

Raccoon Creek Management Plan

A collaboration of Raccoon Creek partners
and community members
of the Raccoon Creek watershed

Prepared by
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EXECUTIVE SUMMARY

PURPOSE OF THE PLAN

Under the Clean Water Act of 1972 the purpose of watershed plans is to restore and maintain the chemical, physical and biological integrity of stream segments that do not currently meet water quality standards. The Raccoon Creek partners have developed a long-term strategy for restoring the creek and educating the community about water quality. This plan addresses restoration efforts for impaired stream segments in the watershed as well as issues that local citizens have identified through an extensive public involvement process.

The first section provides a profile of the watershed, a natural and social resource inventory, and the demographics of its people and their history. The second section is an action plan for improving the creek's water quality through a variety of projects and activities. This section also includes measurable indicators to track the restoration progress. While the first section contains useful data and other information that will be updated and monitored to check progress in the watershed, the second section is a living document that will change as technical expertise and community input direct restoration efforts. Watershed citizens helped generate the goals and objectives for the eight most prevalent problems, and their contributions are reflected in both sections.

Developed on the watershed level, this plan addresses nonpoint sources of pollution. The 1987 amendments to the Clean Water Act first required states to focus on nonpoint-source pollution, while the 1996 Safe Drinking Water Act mandated that threats to public water supplies be identified. Remedial action plans (RAPs), initiated in the 1980s, emphasized the community-driven watershed approach that this plan endorses. Watershed management plans like this one integrate many policy requirements to involve the public in achieving sustainable water quality improvements.

A great deal has been achieved through previous watershed studies, citizens' activities, and projects conducted by agencies and local experts. A wealth of water quality and biological data for Raccoon Creek and its tributaries has been collected. The impact of acid mine drainage (AMD) already has been addressed in various planning documents because it is one of the main impairments that degrades water quality in

southeast Ohio. The Total Maximum Daily Load (TMDL) plan, produced by Ohio EPA, and the Acid Mine Drainage Abatement and Treatment (AMDAT) plans, produced by Raccoon Creek partners, provide a comprehensive picture of acid mine drainage in the watershed and prioritize restoration activities.

While AMD ranked as the watershed's most prevalent problem among local citizen's groups and major stakeholders, it is only one of many concerns. Raccoon Creek partners currently are not undertaking all of the goals and objectives in this document, primarily because of the lack of resources, funding, and partner commitment. To address all of these issues and other stressors affecting water quality in the future, other interested individuals and organizations will be encouraged to become a part of an expanding partnership to achieve our common goals.

Watershed Stakeholder Involvement

A primary goal in developing this plan was to foster community education and involvement in restoration activities. Water quality improvements will continue only if watershed residents feel their concerns and interests are met. A series of public meetings and focus groups allowed citizens to discuss environmental goals for their communities, and this process yielded the eight issues mentioned later in this report.

Interest in restoring Raccoon Creek first began nearly two decades ago. The Raccoon Creek Improvement Committee (RCIC) is a grassroots watershed group that began in Gallia County during the 1980s to address the degraded condition of the creek. The group started with a number of small projects, such as trash pickups and logjam removals, but members quickly realized the problems reached much farther than the borders of their county. The group invited citizens from the six counties in which Raccoon Creek flows to join the cleanup efforts.

To achieve its mission, RCIC has targeted four program areas: community involvement and outreach; greenways and riparian corridor protection; acid mine drainage abatement and abandoned mine land reclamation; and environmental education and ecological awareness.

In addition to this group, several agencies and corporations provided invaluable advice, funding, and technical expertise for ongoing projects. Many of these groups

participate in the Raccoon Creek Forum, which meets monthly to discuss project activities and future initiatives in the watershed. The core partners in this group, who are responsible for coordinating the implementation of this plan, include Vinton County Soil and Water Conservation District; the Institute for Local Government Administration and Rural Development at Ohio University; Ohio Department of Natural Resources, Division of Mineral Resources Management; Natural Resources Conservation Service; Ohio Valley Resource Conservation & Development, and the Ohio Environmental Protection Agency. The Raccoon Creek watershed coordinator, who was hired by the Institute for Local Government Administration and Rural Development in 2000 as part of the watershed coordinator grant program, coordinates this group¹.

An important component in preparing this management plan was the Leadership Review Board. The professionals on this board contributed their expertise and advice to make this document one that will serve a variety of purposes for years to come. This board consists of elected officials, business leaders and other stakeholders. It allows regional leaders and major stakeholders an avenue to support the management plan project through expert feedback on this living document. It is hoped that they can continue beyond the planning process to informally advise project partners on the basis of their experiences in the public and private sectors. Appendix B contains a detailed list of Raccoon Creek Forum members and Leadership Review Board participants.

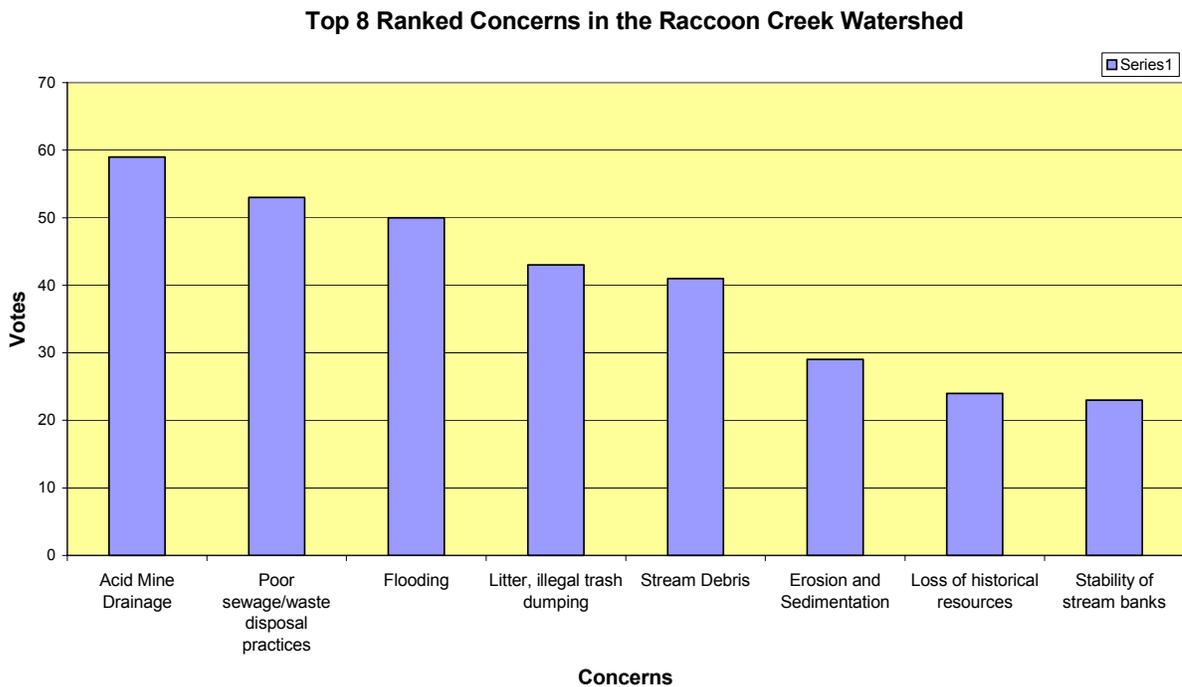
TOP ISSUES

The Ohio EPA has identified the major sources and causes of water quality impairment in the Raccoon Creek watershed. The known sources of impairment to Raccoon Creek and its tributaries are acid mine drainage, wastewater treatment facilities, industry, non-irrigated crop production, removal of riparian vegetation, and oil and gas operations. The known causes of impairment in the watershed include pH, organic enrichment/ dissolved oxygen, metals, ammonia, siltation, flow alteration, brine, and

¹ The ODNR Division of Soil and Water Conservation, in partnership with Ohio EPA, ODNR Division of Mineral Resources Management, OSU Extension, and the Ohio Coastal Management Program developed the watershed coordinator grant program to provide an opportunity for organizations and agencies to plan and implement water quality improvement programs on a watershed basis.

thermal modifications. The general public’s environmental concerns parallel those of Ohio EPA as far as acid mine drainage, non-irrigated crop production, removal of riparian vegetation. Figure 1 shows the top eight issues that ranked the highest during the public meetings in order of importance. Please see Appendix C for a full chart ranking all 20 issues discussed during the public meetings.

Figure 1



This plan will address problems, priorities, and activities that local community members, Raccoon Creek partners and Ohio EPA have identified and would like to address over the next 10 years. Environmental restoration is a lengthy process, and it is conceivable that little dramatic change in water quality will occur in the immediate future. That is why realistic objectives and measurable indicators are crucial when implementing an action plan. The Watershed Issues and Action Strategies section includes a variety of activities for each of the eight priority areas mentioned above. A timeline for work and a guide of possible funding sources will help keep projects on track, while methods for media outreach and public awareness will ensure that watershed

residents are informed of the latest developments. A full set of appendices has been created as part of the document to share information and strengthen the overall content, including water quality and biological data, current and past project summaries and documentation of the public meetings.

A SNAPSHOT OF THE RACCOON CREEK WATERSHED

Watershed Profile

- The 683.5 square mile drainage area of Raccoon Creek encompasses portions of Athens, Hocking, Vinton, Jackson, Meigs and Gallia counties. (Appendix D -Map 1).
- Raccoon Creek discharges into the Ohio River in Gallia County, Ohio, and is 112 miles long.
- The elevation of Raccoon Creek ranges from 1,015 feet at the highest point, the source of Brushy Creek, to 518 feet at the lowest, the mouth in Gallia County.
- The stratigraphy of geologic formations in the watershed is generally consistent with cyclical sequences of clay, coal, shale, limestone and sandstone.
- The watershed contains about 25,610 acres of underground mines and 21,550 acres of surface mines. In the headwaters alone, there are 1,100 acres of abandoned surface mines and 110 acres of abandoned coal refuse piles.
- Eighty-five miles (31.5 percent) of the 269 stream miles surveyed in the Biological and Water Quality Study of The Raccoon Creek Basin (1995) were in full attainment of the warmwater habitat (WWH) or limited resource water-acid mine drainage (LRW-AMD) biocriteria benchmarks (OEPA 1997).² About 140 miles (52 percent) were in partial attainment of these designations, while 44 miles (16.5 percent) were in non-attainment of these goals.
- Known sources of impairment to Raccoon Creek and its tributaries are acid mine drainage, wastewater treatment facilities, industry, non-irrigated crop production, removal of riparian vegetation, and oil and gas operations.
- The Ohio Water Resource Inventory lists known causes of impairment in the watershed as follows: pH, organic enrichment/ dissolved oxygen, metals, ammonia, siltation, flow alteration, brine, and thermal modifications.
- The population centers of the watershed include Wellston in Jackson County with 6,100 residents, McArthur in Vinton County with 1,900, and Rio Grande in Gallia County with 900.

