for reference More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

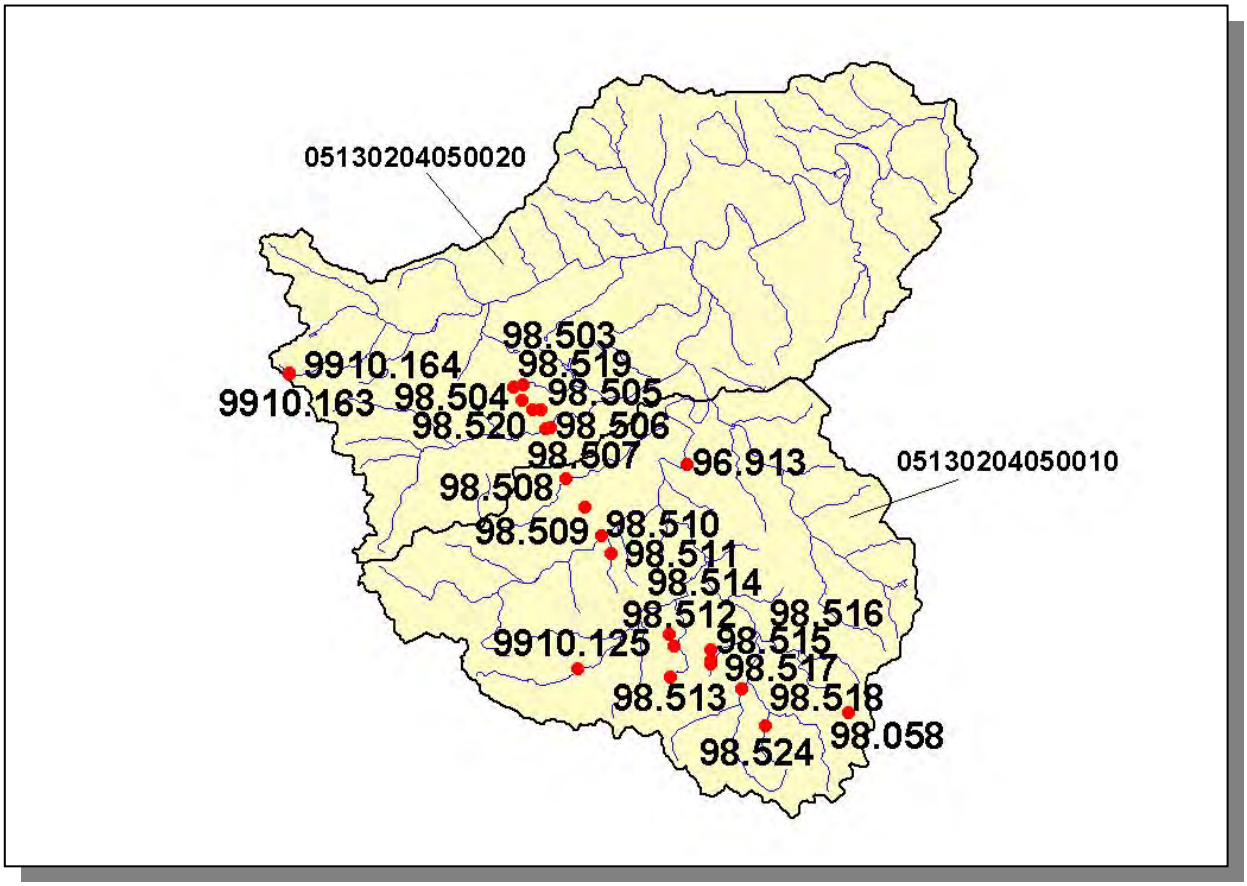

Figure 4-56. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204080. *Subwatershed 05130204050010 and 05130204050020 boundaries are shown for reference. Additional information may be found in Harpeth-Appendix IV.*

4.2.H.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)						
Beef Cow	**Cattle**	**Milk Cow**	**Chickens**	**Chickens Sold**	**Hogs**	**Sheep**
1,956	9,382	84	17	63	834	36

Table 4-55. Summary of Livestock Count Estimates in Subwatershed 05130204080. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	Forest Land (thousand acres)	Timber Land (thousand acres)	Growing Stock (million cubic feet)	Sawtimber (million board feet)
Cheatham	118.2	118.2	2.3	8.4
Dickson	174.3	174.3	1.8	7.7
Hickman	297.2	297.2	5.8	23.0
Williamson	142.0	142.0	1.0	3.3
Totals	**731.7**	**731.7**	**10.9**	**35.4**

Table 4-56. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130204080.

CROPS	TONS/ACRE/YEAR
Non Agricultural Land Use	0.00
Soybeans (Row Crops)	5.19
Grass (Hayland)	0.36
Legume (Hayland)	0.88
Grass (Pastureland)	0.68
Grass Forbs Legumes (Mixed Pasture)	0.69
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	2.23
Corn (Row Crops)	4.11
Other Cropland not Planted	4.74
Legume Grass (Hayland)	0.43
Vineyard (Horticultural)	1.05
Other Vegetable and Truck Crops	7.71
Conservation Reserve Program Land	0.18
Tobacco (Row Crops)	7.10
Wheat (Close Grown Cropland)	1.27
Other Land in Farms	0.12
Legume (Pastureland)	0.46

Table 4-57. Annual Estimated Total Soil Loss in Subwatershed 05130204080.

4.2.I. 05130204090.

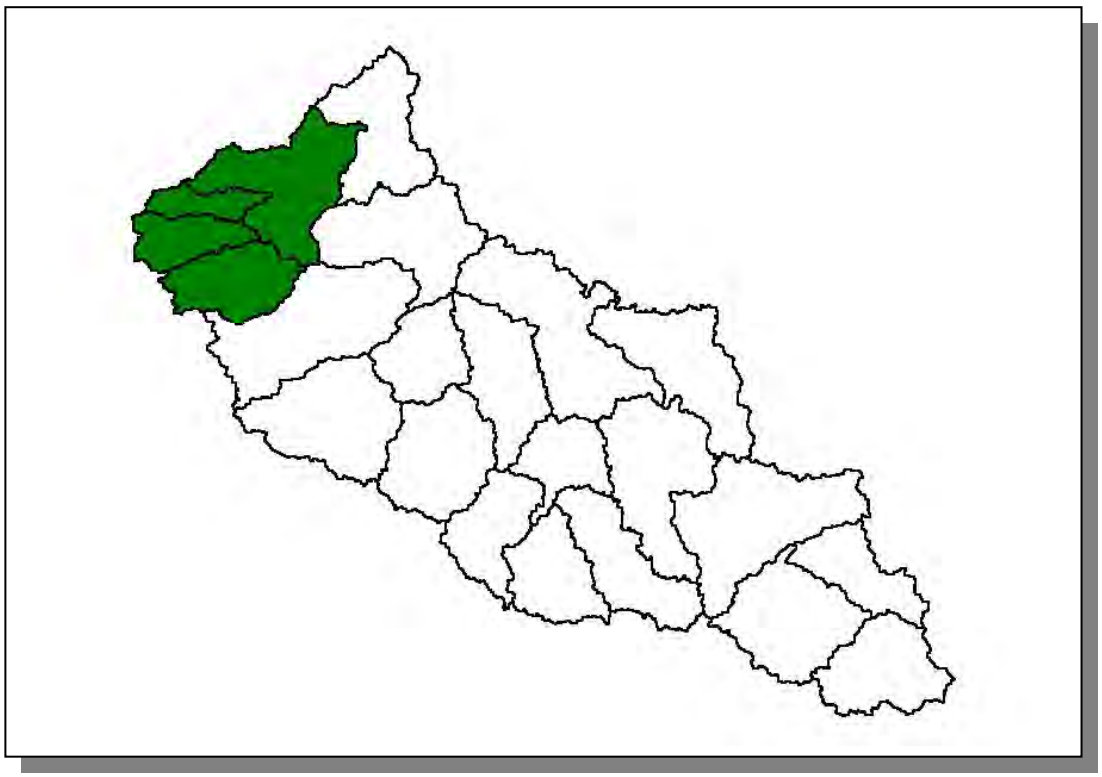

Figure 4-57. Location of Subwatershed 05130204090. *All Harpeth HUC-14 subwatershed boundaries are shown for reference.*

4.2.I.i. General Description.

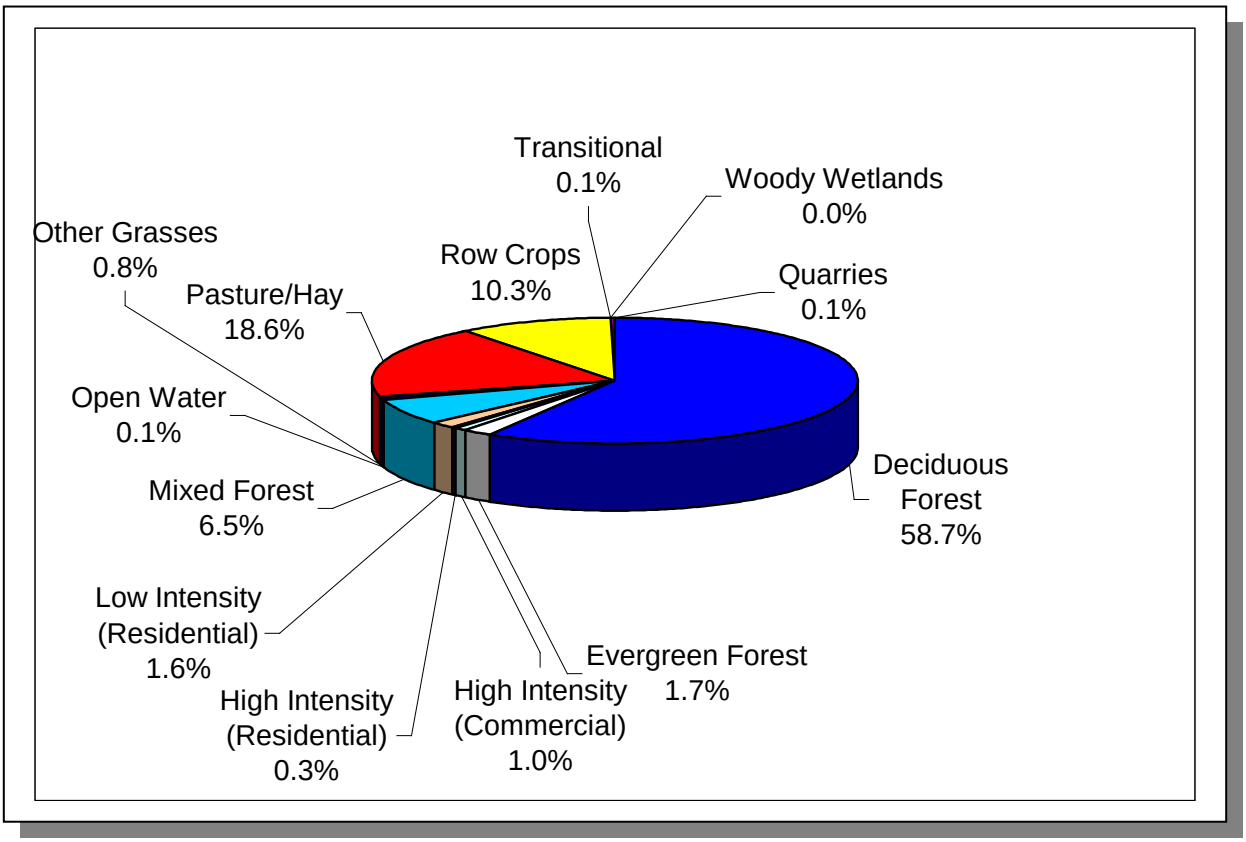

Figure 4-58. Land Use Distribution in Subwatershed 05130204090. *More information is provided in Harpeth-Appendix IV.*

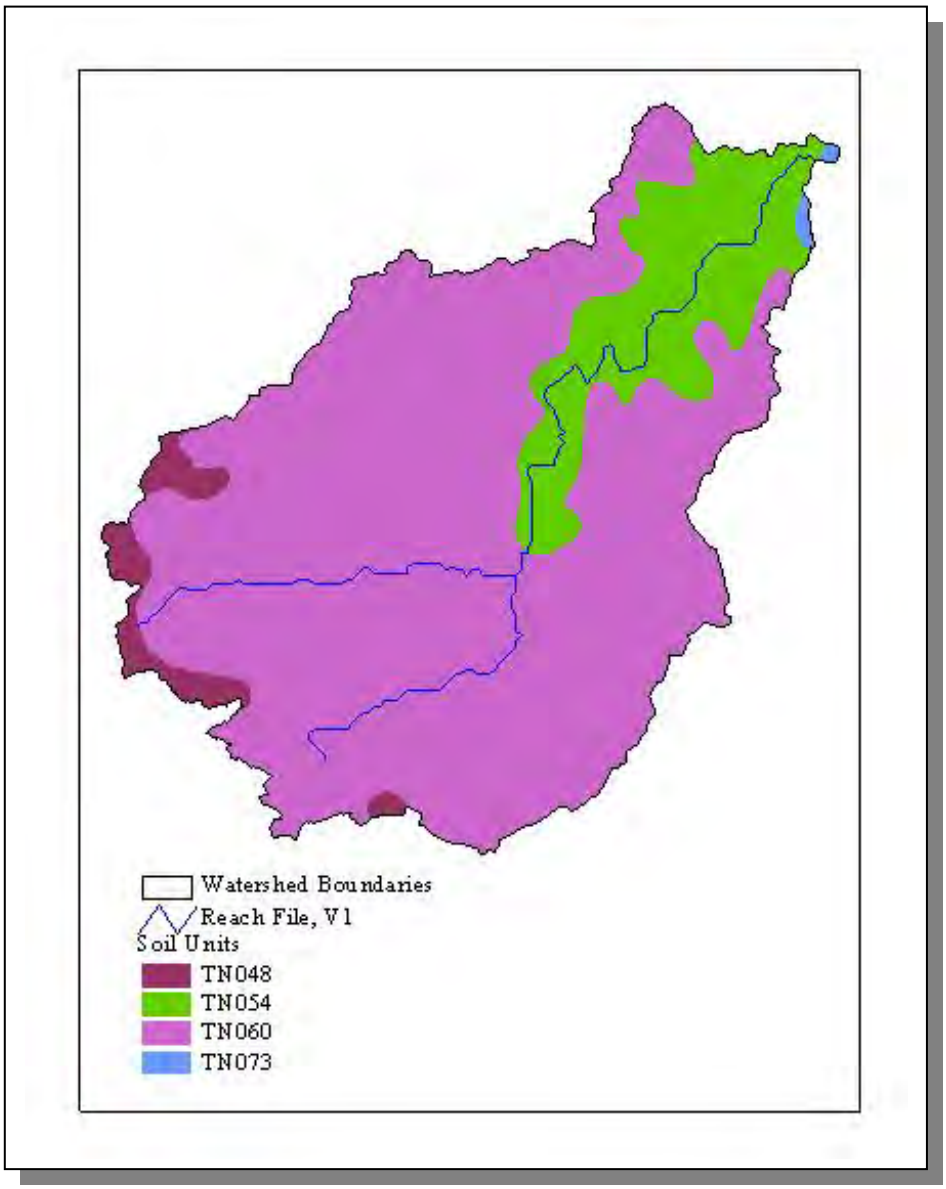

Figure 4-59. STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204090.

STATSGO MAP UNIT ID	PERCENT HYDRIC	HYDROLOGIC GROUP	PERMEABILITY (in/hour)	SOIL pH	ESTIMATED SOIL TEXTURE	SOIL ERODIBILITY
TN048	8.00	C	1.38	5.06	Silty Loam	0.42
TN054	0.00	C	3.04	4.84	Loam	0.32
TN060	5.00	B	1.30	5.32	Silty Loam	0.39
TN073	0.00	B	2.97	5.21	Loam	0.34

Table 4-58. Soil Characteristics by STATSGO (State Soil Geographic Database) Soil Map Units in Subwatershed 05130204090. *More information is provided in Harpeth-Appendix IV.*

	COUNTY POPULATION			ESTIMATED POPULATION IN WATERSHED		% CHANGE
County	**1990**	**1997 Est.**	**Portion of Watershed (%)**	**1990**	**1997**	
Dickson	35,061	40,937	22.29	7,814	9,123	16.8

Table 4-59. Population Estimates in Subwatershed 05130204090.

			NUMBER OF HOUSING UNITS			
Populated Place	**County**	**Population**	**Total**	**Public Sewer**	**Septic Tank**	**Other**
Burns	Dickson	1,127	440	53	384	3
Charlotte	Dickson	854	374	272	97	5
Dickson	Dickson	8,791	3,818	3,268	540	10
White Bluff	Dickson	1,979	820	596	224	0
Totals		**12,751**	**5,452**	**4,189**	**1,245**	**18**

Table 4-60. Housing and Sewage Disposal Practices of Select Communities in Subwatershed 05130204090.

