

## **CHAPTER 5**

### **WATER QUALITY PARTNERSHIPS IN THE POWELL RIVER WATERSHED**

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

**5.2. FEDERAL PARTNERSHIPS.**

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

Performance Results System (PRS) is a Web-based database application providing USDA Natural Resources Conservation Service, conservation partners, and the public fast and easy access to accomplishments and progress toward strategies and performance. The PRS may be viewed at <http://prms.nrcs.usda.gov/prs>. From the opening menu, select “Reports” in the top tool bar. You will select the time period that you are interested in and the conservation treatment of interest on the page that comes up. Depending on the time period of interest, you will have various report options to choose from, such as location, reporting period and program involved in the reporting. You may be required to “refresh” the page in order to get the current report to come up.

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	Feet	Acres	Number
Conservation Buffers	31,529	38	
Erosion Control		6,250	
Nutrient Management		10,816	
Pest Management		11,947	37
Grazing / Forages	14,258	5,026	
Tree and Shrub Practices		3,104	
Tillage and Cropping		673	
Waste Management Systems			1
Wildlife Habitat Management		3,551	
Water Supply	10,250		12

**Table 5-1. Landowner Conservation Practices in Partnership with NRCS in the Tennessee Portion of the Powell River Watershed.** Data are from PRMS for October 1, 2001 through September 30, 2005 reporting period. More information is provided in Appendix V.

**5.2.B. United States Geological Survey – Tennessee Water Science Center Programs.**

The United States Geological Survey (USGS) provides relevant and objective scientific information and data for public use in evaluation of the quantity, quality, and use of the Nation's water resources. National USGS water resource assessments include the National Streamflow Information Program (<http://water.usgs.gov/nsip/>), National Atmospheric Deposition Network (<http://bqs.usgs.gov/acidrain/>), the National Stream Quality Accounting Network (<http://water.usgs.gov/nasqan/>), and the National Water-Quality Assessment Program (<http://water.usgs.gov/nawqa>). For a national overview of USGS water resources programs, please visit <http://water.usgs.gov>. Specific information on the Upper and Lower Tennessee River NAWQA study units can be found at <http://tn.water.usgs.gov/iten/tenn.html> .

In addition to National assessments, the USGS also conducts hydrologic investigations and data collection in cooperation with numerous Federal, State, and local agencies to address issues of National, regional, and local concern. Hydrologic investigations conducted by the USGS Tennessee Water Science Center address scientific questions pertaining to five general thematic topics:

1. Water Use and Availability,
2. Landforms and Ecology,
3. Watersheds and Land Use,
4. Occurrence, Fate, and Transport of Contaminants, and
5. Floods and Droughts.

In support of these investigations, the USGS Tennessee Water Science Center records streamflow continuously at more than 100 gaging stations, makes instantaneous measurements of streamflow at numerous other locations as needed or requested, monitors ground-water levels Statewide, and analyzes the physical, chemical, and biologic characteristics of surface and ground waters. In addition, the Water Science Center compiles annual water-use records for the State of Tennessee and collects a variety of data in support of National USGS baseline and other networks. More information pertaining to USGS activities in Tennessee can be accessed at <http://tn.water.usgs.gov> .

*USGS Water Resources Information on the Internet.* Real-time and historical streamflow, water-level, and water-quality data at sites operated by the USGS Tennessee Water Science Center can be accessed on-line at <http://waterdata.usgs.gov/tn/nwis/nwis> . Data can be retrieved by county, hydrologic unit code, or major river basin using drop-down menus on the web page. For specific information or questions about USGS streamflow data, contact Donna Flohr at (615) 837-4730 or [dfflohr@usgs.gov](mailto:dfflohr@usgs.gov). Recent USGS Tennessee Water Science Center publications can be accessed by visiting <http://tn.water.usgs.gov/pubpg.html>. A searchable bibliographic database is also provided for locating other USGS reports and products addressing specific scientific topics.

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

### **Endangered Species Program**

Through the Endangered Species Program, the Service consults with other federal agencies concerning their program activities and their effects on endangered and threatened species. Other Service activities under the Endangered Species Program include the listing of rare species under the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.) and the recovery of listed species. Once listed, a species is afforded the full range of protections available under the ESA, including prohibitions on killing, harming or otherwise taking a species. In some instances, species listing can be avoided by the development of Candidate Conservation Agreements, which may remove threats facing the candidate species, and funding efforts such as the Private Stewardship Grant Program. The federally endangered gray bat (*Myotis grisescens*), as well as numerous federally endangered mussel species, occur in the Powell River Watershed.

On August 31, 2004, the Service designated critical habitat (Federal Register Volume 69, No. 168) in the Powell River for the federally endangered Cumberland elktoe (*Alasmidonta atropurpurea*), Cumberlandian combshell (*Epioblasma brevidens*), purple bean (*Villosa perpurpurea*), rough rabbitsfoot (*Quadrula cylindrical strigillata*), and oyster mussel (*Epioblasma capsaeformis*) in Claiborne and Hancock Counties. The federally designated critical habitat begins at the U.S. 25E bridge in Claiborne County and extends upstream to the Virginia state line.

Federally designated critical habitat also exists in the Powell River for the federally threatened slender chub (*Erimystax cahni*) and yellowfin madtom (*Noturus flavipinnis*). The federally designated critical habitat extends from the backwaters of Norris Lake upstream to the Virginia state line. For a complete listing of endangered and threatened species in Tennessee, please visit the Service's website at <http://cookeville.fws.gov>.

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

Utilizing funding provided through the Service's Landowner Incentives Program (LIP), the Tennessee Wildlife Resources Agency (TWRA), the Tennessee Nature Conservancy (TNC), and private landowners are implementing habitat restoration activities in the Powell River Watershed. The LIP is a new effort of the Service's endangered species recovery program focusing on the enhancement of in-stream aquatic habitats and the protection and restoration of riparian habitats for the numerous federally listed species which occur in the watershed.