² The WWH designation defines the “typical” warmwater assemblage of aquatic organisms for Ohio streams. It is the principal restoration target for the majority of water resource management efforts in the state. The LRW-AMD designation applies to streams and rivers that have been subjected to severe acid mine drainage pollution from abandoned mine lands or gob piles and for which there is no immediate prospect for reclamation.

- Three villages, McArthur, Rio Grande and Wellston, have wastewater treatment facilities.
- More than 20 partnering organizations are involved in restoring Raccoon Creek, and more than 250 citizens participated in the public meeting process.

INTRODUCTION

Clean water is necessary for all humans, wildlife, and natural processes to thrive. But not only do healthy ecosystems require clean water, healthy economies do as well. While polluted water was indicative of a robust commercial economy in centuries past, that is no longer the case. Now, with a better understanding of the relationship between a healthy environment and a sustainable economy, it is recognized that each mutually serves the other.

Federal and state policies exist to provide guidelines for the improvement of the quality of water in the United States for recreation, tourism, consumption, and habitat preservation. The state and federal environmental protection agencies have enacted legislation that prohibits certain actions that pollute waterways and have been tasked also with providing funding for the restoration of waters damaged by past practices. Grants and incentive programs at the national, state, and local levels provide a means for citizens groups and agencies to pursue projects that improve water quality. Funding sources such as these have provided the foundation for the improvement of Raccoon Creek.

Federal policy to improve and maintain water quality existed as early as the nineteenth century, though not for the same purposes for which it is used today. The Refuse Act of 1899 prohibited the dumping of refuse into navigable waters or any tributary of a navigable water to alleviate the navigation problems that plagued boats on commercial waters. In 1948, federal regulations on water quality aimed at health improvement were established as people began to link health problems to heavy metals and other contaminants in drinking waters. Legislators signed the Water Pollution Control Act of 1948 to support research into the causes of water pollution and authorize the first federal incentives for upgraded municipal wastewater treatment facilities (Sohnen and Rausch 1998).

The Clean Water Act

The milestone generally regarded as the beginning of modern water quality regulation is the overhaul of the Water Pollution Control Act passed in 1972. Amended in 1977 and renamed the Clean Water Act, this legislation set national standards for water

quality. The act's objective is "to restore the chemical, physical, and biological characteristics of the Nation's waters" (Clean Water Act, §101(a)(2)). The act outlined the clear national goal of controlling pollution, requiring pollution discharge permits, creating minimum end-of-pipe standards, allowing civil suits against environmental offenders and encouraging public involvement.

The years following the Clean Water Act brought increased funding for sewage treatment facilities, improved standards for industrial runoff and the introduction of environmental lawsuits. These years also brought the realization that the regulation—and even elimination—of point-source pollution was not going to solve the nation's water quality problems; non-point sources also had to be addressed.

Amendments to the Clean Water Act in 1987 provided money to states for EPA-approved projects to address non-point source pollution. Congress released a report on June 30, 2000, stating that farm and urban runoff were the top pollutants in 40 percent of U.S. lakes, rivers and watersheds (Glasser and Walsh 2000).

Because agricultural runoff can contain harmful pesticides and nutrients, controlling non-point sources is key to improving water quality. Farmers, however, are far from being the only cause of non-point pollution. Soil runoff from construction and residential development, gasoline and other contaminants allowed into storm drains, failing septic systems and abandoned mine lands are all significant causes of non-point source pollution in southeast Ohio. Section 319 of the Clean Water Act makes federal dollars available to states to fight pollution from non-point sources. The program, administered by the Ohio EPA, currently addresses contaminants from agriculture, forestry, mining and on-site septic systems.

THE WATERSHED

Raccoon Creek is one of Ohio's longest streams. The headwaters of Raccoon Creek join near the village of New Plymouth and drain into the Ohio River. From its confluence, the stream travels 112 miles through the Wayne National Forest, Zaleski State Forest, and several towns and villages before it empties into the Ohio River downstream from Gallipolis. The Raccoon Creek watershed covers 683.5 square miles in six different counties.

Decades of unregulated mining and other unhealthy environmental practices have left Raccoon Creek struggling to maintain a diverse and healthy ecosystem. Abandoned surface and underground coal mines leach thousands of pounds of sulfuric acid and metals into the creek every day. The environmental pressures of growing communities and runoff from roads, fields and abandoned mine sites are land use activities past and present that can degrade stream habitat. In addition, industrial discharge, trash and untreated sewage rob the creek of oxygen, which is vital to the survival of aquatic species.

The Ohio Environmental Protection Agency outlines several sources of water quality impairments to the Raccoon Creek watershed in the Water Resource Inventory, 305b Report. Sources include acid mine drainage, wastewater treatment facilities, industry, non-irrigated crop production, removal of riparian vegetation, and oil and gas operations.

These sources cause multiple problems for water quality, which also are listed in the 305b Report. Causes included pH, organic enrichment and dissolved oxygen, metals, ammonia, siltation, flow alteration, brine, and thermal modifications.

But water quality affects more than just the fish and other aquatic species that live in the creek. Poor water quality also significantly limits economic development, tourism, recreation, and domestic use.

The watershed itself is rural with three primary centers of population: Wellston in Jackson County with 6,100 residents; McArthur in Vinton County with 1,900 residents; and Rio Grande in Gallia County with 900 residents. These three villages also have wastewater treatment facilities.

The public involvement necessary to develop this plan took place in towns throughout the watershed. More than 20 partnering agencies and more than 250 residents participated in public meetings, focus groups, and leadership board reviews of this plan. Community members ranked numerous environmental issues, and eight received the highest concern during this process. This plan addresses these issues, in addition to the Ohio EPA water resource quality concerns listed on the 305 b report. The issues to be addressed include:

1. Acid Mine Drainage

2. Sewage and Wastewater Treatment
3. Flooding
4. Litter and Illegal Trash Dumping
5. Stream Debris
6. Erosion and Sedimentation
7. Loss of Historical Resources
8. Stability of Stream Banks

OTHER WATERSHED STUDIES

Research from government agencies and organizations has contributed crucial data on water quality and biological resources within the watershed. Much of this work describes the extent of acid mine drainage, its effects, and methods for restoration. Other agency documents target specific sub-basins of Raccoon Creek and illustrate the forest resources in the area. These reports and others mentioned below were used to guide the management plan process and provide structure for the data included here.

Total Maximum Daily Load (TMDL)

An earlier overlooked provision in the Clean Water Act began getting attention in the 1990s for its potential to curb non-point source pollution. The Total Maximum Daily Load (TMDL) program is, by definition, a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. In other words, the TMDL program requires that, for each water body, the state must identify the appropriate use designation (a measure of chemical, physical, and biological properties) and maintain acceptable conditions for that use.

Water bodies not attaining use designations must have a plan developed that outlines measures for reducing contaminant loads to attain the appropriate use designation. TMDL plans, developed locally and approved at the regional level by the U.S. Environmental Protection Agency, must be developed for each pollutant causing the water body not to comply. TMDL plans for multiple contaminants are not uncommon. For example, the use designation for much of Raccoon Creek is warmwater habitat, which is the typical designation for Ohio rivers and streams with a healthy population of fish and other organisms.

While an overhaul of the TMDL program has been the source of controversy among environmentalists, policy makers and industry representatives, the program still exists under regulations set forth in 1992. States must submit to the U.S. EPA a list of “impaired” water bodies and must develop plans to improve those waters. Raccoon Creek’s TMDL plan was completed in 2002 and focuses primarily on acid mine drainage. Implementing that plan is the responsibility of local watershed groups and is of great value in the cleanup of Raccoon Creek’s acid mine drainage.

AMD Set-Aside Program

The Ohio legislature established the Acid Mine Drainage Abatement and Treatment (AMDAT) fund in March 1995. The Ohio Department of Natural Resources’ Division of Mineral Resources Management transfers up to 10 percent of the annual federal Abandoned Mine Land (AML) grant into the AMDAT fund. Based upon present AML grant levels, the Division transfers approximately \$500,000 to \$600,000 into the fund annually. It is the purpose of the AMDAT fund to provide for the long-term clean up of watersheds impacted by AMD in accordance with the criteria established in ORC 1513.37 (E) for hydrologic units (Ohio Department of Natural Resources 2002).

Local watershed groups and government agencies can use this funding to develop monitoring plans, analyze water samples, seek engineering technical assistance or contract construction work. Raccoon Creek’s AMDAT plans include water chemistry data and analysis of the effects of AMD on the biology in the streams. These plans prioritize future acid mine drainage restoration projects within the watershed. Thus far, plans have been developed for Little Raccoon Creek and the Raccoon Creek headwaters.

Graduate Research

Graduate theses have assisted in defining projects and treatment techniques for many of the acid mine drainage-impacted tributaries. Many of these outline the effects on both water quality and aquatic life throughout specific tributaries and sub-basins in the watershed.

Little Raccoon Creek Management Plan

In addition to these works, information in the Little Raccoon Creek Management Plan (USDA 1994) has been instrumental in developing this document. Although the data does not describe the entire Raccoon Creek watershed, it does cover one of the most acid mine drainage-impacted sections of the watershed.

Many of the problems addressed in the Little Raccoon Creek management plan are similar to those concerns brought up in public meetings during the development of this plan, including acid mine drainage, flooding, solid waste, erosion, and others.

Please see the reference list for a complete listing of these other watershed studies and documents. For a more comprehensive look at ongoing project activities in the watershed, please see Appendix E.

ECONOMIC BENEFITS OF ENVIRONMENTAL RESTORATION

One of the most compelling reasons for environmental restoration is the positive effect it can have on local economies. While an economic boost might take some time, there are both direct and indirect effects of environmental improvement. Direct effects would include increased tourism, recreational opportunities and property values—factors that show an immediate relationship to the environment. More indirect effects would include the diversity and abundance of fish and game, reduced erosion and sedimentation and the reduction of flooding.