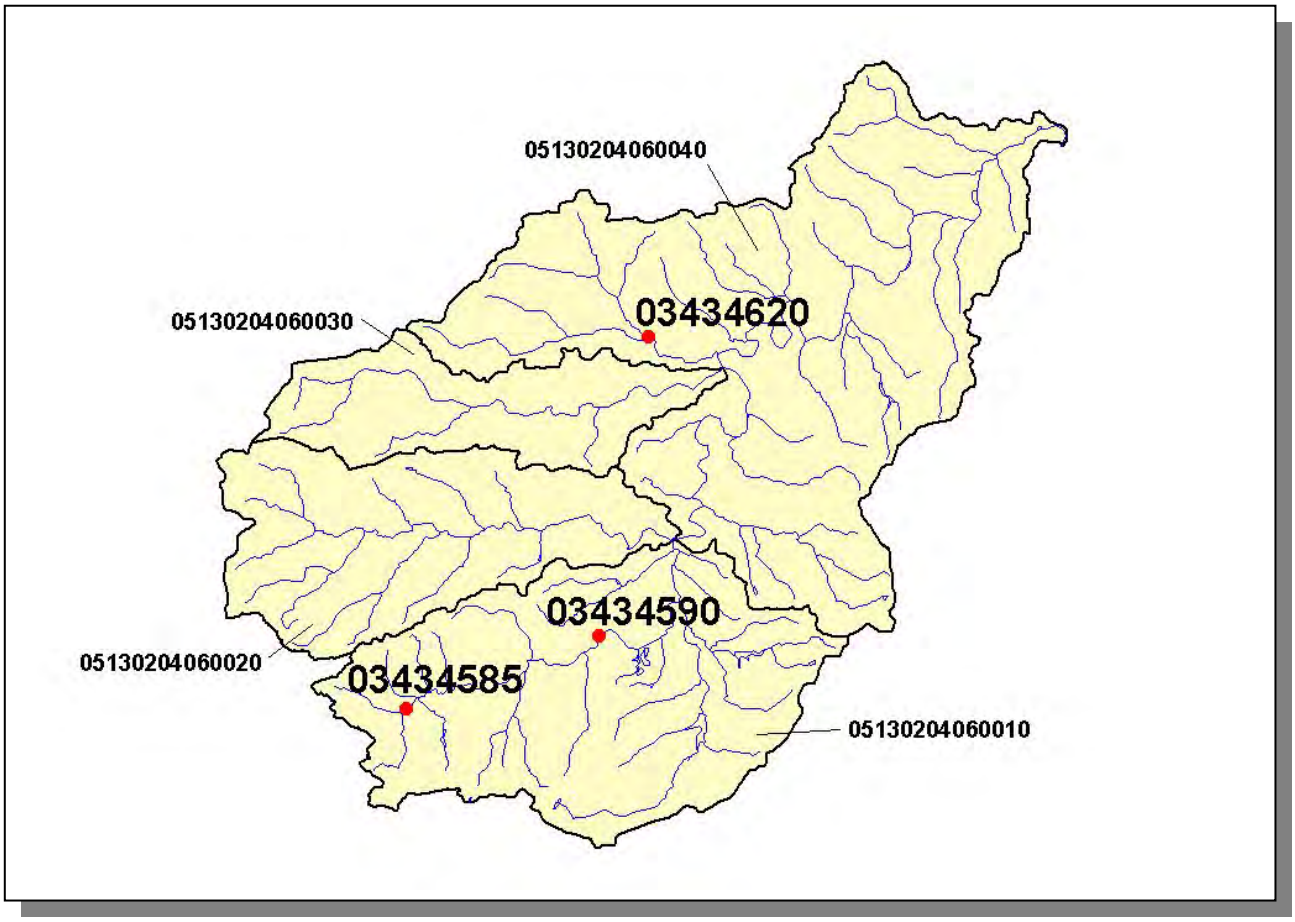

Figure 4-60. Location of Historical Streamflow Data Collection Sites in Subwatershed 05130204090. *Subwatershed 05130204060010, 05130204060020, 051309204060030, and 05130204060040 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

Figure 4-61. Location of STORET Monitoring Sites in Subwatershed 05130204090. *Subwatershed 05130204060010, 05130204060020, 05130204060030, and 05130204060040 boundaries are shown for reference. More information is provided in Harpeth-Appendix IV.*

4.2.I.ii. Point Source Contributions.

Figure 4-62. Location of Active Point Source Facilities (Individual Permits) in Subwatershed 05130204090. *Subwatershed 05130204060010, 05130204060020, 051309204060030, and 05130204060040 boundaries are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

Figure 4-62. Location of Active Mining Sites in Subwatershed 05130204090. *Subwatersheds 05130204060010, 05130204060020, 05130204060030 and 05130204060040 are shown for reference. More information, including the names of facilities, is provided in Harpeth-Appendix IV.*

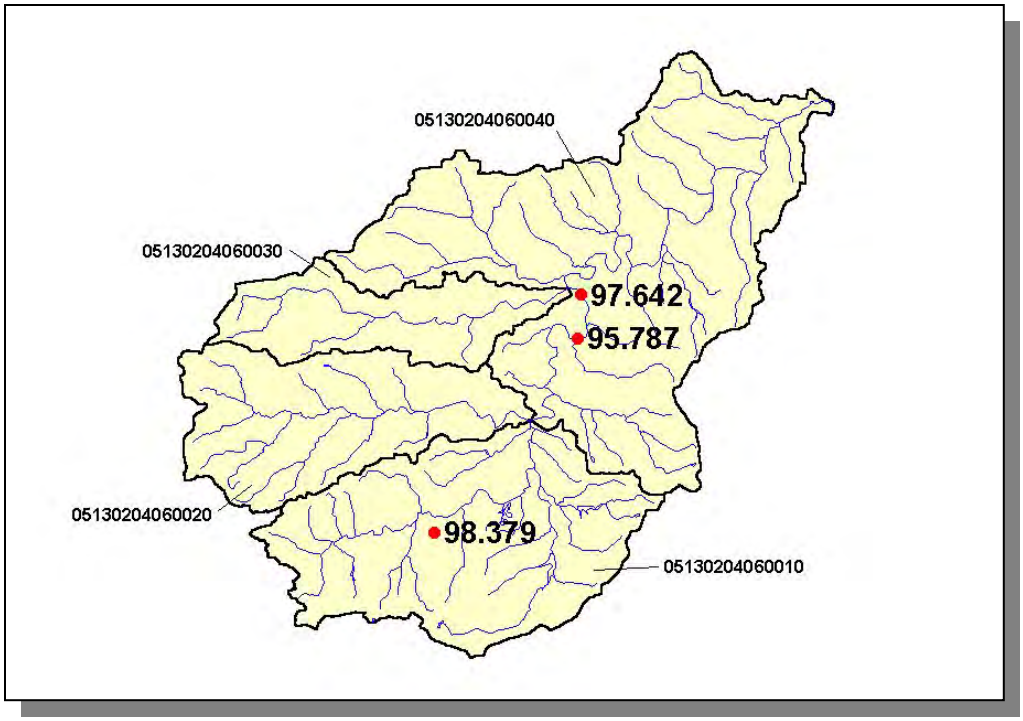

Figure 4-63. Location of ARAP Sites (Individual Permits) in Subwatershed 05130204090. *Subwatershed 05130204060010, 05130204060020, 051309204060030, and 05130204060040 boundaries are shown for reference. More details may be found in Harpeth-Appendix IV.*

4.2.I.iii. Nonpoint Source Contributions.

LIVESTOCK (COUNTS)				
Cattle	**Chickens**	**Chickens Sold**	**Hogs**	**Sheep**
6,998	15	81	502	7

Table 4-61. Summary of Livestock Count Estimates in Subwatershed 05130204090. *According to the 1997 Census of Agriculture, "Cattle" includes heifers, heifer calves, steers, bulls and bull calves.*

	INVENTORY		REMOVAL RATE	
County	**Forest Land (thousand acres)**	**Timber Land (thousand acres)**	**Growing Stock (million cubic feet)**	**Sawtimber (million board feet)**
Dickson	174.3	174.3	1.8	7.7

Table 4-62. Forest Acreage and Average Annual Removal Rates (1987-1994) in Subwatershed 05130204090.

CROPS	TONS/ACRE/YEAR
Corn (Row Crops)	2.91
Grass (Hayland)	0.48
Grass (Pastureland)	0.60
Grass, Forbs, Legumes (Mixed (Pasture)	0.74
Forest Land (Grazed)	0.00
Forest Land (Not Grazed)	0.00
Farmsteads and Ranch Headquarters	3.78
Vineyard (Horticultural)	1.05
Other Vegetable and Truck Crop	7.71
Conservation Reserve Program Land	0.07
Non Agricultural Land Use	0.00
Legume Grass (Hayland)	0.59

Table 4-63. Annual Estimated Total Soil Loss in Subwatershed 05130204090.

CHAPTER 5

WATER QUALITY PARTNERSHIPS IN THE HARPETH 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 Harpeth River Watershed. The information presented is provided by the agencies and organizations described.

5.2 FEDERAL PARTNERSHIPS.

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

Performance & Results Measurement System (PRMS) is a Web-based database application providing USDA Natural Resources Conservation Service, conservation partners, and the public fast and easy access to accomplishments and progress toward strategies and performance. The PRMS may be viewed at http://sugarberry.itc.nrcs.usda.gov/netdynamics/deeds/index.html. From the PRMS Products Menu, select "Products," then select "Conservation Treatments." Select the desired program and parameters and choose "Generate Report."

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

CONSERVATION PRACTICE	ACRES
Conservation Buffer	104
Erosion Control	1,439
Irrigation Management	0
Nutrient Management Applied	1,474
Pest Management	1,425
Prescribed Grazing	1,492
Salinity and Alkalinity Control	0
Tree and Shrub Practices	17
Tillage and Residue Management	957
Wildlife Habitat Management	542
Wetlands Created, Restored, and Enhanced	13
Total	**7,463**

Table 5-1. Landowner Conservation Practices in Partnership with NRCS in Harpeth River Watershed. *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period. More information is provided in Harpeth-Appendix V.*

5.2.B. United States Geological Survey Water Resource Programs—Tennessee District.

The U.S. Geological Survey (USGS) provides relevant, objective scientific studies and information to evaluate the quantity, quality, and use of the Nation's natural resources. In addition to national assessments, the USGS also conducts hydrologic investigations in cooperation with numerous federal, state, and local agencies to address issues of local, regional, and national concern.

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 60 gaging stations equipped with recorders and makes instantaneous measurements of streamflow at many other stations. Groundwater levels are monitored statewide, and the physical, chemical and biological 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, National Stream Quality Accounting Network, and the National Water-Quality Assessment Program.

Current Water Resource Investigation in Harpeth River Basin:

Estimation of Nutrient Loads in the Harpeth River Basin

Continuous Streamflow Information—Harpeth River Basin

- 03432350 Harpeth River at Franklin, TN
- 03432400 Harpeth River below Franklin, TN
- 03433500 Harpeth River at Bellevue, TN
- 03434500 Harpeth River near Kingston Springs, TN

For streamflow data, contact Donna Flohr at (615) 837-4730.

More information on the activities of the USGS can be obtained by accessing the Tennessee District home page on the World Wide Web at http://tenn.er.usgs.gov/

5.2.C. United States Army Corps of Engineers-Nashville District. The geographic boundaries of the Nashville District Corps of Engineers consist of the entire Cumberland and Tennessee river basins, a combined area of approximately 59,000 square miles. This includes portions of seven states: Tennessee, Kentucky, Alabama, Virginia, Mississippi, Georgia, and North Carolina.

Overall responsibilities for the Nashville District include operation and maintenance of 10 reservoirs within the 18,000 square mile Cumberland River Basin. These operate for some or all of the following purposes: hydropower, flood control, navigation, water supply, water quality, fish and wildlife, and recreation.

Within the 41,000 square mile Tennessee River Basin the Nashville District operates a series of navigation locks and has regulatory permit authority over dredge and fill activities under the Federal Clean Water Act.

WATER QUALITY ACTIONS WITHIN THE HARPETH RIVER WATERSHED

Cheatham Lock and Dam is located at Cumberland River Mile 148.7, and is just 4.3 miles downstream from the confluence of the Harpeth River. Because the Harpeth River is a major inflow into the lower reach of Cheatham Reservoir, the Nashville District Corps of Engineers has a keen interest in seeing water quality improvements occur within the Harpeth River watershed. The Nashville District Corps of Engineers collects physical, chemical, and biological water quality data from various locations in the Harpeth River watershed. These data contribute to a better understanding of water quality relationships in Cheatham Reservoir, as well as in Lake Barkley, the reservoir immediately downstream from Cheatham.

Cooperation with the Tennessee Department of Environment and Conservation, Division of Water Pollution Control

Water quality data collected by the Nashville District Corps of Engineers in the Harpeth River and other Cheatham Reservoir locations is provided to the Tennessee Department of Environment and Conservation to form a more complete picture of water quality conditions in the watershed. For some locations in the watershed, Nashville District Corps of Engineers data is the only water quality information available upon which regulatory decisions may be based.

Environmental Education

Environmental education opportunities are provided to area school age children by the Nashville District Corps of Engineers. Water Quality Control personnel participate in environmental awareness programs conducted at Cheatham Reservoir by providing information about various aspects of water quality. These presentations include "hands on" demonstrations of sophisticated water quality monitoring instruments and displays of biological specimens that demonstrate the diversity of aquatic resources and the responses of biological systems to varying water quality conditions. The value of such environmental education is enormous because it touches young people early in their lives. It, hopefully, contributes to a greater lifelong awareness of the importance of conserving and improving water quality and water resources on an individual basis. An added benefit is that many of the students attending the Cheatham Reservoir Environmental Awareness Day reside in the Harpeth River watershed.

Partnership/Assistance to the Cumberland River Compact

Nashville District Corps of Engineers has worked with the Cumberland River Compact over the past several years. Assistance to the Cumberland River Compact has taken several forms, from providing data and clarifying technical information to mapping assistance. The Cumberland River Compact has been particularly successful with involving stakeholders within the Harpeth River basin. One very tangible product of the relationship between the Nashville District Corps of Engineers and Cumberland River Compact is the production of the Harpeth River Watershed Map. When the Cumberland River Compact was chosen by the Southeast Watershed Forum as *The Tennessee Success Story for the Year*, it was due to the production of the Harpeth River Map. The prototype of this map, upon which later modifications were added, was the result of tapping into mapping/GIS expertise within the Nashville District Corps of Engineers' Water Management Section.

The address of the Nashville District home page is http://www.orn.usace.army.mil/

5.2.D. U.S. Environmental Protection Agency (EPA). As part of TMDL development being supported by EPA Region 4's Water Management Division, the Science and Ecosystem Support Division will conduct water quality studies of the Harpeth River. This study is a two-year effort that began with dry weather surveys in 2000, followed by wet weather surveys in 2001.

The primary objective of this study is to collect a representative set of water quality and hydraulic data for the Harpeth River in order to develop a calibrated model of the system

during low flow conditions. This calibrated model will be used as one of the TMDL development tools for the Harpeth River, and it is anticipated that it will provide a better understanding of the impact of nutrient enrichment and depressed dissolved oxygen concentrations during a time frame when nonpoint sources dominate the system. Ultimately, the model should be able to account for the difference between base flow point source dominated and high flow point and nonpoint source dominated conditions.

For more information, contact:

Tom McGill, PE
U.S. Environmental Protection Agency-Region 4
61 Forsyth Street, SW
Atlanta, GA 30303-8960
mcgill.thomas@epa.gov

5.3 STATE PARTNERSHIPS.

5.3.A. TDEC Division of Water Supply. Congress, the Environmental Protection Agency, and the states are increasing their emphasis on the prevention of pollution, particularly in the protection of the raw water sources for public water systems. The initial step toward prevention of contamination of public water supplies came with the Federal Safe Drinking Water Act Amendments of 1986. At that time, each state was required to develop a wellhead protection program to protect the water source of public water systems relying on groundwater (wells or springs). The new Source Water Assessment provisions of the Federal Safe Drinking Water Act of 1996 Amendments expanded the scope of protection beyond groundwater systems to include protection of the waters supplying surface water systems.

A “wellhead” is the source area for the water which is withdrawn through a well or spring, similar to the concept of the head of a river. To protect the water supply, it is important to know from where the water flowing to that well or spring is coming. Source water/wellhead protection areas for public water systems using groundwater are generally based on hydrologic considerations and/or modeling. Source water protection areas for public water systems using surface water are based on the portion of the watershed area upstream of the water intake.

There are three basic steps involved in a wellhead protection program: 1)Defining the wellhead protection area, 2)Inventorying the potential contaminant sources within that area, and 3)Developing a wellhead protection plan. The official designation of wellhead protection areas provides valuable input and emphasis to government agencies in the siting of facilities and the prioritization and cleanup of contaminated sites.