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

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

### **Partners for Fish and Wildlife Program**

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

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

The Service is actively involved with the TNC and private landowners in the upper reaches of the Powell River Watershed to protect riparian habitats and enhance water quality for a number of federally listed mussel and fish species. Current projects include the construction of bank stabilization practices, installation of livestock exclusion fencing, construction of heavy-use feeding pads and travel corridors, and the installation of alternate water supply sources.

## HOW TO PARTICIPATE ...

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

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

**5.2.D. Tennessee Valley Authority (TVA).** Tennessee Valley Authority's (TVA) goals for the 21st century are to generate prosperity for the Tennessee Valley by promoting economic development, supplying low-cost, reliable power, and supporting a thriving river system. TVA is committed to the sustainable development of the region and is engaged in a wide range of watershed protection activities to improve or protect water quality conditions.

TVA's watershed activities are conducted by Watershed Teams located throughout the Valley. Watershed Teams help communities develop and implement protection and restoration activities in their local watersheds. In addition to water quality efforts, Watershed Teams carryout varied resource stewardship functions including management of TVA lands and shorelines, recreation, and resource management. TVA also operates a comprehensive monitoring program to provide water quality and aquatic information.

The following is a summary of TVA's resource stewardship and monitoring activities in the Powell watershed.

## **Water Quality Improvement Efforts**

Watershed Initiatives: Watershed initiatives are major efforts to improve or protect water quality on a watershed scale. These long-term efforts represent a considerable commitment of resources. TVA participation is strategically targeted based on resource condition, partnership opportunity, and a need for TVA involvement. Watershed initiatives are cooperative efforts in which TVA's role varies depending on the needs and the capabilities of other participants.

While each watershed initiative is unique in many respects, TVA applies a conceptual model that provides a consistent framework and structure. This provides a basis for monitoring progress and ensures that each effort is of a sufficient quality to compete successfully for grant funds. Each initiative is viewed as proceeding through four stages of development: Explore, Build/Prepare, Implement, and Transition from an active initiative to a maintenance status. Within these phases, there are key elements that are deemed essential for a successful watershed initiative. These are cause/source identification, development of local capability, communication and marketing, funding strategy, and action plan development.

There are no targeted watershed initiatives currently underway in the Powell watershed. For more information on TVA's overall approach to watershed water quality, contact Donald Anderson at [dwanderson@tva.gov](mailto:dwanderson@tva.gov) or 423-876-6711.

Tennessee Valley Clean Marina Initiative: The Tennessee Valley Clean Marina Initiative is an effort to promote environmentally responsible marina practices. This voluntary program helps marina operators protect the resource that provides them with their livelihood. It addresses sewage management, oil and gas control, marina siting, and erosion prevention. The program certifies marinas that comply with pollution-control standards and allows them to use the Clean Marina logo and flag. As of October 3, 2005, 53 marinas were flying the Clean Marina flag and going the extra mile to protect the waters of the Tennessee Valley.

Norris Reservoir was the pilot for Clean Marina Initiative (CMI) in 2001. Participation and interest in the CMI is extensive. Norris Reservoir has 24 marinas with nine certified as Clean Marinas. Of the nine marinas certified (Norris Dam, Mountain Lake, Indian River, Shanghai, Stardust, Andersonville, Deerfield, Sugar Hollow, and Flat Hollow), three were certified last fiscal year. Currently two marinas are actively working towards CMI certification. Events such as National Clean Boating Day, County Leadership Council tours, and marina employees and customer appreciation celebrations have helped introduce the program to a wide variety of stakeholders. Additionally, monthly meetings held by the Norris Lake Marina Owners Association provide constant support and encouragement for continued CMI success.

For more information contact: David Harrell, TVA Watts Bar-Clinch Watershed Team at [dbharrell@tva.gov](mailto:dbharrell@tva.gov) or 865-632-1327.

Growth Readiness: The Tennessee Growth Readiness program helps communities learn how land use decisions affect water quality, and then make informed choices about managing growth. It helps them comply with regulatory requirements. Planners and public works officials are the program's target audience. They are intimately involved in the nuts-and-bolts of their community's land use and water quality decisions. Since the program began in the fall of 2003, representatives from 280 Tennessee communities have participated. Nearly 200 of these communities have evaluated their existing development rules against a set of model development principles. Development following these principles is economically viable and protects the environment. Statewide 40 communities have changed their development rules to adopt these principles.

Other partnership efforts:

**Davis Creek (06010206-110)**

TVA partnered with the Claiborne Soil Conservation District, Natural Resource Conservation Service, Tennessee Department of Agricultural, and Tennessee Division of Forestry to address water quality impairments throughout the watershed. Federal and state programs along with TVA funds have enabled local landowners to install agricultural best management practices on their farms that improve water quality and farm productivity. Local participation in these programs has steadily increased as more land owners recognize the benefits.

Contact: Todd Reed  
Claiborne County NRCS  
2178 Highway 25 E  
Tazewell, TN 37879-3823  
(423) 626-3811

**Water Quality Monitoring**

TVA's monitoring efforts fall generally in three components: monitoring the ecological health and water quality of TVA reservoirs; assessing the ecological condition of selected stream sites; and monitoring of conditions directly related to human use of aquatic resources.

Reservoir Ecological Health: TVA's Reservoir Ecological Health Monitoring program evaluates current conditions, provides data for trend analysis, and provides assessments of current and future operations. TVA monitors ecological conditions at 69 sites on 31 reservoirs. Each site is monitored every other year unless a substantial change in the ecological health score occurs during a two-year cycle. The overall health ratings of TVA reservoirs include five ecological indicators: dissolved oxygen, chlorophyll, fish, bottom life, and sediment quality. Results from each of the five indicators are evaluated based on TVA's reservoir evaluation system and assigned a rating ranging from 1 (poor) to 5 (excellent).