Recreation and tourism within the watershed are important sources of revenue for local communities. A variety of recreational opportunities managed at the federal, state and local level provide residents and visitors with places to hunt, fish, camp, hike, ride horses or simply enjoy the outdoors.

A survey of 55 visitors to Lake Hope State Park's annual fall hike in 2001 showed that most of them use the park for hiking or walking, camping and picnicking. Canoeing, boating and fishing also were popular reasons to visit the lake. Forty respondents said that they stay overnight during their trips (Andrews, et al. 2001).

In 2001, the lake's peak months of June, July and August brought 19,143 people to cabins and 11,712 people camping. From Nov. 1, 2000, to Oct. 31, 2001, visitors spent \$77,675 in camping and \$739,564 in cabin rental (Sapienza 2001).

Despite the money currently spent in local economies for recreation and tourism, that revenue could be much higher if the watershed's water quality improved. A study conducted by Ohio State University graduate student Allan Sommer (2001) illustrates the economic value of recreation for boaters and fishers in the nearby Hocking River valley.

His research suggests that boaters spend about \$1 million annually in the local economy, while fishers spend about \$3.2 million annually. These visitors boost the local economy in a variety of ways, including buying food, beverages, gasoline and other supplies to prepare for their trips. Both of these groups indicated they were sensitive to water quality, and they acknowledged acid mine drainage and sewage to be primary water quality concerns. These are also identified impairments in Ohio EPA's Water Resource Inventory Report for Raccoon Creek.

Both boaters and fishers said they would take additional recreational trips if water quality in this area improved. Boaters indicated they would take 1.4 additional trips given a small improvement in water quality and 2.5 additional trips given a large improvement. Fishers indicated they would take 2.3 additional trips with a small improvement in water quality and 4.7 additional trips given a large water quality improvement.

The following is a breakdown of how consumer spending from boaters and fishers would increase, provided water quality improved in the Hocking River Valley. Restoration in Raccoon Creek likely would bring increased recreational revenue to local communities, similar to those projected for the Hocking River Valley.

Figure 2

Economic Increase with Water Quality Improvement

| |
|--|
| <p><u>Boaters:</u> Total benefit under current conditions: \$387,981 Increased benefit from small improvement: \$123,448 Increased benefit from large improvement: \$220,444</p> <p><u>Fishers (including Franklin County)</u> Total benefit under current conditions: \$5,403,499 Increased benefit from small improvement: \$2,536,336 Increased benefit from large improvement: \$5,182,948</p> |
|--|

Source: Sommer 2001, pages 76-86.

Aside from recreation, environmental restoration also makes an area more attractive to businesses and prospective property owners. Nationally, homebuyers are willing to pay about 28 percent more to live near clean waters, according to two studies from the Environmental Protection Agency (Fremont 1999). In addition to tourism and economic development, a healthy environment reduces costs to local governments and highway departments because it curbs water pollution. Ample wetlands, trees, floodplains and riparian buffers help reduce purification costs for communities that draw drinking water from surface sources. They also reduce flooding by allowing peak discharge events to occur within their natural boundaries.

The Raccoon Creek watershed does provide a viable fishery in southeast Ohio. While stretches of the main stem currently do not meet warmwater habitat designation,

much of it does, and all sections have good habitat with fish populations migrating through it.

In addition to aquatic benefits, restoration can positively influence land as well. Sustainable forestry, through best management practices (BMPs), helps to ensure a healthy forest that provides a long-term timber supply, forest-related employment and revenue for local governments and schools. Selective harvesting techniques strengthen forest health while providing proper habitat for deer, grouse, turkeys, songbirds and other wildlife.

One particular state program called Trees to Textbooks, administered by the Ohio Department of Natural Resources, routes 40 percent of logging revenue to schools in 18 districts in the counties where the logging took place. Another 40 percent goes to local county and township governments. Vinton County received the second-largest sum from this program, at \$178,000 in 2001 (Press Release, ODNR 2001).

There is an opportunity for both incremental and large-scale improvements in the quality of the land and water, and the quantity and diversity of life they support. This document will present some of the major environmental issues and improvements necessary to achieve this goal.

Through careful planning and community involvement, members of the Raccoon Creek watershed and others throughout southeast Ohio can preserve and strengthen the environmental, economic and historic resources that make this region unique.

NATURAL RESOURCE INVENTORY

DEFINING THE WATERSHED

The Raccoon Creek watershed is a 683.5-square-mile drainage area that feeds the Ohio River. It incorporates sections of Athens, Hocking, Vinton, Jackson, Meigs and Gallia counties and is one of the largest watersheds in the state. The creek itself is 112 miles long and meanders through a topography of steep hills and narrow valleys. This landscape, along with highly erodible soils, has made agriculture difficult.

Like much of southeastern Ohio, the watershed has a history of natural resource extraction, including the removal of coal, iron ore, salt and clay. Coal mining, unregulated for more than a century, has left numerous orange-tinted streams characteristic of acid mine drainage in its wake.

With most of the region's accessible minerals now depleted and few other industries available, the area residents struggle economically. The manufacturing, service and government sectors of the economy employ the greatest number of people in the watershed. Though those sectors provide some jobs, unemployment is high, surpassing figures for the rest of the state. With the exception of Athens County, all counties in the watershed have unemployment rates exceeding the state average. Vinton County's rate of nearly 10 percent unemployed is the highest of the six watershed counties (Ohio Department of Job and Family Services 2001).

Land Use Characterization

The primary land use of the watershed is forest, at 66 percent. Agricultural uses and open urban areas, such as lawns, account for about 28 percent. Shrubland covers about 3 percent, and the remainder includes urban land, barren mine land, water and wetlands (ODNR 1994). More than half of the cropland is considered "highly erodible," according to the 1985 Farm Bill standards. Map 2 in Appendix D shows an overview of the watershed's land uses and Figure 3 breaks it down in table format.

Figure 3
Land Uses in the Raccoon Creek Watershed

| Land Use | Acres | Square Miles | Percent of Watershed |
|--------------------------------------|---------|--------------|----------------------|
| Wooded | 289,847 | 452.89 | 66.37% |
| Agriculture/ Open Urban Areas | 122,861 | 191.97 | 28.13% |
| Shrub | 13,268 | 20.73 | 3.04% |
| Urban | 4,200 | 6.56 | 0.96% |
| Barren (strip mines, quarries, etc.) | 3,615 | 5.65 | 0.83% |
| Open Water | 1,859 | 2.9 | 0.43% |
| Non-forested Wetlands | 1,058 | 1.65 | 0.24% |

Source: Ohio Department of Natural Resources, Ohio Land Cover Inventory, 1994.

The mixed central hardwoods of the Raccoon Creek watershed are dominated by maple species. The Wayne National Forest owns a small portion of the wooded area in the headwaters, while Zaleski State Forest, Lake Hope State Park, Lake Alma State Park and a few state-owned wildlife management areas own much of the public forests. The MeadWestvaco Corporation, owner of the Vinton Furnace Experimental Forest, is the largest private owner of forest land.

MINERALS OF ECONOMIC INTEREST

Salt

Salt was one of the first minerals tapped by Native Americans for its utility and economic value. Local historians said European prisoners in this area caught their first glimpse of salt at the “Salt Licks” of Jackson County. The process of gathering the mineral was an arduous one. One would cut holes in a creek bed, wait for salt water to collect and boil it down to separate the salt grains. The early producers struggled to generate salt from water that was barely 1 percent salt, while about 3,000 feet below them was brine of 20 to 25 percent (Morrow 1956).

Although Native Americans were the dominant users of salt licks, whites from Marietta were traveling to them by 1794. The next year, Native Americans signed a treaty to give up land where Jackson County now stands—which included the salt licks

(Morrow 1956). This began a new era of mining and processing salt. The first salt furnaces were crude, mobile shacks. As Morrow describes, “The great majority of the early salt boilers were transients. The cabins were of the rudest kind, for the builders did not know how soon they must move” (p. 15). Soon, though, the boilers became permanent, and about 20 furnaces were active on tributaries of the Scioto River from 1806 to 1808.

Brines are deposits of trapped sea water that have high salt concentrations. The salinity, or dissolved salt content, of Ohio brines can be more than 10 times as salty as sea water (Kell et al. 1993). Sources in Meigs County include the Massillon Sandstone and the Sharon Conglomerate in the Pennsylvanian System and the Black Hand and Berea sandstones in the Mississippian System. Technology that followed would help the salt mining industry tap this underground resource, and the industry would grow. By the Civil War, Ohio was second in the nation for salt production.

Iron Ore

The Raccoon Creek watershed is rich in iron deposits, with some hilltop beds almost six feet thick. Jackson County opened its first iron ore furnace in 1836, and the railroad boosted the industry in 1853 by allowing goods to reach untapped destinations, thus opening new markets. Six furnaces opened in Vinton County, including Hope Furnace in 1854 and Zaleski in 1858, which was the only furnace to use coal rather than charcoal.

The Hanging Rock Iron Region of southeast Ohio and northern Kentucky became well known for its iron manufacturing, with 24 Kentucky furnaces and 46 Ohio furnaces busy processing the ore. This resource was in high demand, especially during the Civil War, when the ironclad ship, the Monitor, was armored with iron forged near Oak Hill in Jackson County (Farley 2002).

Charcoal, used to fuel the furnaces, typically was produced at streamside and hauled by wagon to the furnace itself. Almost six cords of wood was needed to make the 215 bushels of charcoal used to smelt a ton of iron in a cold blast furnace (Morrow 1956). When charcoal furnaces became obsolete by the late 1800s, some furnaces switched to coal for fuel, while others who could not lose profit were abandoned. The Vinton County

furnace is a local tourist attraction and a reminder of an important economic stage in the region's history.

But improving the efficiency and cost effectiveness of the furnace required continual trial and error—some of which came at a cost of its own. “Scientific design and knowledge of the strength of materials were lacking and boiler failures were not uncommon” (Ervin 1949, 36). An 1873 explosion at Orange Furnace in Jackson County significantly damaged it and nearby property. The furnace ceased operation and closed a year later.

The industry itself was thriving by 1880, and furnace companies and their employees' families settled most of the land. Each furnace supplied between 300 and 500 jobs. The manager and secretary lived in respectable houses, while workers, often with large families, lived in small, 16-by-18-square-foot log cabins. Employees earned 75 cents to \$1.00 a day and were often indebted to the company for supplies—especially in the winter when the furnaces closed.