More information may be found at: http://www.state.tn.us/environment/dws.

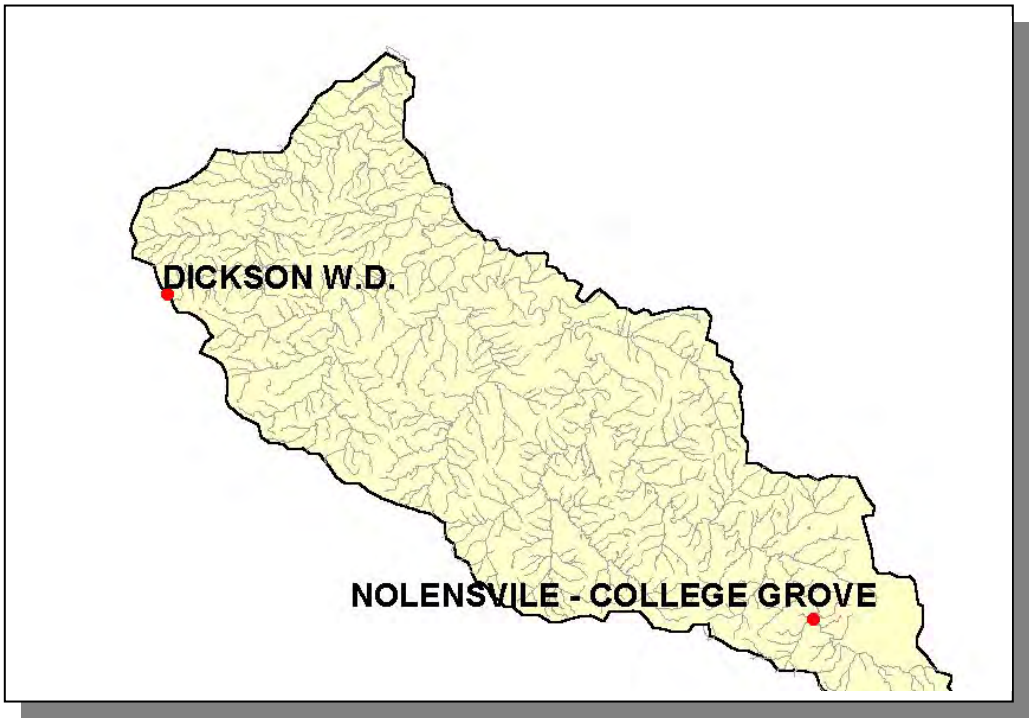

Figure 5-1. Location of Communities Using Groundwater for Water Supply in Harpeth River Watershed. *More information may be found in Harpeth-Appendix V.*

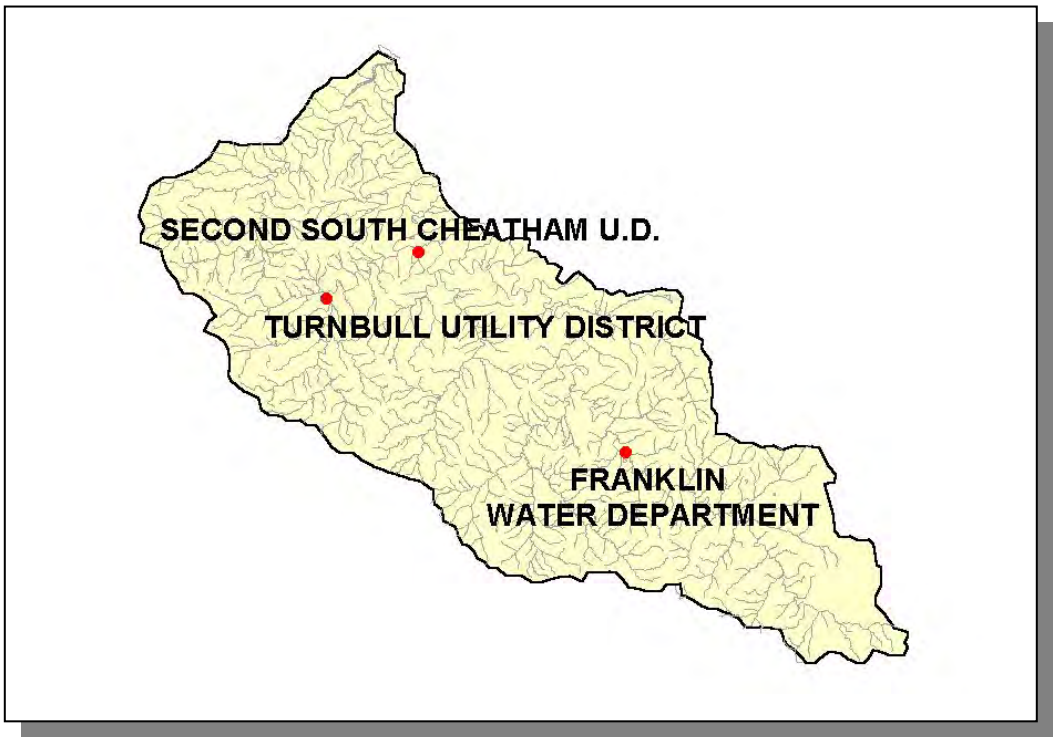

Figure 5-2. Location of Communities with Surface Water Intakes for Water Supply in Harpeth River Watershed. *More information may be found in Harpeth-Appendix V.*

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

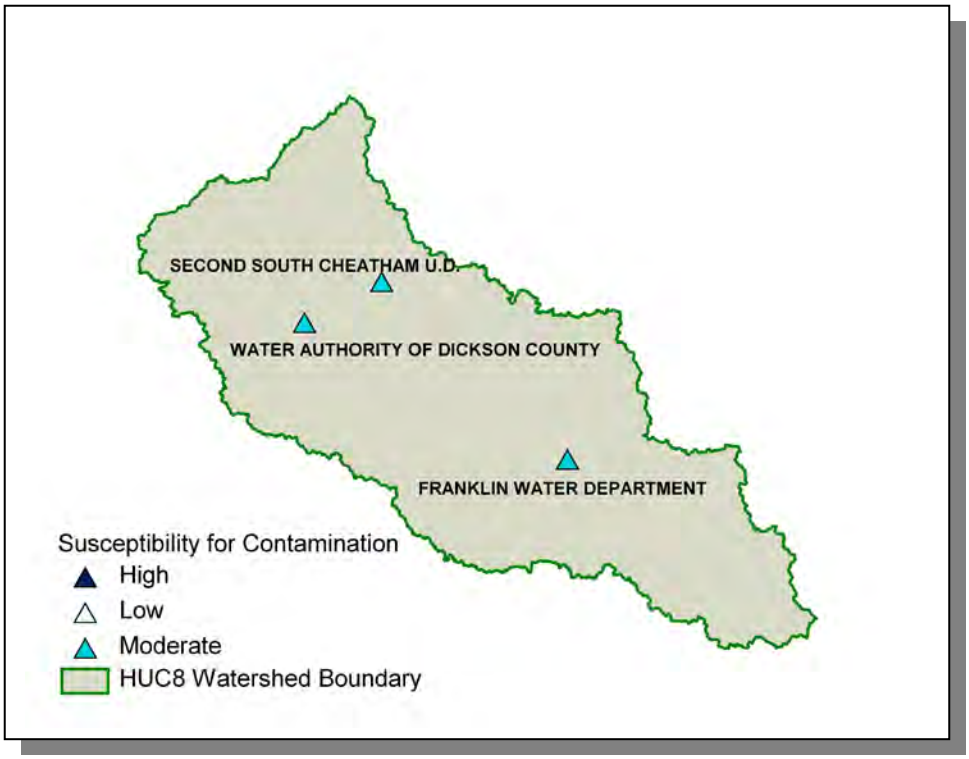

Figure 5-3. Susceptibility for Contamination in the Harpeth River Watershed.

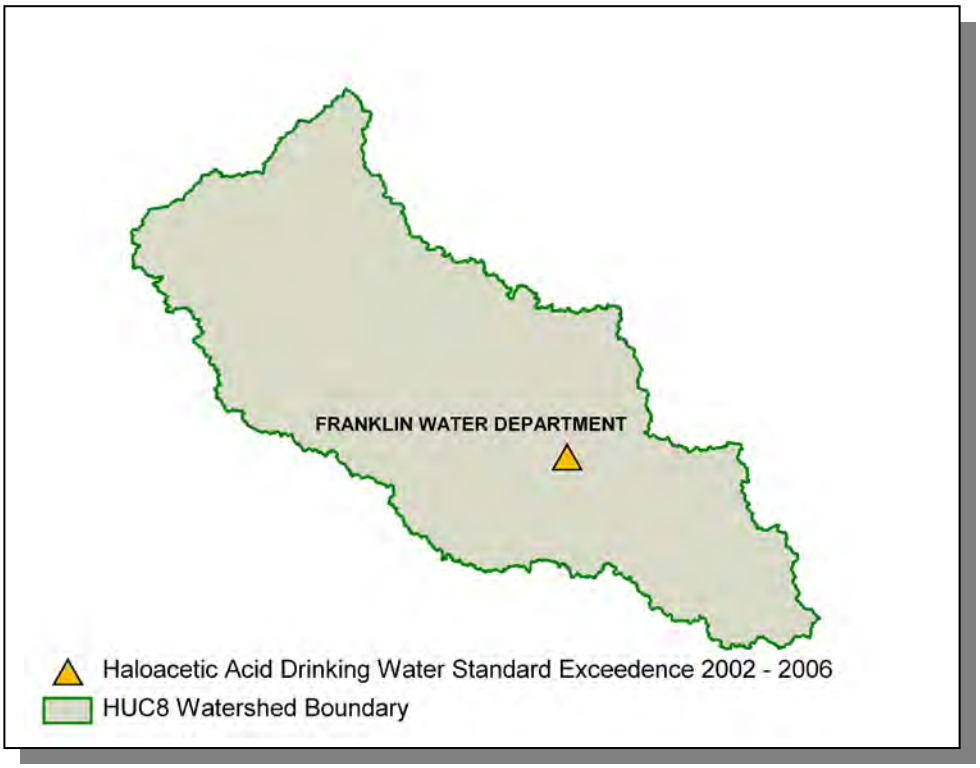

Figure 5-4. Exceedences of the Haloacetic Acid Drinking Water Standard in the Harpeth River Watershed.

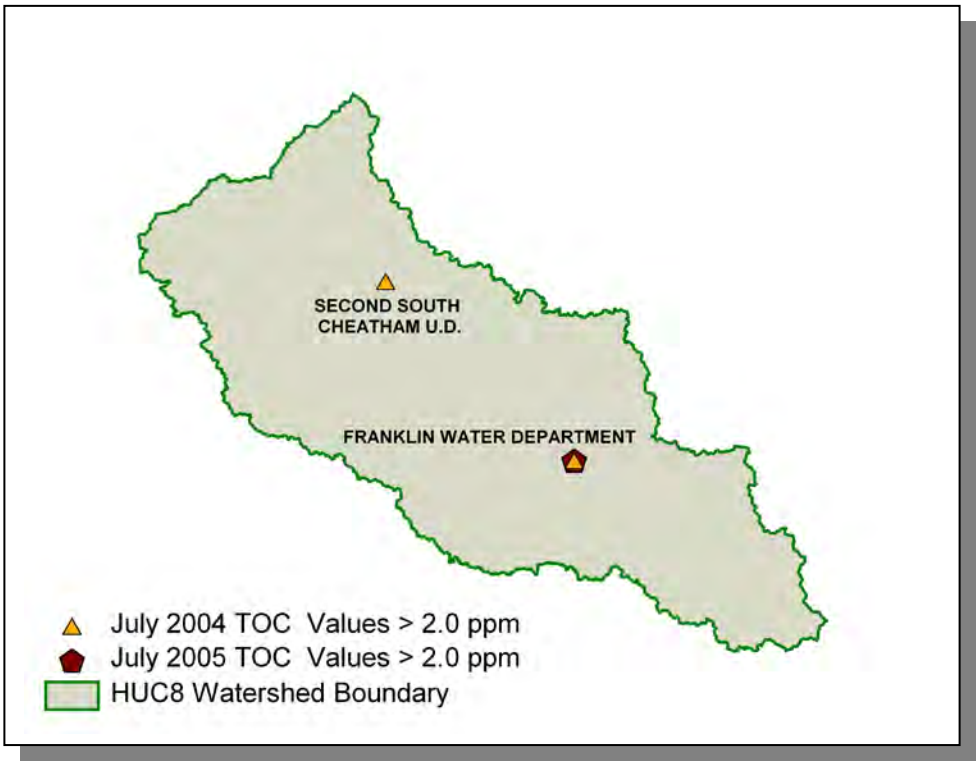

Figure 5-5. July 2004 and 2005 Raw Water Total Organic Carbon (TOC) Analysis in the Harpeth River Watershed.

5.3.B. State Revolving Fund. TDEC administers the state's Clean Water State Revolving Fund Program. Amendment of the Federal Clean Water Act in 1987 created the Clean Water State Revolving Fund (SRF) Program to provide low-interest loans to cities, counties, and utility districts for the planning, design, and construction of wastewater facilities. The U.S. Environmental Protection Agency awards annual capitalization grants to fund the program and the State of Tennessee provides a twenty-percent funding match. TDEC has awarded loans totaling approximately $500 million since the creation of the SRF Program. SRF loan repayments are returned to the program and used to fund future SRF loans.

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

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

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

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

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

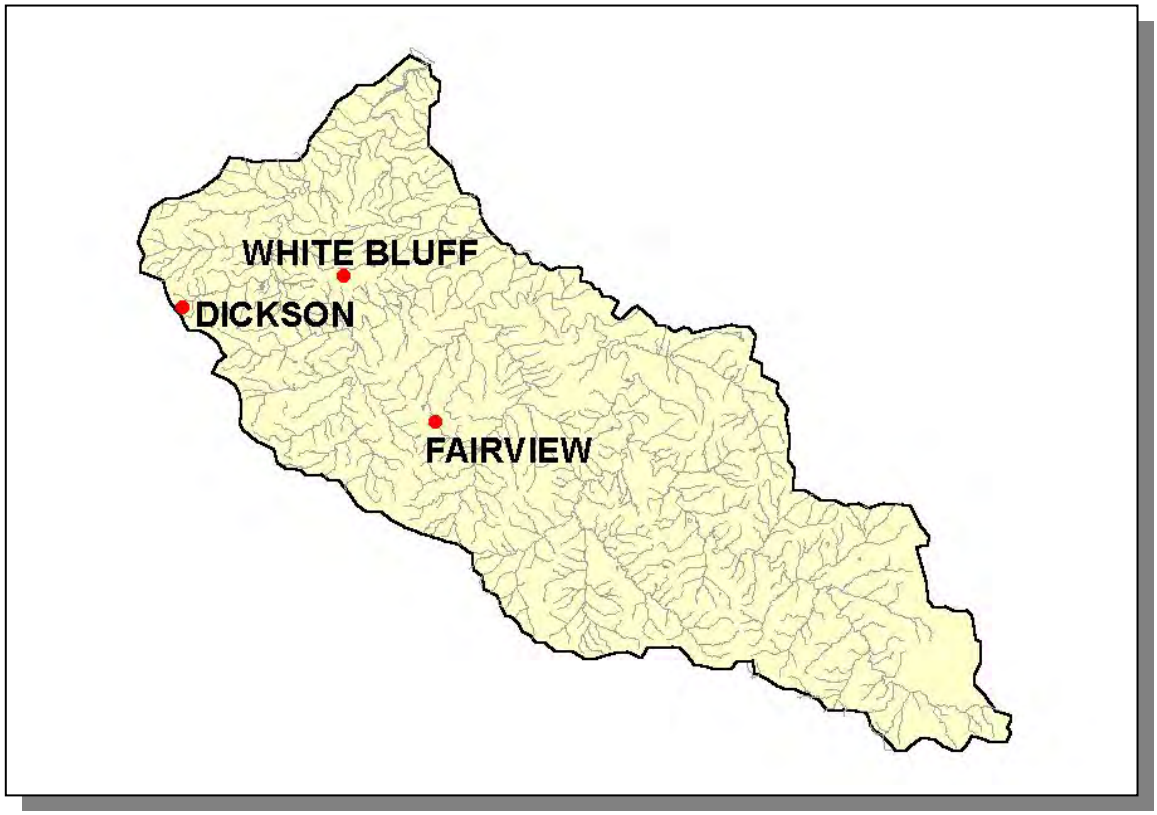

Figure 5-6. Location of Communities Receiving SRF Loans or Grants in the Harpeth River Watershed. *More information is provided in Harpeth-Appendix V.*

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

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

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

- Monitoring Projects. Up to 20% of the available grant funds are used to assist the water quality monitoring efforts in Tennessee streams, both in the state's 5-year watershed monitoring program, and also in performing before-and-after BMP installation, so that water quality improvements can be verified.

- 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.