The ecological health of Norris Reservoir was rated fair in 2003. Individual scores for each sampling site and component are presented in the table below.

Table 1: Ratings for Individual Ecological Health Indicators for Norris Reservoir, 2003

Monitoring Location	Dissolved Oxygen	Chlorophyll	Fish	Bottom Life	Sediment Quality
Forebay	Poor	Good	Fair	Poor	Fair
Mid-Reservoir (Clinch)	Poor	Good	Good	Good	Good
Mid-Reservoir (Clinch)	Poor	Fair	Good	Fair	Good

The most significant ecological health issue on Norris is low dissolved oxygen levels. Dissolved oxygen rated poor at all three monitoring locations because the lower half of the water column contained little oxygen (less than two milligrams per liter) from late summer through early autumn.

This chronic problem is mostly the result of the reservoir's basic characteristics. Norris is a deep tributary storage reservoir with a long summer retention time; that is, it can take more than 200 days for water to move through the reservoir. As the days lengthen in the spring, a warmer layer of water forms on top of a cooler layer. The layers do not mix, so the bottom layer becomes devoid of oxygen as it is used up by decaying plants and other materials that settle to the bottom.

In conjunction with the Reservoir Ecological Health monitoring, TVA collects additional water samples to be analyzed for parameters of interest to public and industrial water supplies.

More information about Reservoir Ecological Health Monitoring and related monitoring can be obtained by contacting Tyler Baker at 423-876-6733 or [tfbaker@tva.gov](mailto:tfbaker@tva.gov) or <http://www.tva.gov>.

### Stream Monitoring

The condition of water resources in the streams is measured using three independent methods: Index of Biotic Integrity (IBI), number of mayfly, stonefly, and caddisfly taxa (EPT), and Habitat Assessment. EPT sampling and fish community assessment (IBI) are conducted at the same sites. Site selection is governed by study objectives, stream physical features, and stream access. TVA's objective is to characterize the quality of water resources within a sub-watershed (11-digit hydrologic unit). Sites are typically located in the lower end of sub-watersheds and at intervals on the mainstem to integrate the effects of land use.

IBI: The index of biotic integrity (IBI) assesses the water quality in flowing water by examining a stream's fish assemblage. Twelve metrics address species richness and composition, trophic structure (structure of the food chain), fish abundance, and fish health. Each metric reflects the condition of one aspect of the fish assemblage and is scored against high quality reference streams in the region. Potential scores for each of the twelve metrics are 1-poor, 3-intermediate, or 5-the best to be expected. Scores for the 12 metrics are summed to produce the IBI for the site.

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

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

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

EPT sampling and fish community assessment (IBI) are conducted at the same sites. Site selection is based on study objectives, stream physical features, and stream access. TVA's objective is to characterize the quality of water resources within a sub-watershed (11-digit hydrologic unit). Sites are typically located in the lower end of sub-watersheds and at intervals on the mainstem to integrate the effects of land use. Nine sites in the Powell have been sampled since 2000 and are being sampled routinely. These sites are typically sampled every five years.

Details about stream sampling sites and scores can be obtained by contacting Charlie Saylor at 865-632-6406 or [cfsaylor@tva.gov](mailto:cfsaylor@tva.gov) or <http://www.tva.gov>.

## Human Use

Bacteriological Monitoring at Recreational Areas: Each summer TVA evaluates about 250 swimming areas and informal water contact recreational sites for *Escherichia coli* (*E. coli*) bacteria. These sites include those operated by TVA and many operated by other agencies. Indicator organisms such as *E. coli* are used to help protect bathers from illnesses that may be contracted from recreational activities in waters contaminated by fecal pollution. Although these tests are not proof of human health threats, they may indicate the presence of more harmful pathogens in waterbodies.

Bacteriological water sampling is conducted between Memorial Day and Labor Day when people are most likely to be recreating. Typically, swimming areas and heavily used canoe sites are monitored every year, while boat ramps and other canoe sites are monitored every other year.

*E. coli* bacteria levels in samples collected on Norris Reservoir in 2004 were within the state of Tennessee's guidelines for water contact. The other sampling locations in 2004 four boat ramps: Shanghai Marina, Flat Hollow Marina, Union County Marina, and Powell Valley Resort.

Fish Flesh Monitoring: TVA conducts fish tissue monitoring by collecting fish from its reservoirs and checking the tissue for metals, pesticides, PCBs, and other chemicals that could affect human health. This data is shared with state agencies, which are responsible for advising the public of health risks from eating contaminated fish.

TVA collected channel catfish and largemouth bass from Norris Reservoir for tissue analysis in fall 2001. All contaminant levels were either below detectable levels or below the levels used by the state of Tennessee to issue fish consumption advisories. These species were collected for analysis again in fall 2005.

More information about Bacteriological Monitoring at Recreational Areas and Fish Flesh Monitoring can be obtained by contacting Rebecca Hallman at 423-876-6736 or [rlhallman@tva.gov](mailto:rlhallman@tva.gov) or <http://www.tva.gov>.

Spring Sport Fish Monitoring: TVA conducts an annual spring sportfish survey to determine the number, age, and general health of black bass and crappie populations in its reservoirs. Results are used by state agencies to protect and improve sport fisheries.

More information about Spring Sport Fish Monitoring can be obtained by contacting Kurt Lakin at (423)-876-6737 or [kmlakin@tva.gov](mailto:kmlakin@tva.gov) or <http://www.tva.gov>.

Sport Fishing Index: TVA and state fisheries agencies have created a Sport Fishing Index (SFI) to help anglers decide where they have the best chance of catching their favorite types of fish. SFI scores for different species are based both on population measures (the size and health of the individual fish, along with the number of fish present) and angler use and success information (the number of anglers looking for a particular type of fish, and the number of that type that they actually catch). The SFI score ranges from a high of 60 (excellent) to a low of 20 (very poor).