Iron discovered on the Vanport limestone was the largest quantity found in the United States, though bigger deposits would be found in the Great Lakes region by 1845. Discovery of other rich deposits in the Lake Superior region eventually led to the decline of the Hanging Rock Region, and the last furnace in this area “blew out” in 1916 (Conway, *The Olde Forester*).

Today, about 19 stone furnaces still exist. Efforts to preserve one of them and the integral role they played have been successful at Buckeye Furnace, which was restored by the Ohio Historical Society. The site contains a company store and manager's house. Hope Furnace is in fairly good condition and is located in Lake Hope State Park (Conway, *The Olde Forester*).

Clay

Clay and its building potential was one of the first resources found in this area. Artifacts from the Adena and Hopewell Native American burial mounds include clay pottery and urns. After the iron ore industry began to fade in the late 1800s, the

production of clay bricks boomed in the area. Vinton County opened its Puritan Brick Plant in 1909, which was the biggest of its kind in southeast Ohio.

Similar to the iron ore industry, the first brick makers were mobile. Once they built permanent brickyards, they employed local people who were paid 50 cents a day to carry loads of bricks out to dry before they could be fired in the kiln. Ten hours or 5,000 bricks were considered a full day's work.

Two of Jackson County's bigger operations were the Aetna and Oak Hill brickyards. Aetna's first shipment of bricks was in September 1873, but on May 1, 1874, a fire destroyed the plant. The owners rebuilt it, and it continued to succeed. By 1926, newer technology allowed it to produce 30,000 bricks a day (Morrow 1956). The Oak Hill brickyard operated from coal and clay extracted from the same mine opening. As for others, transportation was a problem until 1887 when a tram road, an early method of shipping, opened and was used for 40 years until modern trucks took over the shipping demand.

Coal

Coal mining historically has been one of the more lucrative industries and still continues today as one of the major employers in a few of the watershed counties. In the 683.5-square-mile watershed, mining has altered a total of about 25,610 acres in underground mines and 21,550 acres in surface mines³. Map 3 in Appendix D outlines the extent of mining in the watershed. Because the federal Surface Mining Control and Reclamation Act (SMCRA) of 1977 mandates reclamation of mined areas, active mines since that time cease to be a significant contributor of acid mine drainage. Many mine sites excavated before 1977, however, still contain toxic soil and are not recovering as readily as reclaimed land.

Four kinds of mining techniques have been used in the watershed. Companies *strip mine* when the coal seam is near the ground's surface. The soil and rocks, called overburden, are removed and the coal is scooped out before the overburden is replaced.

³ The underground mine layer was digitized by the Ohio Department of Natural Resources, Division of Real Estate and Land Management. The surface mine layer was digitized from the most recent USGS 7.5 minute quads in 1994 at ILGARD.

In *drift mining*, a tunnel is driven into the side of a hill at a coal outcrop. The coal is mined out by following the contour of the bed. Drift mines are commonly found along stream bottoms where erosion has exposed a coal seam. *Slope mining* uses tunnels on a low enough incline to permit mine cars to enter. More than half of all coal mined is taken through drift or slope mining techniques (Ahmad 1979). A vertical opening is driven into the coal in *shaft mining*. This mining technique proceeds along the coal seam, but the excessive depth increases entry, exit and ventilation hazards.

Six coal beds have been the most productive and important in the watershed's history. The Sharon No. 1, Quakertown No. 2, Clarion No. 4A, the Middle Kittanning No. 6, the Lower Kittanning No. 5 and the Upper Freeport No. 7 have played a large role in shaping the coal mining industry in this area of the state. Some of the counties within the watershed historically have been the highest coal producing counties in the state. Athens and Meigs counties rank fifth and ninth, respectively (Ohio Department of Natural Resources, Facts on Coal Mining in Ohio).

Underground mining began in the early 1800s and thrived for more than a century. The arrival of the railroad in 1856 provided a way for coal companies to transport and sell their product easily, and the industry boomed. Around World War II, large excavating equipment and explosives became available and surface mining overtook underground mining as the primary way to extract the mineral (Ohio Department of Natural Resources, History of Coal Mining in Ohio).

Because most of the early underground mines were hand picked and used room-and-pillar methods, considerable coal is still left to create acid mine drainage. The mines leave pyritic material more exposed to air and water, ingredients necessary to form acid mine drainage. AMD is a significant threat to water quality and aquatic life in Raccoon Creek and other watersheds near coal mines. Almost 51 percent (126 miles) of Raccoon Creek and Elk Fork are polluted by acid mine drainage. Acid mine drainage is a chemical condition characterized by low pH and high acidity, specific conductance, and total iron, manganese and sulfate levels. The impacts from past coal mining practices are addressed in the Watershed Issues and Action Strategies section of this plan.

Limestone

European settlers in Ohio first mined limestone in the early 1800s for whitewashing and plastering stone for foundations, cement and windowsills. Since then, limestone has been used for a variety of purposes. Burned limestone, called lime, reduces the impurities in iron and helps to manufacture rubber. Limestone itself is used in fertilizers, water purification, construction and numerous cosmetic products (Weisgarber 1997).

Ohio ranks fourth in the country for producing lime and is seventh in producing crushed stone. In 1999, 124 mines produced 82.2 million tons of limestone and dolomite from 50 of Ohio's 88 counties, including southeast Ohio (Wolfe 2001). This was an all-time record of production, an upward trend that began in 1982 when less than 28 million tons of limestone and dolomite were sold in the state.

Reclaimed land from limestone production typically performs well in terms of drainage and vegetation growth, as the limestone's alkalinity neutralizes the watershed's naturally acidic soils (Farley 2002).

Oil and Natural Gas

Natural gas was an important resource in the watershed in the early 1900s, but it was less widely available and profitable than coal. The first gas well in the watershed was drilled in 1862 to a depth of 800 feet. Wellston-Hamden Gas Company was the first to widely develop the resource in 1902, taking leases in northern Jackson County and southern Vinton County. The Treat and Crawford Company soon followed, setting up a competitive rivalry for leases that eventually ended in the buyout of Wellston-Hamden. Upon its demise in 1908, Treat and Crawford incorporated the Ohio Southern Gas Company to control gas distribution in Wellston, Jackson, Gallipolis, Point Pleasant and nearby areas (Morrow 1956). Jackson County wells peaked in the 1920s. About 450 wells were drilled, 322 of which were drilled by Ohio Fuel Gas Company, a subsequent company to Treat and Crawford.

The Ohio Department of Natural Resources, Division of Mineral Resources Management, regulates oil and gas drilling companies for brine, a saline byproduct

generated during well drilling. As the drill bit penetrates various brine-bearing rock formations, brine is circulated to the surface along with rock cuttings. About 1,000 to 3,000 barrels (42,000 to 126,000 gallons) of brine, with varying salinity, are generated in each drilling operation (Kell et al. 1993). Gas well completion and crude oil operations also produce brine byproduct.

Oil and gas production facilities separate brine from the fuel and then commonly re-inject the brine into underground injection wells. About 60 percent of the salt water produced with U.S. onshore oil and gas operations is injected into enhanced oil recovery wells (GWPC).

While the salt itself is not a major contaminant, metals and chlorides in the brine bind with soil and prevent vegetation from taking nutrients, severely hindering their growth and contaminating ground water. Inspectors ensure that companies use effective liners and adequate well tanks to prevent brine from entering wells and polluting soil or water. ODNR has regulated brine, a point source, since 1978, and most companies now adhere to preventative regulations. But erosion and sedimentation from oil and gas sites still are significant problems statewide and in the watershed. These issues, and activities to curb them, are addressed in the Watershed Issues and Action Strategies section of this plan.

While hundreds of wells once dotted the countryside, many now have been depleted, plugged and abandoned. Low pressure in the remaining wells makes them unprofitable, though several interstate petroleum pipelines serve residents across the watershed. More have been proposed, leaving watershed residents and state officials to weigh the demand for affordable fuel with environmental concerns.

HYDROGEOLOGY

Soils

Located in the Western Allegheny Plateau Ecoregion, the Raccoon Creek watershed is known as the Hanging Rock region for its plentiful iron deposits. The creek drains south, directly into the Ohio River basin. Five major soil associations make up the

unglaciated Raccoon Creek watershed, many of which are acidic (Palone 1995). Map 4 in Appendix D illustrates variable terrain or relief within the watershed.

Steinsburg-Rarden-Lily: Found on steep hillsides and narrow ridge tops, this type is moderately deep over the sandstone and shale bedrock. Steinsburg soils are well drained and are found on steep hillsides. Rarden soils drain moderately and occupy steep hillsides and ridge tops, as do the well-drained Lily soils. The soils generally are not suitable for pasture and cropland but are moderately suited for forest. The major limitations include slope hazard, temporary wetness, slow permeability and high shrink-swell potential (Palone 1994).

Gilpin-Germano-Steinsburg: The most common in the watershed, this soil type is moderately deep, strongly sloping to very steep and well drained. It occurs most frequently in Vinton County and is formed from siltstone and sandstone bedrock hillsides (Palone 1994).

Wharton-Rarden: Covering almost half of Jackson County, this soil association formed from shale and siltstone. It is deep to moderately deep and is found on gently sloping hills to steep slopes. This moderately well drained soil occurs on uplands. Wharton soils are deep, medium textured, strongly sloping and moderately steep. Permeability is slow to moderately slow. Rarden soils are similar but typically are moderately deep and are found on gently sloping to steep inclines. Permeability is slow, with a high shrink-swell potential (Palone 1994).

Rigley-Rarden-Clymer: Formed from upland sandstone and shale, these soils are deep and moderately deep, gently sloping to steep. The permeability ranges from well drained to moderately well drained. Rigley soils are found on side slopes, Clymer soils dominate ridge tops and Rarden soils are found on both. Gently sloping to strongly sloping soils are suitable for cropland, pasture and forest. Moderately steep and steep soils are more appropriate for forests (Palone 1994).

Omulga-Philo: Found in floodplains and valleys of preglacial drainage, these soil slopes characterize slight inclines. Omulga soils are deep, medium textured and moderately well drained. Their slope can vary from nearly level to strongly angled. They are formed in loess, colluvium, alluvium and underlying lacustrine sediments, those formations associated with glacial deposits. Permeability is moderate above the fragipan and slow in the fragipan. Philo soils are deep, poorly drained, medium textured and nearly level. Formed in alluvium on the floodplains, these soils are subject to frequent flooding (Palone 1994).