The Tennessee Department of Agriculture has spent $128,329 for Agriculture BMPs in the Harpeth Watershed since 1998. Additional information is provided in Harpeth Harpeth-Appendix V.

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.

5.3.D. Tennessee Wildlife Resources Agency. The Tennessee Wildlife Resources Agency conducts a variety of activities related to watershed conservation and management. Fish management activities include documentation of fish and aquatic life through stream sampling and stocking of both warm water and cold water sportfish. Fish data are managed in the Geographic Information System (GIS) project called Tennessee Aquatic Data System (TADS). TWRA nongame and endangered species projects include restoration of special status fish ,aquatic life, and riparian wildlife including otters, and nongame fish such as the blue masked darter. The Agency conducts a variety of

freshwater mussel management, conservation, and restoration projects including the propagation and reintroduction of species once common in Tennessee streams. TWRA has been involved in riparian conservation projects since 1991 in partnership with state and federal agencies and conservation groups.

For information on these and other water resources related activities, please contact your Regional TWRA office at the following phone numbers:

West Tennessee (Region I)	1-800-372-3928
Middle Tennessee (Region II)	1-800-624-7406
Cumberland Plateau (Region III)	1-800-262-6704
East Tennessee (Region IV)	1-800-332-0900.

TDD services are available @ 615-781-6691.
TWRA's website is http://www.state.tn.us/twra.

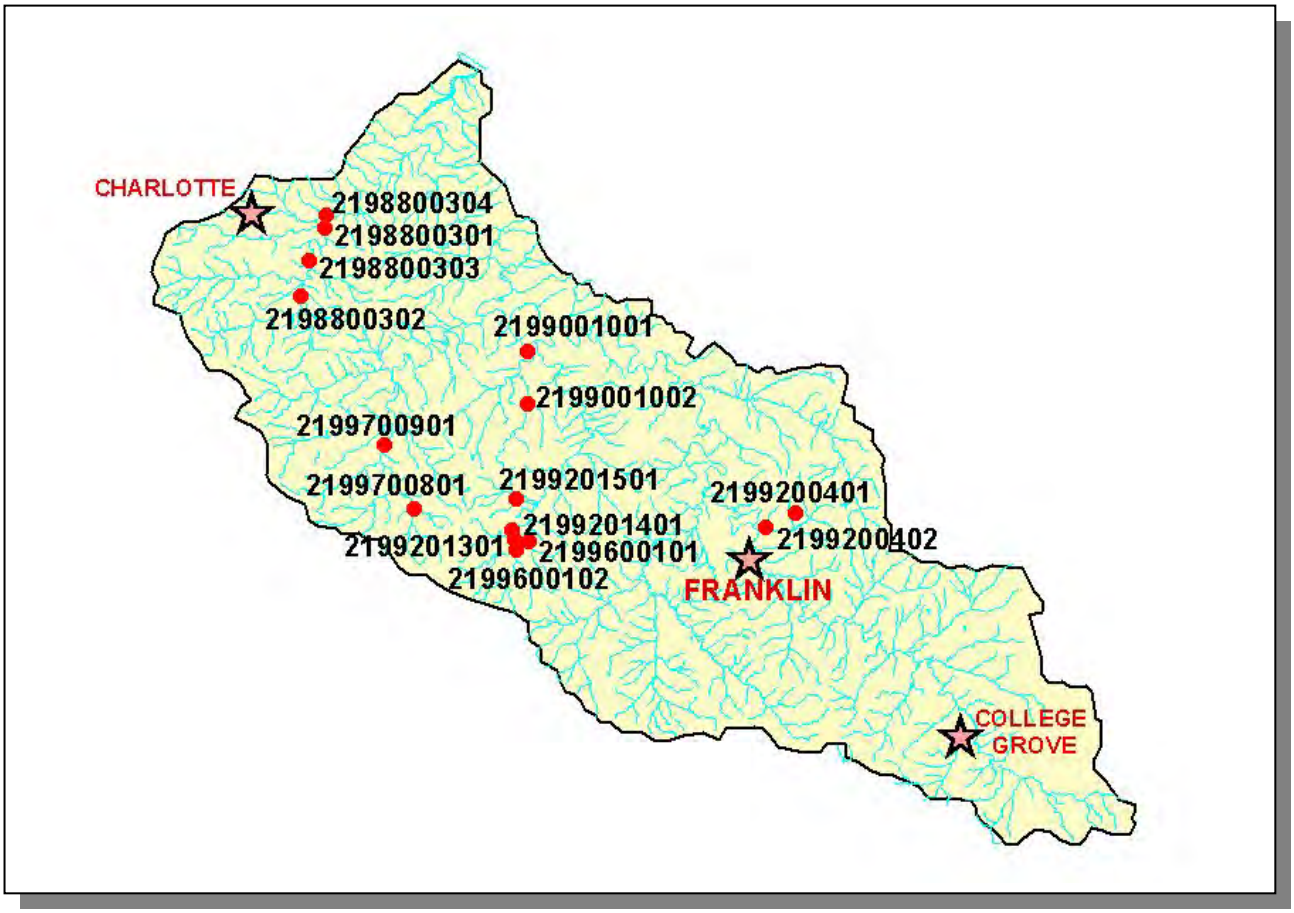

Figure 5-7. Location of TWRA TADS Sampling Sites in Harpeth River Watershed. *Locations of Charlotte, Franklin, and College Grove are shown for reference. Additional Information is presented in Harpeth-Appendix V.*

5.4 LOCAL INITIATIVES.

5.4.A. Cumberland River Compact. The Cumberland River Compact is a not-for-profit educational organization with a mission to*: enhance the water quality of the Cumberland River and its tributaries through education and by promoting cooperation among citizens, businesses, and agencies in Kentucky and Tennessee*.

The Cumberland River, 696 miles long, with a watershed that encompasses almost 18,000 square miles and a stakeholder population of nearly two million has provided the challenge of setting specific goals and utilizing an organized approach to have any effect on the river. By working with TDEC, the Compact started reaching out to the 14 separate watersheds which make up the Cumberland Basin – one at a time in conjunction with Tennessee's five-year watershed management cycle. One watershed has been completed, the Harpeth River. Stakeholders in the Harpeth formed their own organization and continue to work with the Compact and on their own on neighborhood workshops, river clean-ups, water quality testing and have gotten involved with local planning and zoning. They also send a member to the Compact Board meetings and Water Quality Advisory Committees to insure ongoing communication and partnering.

With the goal to educate and promote cooperation among citizens, businesses and agencies the following programs have been established:

- **Splash Bash Teacher Training and Festival** – A combination teaching and celebration program for the river. The Compact brings professionals who work in the field of water quality to teach teachers, and therefore their students, how to perform simple chemical testing, macro-invertebrate identification and learn watershed mapping. Each class adopts a local creek for the purpose of analyzing its health. After each classroom collects their data they come together for a day of exhibiting their data and having fun.
- **Marina Education Program** – This program targets marina owners and boarders to get them involved personally in the river's health. The first project completed was a series of signs reading: "You are in the Cumberland River Watershed – Don't Pollute the Boot." Each of the member marinas proudly displays their signs at their pump docks and offices. The second project the Marina Committee is working on, at marina owners' request, is setting up an education program specifically on pump-out stations – how they work, hook-ups to city sewers, etc.
- **Land Education Program** – Educating "strange bedfellows" through annual programs, the first workshop put on by the Land Committee was a *Conservation Easement Conference*. The Compact brought Stephen Small, the Boston attorney who wrote most of the IRS Codes on the subject of conservation easements, to speak with attorneys, CPA's, appraisers, as well as local landowners on the subject of protecting land through these means. The conference for 2001 will be *Conservation and Common Sense Development – A workshop for Building Better Communities*, co-hosted by the Tennessee River Eastbank Group, The Tennessee Homebuilders, The Tennessee Farm Bureau, the Compact, and others. Opening a dialog between developers, the government agencies who permit them and the citizens who live in their communities will be a wonderful opportunity for the Cumberland River Compact to build more bridges – and ultimately to help our river.

- **Water Quality Advisory Committee** – This committee is responsible for seeing that our technical information in beyond reproach. The committee has members who represent: the Kentucky Division of Water, the Natural Resource Conservation Service, Greater Nashville Regional Council, the Tennessee Department of Agriculture's Nonpoint Source Program, CTE Engineers, TDEC Division of Water Pollution Control, U.S. Army Corps Of Engineers, Nashville Public Works, Nashville Metropolitan Water Services, the United States Geologic Survey, and the Tennessee Wildlife Resource Agency. The two most outstanding products to come out of this Committee to date are the award-winning *Harpeth River Watershed Brochure* (a simple brochure/map of that watershed which answers two questions through the use of government data – Where can I swim? Where can I fish?) and the *Harpeth River Sediment Study Plan*. The Sediment Study Plan follows the Splash Bash Teacher Training in our outreach to each watershed. This project uses local volunteers to measure the sediment being carried through the streams of a particular watershed. Since silt is one of the leading pollutants to all southeastern rivers but is seldom tested by government agencies, this work is important not only to local citizens, businesses, and wildlife but also to our governmental partners who have given this project their stamp of approval.

The Cumberland River Compact was chosen by the Southeast Watershed Forum as *The Tennessee Success Story for the Year* – for the production of the Harpeth River Watershed Map – An Overview of Our Water Quality.

For additional information, contact:

Margo Farnsworth
Executive Director
Cumberland River Compact
P. O. Box 41721
Nashville, TN 37204
(615)837-1151 or email: screendoor@bigfoot.com
http://www.cumberlandrivercompact.com

5.4.B. Harpeth River Watershed Association. The mission of the Harpeth River Watershed Association (HRWA) is to motivate and mobilize the public to preserve and restore the Harpeth River Watershed through education and encouraging compliance with applicable public acts.

The HRWA is the only entity working in the Harpeth River's watershed that has this ecological system in its stated purpose. Other groups that work in the watershed are defined by various political boundaries or by sub-components of the watershed. The approach of HRWA is to:

- Facilitate, coordinate and initiate efforts on behalf of the entire watershed.
- Identify, involve and work constructively with people, businesses, and government entities that live or conduct activities in the watershed.
- Speak for the watershed and what is needed to restore biological integrity amidst various human uses in the watershed.

- Provide information, training, and activities that enable homeowners, landowners, families, and businesses to directly enhance areas of the watershed and become advocates for the Harpeth River and its tributaries.

The HRWA, an all volunteer membership organization, was formed in November 1998 by a group of concerned citizens in response to various pollution problems in the Harpeth, recent fish kills around Franklin, and efforts to expand sewage treatment in the growing Franklin area. This coincided with sampling and survey work in the watershed by TDEC as part of its water management program to gather water quality information. Through 1999, the HRWA participated in the stakeholder meetings conducted by the Cumberland River Compact that were designed to bring a diverse group of people together to discuss the needs of the watershed. One of the biggest concerns identified by this process was siltation.

The primary efforts of the HRWA to date:

- Raised money and is distributing the first watershed map for the Harpeth River, produced by the Cumberland River Compact. The map synthesizes the data from the TDEC 305b reports on water quality in an excellent format for the public to comprehend. The map identifies all segments of streams and the mainstem of the Harpeth River listed as "impaired" on state 303d list, and details the causes and sources of pollution.

- Launched the first sediment study in the watershed in collaboration with the Cumberland River Compact, who designed the volunteer based sediment study as an outcome of their stakeholder meetings. Over 30 volunteers are providing data as of the Fall of 2000.

- Collaborated with the Cumberland River Compact to conduct a day-long teacher training workshop on watershed ecology for secondary science teachers in Williamson County. These workshops are part of the Cumberland River Compact's Splash Bash education program.

- Worked with the City of Franklin on the taskforce to improve management of stormwater runoff.

- Documented non-compliance with road construction, suburban development and agricultural practices and encouraging compliance with applicable laws.

For more information, contact:

Harpeth River Watershed Association
P.O. Box 1127
Franklin, TN 37065

Dorene Bolze, President
Conservation Policy Specialist
Doriebolze@home.com
(615) 591-9095

5.4.C. Harpeth River Watershed Sediment Study. The Harpeth River Watershed Association (HRWA) and the Cumberland River Compact (CRC) are carrying out a study of sediment in the Harpeth River watershed; the two-year study is near the end of its first year. Twenty-seven volunteers have collected 631 turbidity measurements and 184 total suspended solids (TSS) measurements at 45 stations. Stream stages and rain gage readings are also routinely reported.

Assistance in the design of the study was obtained from Tim Diehl, Jim Kingsbury, and Ank Webbers (U.S. Geological Survey), Jimmy Smith (TDEC), Don Green (Tennessee Department of Agriculture, Nonpoint Source Program), Jenny Adkins (Natural Resources Conservation Service), and Bob Sneed (U.S. Army Corps of Engineers) through the CRC's Water Quality Advisory Board. Recruiting of volunteers and acquisition of equipment were facilitated by Al Cox, Dorie Bolze and Mary Brockman (HRWA) and Margo Farnsworth and Tracey Hay (CRC). Technical assistance is provided by Rick Lockwood (HRWA), The project is directed by Dave Wilson (CRC).

The data have been examined by a number of statistical tests. The average turbidities (reciprocal meters) for all stations having seven or more measurements (34 sites) have been computed; these show an enormous range--from less than 1 for Slickrock Branch (a near-pristine stream) to over 16 for the Harpeth River at Moran Road. Stations on the Harpeth, Little Harpeth, and West Harpeth Rivers tend to have quite high turbidities and TSS values. The South Harpeth is significantly cleaner (summed ranks test). Two stations on Turnbull Creek downstream from the I-40/840 interchange site have enough data to yield a meaningful average; both show excessive sediment.

One objective of this study is to explore the relationship between turbidity and TSS, which seemed in the project's early work to be well approximated by a single straight line. This conclusion was based on results on the Harpeth at Highway 100, the Little Harpeth at Vaughn Rd, the South Harpeth at South Harpeth Rd, and Garrison Creek; results from all four sites correlated well to the same straight line.

For individual stations one continues to find good linear correlation between turbidity and TSS, as illustrated by results for Garrison Creek and for the Harpeth River at Highway 100 in Bellevue, which show coefficients of determination of 0.96 and 0.95, respectively. However, two more sites now have enough data to warrant interpretation. The plots of TSS versus turbidity for the Harpeth River at Moran Road and for Turnbull Creek have slopes which are markedly less than the slopes of the plots of data from the Harpeth at Highway 100, the Little Harpeth at Vaughn Rd, the South Harpeth at South Harpeth Rd, and Garrison Creek. Evidently, there are variations in sediment characteristics from site to site. Theory suggests smaller particle sizes at the Harpeth at Moran Rd and at the Turnbull Creek sites than at the other sites.

For further information on the project contact:

Dave Wilson
Brown and Caldwell, 501 Great Circle Rd., Suite 150, Nashville, TN 37228.
(615) 250-1248
djwilson@brwncald.com

5.4.D. The Nature Conservancy. The mission of The Nature Conservancy is “to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive."

The Nature Conservancy's Tennessee Chapter has joined with several landowners in Williamson County's Kelley Creek watershed (South Harpeth River system) to preserve an intact example of western highland rim limestone seeps and associated habitats. Clear creeks with high fish diversity, rare plants like the large-leaved grass-of-Parnassus and Eggert's sunflower, and the shelf-like limestone rock outcroppings make Kelley Creek one of The Nature Conservancy's conservation priorities. In addition to the Conservancy owning over 50 acres in the project area, several landowners have pledged their intent to donate conservation easements on their tracts; these easements will allow limited development which does not impair the watershed's unique biodiversity and water quality.

For more information, contact Gabby Call, Director of Protection, gcall@tnc.org

CHAPTER 6

FUTURE DIRECTIONS IN THE HARPETH RIVER WATERSHED

6.1 BACKGROUND.

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

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

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

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

6.2.A. Year 1 Public Meeting. The first Harpeth River Watershed public meeting was held August 19, 1996. The goals of the meeting were to 1)present, and review the objectives of, the Watershed Approach, 2)introduce local, state, and federal agency and nongovernment organization partners, 3)review water quality monitoring strategies, and 4)solicit input from the public.

Major Concerns/Comments

- Potential dams on Harpeth River for water supply and flood control
- Nonpoint source impacts on Harpeth River
- Impacts from road contruction and resulting development
- Sediment
- Herbicide treatment under power lines along streams
- Litter

6.2.B. Year 3 Public Meeting. The second Harpeth River public meeting was held May 20, 1998 at the Williamson County Administrative Complex. The goals of the meeting were to 1)provide an overview of the watershed approach, 2)review the monitoring strategy, 3)summarize the most recent water quality assessment, 4)discuss the TMDL schedule and citizens' role in commenting on draft TMDLs, and 5)discuss BMPs and other nonpoint source tools available through the Tennessee Department of Agriculture 319 Program and NRCS conservation assistance programs.