The spring sportfish surveys are conducted from March through early June and include twelve 30-minute electrofishing runs covering the various habitat types present. Fish are weighed, measured, checked for anomalies, and released. This approach to determining fish abundance is used by state game and fish agencies and academia. The survey predominantly targets three species of black bass — largemouth, smallmouth, and spotted bass — and black and white crappie.

Information about the Sport Fishing Index can be obtained by contacting Greg Shaffer at 865-632-6365 or [gshaffer@tva.gov](mailto:gshaffer@tva.gov) or <http://www.tva.gov>.

**5.2.E. United States Army Corps of Engineers-Nashville District.** The Nashville District, U.S. Army Corps of Engineers is one of seven districts in the Lakes and Rivers Division. The district's area is determined by the Cumberland River and the Tennessee River's watersheds and encompasses 59,000 square miles in portions of seven states. This geographic area is represented by 14 senators and 20 Congressional representatives. The Nashville District's missions include providing flood protection, recreation, hydropower, and navigation. The District also provides environmental stewardship through our Regulatory and Civil Works programs, conducts emergency response to disasters, and to performs other authorized Civil Works projects.

Within the 18,000 square mile Cumberland River Basin, overall responsibilities for the Nashville District include operation and maintenance of 10 reservoir projects. Each of these is operated for some or all of the following purposes: hydropower production, flood control, navigation, water supply, water quality, fish and wildlife, and recreation.

Within the much larger, 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 Clean Water Act and the Rivers and Harbors Act.

As of 2005, the District's flood control projects have prevented more than \$1.96 billion in flood damages. The District also provides flood prevention planning assistance to the states and local governments.

Lakes in the Nashville District are the most popular in the nation. More than 36 million people visited our 10 lakes last year. These recreation users had an economic impact on the region of nearly \$877 million dollars. Five Nashville District lakes rank among the top 25 in Corps-wide visitation. In 2000, the District's 70 commercial concessionaires produced \$1.3 million in profit, and returned more than \$300,000 to the U.S. Treasury in rent payments for leases.

The Nashville District has the capacity to produce more than 914 megawatts of clean electricity, enough to power the needs of a city the size of Nashville, at nine different hydropower generations plants in the Cumberland River Basin. The District generates about \$44 million in revenue from the sale of this power annually. This revenue is returned to the U.S. Treasury.

The Nashville District operates and maintains 1,175 commercially navigable river miles; almost 10% of the total within the U.S. Army Corps of Engineers. The district operates and maintains 14 navigation lock projects; nine on the Tennessee River, four on the Cumberland River, and one on the Clinch River. There are more than 40,000 commercial and recreational lockages annually. More than 74 million tons of commodities passed through these 14 locks during 2005. Wilson Lock in Alabama has the highest single lift east of the Rocky Mountains, between 93 and 100 feet, depending on the current river water level.

## **Regulatory Program**

The U.S. Army Corps of Engineers has been involved in regulating certain activities in the nation's water since 1890. Prior to 1968, the primary thrust for the regulatory program was the protection of navigation. As a result of new laws and judicial decisions, the program has evolved to one that considers the full public interest by balancing the favorable impacts against detrimental impacts. The Nashville District annually handles more than 3,000 regulatory actions, 97% of which were evaluated in less than 60 days.

Section 10 of the Rivers and Harbors Act of 1899 - requires approval prior to the accomplishment of any work in or over navigable waters of the United States, or which affects the course, location, condition or capacity of such waters. Typical activities requiring Section 10 permits are:

- Construction of piers, wharves, bulkheads, dolphins, marinas, ramps, and cable/pipeline crossings.
- Dredging and excavation

Section 404 of the Clean Water Act - requires approval prior to discharging dredged or fill material into the waters of the United States. Typical activities requiring Section 404 permits are:

- Depositing of fill or dredged material in waters of the U.S. or adjacent wetlands.
- Site development fill for residential, commercial, or recreational developments.
- Construction of revetments, groins, breakwaters, levees, dams, dikes, and weirs.
- Placement of riprap and road fills.

## **Civil Works Program**

The Corps' ongoing Civil Works responsibilities date back to the early 1800's when Congress authorized the removal of navigation hazards and obstacles. Over the years, succeeding Administrations and Congresses have expanded the Corps' missions to include most all water-related planning, development, and construction areas where a Federal interest is involved. Funds for Congressionally Authorized Projects are provided through Energy and Water Appropriations Acts and through contributions from non-Federal entities for specific projects.

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

## **Nashville District Corps of Engineers Water Quality Program**

The Nashville District Corps of Engineers collects a significant volume of physical, chemical, and biological water quality data every year. These data are collected at representative points both within all ten Nashville District lakes, on various major and/or

representative inflow streams, and in the tailwaters. Where there are known water quality problems, such as seasonal low DO in certain turbine releases, monitoring is significantly intensified to track and quantify a particular problem. This information is used to make informed decisions about how a project's powerplant should operate. Baseline, continuous recording, multiparameter water quality monitors keep track of conditions at critical points on the main stem of the Cumberland River from the mouth of the Obey River near Celina, Tennessee to the tailwater of Lake Barkley in western Kentucky. The monitor at the Old Hickory Dam tailwater, in particular, provides key information, since water discharged from Old Hickory must be able to absorb inputs from Nashville which is just downstream.

The data collected by the Nashville District are used to help determine watershed water quality trends and to provide for better management of the comprehensive reservoir system. The data are essential for running predictive water quality models, a growing trend in Corps' water management practice.

Additional information concerning projects, programs, and activities of the Nashville District Corps of Engineers can be obtained on the World Wide Web at <http://www.orn.usace.army.mil/>

### **Environmental Education**

Environmental education opportunities are provided to area school age children by the Nashville District Corps of Engineers. Water Quality personnel have participated in environmental awareness programs for the past several years at the majority of Nashville District lakes. These programs are organized by the local lake Resource Management staff and involve various area schools. The programs provided allow students to have a "hands on" experience in water quality surveillance techniques. Typically the programs include an interactive discussion of overall water quality issues. This is supplemented with demonstrations of sophisticated water quality instrumentation, collection and analysis of biological specimens from local aquatic environments, and viewing of reference materials and preserved specimens. The value of such environmental education is enormous, because it reaches young people early in their lives and exposes them to a scientific learning experience that is impossible to duplicate in a formal classroom. This experience hopefully contributes to a greater lifelong awareness by the individual of the importance of conserving and improving water quality and wise use of water resources.