Geology

The bedrock in the watershed consists of four formations from the Pennsylvanian Age that formed about 325 to 290 million years ago (Map 5 – Appendix D). Throughout these formations are numerous coal seams, which attracted significant mining operations beginning in the early 1800s and continuing today to some extent. Much of the economically feasible coal already has been extracted, and environmental standards have reduced demand for southeast Ohio’s sulfuric coal in recent decades. Because this coal—especially the No. 6 seam—is particularly high in sulfur, it creates more water pollution problems in terms of acid mine drainage from abandoned mine lands.

The Pottsville Formation, the oldest of the four, is concentrated in the northwestern and western areas of the watershed. The Pottsville Formation is the basal formation of the Pennsylvanian System and contains shale and sandstone with a thin strata of limestone. Twelve coal beds have been identified in this formation, some of which are among the highest quality heating coals in Ohio. These beds include the Sharon (No. 1) and Quakertown (No. 2). Other mineable beds are the Lower Mercer, Middle Mercer and Bedford beds (Hughes et al. 1996; Wilson 1988).

The Allegheny Formation can be found in the central portion of the watershed, east of Wellston, and, like the Pottsville Formation, consists of sandstone and shales. Minor amounts of marine limestone are present; the primary resource in this formation is thick and persistent coal. Thirteen coal beds have been identified, including the

Brookville (No. 4), Clarion (No. 4a), Lower Kittanning (No. 5), Middle Kittanning (No. 6), Lower Freeport (No. 6a) and Upper Freeport (No. 7) (Wilson 1988).

The Conemaugh Formation is concentrated in the eastern and southern sections of the watershed. The Conemaugh contains limestone in mineable quantities and consists of 13 identified coal beds. Only a few of these beds are mineable, including the Mahoning, Wilgus, Anderson and Harlem (Wilson 1988).

The Monongahela Formation, the youngest or most recently formed of the four, occurs in the northeast portion of the watershed. It contains a coal-bearing stratum and has clay, shale, sandstone and limestone. This formation has more freshwater limestone and less sandstone than the other Pennsylvania formations. Carbonates, primarily calcium carbonate found in limestone, act as a pH buffer and work to reduce acid mine drainage. Younger formations contain more carbonate, so the Monongahela Formation possesses the most buffering ability, while the Allegheny and Conemaugh formations lack this capacity (Razem and Sedam 1985). Important coal beds include the Pittsburgh (No. 8), Meigs Creek (No. 9), Uniontown (No. 10) and Waynesburg (No. 11), though most of these seams do not occur in the Raccoon Creek watershed (Razem and Sedam 1985).

Surface Water

Originating in southeast Ohio's Hocking County, Raccoon Creek flows 112 miles through Vinton, Meigs and Gallia counties and empties into the Ohio River. Primary industries within the watershed include resource extraction, wood processing and small-scale manufacturing (Wilson 1988). While there are no municipal water supplies taken from the creek, two public surface water supplies in Rio Grande and Wellston do exist. Other communities and businesses in the area access water through wells.

Several tributaries contribute to Raccoon Creek, including Little Raccoon Creek. This tributary enters the main stem just south of the village of Vinton in the northwest portion of Gallia County. The Lower Raccoon Creek basin drains 434 square miles, while the Upper Raccoon Creek basin drains 139 square miles (Sedam and Fancy 1993). Little Raccoon Creek itself has a 155-square-mile drainage area. Other tributaries are Elk Fork (59.8-square-mile drainage), Hewett Fork (40.5-square-mile drainage) and Brushy Creek

(34-square-mile drainage) (Wilson 1985). Map 6 in Appendix D shows the various sub-basins that make up the Raccoon Creek watershed.

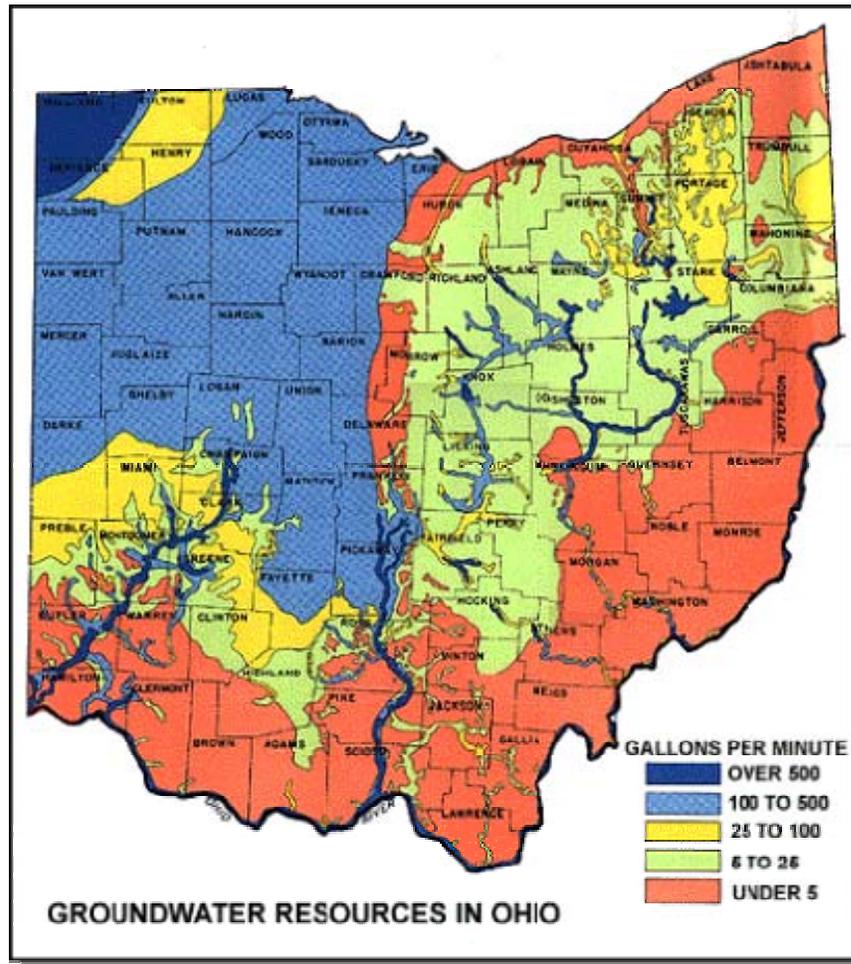
Lake Hope, Lake Alma, Lake Rupert and Tycoon Lake are the four lakes that lie within the watershed. Agricultural activities, mining, failing on-lot sewage systems or inadequate wastewater treatment facilities have affected Lake Rupert and Lake Alma. The Ohio Environmental Protection Agency has given these two lakes priority for water quality improvements (Palone 1994).

Groundwater

In the state of Ohio, sedimentary bedrock from the Silurian, Devonian, Mississippian and Pennsylvanian systems comprises the dominant bedrock groundwater sources, and precipitation is the primary recharge to aquifers here (Rowland and Pennell 1991). The Pennsylvanian system is the bedrock of the Raccoon Creek watershed. Groundwater in this system is found in sandstone, shale and fractured coal, with a general yield of zero to 25 gallons per minute. The best water-producing zone occurs in the Sharon Conglomerate, and water quality depends on the presence or absence of coal. Quality is relatively high with respect to sulfate, iron, manganese and total dissolved solids (Rowland and Pennell 1991).

Groundwater is the dominant source of domestic water supply in the Raccoon Creek watershed (Wilson 1988). Compared to the rest of the state, however, southeast Ohio has relatively little groundwater, at flows of less than five gallons per minute (see following map from the Ohio Groundwater Consortium). Groundwater flows significantly more slowly than surface water does, and factors determining this are bedrock porosity, aquifer gradient and types of outlets, such as lakes, rivers or streams.

Figure 4



Source: Ohio Groundwater Consortium

The majority of Gallia County has groundwater flows of less than three gallons per minute, with wells drilled to depths of 40 to 250 feet. Depth to the bedrock is shallow in most areas, some as close as two feet. Aquifers are primarily sand, sandstone and gravel aquifers (Schmidt 1985).

Much of Jackson and Vinton counties yields less than three gallons of water per minute. This bedrock contains sandstone, shale, fireclay, coal and limestone. A large section of the Black Hand sandstone lies in the central and northeast parts of the counties, extending south of Wellston up to Hocking County. This bedrock yields five to 25 gallons per minute, with more mineralized water found in the east. Aquifers here are sand and sandstone (Walker 1985).

Athens and Meigs counties typically obtain flows at less than two gallons per minute, except around the Hocking River, which can receive five to 15 gallons per minute. Well depths in these counties range from 20 feet up to 400 feet in the primarily sand and gravel aquifers (Schmidt 1985).

The southeastern part of Hocking County in the watershed ranges between one and 25 gallons per minute. Starr Township consists of sandy shale and sandstones and has some very deep wells, some more than 500 feet. Washington Township, however, receives water from the Black Hand sandstone aquifer, and has well depths of between 165 and 400 feet (Walker 1991).

In the six counties of the Raccoon Creek watershed, 17 drinking water sources come from purchased surface water. Groundwater supplies 13 sources, while surface water supplies five sources and purchased groundwater supplies three (U.S. Environmental Protection Agency, Web page, Envirofacts). When a community does not have enough groundwater to provide for its residents' needs, it might become necessary to purchase that supply from another that does.

While only 0.2 percent to 2 percent of the nation's aquifers are contaminated, contaminants in groundwater are difficult and costly to remove. When a small contaminant leaks through the unsaturated soil and bedrock and reaches the water table, or saturated zone, it spreads into a plume—an underground pool of the pollutant. As the plume expands, suction from public and private water pumping wells can draw it in, contaminating the water supply. The water supplies in the Raccoon Creek watershed have had little contamination, and most violations have been either monitoring deficiencies or the presence of fecal coliform (U.S. Environmental Protection Agency, Web page, Envirofacts).

WATER QUALITY

The Ohio Water Resource Inventory (305b Report) lists known causes of impairment in the watershed as follows: pH, metals, organic enrichment/ dissolved oxygen, ammonia, siltation, thermal modifications, and flow alteration. Some of the known sources of impairment include: surface and subsurface mining, municipal and

industrial point sources, removal of riparian vegetation, pastureland, nonirrigated cropland and natural causes.

To comply with the Clean Water Act, the state developed water quality standards for lakes, streams and other surface water. The following use designation recommendations are based on a combination of biological, chemical and physical attributes examined during a 1995 biological and water quality study of the Raccoon Creek basin conducted by the Ohio EPA.