Major Concerns/Comments

- Problems with complaint tracking and problem resolution
- Uneven enforcement by TDEC
- Pollution caused by TDOT
- Section 118a complaint process is ineffective because of time lag
- Lynnwood STP expansion
- TMDLs may not be written before permits are issued

In addition, several individuals requested an opportunity to speak:

Richard Layhew spoke about the contaminated sediment (lead) near streams in the College Grove area.

Robin Lockwood spoke about increased impervious surfaces associated with road construction leading to localized flooding.

Joe McCaleb made a short presentation about water quality problems related to limited TDEC staff and resources.

John Noel spoke about the problems caused by exempting standard agriculture and silviculture practices.

6.2.C. Special Meeting Held at Citizens' Request. An additional meeting was held on October 13, 1998 at the Williamson County Administrative Complex.

Major Concerns/Comments

- Nonpoint sources not subject to regulatory solutions
- Less apparent biodiversity along Harpeth River and its tributaries
- Cumulative effects of pollutants
- Low flow streams receiving effluent from STP
- Lynnwood STP expansion
- TMDLs will be written before permits are issued

Gene Cotton (Southwest Williamson County Watershed Association) made a short presentation about his group and appealed to all to join a newly formed Harpeth River Watershed Association.

6.2.D. Year 5 Public Meeting. The third Harpeth River Watershed public meeting was held August 27, 2002 at the Williamson County Administrative Complex (Franklin). The meeting featured nine educational stations:

- Draft Watershed Water Quality Management Plan
- Benthic macroinvertebrate samples and interpretation
- Smart Board with interactive GIS maps
- "Watershed Approach" (self-guided slide show)
- "How We Monitor Streams" (self-guided slide show)
- "Why We Do Biological Sampling" (self-guided slide show)
- Landowner Assistance Programs (NRCS and TDA)
- Stormwater Management Programs (Williamson County, Franklin, Metro Nashville)
- Local Citizen Group Displays (HRWA, Franklin High School)

In addition, citizens had the opportunity to make formal comments on the Draft Year 2002 303(d) List.

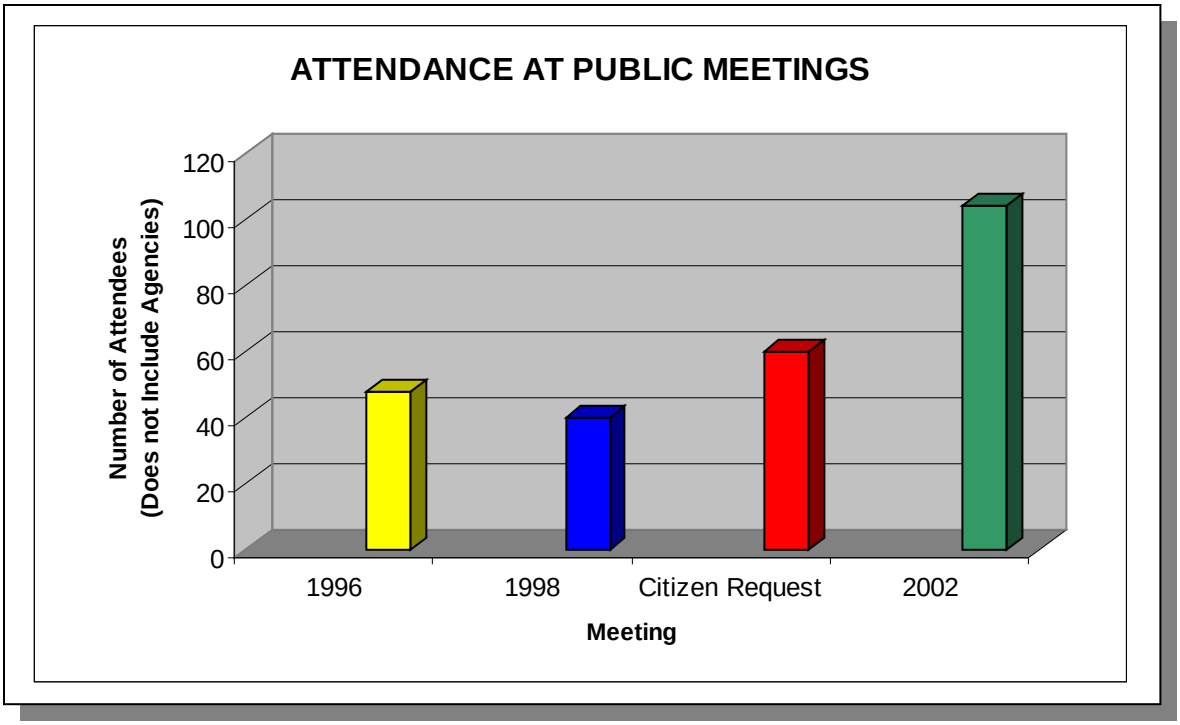

Figure 6-1. Attendance at Public Meetings in the Harpeth River Watershed. *Attendance numbers do not include agency personnel.*

Figure 6-2. Biologist Jimmy Smith Prepares the Biological Education Station at the Harpeth River Watershed Meeting.

6.2.E. Additional Public Meetings. Additional public meetings were conducted by the Cumberland River Compact and Greater Nashville Regional Council through an EPA 604(b) Planning Grant administered by the Tennessee Department of Environment and Conservation. The goal of the grant was to "build a local forum in the Harpeth River Watershed in which a diverse group of citizenry could meet and discuss the issues and challenges of the watershed…"

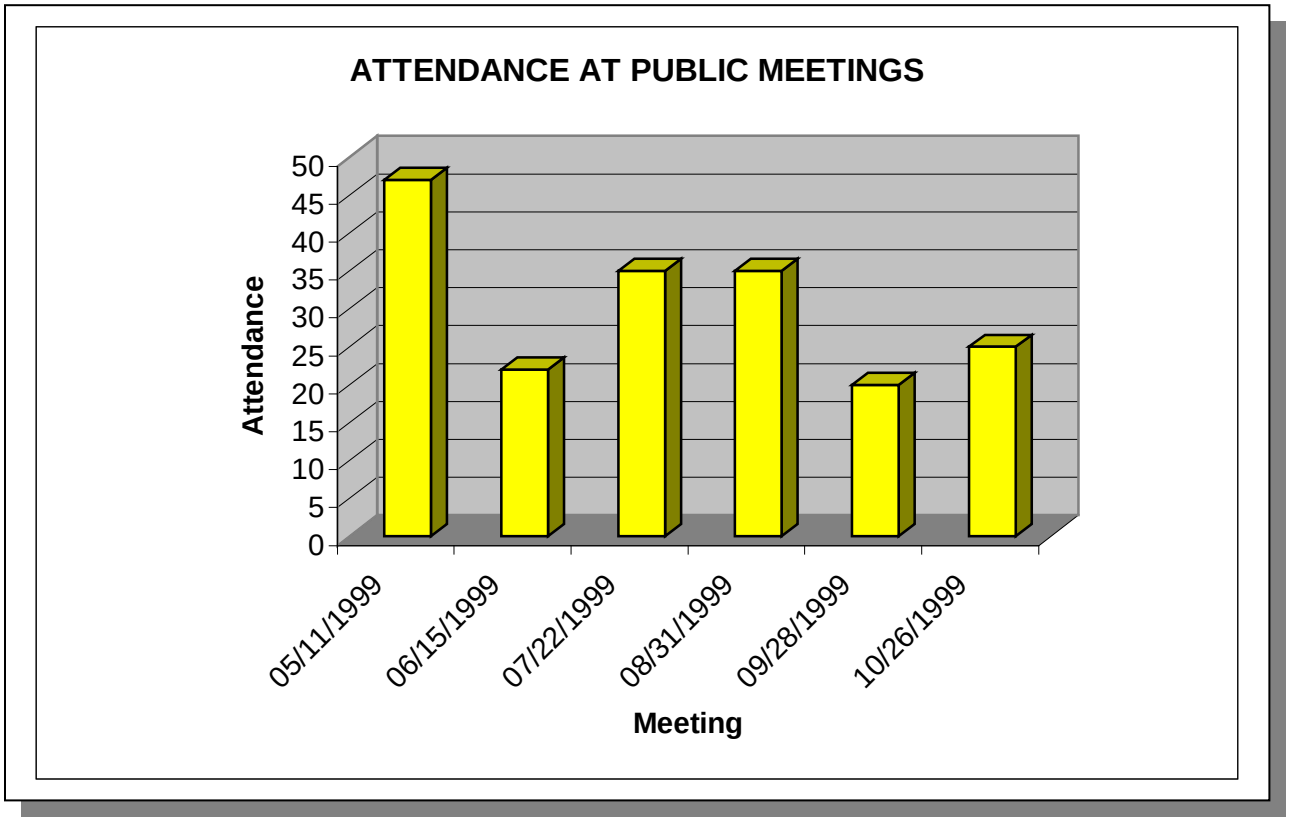

Figure 6-3. Attendance at Harpeth River Watershed meetings conducted by Cumberland River Compact and Greater Nashville Regional Council through a 604(b) Planning Grant administered by TDEC.

6.3. ASSESSMENT OF NEEDS.

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

Currently, the mainstem of the Harpeth River in the vicinity of the city of Franklin is the only impacted waterbody within the watershed for which NPDES-permitted point sources are significant contributing factors. The Harpeth River is impacted by excessive nutrients, leading to low dissolved oxygen during low flow conditions, and a substantial portion of this nutrient load comes from the discharge of treated municipal wastewater from three treatment plants: Lynnwood, Cartwright UD, and the Franklin WWTP. Of these, the Franklin plant contributes the largest load by far (although it usually achieves a lower concentration of nutrients per volume than the other two).

All three of the Franklin-area WWTP's will continue to need close monitoring of effluent quality, and be required to utilize the most modern and efficient technologies as they become available. Improvement of pretreatment programs and collection system maintenance and inspections should be continues.

Even if optimal performance of wastewater plants is achieved, non-point source issues in the watershed must also be addressed. Control strategies for the Harpeth River in the vicinity of the Franklin WWTP will need to include a substantial reduction in upstream non-point nutrient/enrichment runoff from the urban and agricultural area it drains. This is vital to increase the available assimilative capacity of the receiving streams, and will require locally implemented development strategies. The City of Franklin built a new wastewater treatment plant in 1999, among other upgrades and modernizations, and this has helped lower nutrient levels in the effluent. In addition, up to a million gallons per day of treated effluent is now used for irrigation at local golf courses, utilizing this rich source of nutrients and diverting some loading from the river.

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

TMDLs are prioritized for development based on many factors.

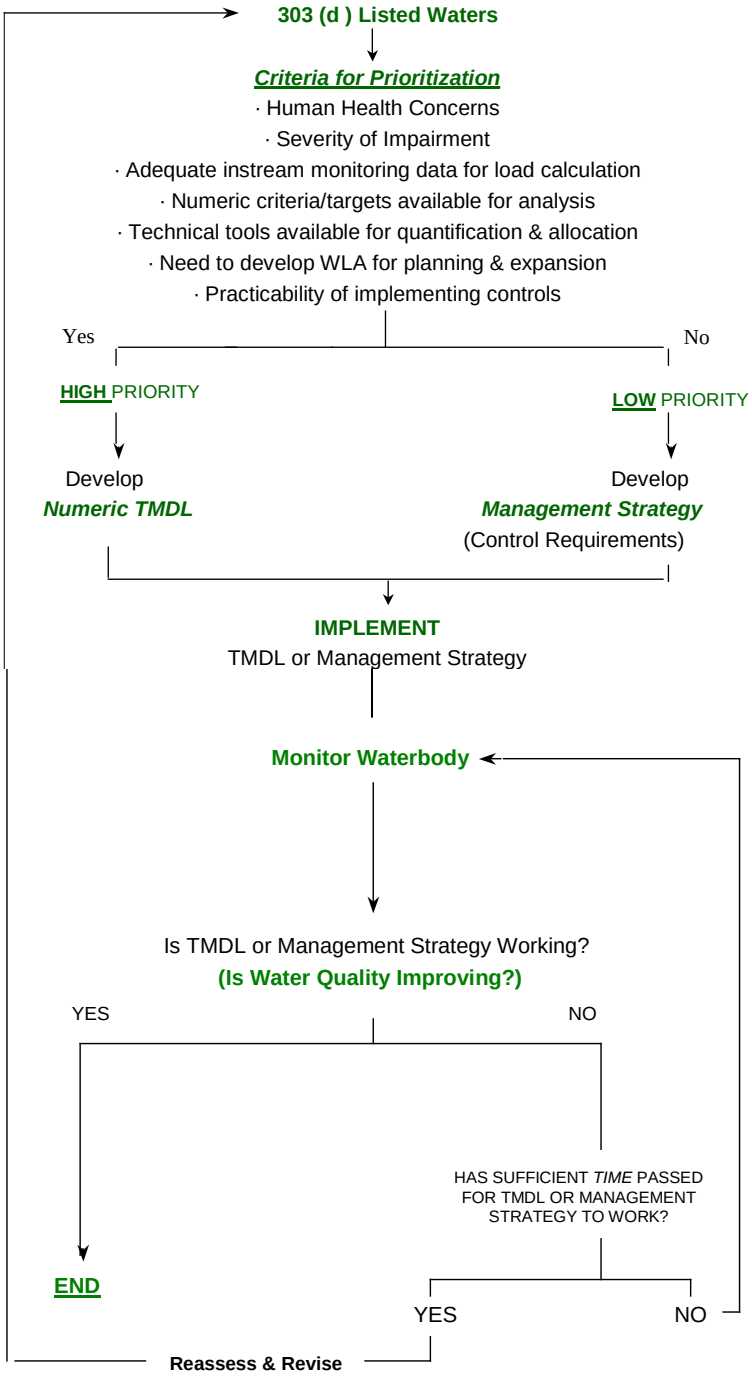

Figure 6.4. Prioritization scheme for TMDL Development.

6.3.B. Nonpoint Sources.

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

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

State and federal regulations can address some of the contaminants impacting the Harpeth River, and much attention has been addressed to point sources (discharged through a pipe or ditch). However, since the vast majority of impacts to streams in the Harpeth River watershed are nonpoint, or diffuse, in nature, controls of point sources are often not sufficient to protect waters.

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

6.3.B.i. Sedimentation.

6.3.B.i.a. From Construction Sites. Construction activities have historically been considered "nonpoint sources." In the late 1980's, EPA designated them as being subject to NPDES regulation if more than 5 acres are disturbed. The general permit issued for such construction sites sets out conditions for maintenance of the sites to minimize pollution from stormwater including requirements for inspection of the controls. Also the general permit imposes more stringent inspection and self-monitoring requirements on sites in the watershed of streams that are impaired due to sedimentation.

Construction sites within a sediment-impaired watershed may also have higher priority for inspections by WPC personnel, and are likely to have enforcement actions for failure to control erosion. Some sediment-impaired streams subject to intensive land development in the Harpeth River watershed are Jones Creek and Gum Branch in the Dickson area; Otter Creek and Beech Creek in the Nashville area; Lynnwood Creek, Spencer Creek, Watson Branch, and Fivemile Creek in the Franklin/Brentwood area; and Arrington Creek and Cheatham Branch in the Nolensville area.

Road construction is another form of land disturbance currently affecting several streams in the Harpeth River, in particular the southern loop of the large-scale S.R. 840 project. Impacts to streams associated with road building involve sediment runoff and habitat

alteration, and in general, similar control measures are necessary to mitigate erosion runoff as those for commercial or residential construction sites. In addition, pre-construction planning to avoid multiple stream crossings, steep slopes, and to use bridge spans instead of culvert-and-fill crossings can help minimize impacts. Examples of streams impaired by road construction include Dog Creek, Donelson Creek, Tidwell Branch, Rials Branch, Parker Creek, Goslin Branch, Nails Creek, and Jordan Hollow Branch. Many of these are in the Turnbull Creek drainage near Dickson.

The same additional permit requirements applying to construction sites in sediment-impaired drainages also apply to those within the drainage of high quality waters. The South Fork Harpeth, Kelly Creek (S. Harpeth drainage), and portions of the Harpeth River are examples of high quality streams in the Harpeth River Watershed.

The state's construction stormwater permitting measures are currently required for all sites of 5 acres or more, but may also be required on a site-by-site basis for smaller sites where warranted. Regardless of the size, state regulations direct that no construction site be allowed to cause a condition of pollution.

Due to the explosive population growth within the Harpeth River Watershed during the last decade, sediment erosion and riparian destruction from construction activities have become main sources of stream impairment. The rapid pace and ephemeral nature of these activities have put a substantial strain on the ability of agencies to inspect and monitor these sites adequately. The establishment of local stormwater management agencies within larger urbanized areas over the next couple of years should aid in regulating and controlling runoff from construction activities. Williamson County and the cities of Franklin and Brentwood are currently proposing for, or in the process of developing their own, MS4 (Municipal Separate Storm Sewer System) programs. Part of the mandate for these MS4 programs will be to draft zoning and building codes designed to address sediment pollution. A few municipalities have already put in place progressive developmental regulations, most notably Franklin and Williamson County. In addition, new federal requirements will reduce the size of the sites subject to NPDES construction storm water permitting to one acre.