### **Additional Information**

To obtain additional information about the District, please refer to the home page at: <http://www.lrn.usace.army.mil/>, or contact the following offices:  
Public Affairs Office (General Information): (615) 736-7161  
Regulatory Branch: (615) 369-7500

**5.2.F. National Park Service.** All the streams within Cumberland Gap National Historic Park, with the exception of Little Yellow Creek, originate on parklands. A majority of the streams begin and pass through a proposed wilderness area and can be considered to have exceptional water quality. The park contains eight warm-water aquatic habitat streams and 2 cold-water aquatic habitat streams. The surface streams originate on the steep slopes of Cumberland Mountain and flow westward into Kentucky and eastward into Tennessee and Virginia. Many of the streams in the park were intensively monitored during the construction of the Cumberland Gap Tunnel and the restoration of the Wilderness Road during the 1990's.

In October of 2006, the park began collecting water quality data in accordance with the National Park Service's "Water Quality Monitoring Program for the Cumberland Piedmont Network". At nine sites within the park, the following parameters are monitored every second Tuesday of the month: fecal coliform, turbidity, pH, dissolved oxygen, temperature, specific conductance, and discharge. The fixed monthly sampling provides comparative statistics for these sites under variable flow conditions.

In October of 2004, the park began collecting the following monthly data at 14 sites: turbidity, pH, dissolved oxygen, temperature, specific conductance, and oxidation-reduction potential. The five-backcountry sites were chosen in order to monitor the low pH levels in the creeks. The remaining front country sites are monitored for a variety of reasons.

Through the NPS Cumberland Piedmont Network, a fish inventory was completed in the park during 2004. Four warm-water reaches and 2 cold-water reaches were sampled within the park. A total of 1,410 meters of stream length were sampled. 1,946 individuals representing 22 species were identified during this study. The species included nine minnows, six sunfish, four darters, two suckers, and one sculpin. The cold-water streams were found to be almost entirely fishless. Over the years, the park has documented a very low pH in these cold-water streams within the park.

The threatened Blackside dace (*Phoxinus cumberlandensis*) currently occurs in the park within Davis Branch. The park conducted annual surveys of the Blackside dace population from 1991-2002. Another survey was completed in 2006.

For more information, please visit the Cumberland Gap National Historic Park website at <http://www.nps.gov/cuga/> or contact biologist Jenny Beeler at [jenny\\_beeler@nps.gov](mailto:jenny_beeler@nps.gov).

### **5.3. STATE PARTNERSHIPS.**

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

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

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

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

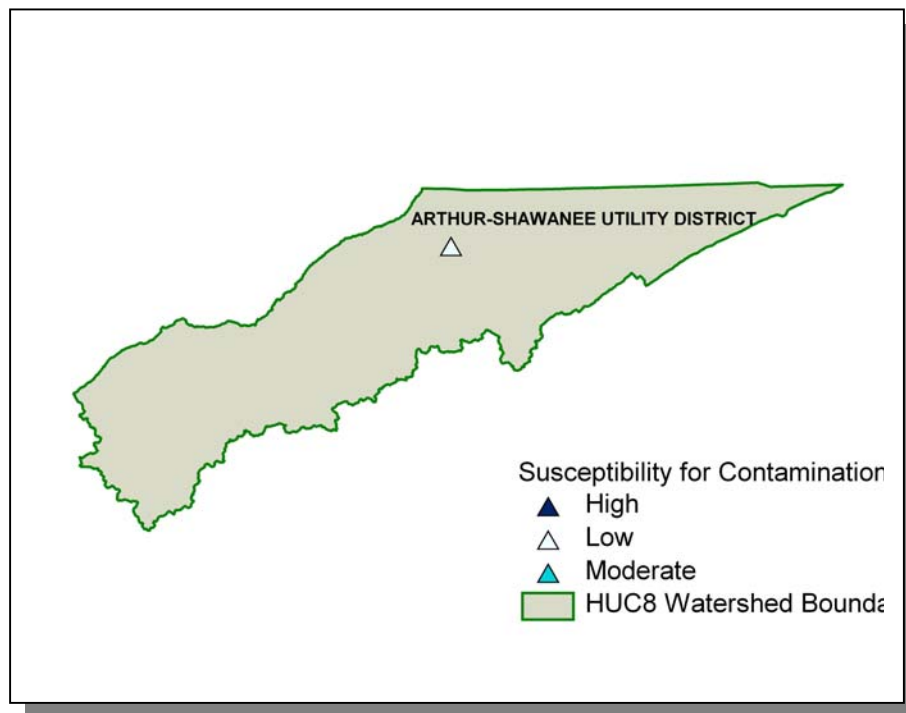
Watershed management plays a role in the protection of both ground water and surface water systems. Watershed Management is particularly important in areas with karst (limestone characterized by solution features such as caves and sinkholes as well as disappearing streams and spring), since the differentiation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

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

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

Tennessee's Wellhead Protection Rules were revised as of October 29, 2005 to include requirements for similar protection for public water systems using surface water sources under the heading of Drinking Water Source Protection Rule (1200-5-1-.34) in addition to the previous requirements for wellhead protection for public water systems using ground water sources. The rule addresses surface or ground water withdrawals in the vicinity of public water sources as well as potential contaminant sources threatening public water sources to reflect the amended prohibitions in the 2002 Amendments to the Tennessee Safe Drinking Water Act, TCA 68-221-771. There are additional reporting requirements of potential contaminant source inventories and emergency response for the public water systems as well. The Division of Water Supply will be able to use the Drinking Water Source Protection Rule to work in complimentary fashion with the Division of Water Pollution Control and other Departmental agencies in activities to protect public water sources.