A total of 269 river and stream miles in Raccoon Creek was assessed. Eighty-five miles were in full attainment of the warmwater habitat (WWH) biocriteria or the limited resource water-acid mine drainage (LRW-AMD) designation—meaning they meet those designated “benchmarks.” Approximately 140 miles were in partial attainment, and 44 miles were in non-attainment of these benchmarks (OEPA 1997, 2).

Of the five different aquatic life uses defined in the Ohio Water Quality Standards, Raccoon Creek streams fell into one of the following two designations (See Appendix F for a table of aquatic use designations for the entire watershed):

- Warmwater habitat (WWH) defines the “typical” warmwater assemblage of aquatic organisms for Ohio streams. It is the principal restoration target for the majority of water resource management efforts in the state. For example, from the village of Vinton to the creek’s discharge into the Ohio River, the stream is in full attainment of warmwater habitat.
- Limited resource water-acid mine drainage (LRW-AMD) applies to streams and rivers that have been subjected to severe acid mine drainage pollution from abandoned mine lands or gob piles and for which there is no immediate prospect for reclamation. The representative aquatic assemblages are generally composed of species that are tolerant to low pH, silt, metals and overall poor habitat quality. For example, OEPA stated that the performance of the biological community and prevalence of AMD chemical parameters in the Raccoon Creek Headwaters, extending from the confluence of the East and West Branches (RM 111.96) to Sandy Run (RM 92.52), warrants the LRW-AMD use designation. Mining impact has caused severe degradation in the East Branch of Raccoon Creek, which also was given this designation.

Ohio EPA recently completed a TMDL of the Upper Raccoon Creek watershed, which extends to just above the confluence of Little Raccoon Creek near the village of Vinton. One finding suggests that the 1998, 303 (d) list reported 12 stream segments in non-attainment of water quality standards. The 2002, 303 (d) list reports 33 segments in non-attainment. This is based primarily on more extensive field analysis as opposed to further degradation of the stream segments.

Water Quality Impairments

The Ohio EPA has assessed streams in the Raccoon Creek basin and has designated them as warmwater habitat or limited resource water-acid mine drainage. Maps 10 and 11 and the aquatic use designation summary table in Appendix F identify polluted tributaries and the causes of impairment. These water quality problems are identified below and addressed in the Watershed Issues and Action Strategies section of this plan.

Acid Mine Drainage

More than a century of coal mining has affected the water quality of the watershed's surface waters. Acid mine drainage, formed from chemical reactions among air, water and the coal's pyrite, is the most prevalent pollutant in Raccoon Creek and its tributaries. Through the Acid Mine Drainage Abatement and Treatment (AMDAT) plans and Ohio EPA's Total Maximum Daily Load (TMDL) plan for Raccoon Creek, a substantial amount of water quality testing across the watershed has been done (see Appendix G for water chemistry data). This testing has led to an understanding of where the biggest problems lie and focuses on the impaired stream segments in an effort to restore them to warmwater habitat. See Appendix H for more information on the completed AMDATs and TMDL in the watershed.

According to OEPA's TMDL of the Upper Raccoon Creek, the primary causes of non-attainment in 33 stream segments are pH, metals and siltation. This study did not encompass the Little Raccoon Creek sub-basin, which is also degraded by AMD. According to the AMDAT plan for Little Raccoon Creek and OEPA's 1995 basin study,

an additional 10 stream segments are in non-attainment due to the same causes mentioned above (Appendix F).

Acid Mine Drainage (AMD) flowing from abandoned underground and surface coal mines causes the most severe degradation to the living resources and aquatic habitat in the Raccoon Creek watershed. The gravity of the problem ranges from a reduction in the diversity and quantity of fish in most of the main stem to the complete loss of wildlife and quality habitat in some of the tributaries. The U.S. Environmental Protection Agency has singled out AMD as the number one water quality problem in Appalachia.

Water quality problems occur when coal and pyrite (iron sulfide) are exposed to oxygen and water. Through oxidation of the pyrite, sulfuric acid is formed. As this acid passes over different rock strata surrounding the pyrite, it dissolves metals including iron, aluminum and manganese. This influx of acid and metal not only reduces the number and diversity of aquatic organisms, it also increases the corrosiveness of the water, limits its domestic use and impairs the aesthetic qualities.

Not every AMD seep is harmful, and the severity of the effects may vary depending on the time of year. The East Branch (EB) of Raccoon Creek is one of the largest trouble spots and affects the main stem of Raccoon Creek for a full five to seven miles downstream. AMD production is pervasive throughout the East Branch because almost every ridge top in the subwatershed has been mined. Along the same reach of the stream, Brushy Fork (BF) discharges into the main stem (draining the Pumpkin Ridge and Mt. Pleasant area of Vinton County). At certain times of the year, this discharge contributes significant AMD to the watershed to the point where the Ohio EPA has designated this reach as a limited resource water.

The creek begins to improve as it heads towards the Ohio River, but soon receives discharge from Hewett Fork. Hewett Fork is a long stream traveling out of Athens County through Zaleski State Forest and reaching Raccoon Creek in Vinton County near the Moonville Tunnel. Most of the AMD problems in this subwatershed are located in the Carbondale area, Trace Run on State Route 56 and upstream of Carbondale in an area of reclaimed strip mines near Conneaut. Downstream of Hewett Fork, Raccoon Creek begins to improve again until it receives the discharge of Pierce Run near Radcliff in Vinton County. Pierce Run is highly impacted by deep mine discharges, gob piles, and

current mining that changes the flow of groundwater and makes the stream harder to monitor. Pierce Run has been known to drop the pH in Raccoon Creek by one standard unit. Along this reach the stream travels through Hawk Station (HS) where abandoned strip mines reach the bank of the creek. Deep mine discharges can be found flowing from steep hillsides within 50 feet of the stream.

As the stream travels toward Gallia County it again begins to improve. This stretch is the recipient of the largest tributary to the main stem, Little Raccoon Creek. Little Raccoon suffers severe AMD degradation in the middle portion of its drainage, but is largely a positive addition to the main stem.

In addition to water chemistry testing, biological sampling is conducted in the watershed. Long-term water quality monitoring sampling plans are developed with each AMDAT plan, which includes selecting biology sites throughout portions of the watershed. Samples collected periodically at these sites provide water chemistry data that is crucial in prioritizing AMD restoration efforts.

Setting targets and load calculations

Based on the work completed for the Raccoon Creek Headwaters AMDAT plan and the OEPA TMDL, a number of projects have been defined to bring the impaired stream segments back into attainment of warmwater habitat. The TMDL team developed a model that calculated net alkalinity as a surrogate for pH, which cannot be modeled. A net alkalinity target of 20 mg/l has been set. Stream segments that meet this target at the point of evaluation should then also have other listed parameters (metals and pH, for example) meeting standards and allowing it to attain warmwater habitat—pH 6.5 – 9.0, net alkalinity 20 mg/l, iron 1000 ug/l, aluminum 750 ug/l, manganese 2000 ug/l, and total dissolved solids 1,500,000 ug/l. This model allows the target to serve as a goal for both pH and metals as causes of impairment on the 303(d) list. This method assures that the standard for pH is met when the acid concentration reduction or net alkalinity target is met.

Figure 5 below is adapted from the TMDL completed in 2002. The deviation from target states how much change in net alkaline concentration must occur to meet the target level. According to the TMDL in Appendix F, because concentration is used in the

model rather than load, the pollutant load was not converted to a commonly measured value of pounds per day or kilograms per day in the TMDL. The load is calculated for each end of reach stream segment. The results are as follows: in the East Branch of Raccoon Creek the load must be reduced by 275, in the West Branch of Raccoon Creek by 37, in the Middle Section to Brushy Creek by 48, in Brushy Creek by 29, in the Middle Section to Lake Hope by 31, in Hewett Fork by 116, and in the Middle section to Bolin Mills by 242. These values can be converted into any common weight value. It is not easy to relate the difference in mainstem sections with those of tributaries because the rate of flow varies so greatly. A large value of load can relate to a small concentration change in a mainstem section or work the opposite way in a tributary.