Additional non-regulatory strategies for controlling sediment runoff for residents to consider include the immediate re-vegetation of any bare area, including ditches beside driveways, and the covering of topsoil piles.

6.3.B.i.b. From Channel Alteration and Bank Erosion. Due to past bank and channel alterations and riparian vegetation removal, many streams within the Harpeth River Watershed have unstable and eroding banks. This erosion can release a surprising amount of sediment downstream. Several agencies are working to stabilize portions of stream banks. These include NRCS, TDOT, and TDA. Much of this work involves voluntary, cost-sharing projects with landowners. Some methods or controls that might be necessary to address common problems are:

Voluntary activities

- Re-establishment of bank vegetation. This is perhaps the most effective means of reducing not only bank erosion and sedimention, but also a variety of other impacts, including organic enrichment and aggravated flooding. Many impacted streams would benefit from the re-establishment of riparian vegetation, including Newsome Branch, Beech Creek, Lynnwood Branch, Otter Creek in primarily

urbanized areas; and Polk Creek, West Harpeth River, Arrington Creek, Fivemile Creek, and Cheatham Branch in primarily rural areas.

- Establish off-channel watering areas for cattle. Cattle activity can create very destabilized and denuded banks. Several current BMP methods exist for moving watering troughs and feeders back from stream banks, including solar powered pumps, or pond construction. Examples of streams that could benefit would be Murray Branch, Bedford Creek, and Cayce Branch. Where it is not possible to exclude cattle from a creek, effort should be made to limit cattle access to streams to a single point, using fencing or other methods.

Additional strategies

- Increase efforts in the Master Logger program to recognize impaired streams and require more effective erosion management and road-building practices in silviculture activities.
- Additional restrictions on logging in streamside management zones.
- Better community planning of development impacts on small streams, especially development in rapidly growing areas.
- Local restrictions requiring postconstruction runoff rates to be no greater than preconstruction rates in order to avoid in-channel erosion and downstream flooding.
- Restrictions on impervious surface densities in urbanized areas. Impervious surfaces (parking lots, roads, rooftops) increase runoff rates to streams, causing destabilization and erosion as well as increased pollutant transport.
- Better landowner education on the proper, low-impact methods for clearing of stream and ditch banks *Note: Permits are currently required for any work along streams if water quality is altered.*
- Additional restrictions on multiple road and utility line crossings of streams. This should include the proper sizing and installation of culverts.
- Restrictions on the use of off-highway vehicles on stream banks and in stream channels.

6.3.B.ii. Pathogen Contamination.

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

Other measures that may be necessary to control pathogens are:

Voluntary activities

- Off-channel watering of livestock or limiting livestock access to streams (see above).
- Proper management of animal waste from feeding operations.

Enforcement strategies

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

Additional strategies

- Restrict development in areas where sewer is not available to only those sites with appropriate soils.
- Develop and enforce leash laws and controls on pet fecal material in highly populated areas.
- Greater efforts by sewer utilities to identify leaking lines or overflowing manholes, and more frequent upgrades to reduce infiltration and inflow, or catastrophic failures (examples of affected streams are Spencer Creek and Harpeth River).

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

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

Other sources of nutrients can be addressed by:

Voluntary activities

- Encourage no-till farming, and the proper rate of fertilizer for the soil and crop.
- Educate homeowners and lawn care companies in the proper application of fertilizers.
- Encourage landowners, developers, and builders to leave stream buffer zones. Streamside vegetation can filter out many nutrients and other pollutants before they reach the stream. These riparian buffers are also vital along livestock pastures. Examples of streams that need buffers to reduce nutrient runoff are Beech Creek, Rattlesnake Branch, Concord Creek, and Kelly Creek (upper Harpeth drainage).
- Use grassed drainageways that can remove fertilizer before it enters streams.
- Use native plants for landscaping since they don't require as much fertilizer and water.

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

- Maintain shade over a stream. Cooler water can hold more oxygen and retard the growth of algae. Many streams in the Harpeth River watershed suffer from canopy removal.
- Discourage impoundments. Deepwater environments such as ponds and lakes do not aerate water, and often become eutrophic through nutrient buildup, encouraging algae growth. *Note: Permits are required for any work on a stream, including impoundments.*

6.3.B.iv. Toxins and Other Materials.

Only one area in the Harpeth River watershed is considered significantly polluted by a toxic substance, although many streams are affected by foreign material thrown or dumped into them. A short reach of the Harpeth mainstem near College Grove contains sediments contaminated by lead and other heavy metals—an historic legacy from decades of operation at a nearby battery recycling plant, and improper disposal of wastes generated there. Although these disposal practices ceased years ago, and the water itself is not contaminated, levels in the muddy bottom are still high, and probably will be for many years to come. Fortunately, the lead and other pollutants are effectively sealed off from casual human contact at the bottom of the Harpeth River, and efforts to excavate or dredge these sediments up would only serve to reintroduce them to the environment and carry them, stirred up, farther downstream.

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

Voluntary activities

- Providing public education.
- Painting warnings on storm drains indicating connection with a stream. (This would benefit urban streams like Newsome Branch, Beech Creek, the Harpeth River and many of its unnamed tributaries).
- Sponsoring community clean-up days.
- Landscaping of public areas and greenway development.
- Encouraging public surveillance of their streams and reporting of dumping activities to their local authorities.
- Public education concerning dumping into sinkholes, and their connection with groundwater contamination.

Needing regulation

- Prohibition of illicit discharges to storm drains. (Local MS4 programs will help address this.)
- Litter laws and strong enforcement at the local level.

6.3.B.v. Habitat Alteration.

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

Measures that can help address this problem include:

Voluntary activities

- Organizing stream cleanups removing trash, limbs and debris by hand or winch before they cause blockage.
- Avoiding use of heavy equipment to "clean out" streams.
- Planting vegetation along streams to stabilize banks and provide habitat.
- Encouraging developers to avoid extensive culverting or relocation of streams.

Current regulations

- Reduce or restrict modification of streams by such means as channelization, culverting, lining, or impounding. (Spicer Branch and a tributary to Jones Creek in the Dickson area would benefit.)
- Require mitigation for impacts to streams and wetlands when modifications are allowed.

Additional Enforcement or Restrictions

- Increased enforcement may be needed when violations of current regulations occur.
- More restrictive alteration regulations to discourage extensive relocations, impoundment of headwater streams, ripraping of banks, and removal of riparian vegetation. (Trace Creek, Kennedy Creek, Starnes Creek, and Little Harpeth River would benefit.)

APPENDIX II

ID	NAME	HAZARD		ID	NAME	HAZARD
117001	Craig Lake	O		947009	Lake Weona	2
117004	Dillard	L		947010	Robinson	S
197002	Shangri-La	B		947012	Jackson	H
197009	Radnor Lake	1		947014	Rotary Club	2
197012	Lake Ogallala	S		947017	Cox Dam	L
197020	Enoree Lake	S		947018	Dickinson	O
197021	Chippewa Lake	S		947019	Hidden Valley	H
197025	Lackey Farm Pond	O		947020	Hooker	L
227002	Acorn Lake	1		947022	Deitschman	S
227004	Woodhaven	1		947023	Leonard Todd	H
227005	Luther	1		947024	Wright	L
227006	Luther #2	3		947025	Rich	H
227007	Luther #3	3		947026	White	S
227008	Luther #4	3		947027	Eagle Rest	L
227010	Luther #5	S		947028	Walker	S
227011	Creech Hollow Dam	2		947029	Crockett Springs	2
227012	Hava-Lakatu #2	L		947030	Clovercroft	L
227013	Hava-Lakatu #1	L		947031	Nelson Elam #2	H
227014	Duke	S		947032	Maryland Farms Det # 2	1
227015	Lake View Acres	O		947034	Johnson	L
947001	Dyer	O		947035	Big Brother	N
947002	Gentry	L		947037	Houghland Farm	L
947003	Nelson Elam #1	H		947038	Poplar Grove #2	O
947004	Fernvale Lake	3		947039	Lakewood	O
947005	Lake Colonial Estate	1		947040	Franklin Water Works	1
947007	Pine Hill	H		947041	Lee Lake	L
947008	Lever	1				

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

LAND COVER/LAND USE	SQUARE MILES	% OF WATERSHED
Open Water	3.7	0.4
Forested Wet	4.1	0.5
Nonforested	1.4	0.2
Pasture	375.5	43.5
Crop Land	23.9	2.8
Scrub Shrub	0.0	0.0
Deciduous Forest	395.5	45.8
Mixed Forest	32.9	3.8
Coniferous Forest	7.0	0.8
Urban	18.6	2.2
Barren Land	0.0	0.0
Strip Mines	0.0	0.0
Cloud/Shadow	0.0	0.0
Forested Dead Wetland	0.0	0.0
Total	**862.7**	**100**

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

ECOREGION	REFERENCE STREAM	WATERSHED (HUC)
Western Highland Rim (71f)	Brush Creek	Buffalo River (06040004)
	Little Swan Creek	Lower Duck (06040003)
	Panther Creek	TN Western Valley (06040005)
	South Harpeth River	Harpeth (05130204)
	Swanegan Branch	Pickwick Lake (06030005)
	Wolf Creek	Lower Duck (06040003)
Outer Nashville Basin (71h)	Carson Fork	Stones (05130203)
	Clear Fork	Caney Fork (05130108)
	Flynn Creek	Cordell Hull (05130106)
	Indian Creek	Caney Fork (05130108)
	West Fork Mulberry Creek	Upper Elk (06030003)
Inner Nashville Basin (71i)	Flat Creek	Upper Duck (06040002)
	Sinking Creek	Upper Duck (06040002)
	Spring Creek	Upper Duck (06040002)
	Stewart Creek	Stones (05130203)
	West Fork Stones River	Stones (05130203)

Table A2-3. Ecoregion Monitoring Sites in Level IV Ecoregions 71f, 71h, and 71i.

CODE	NAME	AGENCY	AGENCY ID
48	TDEC/DNH BIG TURNBULL CREEK TNC REGISTRY SITE	TDEC/DNH	S.USTNHP 285
137	TDEC/DNH HARPETH STATE SCENIC RIVER SITE	TDEC/DNH	S.USTNHP 14
164	TDEC/DNH SPENCER CREEK SEEP SITE	TDEC/DNH	S.USTNHP 210
200	USACOE-NASHVILLE CLIENT SITE	USACOE-N	
212	USACOE-NASHVILLE CLIENT SITE	USACOE-N	
226	USACOE-NASHVILLE CLIENT SITE	USACOE-N	
227	USACOE-NASHVILLE CLIENT SITE	USACOE-N	
264	USACOE-NASHVILLE CLIENT SITE	USACOE-N	
335	TDOT SR 1 MITIGATION/PERMIT SITE	TDOT	
449	TDEC/WPC DICKSON COUNTY INDUSTRIAL PARK PERMIT SITE	TDEC/WPC	
453	TDEC/WPC HARPETH RIVER TRIB PERMIT/MITIGATION SITE	TDEC/WPC	
488	TDEC/WPC WATSON BRANCH PERMIT/MITIGATION SITE	TDEC/WPC	
523	TDOT SPENCER CREEK PERMIT SITE	TDOT	
1530	USACOE-ORN PN 96-8/CITY OF FRANKLIN SITE	USFWS	
1962	TWRA HALEY-JACQUETH SITE	TWRA	
1963	TWRA HALEY-JACQUETH SITE	TWRA	
1964	TWRA HALEY-JACQUETH SITE	TWRA	
1965	TWRA HALEY-JACQUETH SITE	TWRA	
1966	TWRA HALEY-JACQUETH SITE	TWRA	
1967	TWRA HALEY-JACQUETH SITE	TWRA	
2701	TDEC/DNH SLOAN-HUNTER TRACT SITE	TDEC/DNH	S.USTNHP
2776	HARPETH WETLAND MITIGATION BANK	USFWS	

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

APPENDIX III

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Allen Branch	TN05130204010_0900	3.2
Bear Creek	TN05130204013_0340	6.0
Beaverdam Creek	TN05130204006_0600	39.7
Brush Creek	TN05130204009_1200	34.8
Caney Fork Creek	TN05130204010_0800	8.8
East Fork Creek	TN05130204010_0400	18.9
Harpeth River	TN05130204001_1000	42.2
Harpeth River	TN05130204009_1000	27.1
Harpeth River	TN05130204009_2000	16.8
Hunting Camp Creek	TN05130204010_1100	9.5
Jones Creek	TN05130204002_1000	14.2
Joslin Branch	TN05130204002_0100	10.0
Kelly Creek	TN05130204010_0700	10.7
Leatherwood Creek	TN05130204001_0700	20.8
Leipers Fork	TN05130204013_0400	43.6
Little Harpeth River	TN05130204021_2000	12.1
Little Jones Creek	TN05130204002_0700	29.7
Little Turnbull Creek	TN05130204006_0200	18.0
Mayes Creek	TN05130204016_0400	24.9
McCrory Creek	TN05130204016_0600	18.5
Mound Creek	TN05130204001_0400	5.3
Murfrees Fork	TN05130204013_0300	24.7
Nails Creek	TN05130204006_0500	19.1
Nelson Creek	TN05130204018_0100	20.3
Oakley Creek	TN05130204001_0800	2.8
Overall Creek	TN05130204018_0500	18.4
Poplar Creek	TN05130204010_0100	3.4
South Harpeth River	TN05130204010_1000	21.9
Sulphur Creek	TN05130204001_0300	6.6
Sulphur Fork	TN05130204002_0800	14.4
Toon Creek	TN05130204016_0800	5.3
Town Branch	TN05130204002_0900	13.9
Trace Creek	TN05130204001_0600	8.3
Turnbull Creek	TN05130204006_1000	27.0
Turner Creek	TN05130204009_0100	7.7
Turnipseed Creek	TN05130204001_0200	5.0
Unamed trib to West Fork Harpeth River	TN05130204013_0500	5.0
Unnamed tributary to Harpeth River	TN05130204001_0900	6.9
Unnamed tributary to South Harpeth River	TN05130204010_1200	1.7
Unnamed tributary to South Harpeth River	TN05130204010_0200	1.5
West Fork Harpeth River	TN05130204013_3000	6.6
West Harpeth River	TN05130204013_2000	11.6
West Prong Murfrees Fork	TN05130204013_0330	6.0
Will Hall Creek	TN05130204002_0200	9.9
Willow Branch	TN05130204002_0600	4.8

Table A3-1a. Streams Fully Supporting Designated Uses in Harpeth River Watershed. *Data are based on Year 2000 Water Quality Assessment*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Arkansas Creek	TN05130204010_0600	5.7
Arrington Creek	TN05130204016_0500	24.6
Barren Fork	TN05130204006_0300	9.5
Bedford Creek	TN05130204010_0500	5.0
Beech Creek	TN05130204021_0200	7.7
Cayce Branch	TN05130204013_0320	5.9
Cheatham Branch	TN05130204018_0400	3.4
Fivemile Creek	TN05130204016_0900	14.4
Harpeth River	TN05130204016_1000	10.7
Harpeth River	TN05130204016_2000	9.0
Harpeth River	TN05130204016_3000	7.5
Harpeth River	TN05130204018_1000	6.0
Jones Creek	TN05130204002_2000	15.1
Kennedy Creek	TN05130204013_0200	4.8
Little Harpeth River	TN05130204021_1000	4.1
Lynwood Creek	TN05130204016_0100	5.4
Murray Branch	TN05130204009_0600	3.6
Newsom Branch	TN05130204009_0200	1.7
Otter Creek	TN05130204021_0100	4.6
Parker Creek	TN05130204006_0400	14.2
Polk Creek	TN05130204013_0100	8.8
Rials Branch	TN05130204006_0310	3.0
Spencer Creek	TN05130204016_0200	19.9
Starnes Creek	TN05130204016_0700	10.0
Trace Creek	TN05130204009_0900	4.9
Watson Branch	TN05130204016_0300	6.8
West Harpeth River	TN05130204013_1000	13.4

Table A3-1b. Streams Partially Supporting Designated Uses in Harpeth River Watershed.
Data are based on Year 2000 Water Quality Assessment.