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



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

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

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

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

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

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

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

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

**5.3.C. Tennessee Department of Agriculture.** The Tennessee Department of Agriculture's Water Resources Section consists of the federal Section 319 Nonpoint Source Program and the Agricultural Resources Conservation Fund Program. Both of these are grant programs which award funds to various agencies, non-profit organizations, and universities that undertake projects to improve the quality of

Tennessee's waters and/or educate citizens about the many problems and solutions to water pollution. Both programs fund projects associated with what is commonly known as "nonpoint source pollution."

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

- BMP Implementation Projects. These projects aid in the improvement of an impaired waterbody, or prevent a non-impaired water from becoming listed on the 303(d) List.
- Monitoring Projects. Up to 20% of the available grant funds are used to assist the water quality monitoring efforts in Tennessee streams, both in the state's 5-year watershed monitoring program, and also in performing before-and-after BMP installation, so that water quality improvements can be verified. Some monitoring in the Powell River Watershed was funded under an agreement with the Tennessee Department of Agriculture, Nonpoint Source Program (U.S. Environmental Protection Agency Assistance Agreement C99944674-04-0).
- Educational Projects. The intent of educational projects funded through TDA-NPS is to raise the awareness of landowners and other citizens about practical actions that can be taken to eliminate nonpoint sources of pollution to the waters of Tennessee.

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

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

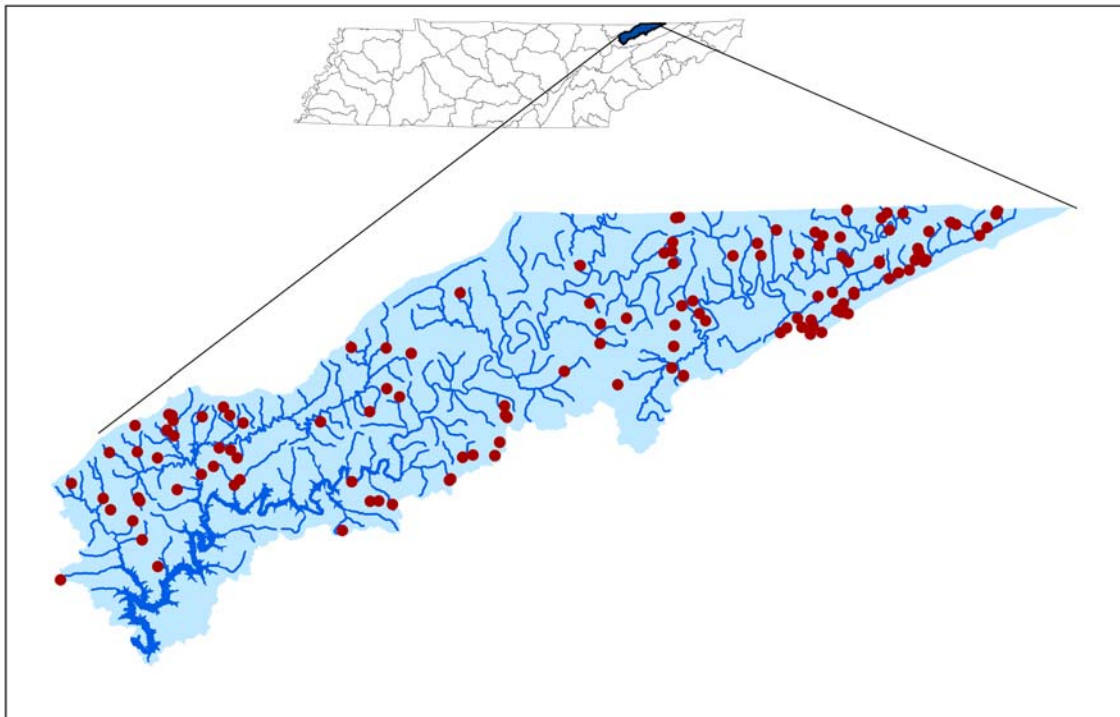
Since January of 1999, the Department of Agriculture and the Department of Environment and Conservation have had a Memorandum of Agreement whereby

complaints received by TDEC concerning agriculture or silviculture projects would be forwarded to TDA for investigation and possible correction. Should TDA be unable to obtain correction, they would assist TDEC in the enforcement against the violator. More information forestry BMPs is available at:

<http://www.state.tn.us/agriculture/forestry/bmpmanual.html>

and the complaint form is available at:

[http://www.state.tn.us/environment/wpc/forms/wqlogging\\_cn1274.doc](http://www.state.tn.us/environment/wpc/forms/wqlogging_cn1274.doc)



**Figure 5-2. Location of BMPs installed from 1999 through 2005 in the Tennessee Portion of the Powell River Watershed with Financial Assistance from the Tennessee Department of Agriculture's Nonpoint Source and Agricultural Resources Conservation Fund Grant Programs. More information is provided in Appendix V.**

**5.3.D. Virginia Department of Environmental Quality.** Water quality management planning in Virginia began in 1972, with the passage of the Clean Water Act. Section 303(e) of the law required development of water quality management plans that focused on pollution control and set strategies for its prevention and control on a basin-wide basis. Section 208 of PL 92-500 required area-wide waste treatment management planning for areas having industrial concentrations or having other factors.

The State Water Control Board (SWCB) originally adopted the Tennessee–Big Sandy Water Quality Management Plan (WQMP) in 1977 as a regulatory document. The plan was later amended in 1980. In 2003, the Tennessee-Big Sandy WQMP was deregulated. A Water Quality Management Plan Regulation was put in place after all

basin plans were de-regulated. Serving as a repository for EPA approved TMDL Reports for each impaired segment, the WQMP regulation also includes wasteload allocations for permitted dischargers within the Commonwealth. It is the intention of the Virginia Department of Environmental Quality to update and amend the Water Quality Management Plan Regulation as more TMDL's are approved by EPA or as new wastewater treatment plants are constructed and permitted in the Commonwealth.