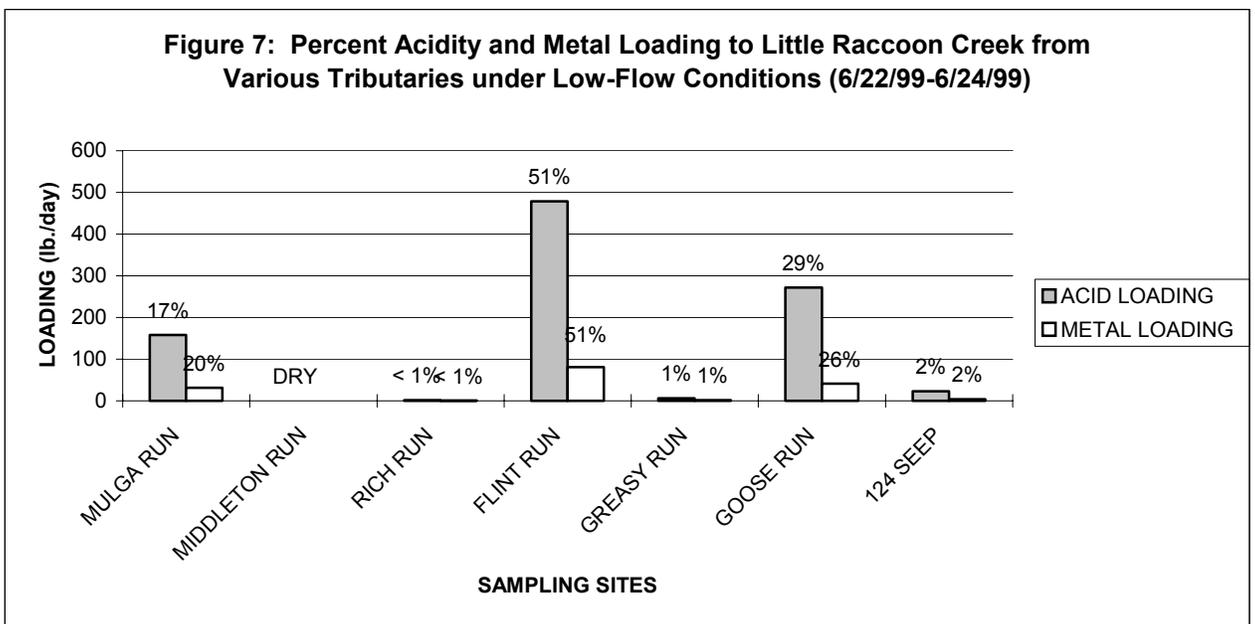
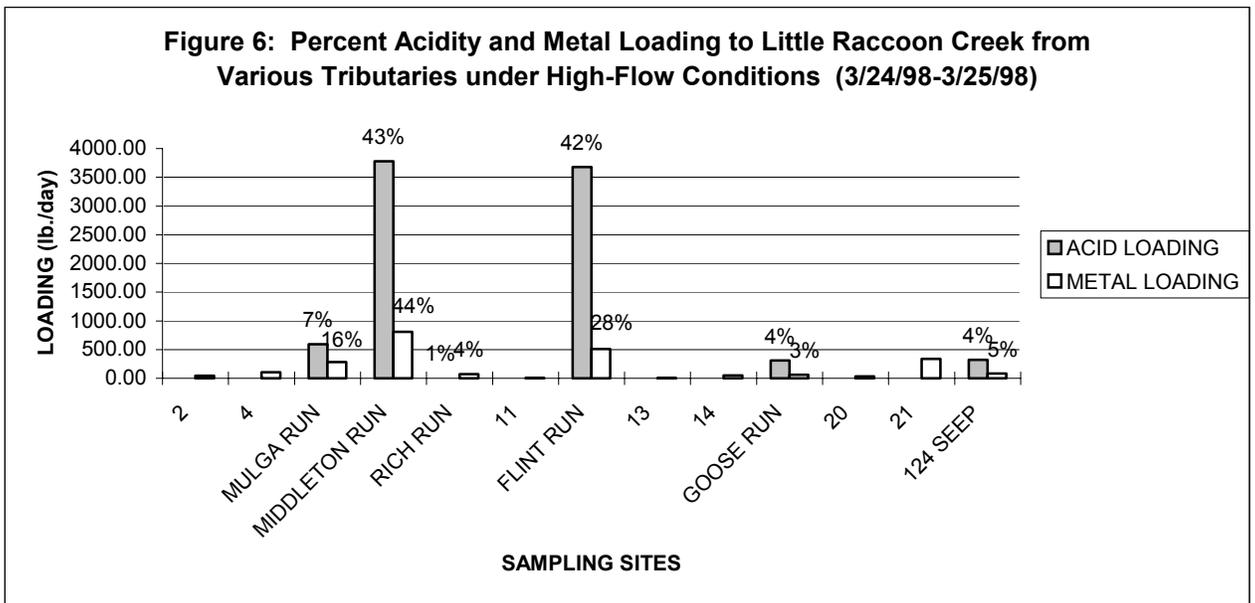
Figure 5- Segment End Net Alkalinity Target Deviation under Existing Conditions

| Net Alkalinity | | | | |
|-----------------------------|---------------------|-------------------------|---------------|------------------------------|
| STREAM SEGMENT | Existing Conditions | | TARGET (mg/l) | DEVIATION FROM TARGET (mg/l) |
| | | CUMULATIVE CONC. (mg/l) | | |
| EAST BRANCH RACCOON CREEK | reach end | -59.0 | 20 | -79.0 |
| WEST BRANCH RACCOON CREEK | reach end | -20.2 | 20 | -40.2 |
| MIDDLE SECTION BRUSHY CREEK | reach end | -6.1 | 20 | -26.1 |
| BRUSHY CREEK | reach end | -13.2 | 20 | -33.2 |
| MIDDLE SECTION LAKE HOPE | reach end | 12.0 | 20 | -8.0 |
| HEWETT FORK | reach end | -33.0 | 20 | -53.0 |
| MIDDLE SECTION BOLINS MILLS | reach end | -9.5 | 20 | -29.5 |

In the Little Raccoon Creek subwatershed 12 tributaries were studied as part of the AMDAT plan completed by Ohio University in 2000. Of the 12 tributaries studied,

six contribute 99% of the total acidity to Little Raccoon Creek, which varies from 8700 lbs/day during high flow (March, 1998) to 1000 lbs/day during low flow (June, 1999). These six priority subwatersheds show elevated levels of acidity, conductivity, total dissolved solids (TDS) and metals, and low levels of pH and alkalinity, during both high- and low flow periods. The six priority subwatersheds are all located in northeastern Jackson County, where coal mining was most active. Under high-flow conditions the heavy acidity loading tributaries are Middleton Run (43%), Flint Run (42%), Mulga Run (7%), Goose Run (4%) and the 124 Seep (4%) (Figure 6). Under low-flow conditions, the total loading is much less, and the tributaries play different roles in the total: Flint Run (51%), Goose Run (29%), Mulga Run (17%), the 124 Seep (2%), and Greasy Run (1%) (Figure 7). The remaining <1% of the acidity load comes from Rich Run during low flow. While the relative role of tributaries under different conditions varies (e.g., Middleton Run is the heaviest loader under high-flow conditions, but contributes a negligible amount under low-flow conditions), Flint Run is consistently a heavy source of acidity, and ranks as the top-priority source.

The model used to calculate load reductions in the Upper Raccoon Creek has not been used in Little Raccoon Creek; however, the goal for AMD load reduction here is simply to reduce the acidity load in each stream by the percent contribution listed above. The same targets developed by the TMDL team for the Upper Raccoon Creek apply to the Little Raccoon Creek subwatershed.



Erosion and Sedimentation

Erosion is the process in which soil particles loosen and are carried away by water or wind. The process transfers topsoil to the stream, reducing water quality, harming aquatic life, and destabilizing hillsides and riparian zones. Erosion generally occurs in three phases: the detachment of soil particles from the soil, the transport of the particles

by erosive agents, and the deposition of the soil when there is not enough energy to suspend the particles (Morgan 1986).

Sedimentation is the accumulation of soil in the streambed, which usually occurs where the water current has slowed and cannot suspend soil particles. This accumulation reduces water clarity and can alter aquatic habitat that is essential for fish and macroinvertebrates.

According to the U.S. Geological Survey report Chemical Quality, Benthic Organisms, and Sedimentation in Streams Draining Coal-Mine Lands in Raccoon Creek Basin by Karen Wilson (1984) the range of sediment yield that is typical for a Southeastern Ohio stream is 100 to 200 tons per square mile per year. In Raccoon Creek the U.S. Geological Survey collected sediment data from 1946 to 1970 and from October 1984 through September 1985. The average sediment yield at three sites on Raccoon Creek ranged from 70.7 to 41.4 tons per square mile. Wilson concluded that these yields indicate that excessive sedimentation from past coal mining processes was not a large-scale problem in the basin.

More recently the Ohio EPA has identified siltation on the 305b list, 303 d list and in the 1995 Raccoon Creek Basin Study as a significant problem ranging from high to moderate degradation of the creek with the main sources of impairment ranging from abandoned coal mines to removal of riparian habitat. Ohio EPA's TMDL for the Upper Reaches of Raccoon Creek (2002) cites siltation problems in the following stream segments: Sandy Run, Lake Hope, Honey Fork, Wheelabout Creek, Elk Fork, Meadow Run, Opposum Run, Strongs Run, Raccoon Creek (from Flatlick Run to Little Raccoon Creek) and Williams Run. The TMDL for the upper reaches did not research problems related to siltation; rather the focus was on streams impacted by acid mine drainage.

A current study being conducted by the Center for Applied Biocriteria and Bioassessment, which focuses on "Using the Qualitative Habitat Evaluation Index (QHEI) to derive TMDL targets for sediment impairment in Southeast Ohio" suggests that gross erosion rates are not good predictors of ecological health. Southeast Ohio, with some of the greatest erosion rates, also has streams with higher gradients, in addition to natural stream habitats, which can often assimilate or export fine sediments (Rankin 2002). This study suggests using subcomponents of the QHEI to create restoration targets

for sediment, such as substrate conditions and habitat quality. There is a significant relationship between the Index of Biotic Integrity (fish) and the overall QHEI score as well as components of the QHEI. The study suggests setting the following restoration targets for streams in the Western Allegheny Plateau that are impacted by sediment:

QHEI Substrate Metric Endpoint for WWH streams: 13-14

QHEI Embeddedness Measure: Low-None

In addition to the QHEI subcomponent targets listed above, Figure 8 below details overall QHEI, ICI and IBI scores by use designation. For Raccoon Creek the warmwater habitat or WWH scores represent the benchmarks for restoration that this plan hopes to achieve.

Figure 8

Ecoregion Biocriteria: Western Allegheny Plateau (WAP)(OEPA, 1997)

| | EWH | WWH | MWH | LRW-AMD |
|-------------------------------------|------------|------------|------------|----------------|
| QHEI | 75 | 60 | 45 | ? |
| ICI | 46 | 36 | 30 | 8 |
| IBI- wading & headwaters | 50 | 44 | 24 | 18 |

Figure 9 is an abridged version of the Aquatic Life Use Attainment Status table from Ohio EPA’s 2002 TMDL. Two additional columns have been added to reflect the QHEI substrate and embeddedness subcomponent information for each stream segment. None of the stream segments meet the suggested substrate or embeddedness score targets mentioned above, except for Honey Fork. In the case of Honey Fork the IBI score is low and the ICI score is fair indicating that some other source of impairment is affecting the water quality and biological health of the stream. Figure 10 offers a qualitative analysis of the problem that is potentially affecting Honey Fork.

Figure 9
Aquatic Life Use Attainment Status for Streams Impaired by Sediment 1996-2000⁴

| Stream | IBI | ICI | QHEI | Attainment Status | Substrate Score | Embeddedness Score |
|--|-------|-------|---------|-------------------|---------------------|---------------------|
| Honey Fork | 30 | Fair | 76 | Partial | 16 | Little |
| Wheelabout Creek | 28 | Good | 67 | Partial | 10 | Moderate |
| Sandy Run | 18 | NA | 56.5 | Non | 11 | Little |
| Lake Hope | --- | --- | --- | Partial | --- | --- |
| Elk Fork (0.1-18.6 RM) | 36-44 | 36-54 | 54-75 | Partial | 5.5-16 ⁵ | Little to Extensive |
| Meadow Run | --- | --- | 51.5-56 | Non | 2-7.5 | Extensive |
| Opossum Run | 42 | Fair | 64 | Partial | 10 | Extensive |
| Strong's Run | 28 | -- | 64.5 | Partial | 12 | Moderate |
| Williams Run | --- | --- | 55.5 | Partial | 9 | Moderate |
| Raccoon Creek (Flatlick Run to Little Raccoon) | 41 | 38 | 47 | Partial | 6 | Extensive |

Of the ten stream segments mentioned above, a qualitative analysis of Honey Fork and Wheelabout Creek was done by Raccoon Creek partners. Figure 10 summarizes the findings.