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Beech Creek	TN05130204009_1100	3.6
Concord Creek	TN05130204018_0200	15.1
Dog Creek	TN05130204001_0500	3.8
Donelson Creek	TN05130204016_1100	3.4
Harpeth River	TN05130204018_2000	7.4
Kelley Creek	TN05130204018_0300	9.3
Rattlesnake Branch	TN05130204013_0310	6.5
Spicer Branch	TN05130204002_0300	4.6
Unnamed trib to Harpeth River	TN05130204009_0800	2.1
Unnamed trib to Jones Creek	TN05130204002_0400	0.5

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

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SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)
Big Bethany Creek	TN05130204001_0100	6.1
Brown Creek	TN05130204009_0700	5.3
Buffalo Creek	TN05130204009_0300	5.2
Cartwright Creek	TN05130204009_0500	5.7
Flat Creek	TN05130204009_0400	3.6
Grassy Spring	TN05130204002_0500	2.0
Harpendene Creek	TN05130204010_0610	3.8
Misc tribs to Harpeth River	TN05130204018_0999	22.5
Misc tribs to West Fork Harpeth River	TN05130204013_1999	27.5
Misc tribs to West Fork Harpeth River	TN05130204013_2999	28.1
Misc. tribs to Harpeth River	TN05130204001_0999	24.8
Misc. Tribs to Harpeth River	TN05130204009_0999	10.6
Misc. tribs to Harpeth River	TN05130204016_0999	39.5
Misc. tribs to Little Harpeth River	TN05130204021_0999	31.8
Misc. tribs to South Harpeth River	TN05130204010_0999	28.4
Misc. Tribs to Turnbull Creek	TN05130204006_0999	46.2
Misc.tribs to Jones Creek	TN05130204002_0999	57.6
Prichard Branch	TN05130204010_0300	5.5
Talley Creek	TN05130204006_0100	4.6
Unnamed Trib to Arkansas Creek	TN05130204010_0620	1.6

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (ACRES)
Acorn Lake	TN05130204ACORNLK_1000	24
Creech Hollow Lake	TN05130204CREECH_1000	35
Luther Lake	TN05130204LUTHER_1000	5
Radnor Lake	TN05130204RADNORLK_1000	80
Woodhaven Lake	TN05130204WOODHAVEN_1000	511

Table A3-1e. Lakes Not Assessed in Harpeth River Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Bedford Creek	TN05130204010_0500	5.0	Partial
Beech Creek	TN05130204021_0200	7.7	Partial
Beech Creek	TN05130204009_1100	3.6	Not supporting
Cayce Branch	TN05130204013_0320	5.9	Partial
Cheatham Branch	TN05130204018_0400	3.4	Partial
Concord Creek	TN05130204018_0200	15.1	Not supporting
Dog Creek	TN05130204001_0500	3.8	Not supporting
Harpeth River	TN05130204018_2000	7.4	Not supporting
Kelley Creek	TN05130204018_0300	9.3	Not supporting
Kennedy Creek	TN05130204013_0200	4.8	Partial
Little Harpeth River	TN05130204021_1000	4.1	Partial
Lynwood Creek	TN05130204016_0100	5.4	Partial
Otter Creek	TN05130204021_0100	4.6	Partial
Parker Creek	TN05130204006_0400	14.2	Partial
Polk Creek	TN05130204013_0100	8.8	Partial
Rattlesnake Branch	TN05130204013_0310	6.5	Not supporting
Spicer Branch	TN05130204002_0300	4.6	Not supporting
Starnes Creek	TN05130204016_0700	10.0	Partial
Trace Creek	TN05130204009_0900	4.9	Partial
Unnamed trib to Jones Creek	TN05130204002_0400	0.5	Not supporting

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

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Beech Creek	TN05130204009_1100	3.6	Not supporting
Concord Creek	TN05130204018_0200	15.1	Not supporting
Harpeth River	TN05130204016_1000	10.7	Partial
Jones Creek	TN05130204002_2000	15.1	Partial
Kelley Creek	TN05130204018_0300	9.3	Not supporting
Rattlesnake Branch	TN05130204013_0310	6.5	Not supporting

Table A3-2b. Stream Impairment Due to Organic Enrichment/ Low Dissolved Oxygen Levels in Harpeth River Watershed. *Data are based on Year 2000 Water Quality Assessment.*

SEGMENT NAME	WATERBODY SEGMENT ID	SEGMENT SIZE (MILES)	SUPPORT DESCRIPTION
Arkansas Creek	TN05130204010_0600	5.7	Partial
Arrington Creek	TN05130204016_0500	24.6	Partial
Barren Fork	TN05130204006_0300	9.5	Partial
Bedford Creek	TN05130204010_0500	5.0	Partial
Beech Creek	TN05130204021_0200	7.7	Partial
Cayce Branch	TN05130204013_0320	5.9	Partial
Cheatham Branch	TN05130204018_0400	3.4	Partial
Concord Creek	TN05130204018_0200	15.1	Not supporting
Dog Creek	TN05130204001_0500	3.8	Not supporting
Donelson Creek	TN05130204016_1100	3.4	Not supporting
Fivemile Creek	TN05130204016_0900	14.4	Partial
Harpeth River	TN05130204018_2000	7.4	Not supporting
Harpeth River	TN05130204016_3000	7.5	Partial
Harpeth River	TN05130204016_2000	9.0	Partial
Jones Creek	TN05130204002_2000	15.1	Partial
Kelley Creek	TN05130204018_0300	9.3	Not supporting
Little Harpeth River	TN05130204021_1000	4.1	Partial
Lynwood Creek	TN05130204016_0100	5.4	Partial
Murray Branch	TN05130204009_0600	3.6	Partial
Newsom Branch	TN05130204009_0200	1.7	Partial
Otter Creek	TN05130204021_0100	4.6	Partial
Parker Creek	TN05130204006_0400	14.2	Partial
Polk Creek	TN05130204013_0100	8.8	Partial
Spencer Creek	TN05130204016_0200	19.9	Partial
Spicer Branch	TN05130204002_0300	4.6	Not supporting
Starnes Creek	TN05130204016_0700	10.0	Partial
Trib to Harpeth River	TN05130204009_0800	2.1	Not supporting
Unnamed trib to Jones Creek	TN05130204002_0400	0.5	Not supporting
Watson Branch	TN05130204016_0300	6.8	Partial
West Harpeth River	TN05130204013_1000	13.4	Partial

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

APPENDIX IV

LAND USE/LAND COVER	AREAS IN HUC-11 SUBWATERSHEDS (SQUARE MILES)								
	010	**020**	**030**	**040**	**050**	**060**	**070**	**080**	**090**
Deciduous Forest	30.66	29.19	30.36	48.84	14.33	64.91	88.26	65.03	63.54
Emergent Herbaceous Wetlands	0.02								
Evergreen Forest	5.13	3.82	1.87	2.15	2.65	0.47	1.09	2.87	1.86
High Intensity: Commercial/Industrial	0.23	2.28	0.81	0.3	1.23	0.33	0.46	1.09	1.12
High Intensity: Residential	0.01	0.65	0.51	0.02	0.17	0.06	0.07	0.08	0.30
Low Intensity: Residential	0.47	4.51	3.68	0.57	3.32	0.41	0.83	0.73	1.69
Mixed Forest	16.67	17.58	8.24	11.34	9.99	2.44	4.40	7.50	7.08
Open Water	0.13	0.59	0.94	0.28	0.12	0.05	1.05	0.09	0.16
Other Grasses: Urban/Recreational	0.22	4.92	2.11	0.35	3.18	0.23	0.36	0.52	0.88
Pasture/Hay	36.31	37.53	11.48	42.24	9.57	8.88	10.73	26.65	20.12
Row Crops	14.95	13.51	3.27	11.30	2.57	3.41	6.66	9.78	11.13
Transitional	0.29	0.08	0.03	0.06		0.03	0.45	0.60	0.12
Quaries/Strip Mines		0.22	0.06	0.01				0.08	0.14
Woody Wetlands	0.48	0.04	0.15				0.44	0.01	0.05
Total	**105.56**	**114.68**	**63.54**	**117.48**	**47.13**	**81.22**	**115.35**	**115.04**	**108.17**

Table A4-1. Land Use Distribution in Harpeth River Watershed by HUC-11. *Data are from 1992 Multi-Resolution Land Characterization (MRLC) derived by applying a generalized Anderson Level II system to mosaics of Landsat thematic mapper images collected every five years.*

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

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

STATION	HUC-11	NAME	AREA (SQ. MILES)	PERIOD OF OBSERVATIONS	FLOW (CFS)		
					Min	Max	Mean
03432400	05130204020	Harpeth River	210.0	08/01/88 - 09/30/94	4.0	508.0	109.0
03432371	05130204020	Harpeth River					
03432350	05130204020	Harpeth River	191.0	10/01/74 - 09/30/94	0.0	18,500.0	298.0
03433500	05130204030	Harpeth River	408.0	05/01/20 - 09/30/96	0.0	32,400.0	592.0
03432500	05130204040	West Harpeth River	66.9	10/01/54 - 09/30/61	0.0	8,020.0	94.0
03432925	05130204050	Little Harpeth River	22.0		0.0		
03433660	05130204060	South Harpeth River	27.6		5.0		
03433700	05130204060	South Harpeth River	59.6		9.4		
03433810	05130204070	Brush Creek Near Kingston Springs	27.2		2.3		
03434560	05130204070	Trace Creek Near White Bluff	2.0		0.2		
03434580	05130204070	Harpeth River Near Petway	727.0		23.8		
03434500	05130204070	Harpeth River Near Kingston Springs	681.0	08/01/25 - 12/11/00	16.0	15,300.0	1,200.0
03433910	05130204080	Big Turnbull Creek	66.4		6.0		
03434585	05130204090	Jones Creek Trib at Dickson	5.1		0.4		
03434590	05130204090	Jones Creek Near Burns	13.3		0.3		
03434620	05130204090	Town Branch Near Charlotte	8.3		0.0		

Table A4-3. Historical USGS Streamflow Data Summary Based on Mean Daily Flows in Harpeth River Watershed. *Min, absolute minimum flow for period of record.*

PARAMETER ID	PARAMETER NAME
00010	Water Temperature (Degrees Centigrade)
00061	Flow, Stream, Instantaneous (cfs)
00080	Color (Platinum-Cobalt Units)
00094	Specific Conductance, Field (μmhos/cm @ 25° C)
00095	Specific Conductance, Field (μmhos/cm @ 25° C)
00300	Oxygen Dissolved (mg/L)
00310	BOD 5 Day @ 20° C (mg/L)
00335	COD in .025 N $K_2Cr_2O_7$ (mg/L)
00400	pH (Standard Units)
00410	Alkalinity, Total (mg/L as $CaCO_3$)
00515	Residue, Total Filtrable (mg/L)
00530	Residue, Total Nonfiltrable (mg/L)
00610	Nitrogen Ammonia Total (mg/L as N)
00619	Ammonia, Unionized (Calculated From Temp-pH-NH_4; mg/L)
00630	Nitrite Plus Nitrate, Total (1 Determination mg/L as N)
00635	Nitrogen, Ammonia and Organic , Total (mg/L as N)
00665	Phosphorus, Total (mg/L as P)
00900	Hardness, Total (mg/L as $CaCO_3$)
00940	Chloride, Total In Water (mg/L)
00945	Sulfate, Total (mg/L as SO_4)
01002	Arsenic, Total (μg/L as As)
01027	Cadmium, Total (μg/L as Cd)
01034	Chromium, Total (μg/L as Cr)
01042	Copper, Total (μg/L as Cu)
01045	Iron, Total (μg/L as Fe)
01051	Lead, Total (μg/L as Pb)
01067	Nickel, Total (μg/L as Ni)
01077	Silver Total (μg/L as Ag)
01092	Zinc, Total (μg/L as Zn)
31616	Fecal Coliform (Membrane Filter, M-FC Broth at 44.5° C)
71900	Mercury, Total (μg/L as Hg)

Table A4-4a. Water Quality Parameters and Codes.

PARAMETER ID	SUBWATERSHED				
	020	040	060	070	090
00010	a,b,c	d	e	f,g,h,i	j
00061	a		e	g	
00080			e		
00094	c	d	e	f,h,i	j
00095	a,b			g	
00300	c	d	e	f,h,i	j
00310	c			h,i	j
00335				f	
00400	c	d	e	f,h,i	j
00410		d	e		
00515		d	e	f	
00530	c	d	e	f,h,i	j
00610	c	d	e	f,h,i	j
00619	c	d	e	f,h,i	j
00630		d	e	f	
00635			e		
00665		d		f	
00900	c	d	e	f,h,i	j
00940		d	e		
00945		d	e		
01002		d	e	f	
01027	c	d	e	f,h,i	j
01034	c	d	e	f,h,i	j
01042	c	d	e	f,h,i	j
01045		d	e		
01051	c	d	e	f,h,i	j
01067	c	d	e	f,h,i	j
01077	c		e	h,i	
01092	c	d	e	f,h,i	j
31616		d	e	f	
71900	c	d	e	f,h,i	j

Table A4-4b. Water Quality Parameters Monitored in the Harpeth River Watershed.

CODE	STATION	ALIAS	AGENCY	LOCATION
a	03432350		USGS	Harpeth River @ Franklin
b	03432400		USGS	Harpeth River Below Franklin
c	HARPETH085.2	HARPE085.2WI	TDEC	Harpeth River upstream of Franklin STP
d	ECO71h15	WHARP002.3WI	TDEC	West Harpeth River @ RM 22.3
e	ECO71f12		TDEC	South Harpeth River @ RM 16.9
f	0014311	HARPE040.5CH	TDEC	Harpeth River @ RM 40.5
g	03434500		TDEC	Harpeth River Near Kingston Springs
h	FLATROCK002.15	FLAT002.1WI	TDEC	100 Feet Upstream of Fairview STP
i	TRACE004.3	TRACE004.3DI	TDEC	0.25 Mi Upstream of White Bluff STP
j	JONES021.7	JONES021.7DI	TDEC	Jones Creek @ RM 21.7

Table A4-4c. Water Quality Monitoring Stations in Harpeth River Watershed*. TDEC, Tennessee Department of Environment and Conservation; USGS, United States Geological Survey.*

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	MADI	WATERBODY	SUBWATERSHED
TN0067164	College Grove ES	4952	Sewerage Systems	Minor	Unnamed trib @ mi 0.7 to Overall Creek @ mi 0.8	05130204010
TN0064475	Bethesda ES	4952	Sewerage Systems	Minor	Unnamed trib @ mi 0.46 to Rutherford Creek @ mi 27.9	05130204010
TN0001384	General Smelting and Refining	3339	Primary Smelting and Refining of Nonferrous Metals	Major	Harpeth River @ mi 110.3	05130204010
TN0057789	Eagleville School	4952	Sewerage Systems	Minor	Cheatham Branch @ mi 1.9	05130204010
TN0067873	Oakview ES	8211	Elementary and Secondary Schools	Minor	Unnamed Trib to Five Mile Creek @ mi 1.1	05130204020
TN0028827	Franklin STP	4952	Sewerage Systems	Major	Harpeth River @ mi 85.2	05130204020
TN0060216	Best Western-Goose Creek Inn STP	4952	Sewerage Systems	Minor	Five Mile Creek @ mi 2.2	05130204020
TN0068861	Williamson County Hwy Dept	1422	Crushed and Broken Limestone	Minor	Trib To Harpeth River	05130204020
TN0064297	Trinity ES	4952	Sewerage Systems	Minor	Unnamed trib @ mi 0.4 to Mayes Creek @ mi 1.7	05130204020
TN0073580	Nashville South Auto/Truck Plaza	5541	Except with Convenience Stores	Minor	Surface Ditch To Five Mile Creek @ mi 2.2	05130204020
TN0057835	Page MS	4952	Sewerage Systems	Minor	Harpeth River @ mi 101.9	05130204020
TN0025232	Harpeth Valley Utility District STP	4952	Sewerage Systems	Major	Harpeth River @ mi 57.8	05130204030
TN0027278	Cartwright Creek U.C. STP	4952	Sewerage Systems	Minor	Harpeth River @ mi 68.8	05130204030
TN0029718	Lynnwood Utility Corp. STP	4952	Sewerage Systems	Minor	Harpeth River @ mi 77.9	05130204030

TN0066672	Hutton Stone, Inc.	1422	Crushed and Broken Limestone	Minor	Harpeth River	05130204030
TN0068489	Delta Express #3217	5441	Processed Wastewater	Minor	Tributary of Flat Creek	05130204030
TN0074586	Pegram STP	4952	Sewerage Systems	Minor	Harpeth River at Mile 46.0	05130204030
TN0025232	Harpeth Valley Utility District STP	4952	Sewerage Systems	Major	Harpeth River @ mi 57.8	05130204040
TN0027278	Cartwright Creek U.C. STP	4952	Sewerage Systems	Minor	Harpeth River @ mi 68.8	05130204040
TN0029718	Lynnwood Utility Corp. STP	4952	Sewerage Systems	Minor	Harpeth River @ mi 77.9	05130204040
TN0057827	Hillsboro ES	4942	Sewerage Systems	Minor	Pinewood Branch @ mi 0.1 to Wilkie Branch @ mi 0.5	05130204040
TN0074586	Pegram STP	4952	Sewerage Systems	Minor	Harpeth River @ Mile 46.0	05130204040
TN0059790	Kingston Springs STP	4952	Sewerage Systems	Minor	Harpeth River @ mi 31.5	05130204070
TN0004294	Second South Cheatham UD	4941	Water Supply	Minor	Harpeth River @ mi 36.1	05130204070
TN0020460	White Bluff STP	4952	Sewerage Systems	Minor	Trace Creek @ mi 4.3	05130204070
TN0068675	Interstate Packaging Corporation	2671	Noncontact Cooling Water	Minor	Wet Weather Conveyance into Flat Creek @ mi 3.1	05130204070
TN0062332	Fairview STP	4952	Sewerage Systems	Minor	Flatrock Branch @ mi 2.15	05130204070
TN0028991	Bethany Hills Camp STP	4952	Sewerage Systems	Minor	Sullivan's Branch @ mi 1.8	05130204080
TN0063878	Stuart Burns ES	6211	Other	Minor	Beaver Dam Creek @ mi 3.7	05130204080
TN0074659	Saltire Industrial			Minor	Unnamed Trib to Willow Branch of Piney River	05130204080
TN0057002	Dickson Motel STP	4952	Sewerage Systems	Minor	Gin Branch @ mi 3.0	05130204080

TN0004855	Turnbull UD-Burns	4941	Water Supply	Minor	Turnbull Creek	05130204080
TN0066958	Dickson STP	4952	Sewerage Systems	Major	Jones Creek at Mile 21.7	05130204090

Table A4-5. Active Permitted Point Source Facilities in the Harpeth River Watershed. *SIC, Standard Industrial Classification; MADI, Major Discharge Indicator; UD, Utility District.*

FACILITY NUMBER	FACILITY NAME	SIC	SIC NAME	WATERBODY	HUC-11
TN0068861	Williamson County Quarry	1422	Crushed and Broken Limestone	Trib to Harpeth River	05130204020
TN0027774	Franklin Quarry	1422	Crushed and Broken Limestone	Wet Water Conveyance to Carters Creek	05130204020
TN0066672	Hutton Stone Quarry	1422	Crushed and Broken Limestone	Harpeth River	05130204030
TN0072273	Hickman County Quarry	1422	Crushed and Broken Limestone	Trib to Rials Branch	05130204080
TN0002747	Dickson Quarry	1422	Crushed and Broken Limestone	Jones Creek	05130204090

Table A4-6. Active Mining Sites in Harpeth River Watershed.