***Authority for Water Quality Management Planning.***

State Law; Section 62.1-44.15(13) of the Code of Virginia authorizes the SWCB to establish policies and programs for effective area wide and basin wide water quality control and management. Section 62.1-44.19:7 of the Code of Virginia authorizes the SWCB to develop and implement a plan to achieve fully supporting status for impaired waters of the state. Federal Law: Water quality management plans are required by Section 303(e) of the Clean Water Act (CWA) as implemented by 40 CFR 130. In 2002, EPA emphasized the Continuous Planning Process and watershed planning.

***Purpose of the Plan.***

Plans are intended to provide a management tool for assisting the Commonwealth, local governments, industries and agricultural interests in anticipating, achieving and maintaining applicable water quality goals in the river basins. Plans need to meet all applicable requirements of 40 CFR 130 for water quality management plans and meet the requirements of the Virginia Water Quality Monitoring, Information and Restoration Act, Section 62.1-44.19-4 et seq. of the Code of Virginia.

***Clinch/Powell River Basin Total Maximum Daily Load Reports.***

There are seven completed and approved TMDL reports in this river basin. Of these seven studies, five watersheds are in the Clinch River drainage and 2 are in the Powell River drainage. These TMDL streams, the location by county and pollutant addressed in the TMDL study are listed in the Table below. Wasteload allocations for permitted discharges within the impaired segment were adopted as part of the Water Quality Management Plan Regulation by the Virginia State Water Control Board. The dates of state adoption are in the fifth column of the Table. Black Creek and Dumps Creek were the first TMDL studies with a resource extraction land use component. These studies included interagency collaboration between the Virginia Department of Mines, Minerals and Energy, Virginia Department of Environmental Quality, and the Virginia Department of Conservation and Recreation. More information about the Virginia TMDL program may be found at:

<http://www.deq.virginia.gov/tmdl/develop.html>.

Table 1: Approved TMDL Reports

TMDL Project	County	Pollutant	EPA Approval Date	State Water Control Board Adoption Date
Guest River	Wise	Sediment	5/04/2003	3/23/2004
Upper Clinch River	Tazewell	Sediment	4/26/2004	8/31/2004
Guest River Tributaries: Crab Orchard, Sepulcher, Toms Creek and Little Toms Creek	Wise	Bacteria	5/04/2004	8/31/2004
Lewis Creek	Russell	Sediment	5/26/2004	6/28/2005
Black Creek and Tributaries	Wise	Alkalinity, Manganese	6/03/2004	8/31/2004
Dumps Creek	Russell	Total Dissolved and Total Suspended Solids	6/03/2004	8/31/2004
Stock Creek	Scott	Sediment	5/15/2006	

Additionally, DEQ submitted 2 TMDL studies to EPA in April 2006 that have yet to be approved. Those studies include TMDLs for bacteria, total dissolved solids and total suspended solids for Straight Creek and for Callahan Creek.

***Implementation Plans.***

In 1998, implementation plans for approved TMDL studies were mandated in the Water Quality Monitoring, Improvement and Restoration Act. The Department of Conservation and Recreation, through a memorandum of understanding with the Department of Environmental Quality, has taken the lead role in instances where the sources of impairment are due to nonpoint influences.

Development of an implementation plan for Guest River that includes both the sediment TMDL and the bacteria TMDLs on Crab Orchard Creek, Sepulcher Creek, Toms Creek and Little Toms Creek began in 2004 and was approved by the State Water Control Board June 28, 2005. This implementation plan was written by a local stakeholder group consisting of members of the Guest River Group. Members include land owners, business owners as well as local, state and federal agency staff. The implementation plan for Guest River can be viewed at the DEQ website: <http://www.deq.virginia.gov/tmdl/iprpts.html>.

Black Creek, located west of Norton, Virginia has implementation activities ongoing through re-mining and restoring abandoned mine lands in the watershed. The aquatic life use in this watershed is improving as acid mine drainage and sedimentation are corrected.

In 2006, DEQ contracted with a consulting firm to develop an implementation plan for Dumps Creek. It is anticipated that this study will be completed by years end.

Beyond developing watershed implementation plans for specific impaired watersheds, in June 2000, the Department of Conservation and Recreation held meetings with grassroot public participation to develop an Upper Tennessee River Watershed Strategic Plan. The purpose of this document was to assess the quality of waters and to identify ways to make them comply with water quality standards. An umbrella group, Upper Tennessee River Roundtable, is using this document as a spring-board for writing grant applications to implement some of the recommended strategies. In 2004, this group, in cooperation with Tennessee and North Carolina, successfully wrote a million dollar grant to undertake demonstration projects and provide educational opportunities in the Tennessee River Basin which includes both the Clinch River and Powell River watersheds.

***Future TMDL Studies for the Clinch/Powell River Watershed.***

There are still stream segments in the Clinch/Powell River Basin that are scheduled for TMDL studies. In 2008, DEQ anticipates completion of reports for North Fork Powell River, Powell River in Big Stone Gap, and Lick Creek in Russell County. To find out about other impaired segments, visit the DEQ website, <http://www.deq.virginia.gov> and search on TMDLs. For questions about impaired segments in the Upper Tennessee River Basin located in Virginia, you may contact Shelley D. Williams at (276)676-4845 or by email at [sdwilliams@deq.virginia.gov](mailto:sdwilliams@deq.virginia.gov).