SITE NUMBER	SITE NAME	COUNTY	LIVESTOCK	WATERBODY	HUC-11
TNA000031	Harlin and Sumners Dairy	Williamson	Dairy	Polk Creek	05130204020

Table A4-7. CAFO Sites in Harpeth River Watershed.

LOG NUMBER	COUNTY	DESCRIPTION	WATERBODY	HUC-11
95.280	Williamson	Gravel Dredging	Harpeth River	05130204020
95.649	Williamson	Gravel Dredging	Harpeth River	05130204020
98.003	Williamson	Box Culvert	Dry Branch	05130204020
98.095	Williamson	Extension of Box Culvert	Trib to Mayes Creek	05130204020
98.146	Williamson	Box Culvert	Trib to Spencer Creek	05130204020
98.392	Williamson	2 Box Culverts	Trib to Mayes Creek	05130204020
98.447	Williamson	Dredging of Pond Sediment	Trib to Harpeth River	05130204020
98.560	Williamson	Overflow From Detention & Wet Area	Spencer Creek	05130204020
98.566	Williamson	Culvert Extension	Trib to Spencer Creek	05130204020
98.567	Williamson	Sewer Crossings	South Prong Spencer Creek	05130204020
99.024	Williamson	Stream Relocation	South Prong Spencer Creek	05130204020
99.133	Williamson	Road Crossing and Detention	Trib to South Prong Spencer Creek	05130204020
99.166	Williamson	Detention/Retention Pond	South Prong Spencer Creek	05130204020
99.176	Williamson	Channelization	Brush Creek and Unnamed Trib	05130204020
99.369	Williamson	Stream Restoration	Trib to Lynnwood Branch	05130204020
99.453	Williamson	Culvert	Lynnwood Branch	05130204020
99.521	Williamson	Low Water Crossing	Watson Branch	05130204020
9810.132	Williamson	Road Crossing	Spencer Creek	05130204020
9810.156	Williamson	Road Crossing	Trib to Burke Branch	05130204020
9910.192	Williamson	Road Crossing	Trib to Watson Branch	05130204020
9910.207	Williamson	Road Crossing	Trib to Watson Branch	05130204020
9910.208	Williamson	Road Crossing	Trib to Watson Branch	05130204020
9910.209	Williamson	Road Crossing	Trib to Watson Branch	05130204020
9910.210	Williamson	Road Crossing	Trib to Watson Branch	05130204020
9910.218	Williamson	Road Crossing	Trib to Mayes Creek	05130204020
00.102	Williamson	Minor RoadCrossing	Little Harpeth River (and Trib)	05130204030
98.248	Williamson	Road Crossings	Trib to Harpeth River	05130204030
98.374	Williamson	Pipe	Harpeth River	05130204030
99.393	Williamson	Culvert Replacement	Cartwright Creek	05130204030
9810.152	Cheatham	Utility Line	Harpeth River	05130204030
9910.025	Williamson	Road Crossing	Trib to Cartwright Creek	05130204030
9910.174	Davidson	Utility Line Crossing	Trib to Harpeth River	05130204030
00.012	Williamson	Stream Relocation/Restoration	Trib of Harpeth River	05130204040
95.244	Williamson	Gravel Dredging	Bear Creek	05130204040
98.073	Williamson	Bridge	Trib to West Harpeth River	05130204040
98.168	Williamson	Pipe Culvert	Trib to Harpeth River	05130204040
98.235	Williamson	Culvert Backfill For Construction	Trib to West Harpeth River	05130204040
98.451	Williamson	Impoundment & Wetland Construction	Trib to Leipers Fork	05130204040
9810.149	Williamson	Utility Line	West Harpeth River	05130204040
9810.219	Williamson	Bank Stabilization	West Harpeth River	05130204040
9810.232	Williamson	Gravel Dredging	Leipers Fork Creek	05130204040
9810.233	Williamson	Gravel Dredging	Leipers Fork Creek	05130204040
9910.005	Williamson	Road Crossing	Trib to Harpeth River	05130204040
9910.006	Williamson	Road Crossing	Trib to Harpeth River	05130204040
9910.028	Williamson	Road Crossing	Trib to Harpeth River	05130204040
97.769	Williamson	Residential Bridge Crossing	Little Harpeth River	05130204050
98.152	Williamson	Stream Bank Restoration	Trib to Little Harpeth River	05130204050
98.237	Davidson	Barge Terminal	Cumberland River	05130204050
98.251	Williamson	Bank Stablization	Little Harpeth River	05130204050
98.305	Williamson	Slab Bridge	Trib to Little Harpeth River	05130204050
99.231	Williamson	Culvert	Trib to Little Harpeth River	05130204050
99.289	Williamson	Bank Stabilization	Little Harpeth River	05130204050
9810.148	Williamson	Road Crossing	Trib to Little Harpeth River	05130204050
9810.197	Williamson	Road Crossing	Trib to Little Harpeth River	05130204050

9810.198	Williamson	Sanitary Sewer & Water Main	Trib to Little Harpeth River	05130204050
9910.189	Davidson	Debris Removal	Otter Creek	05130204050
9910.190	Davidson	Debris Removal	Otter Creek	05130204050
9910.191	Davidson	Debris Removal	Otter Creek	05130204050
95.085	Williamson	Gravel Dredging	Little Harpeth River	05130204060
95.884	Williamson	Gravel Dredging	Hunting Camp Creek	05130204060
96.555	Williamson	Gravel Dredging	South Harpeth River	05130204060
96.556	Williamson	Gravel Dredging	South Harpeth River	05130204060
97.137	Williamson	Gravel Dredging	South Harpeth River	05130204060
97.341	Cheatham	Gravel Dredging	South Harpeth River	05130204060
97.675	Cheatham	Gravel Dredging	South Harpeth River	05130204060
97.706	Williamson	Gravel Dredging	South Harpeth River	05130204060
98.270	Cheatham	Deflectors & Cedar Tree Revetment	South Harpeth River	05130204060
99.150	Williamson	Single Span Bridge	Caney Fork Creek	05130204060
9810.018	Williamson	Gravel Dredging	South Harpeth River	05130204060
9810.131	Davidson	Road Crossing	South Harpeth River	05130204060
9910.003	Williamson	Sewer Line Crossing	Hunting Camp Creek	05130204060
9910.151	Williamson	Bank Stabilization	Trib to Little East Fork	05130204060
9910.193	Williamson	Road Crossing	Caney Fork Creek	05130204060
94.951	Davidson	Gravel Dredging	Harpeth River	05130204070
96.475	Cheatham	Gravel Dredging	Harpeth River	05130204070
97.555	Cheatham	Gravel Dredging	Harpeth River	05130204070
99.206	Cheatham	Bank Stabilization	Brush Creek	05130204070
9910.002	Williamson	Sewer Line Crossing	Brush Creek	05130204070
96.913	Dickson	Gravel Dredging	Turnbull Creek	05130204080
98.058	Williamson	Concrete Bridge	Trib to Big Turnbull Creek	05130204080
98.503	Dickson	I-840		05130204080
98.504	Dickson	I-840		05130204080
98.505	Dickson	I-840		05130204080
98.506	Dickson	I-840		05130204080
98.507	Dickson	I-840		05130204080
98.508	Dickson	I-840		05130204080
98.509	Dickson	I-840		05130204080
98.510	Dickson	I-840		05130204080
98.511	Dickson	I-840		05130204080
98.512	Dickson	I-840		05130204080
98.513	Dickson	I-840		05130204080
98.514	Dickson	I-840		05130204080
98.515	Dickson	I-840		05130204080
98.516	Dickson	I-840		05130204080
98.517	Dickson	I-840		05130204080
98.518	Dickson	I-840		05130204080
98.519	Dickson	I-840		05130204080
98.520	Dickson	I-840		05130204080
98.524	Dickson	I-840		05130204080
9910.125	Hickman	Road Crossing	Barren Fork Big Turnbull Creek	05130204080
9910.163	Dickson	Wet Weather Conveyance (WWC)	WWC to Gum Branch	05130204080
9910.164	Dickson	Wet Weather Conveyance (WWC)	WWC to Gum Branch	05130204080
95.787	Dickson	Gravel Dredging	Jones Creek	05130204090
97.642	Dickson	Gravel Dredging	Jones Creek	05130204090
98.379	Dickson	Utiliity Line Crossing	Jones Creek	05130204090

Table A4-8. Individual ARAP Permits Issued January 1994 Through June 2000 in Harpeth River Watershed.

PERMIT #	COUNTY	DATE ISSUED	SITE	IMPACTED ACRES	IMPACTED WATER	MITIGATION	HUC-11
93.59400	Williamson	11/09/93	Lewisburg Pike	0.20 acres	Harpeth River	on-site	05130203020
93.75000	Williamson	04/08/94	SR 96	0.37 acres	Watson Branch		05130203020

Table A4-9. Individual ARAP Permits Issued for Impacting Wetlands in Harpeth River Watershed.

PERMIT #	COUNTY	IMPACTED ACREAGE	MITIGATED ACREAGE	SITE	HUC-11
93.59400	Williamson	0.2 acres	0.5	Impacted Wetland	05130203020

Table A4-10. Individual ARAP Permits Issued for Mitigating Wetlands in Harpeth River Watershed.

APPENDIX V

CONSERVATION PRACTICE	UNITS	AMOUNT
Alley Cropping	Acres	0
Contour Buffer Strips	Acres	11
Crosswind Trap Strips	Acres	0
Grassed Waterways	Acres	6
Filter Strips	Acres	4
Riparian Forest Buffers	Acres	83
Streambank and Shoreline Protection	Feet	600
Windbreaks and Shelterbelts	Feet	0
Hedgerow Plantings	Feet	0
Herbaceous Wind Barriers	Feet	0
Field Borders	Feet	72,340

Table A5-1a. Conservation Buffers Conservation Practices in Partnership with NRCS in Harpeth River Watershed. *Data are from Performance & Results Measurement System (PRMS) for October 1, 1999 through September 30, 2000 reporting period.*

PARAMETER	TOTAL
Highly Erodible Land With Erosion Control Practices	1,315
Estimated Annual Soil Saved By Erosion Control Measures (Tons/Year)	6,065
Total Acres Treated With Erosion Control Measures	1,439

Table A5-1b. Erosion Control Conservation Practices in Partnership with NRCS in Harpeth River Watershed. *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

PARAMETER	TOTAL
Acres of AFO Nutrient Management Applied	0
Acres of Non-AFO Nutrient Management Applied	1,474
Total Acres Applied	1,474

Table A5-1c. Nutrient Management Conservation Practices in Partnership with NRCS in Harpeth River Watershed. *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

PARAMETER	TOTAL
Number of Pest Management Systems	19
Acres of Pest Management Systems	1,425

Table A5-1d. Pest Management Conservation Practices in Partnership with NRCS in Harpeth River Watershed. *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

CONSERVATION PRACTICE	ACRES
Acres of Coniferous Tree and Shrub Establishment	7
Acres Prepared for Revegetation of Forestland	0
Acres Improved Through Forest Stand Improvement	871
Acres of Tree and Shrub Establishment	17

Table A5-1e. Tree and Shrub Conservation Practices in Partnership with NRCS in Harpeth River Watershed. *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

CONSERVATION PRACTICE	ACRES
Acres of Upland Habitat Management	525
Acres of Wetland Habitat Management	17
Total Acres Wildlife Habitat Management	542

Table A5-1f. Wildlife Habitat Management Conservation Practices in Partnership with NRCS in Harpeth River Watershed. *Data are from PRMS for October 1, 1999 through September 30, 2000 reporting period.*

PUBLIC WATER SYSTEM	WELLHEAD PROTECTION PLAN COMPLETED	WELL	PUBLIC WATER SYSTEM ID CODE	NUMBER OF CONNECTIONS
Dickson WD	Y	1	0000191	1,000-3,000
Nolensville-College Grove	Y	4	0000511	1,000-3,000

Table A5-2a. Communities Using Groundwater for Water Supply in Harpeth River Watershed.

PUBLIC WATER SYSTEM	DATE ASSESSMENT COMPLETED[a]	AVERAGE DAILY PRODUCTION[b]	NUMBER OF SERVICE CONNECTIONS
Second South Chetham UD	7/1/99	36.6	4,873
Turnbull UD	7/1/99	11.1	7,184
Franklin Water Dept.	7/1/99		

Table A5-2b. Communities with Surface Water Intakes for Water Supply in Harpeth River Watershed. [a]Excluding Susceptibility Analysis, [b]Million Gallons per day.

COMMUNITY	TYPE OF LOAN	PROJECT DESCRIPTION	AWARD DATE
Dickson	Design/Construction	Infiltration/Inflow Equipment	5/16/1990
Dickson	Plan/Design/Construction	STP Expansion and Construction	10/14/1997
Dickson	Design/Construction	Interceptor	10/14/1997
Dickson	Construction	Sludge Handling System	7/13/2000
Fairview	Construction	Gravity Collection Lines	1/30/1989
White Bluff	Plan/Design/Construction	Plan/Design/Construct WWTP Upgrade and Expansion	3/22/1991

Table A5-3. Communities in Harpeth River Watershed Receiving SRF Grants or Loans.

PRACTICE	COUNTY	NUMBER OF BMPs
Critical Area Treatment	Cheatham	1
Critical Area Treatment	Dickson	1
Critical Area Treatment	Williamson	5
Cropland Conversion	Dickson	8
Cropland Conversion	Williamson	5
Fencing	Cheatham	1
Grassed Waterway	Williamson	3
Hayland Planting	Cheatham	1
Pasture Establishment	Davidson	1
Pasture Establishment	Dickson	3
Pasture Establishment	Williamson	3
Pasture Renovation	Dickson	1
Pasture Seeding	Davidson	3
Pasture/Hayland Planting	Williamson	1
Pond	Cheatham	1
Pond	Dickson	3
Pond	Williamson	15
Seeding	Williamson	6
Seeding/Pasture Mgt.	Williamson	1
Stream Crossing	Dickson	1
Stream Stabilization	Dickson	1
Use Exclusion	Williamson	1
Waterway	Williamson	2

Table A5-4. Best Management Practices Installed by Tennessee Department of Agriculture and Partners in Harpeth River Watershed.

SITE ID	WATER BODY
2198800301	Jones Creek
2198800302	Jones Creek
2198800303	Jones Creek
2198800304	Jones Creek
2199001001	Brush Creek
2199001002	Brush Creek
2199200401	Spencer Creek
2199200402	Spencer Creek
2199201301	South Harpeth River
2199201401	Caney Fork Creek
2199201501	Hunting Camp Creek
2199600101	South Harpeth Creek
2199600102	South Harpeth Creek
2199700801	Turnbull Greek
2199700901	Turnbull Greek

Table A5-5. TWRA TADS Sampling Sites in Harpeth River Watershed.