## **5.4. LOCAL INITIATIVES.**

**5.4.A. The Nature Conservancy (TNC).** The Tennessee State Wildlife Action Plan (SWAP), formerly known as the Comprehensive Wildlife Conservation Strategy (CWCS), was developed by the Tennessee Wildlife Resources Agency with assistance from The Nature Conservancy in 2005. Congress mandated that each state and territory in the United States develop a SWAP as a requirement for continued receipt of federal State Wildlife Grant funding. These plans require the completion of 8 key elements of wildlife planning: 1) a list of animal species of greatest conservation need, 2) information about the distribution and abundance of species targets, 3) locations and relative conditions of key habitats, 4) descriptions of problems affecting target species and their habitats, 5) descriptions of conservation actions and priorities for conserving target species and habitats, 6) details for monitoring target species, conservation actions, and adaptive management, 7) discussion of plans to review the SWAP at specific intervals, and 8) information about coordination and implementation of the SWAP with major stakeholders. In Tennessee, the SWAP was integrated into a spatial model using Geographic Information Systems (GIS) and other database technology.

Priority aquatic, terrestrial, and subterranean areas for conservation were identified across the state. Priorities were determined in the GIS model based upon relative differences in species rarity, population viability, and potential mobility of species across habitat units. Priority problems affecting species and needed conservation actions are detailed across each region of the state. For complete information about the Tennessee SWAP, please visit:

<http://www.state.tn.us/twra/cwcs/cwcsindex.html> to read or download the full report.

Contact:

Chris Bullington  
State Conservation Planning Manager  
The Nature Conservancy, TN Chapter  
2021 21st Avenue South; Suite C-400  
Nashville, TN 37212  
phone: (615) 383-9909 x 227

## **5.4.B. Clinch Powell Resource Conservation and Development (RC&D) Council.**

### **Clinch River Community Project**

The Clinch River Community Project is a groundbreaking partnership between the Clinch-Powell Resource Conservation & Development Council and The Nature Conservancy. These two not-for-profit entities have worked hand in hand for more than a dozen years in the free flowing sections of the Clinch and Powell rivers in Tennessee.

The mission of the Clinch-Powell RC&D Council is to demonstrate regional leadership, secure resources and deliver programs and services that build strong vibrant communities where conservation and development are in balance with the needs of people. The formation of the Clinch-Powell RC&D Council in 1989 was an outgrowth of a bi-state effort to protect these world class rivers and to improve the life and livelihood of the people who live in their watersheds. 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 Clinch and Powell rivers have been designated as on the the Last Great Places on Earth by TNC.

Our joint purpose is to provide financial assistance to farmers in the area wishing to make improvements that protect the waters of the Clinch and Powell rivers systems. We are not a regulatory agency, we are simply offering assistance to those who request it. For more information please contact the Clinch River Community Project office at 423-733-2100 or visit us at the main office of the old Hancock County High School.

### *The Clinch River*

Being the only undammed and ecologically intact headwaters of the Tennessee River system has resulted in the Clinch River being the most ecologically rich river in the nation. The Clinch River has 48 imperiled and vulnerable fish and mussel species, including 21 that are federally listed as endangered or threatened. The Clinch and Powell Rivers in Hancock County alone boasts a collection of freshwater mussel species unmatched anywhere in the world. In addition to the aquatic biodiversity, the limestone soil and vast expanses of underground caves and waterways add other rare species to the list such as flowers, bats, and salamanders. The Clinch River Community Project is striving to educate the public of their great environmental resources and assist them in their protection.



*The Clinch River is the most ecologically diverse river in the nation.*

## **Best Management Practices**

Through our Voluntary program, we install Best Management Practices "BMP's", which are agricultural practices designed to increase farm productivity while minimizing impacts on the environment. They provide cost effective management of soil erosion issues including streambank and topsoil losses. BMP's may include graveled farm roads, graveled feed areas, streambank stabilization, graveled stream crossings and grassed waterways. We also construct streambank fencing to protect the streamside vegetation along with providing safe, reliable watering system for livestock including ponds, spring developments, pumping systems and/or water tanks.

Once assistance is requested by a landowner, it is the responsibility of the Clinch River Community Project staff to meet with the landowner and discuss the problems and possible solutions. We then assist the landowner in design and placement of the BMP's, as well as obtaining any permits need for the work. The staff is then present during most phases of the construction, assisting in any last minute decision, which need to be made. We feel that being involved with every aspect of the project makes the process simpler and easier on the landowner. Upon completion, these BMP's are used as demonstrations for other landowners in the area. This allows local landowners to learn from each other about the ups and downs of these Best Management Practices.

**5.4.C. Powell River Aquatic Research Station.** Lincoln Memorial University (LMU) and the Cumberland Mountain Research Center (CMRC) currently operate the Powell River Aquatic Research Station (PRARS) in Tazewell, TN. PRARS was developed through a partnership with the Tennessee Valley Authority (TVA), local officials, and LMU to create additional infrastructure capable of supporting increased study of the Powell River. The facility is currently managed by CMRC, a research unit at LMU that is directed by Dr. Ron Caldwell.

PRARS is a 576 square foot field station located in southern Claiborne County. The facility is located approximately fifty yards from the Powell River at the Brooks Bridge location. The Virginia state line is less than ten miles from the PRARS location. Improvements are currently being made at the location to improve accommodations and facilitate longer stays by visiting researchers and students. In addition, improvements are being made to provide increased internet connectivity and availability of technology resources. Renovations and improvements are supported by a grant from the National Science Foundation Field Stations and Marine Laboratories program.

CMRC is located on the LMU campus, eighteen miles from PRARS, and offers a fully-functioning laboratory setting to support research conducted in the field. Founded in 1990, CMRC is a member of the CESU Southern Appalachian Mountains Division and a partner in the National Biological Information Infrastructure project. CMRC faculty and students have participated in research efforts and grant-funded projects with numerous state and federal agencies for almost 20 years. Interested individuals and agencies are invited to contact CMRC and LMU to discuss the availability of PRARS in supporting research efforts concerning the Powell River region. The University hopes to serve as a

partner in research and conservation efforts that will create a greater understanding of the ecological value of the Powell River and the surrounding region.

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