⁴ See Appendix H for the complete Aquatic Life Use Attainment Status for Impaired Streams Table in the Ohio EPA TMDL report.

⁵ This QHEI information is from 1995. The range of substrate scores represents several evaluations done along the stream from river mile 0.1 – 18.6.

Figure 10 – Qualitative Assessment of Sediment Problem

| Site/Location | Comment |
|---|--|
| Wheelabout Creek –Most of the creek is located in Zaleski State Forest. | Most of the stream from its headwaters has very good forest cover. No sources of sediment could be identified. As the stream approaches Raccoon Creek the valley broadens, but there is still excellent forest cover. At this point it is noted that a serious sediment problem exists; however no sources have been identified. Sediment sample was examined for coal fines, but this did not seem to be the contributing factor in the sediment. |
| Honey Fork- Along Orland Flat Road | Most of Honey Fork is lined with a thin stretch of trees and the rest of the flood plain consists of a hay field. One horse pasture along the creek was noted, however the stream bank seemed to be intact. Downstream cattle accessing the creek were noted. The banks were heavily trampled—not sure at this point how many access points there are for the cattle. |

Turbidity and Transparency testing

Turbidity is a measure of water clarity and how much the material suspended in water decreases the passage of light through the water. Transparency is a measure of light scattering and absorption. Higher turbidity levels increase water temperatures because suspended particles absorb more heat. This can cause significant problems for stream life because the concentration of dissolved oxygen is reduced. As particles settle, they can blanket the stream bottom, which can harm fish eggs and macroinvertebrates. Sources of suspended materials can include sediment runoff from farm fields and abandoned mine lands in the Raccoon Creek watershed.

In the winter of 2002 Raccoon Creek partners began to analyze the transparency of the stream at 30 sites in the headwaters of Raccoon Creek and in the sub-basin of Little Raccoon Creek. These sites cover the general areas where the 10 impaired stream segments are located. The turbidity tube is being calibrated to measure turbidity as well as transparency with the hope that a correlation between the two will be found as this study continues. Testing of the stream will be on-going, as it may take several samples at high and low flows, and before and after heavy rain events to determine the real problem areas. Figure 11 offers a sample of transparency results thus far in the watershed.

Figure 11
Transparency Tube Readings

| Little Raccoon Creek Sites | Transparency (cm) | Headwaters Sites | Transparency (cm) |
|------------------------------------|--------------------------|---------------------------|--------------------------|
| LRC below Lake Rupert | 120+ | RCH @ SR 328 | 95 |
| LRC below Lake Alma | 83.61 | RCH @ Minnie White Bridge | 120+ |
| Meadow Run (below Pillsbury plant) | 10.00 | RCH @ Mitchell Hollow | 120+ |
| LRC @ US 32 | 42.26 | RCH @ Creek Road Bridge | 120+ |
| LRC @ SR 124 | 38.80 | RCH @ Hope School | 120+ |
| LRC @ Buckeye Furnace | 49.93 | RCH @ below Moonville | 120+ |
| LRC @ Keystone Furnace | 57.90 | RCH @ SR 356 Bridge | 120+ |
| LRC @ Confluence | 52.40 | | |

In Figure 11 readings at 120 cm means high visibility and low turbidity. Zero centimeters means no visibility and high turbidity. The transparency value between Lake Alma and US 32 at Meadow Run was 10 cm, which reflects extremely degraded conditions. This site is below the Pillsbury Plant, which is currently eliminating its lagoon and discharging sludge into Little Raccoon Creek. The plant has an NPDES permit and is currently working with Ohio EPA to resolve this issue.

The sampling that has taken place in the Raccoon Creek Headwaters for the most part has shown very good results. A transparency reading at Moonville tunnel after a rainstorm, which increased the creek flow to 1700 cfs, was 17.13 cm, which is very poor. However, the next reading at a lower flow was back to 120+ cm, which reflects excellent conditions. It is important to note at this second reading that the transparency was excellent, but the field crew did note that the stream bottom was coated with a thick blanket of silt and metals. The use of the turbidity and transparency tube will continue so that more data can be collected, enabling the Raccoon Creek partners to identify the problems areas affected by sediment.

Municipal Point Sources and Household Sewage Systems

The presence of untreated or poorly treated sewage in surface or groundwater can pose significant risks to both humans and the environment. Raw sewage contains many pathogens that are dangerous to public health. People who come into contact with contaminated water could contract illnesses such as typhoid, tuberculosis, cholera, hepatitis, tetanus, dysentery, and gastroenteritis.

Poor sewage disposal practices—in the most extreme cases, a pipe that discharges waste directly into a water body—can significantly damage the aquatic ecology. The high levels of nutrients in sewage can increase the amount of algae present in the water. Rapid increases of algae colonies, or “blooms,” can significantly decrease the amount of oxygen in the water, making the stream inhospitable to other aerobic (oxygen-dependent) organisms. Such an event is often referred to as a “fish kill” and is commonly associated with sewage system failures and other episodes of contamination.

A permitting system helps delegate responsibility for installing and inspecting wastewater treatment systems. Permits for systems serving single-family homes or two- or three-family dwellings are under the jurisdiction of the county health departments. For systems serving more than two homes or a dwelling unit with four or more families, the EPA is the responsible regulatory agency.

Municipal Point Sources

Only a few communities in the Raccoon Creek watershed have municipal sewage treatment facilities. The towns of McArthur, Rio Grande and Wellston are sewered and have their own wastewater treatment plants. Ohio EPA’s 305b Report lists Meadow Run and Little Raccoon Creek as impaired by wastewater from municipal point sources with the cause of impairment listed as organic enrichment/ dissolved oxygen (see Appendix J for a listing of NPDES permits).

Household Sewage Systems

The Ohio EPA has not identified household sewage systems or failing on-lot septic systems as a source of impairment in Raccoon Creek; however, it was ranked very

high as a problem through public meetings and interviews with local health department officials. Please see Appendix I for a transcript of interviews with county health departments. Based on the fact that the watershed is primarily served by private systems, we have included restoration goals in the Watershed Issues and Action Strategies section related to household on-lot sewage problems. Private septic systems typically are environmentally sound, as long as they function properly and are maintained. Many systems in the watershed are not, leaving untreated sewage to discharge into Raccoon Creek and other waterways. In addition, inadequate funding for monitoring and staffing leaves county health professionals responding to emergency complaints, rather than proactively checking the functioning of on-site systems.

Figure 12 offers a breakdown of sewerred communities, those with septic or cesspool, and those using other means of disposal in the watershed. The shaded rows represent areas completely contained within the watershed, and the rows in bold represent areas that are partially contained in the watershed. Looking at the numbers of households with septic or cesspool that are completely contained in the watershed, there are approximately 3,380 households in this category. Based on the estimates made by county health officials during personal interviews, approximately half of these systems or 619 have failed or are in need of maintenance except for Vinton County, where health department officials have estimated 80% or 2,186 systems may be failing or in need of maintenance.

Figure 12
Wastewater Treatment Status in the Watershed, 1990

| | Sewered | | Septic/Cesspool | | Other | |
|---|---------|--------|-----------------|--------|-------|-----|
| | % | # | % | # | % | # |
| <i>Athens County Total</i> | 47.80% | 10,384 | 48.80% | 10,614 | 3.40% | 739 |
| Remainder of Lee Township | 9.9% | 57 | 87.7% | 506 | 2.4% | 14 |
| Waterloo Township | 7.3% | 69 | 83.8% | 794 | 9.0% | 85 |
| Remainder of York Township | 7.4% | 49 | 85.6% | 565 | | |
| <i>Gallia County Total</i> | 30.10% | 3,778 | 66.50% | 8,359 | 3.40% | 427 |
| Clay township | 4.7% | 36 | 91.4 | 705 | 3.9% | 30 |
| Green township | 37.8% | 786 | 60.8% | 1264 | 1.4% | 29 |
| Remainder of Guyan Township | 0.0% | 0 | 78.1% | 207 | 21.9% | 58 |
| Harrison Township | 3.1% | 12 | 86.4% | 331 | 10.4% | 40 |
| Remainder of Huntington Township | 0.6% | 3 | 89.0% | 437 | 10.4% | 51 |

| | | | | | | |
|--|---------------|------------------|---------------|----------------|--------------|---------------|
| Vinton Village | 7.2% | 10 | 92.8% | 128 | 0.0% | 0 |
| Morgan Township | 0.0% | 0 | 97.6% | 439 | 2.4% | 11 |
| Perry Township | 1.7% | 7 | 93.6% | 383 | 4.6% | 19 |
| Reminder of Raccoon Township | 5.6% | 27 | 91.6% | 438 | 2.7% | 13 |
| Centerville Village | 15.5% | 9 | 81.0% | 47 | 3.4% | 2 |
| Rio Grande Village | 96.6% | 288 | 3.4% | 10 | 0.0% | 0 |
| Springfield Township | 12.8% | 156 | 85.1% | 1037 | 2.1% | 25 |
| Walnut Township | 0.0% | 0 | 97.2% | 375 | 2.8% | 11 |
| <i>Hocking County Total</i> | 35.70% | 3,744 | 60.10% | 6,302 | 4.20% | 435 |
| Starr Township | 0.0% | 0 | 91.0% | 487 | 9.0% | 48 |
| Washington Township | 0.0% | 0 | 87.8% | 338 | 12.2% | 47 |
| <i>Jackson County Total</i> | 51.60% | 6,428 | 44.20% | 5,499 | 4.20% | 525 |
| Bloomfield Township | 1.6% | 5 | 92.3% | 287 | 6.1% | 19 |
| Remainder of Coal Township | 66.4% | 144 | 30.9% | 67 | 2.8% | 6 |
| Franklin Township | 0.0% | 0 | 92.3% | 519 | 7.7% | 43 |
| Remainder of Lick Township | 44.4% | 424 | 49.6% | 474 | 6.0% | 57 |
| Milton Township | 10.6% | 45 | 80.5% | 342 | 8.9% | 38 |
| Washington Township | 4.9% | 13 | 84.2% | 224 | 10.9% | 29 |
| Wellston | 88.80% | 2,224 | 10.90% | 274 | 0.30% | 7 |
| <i>Meigs County Total</i> | 32.10% | 3,145 | 62.20% | 6,093 | 5.70% | 557 |
| Columbia Township | 0.0% | 0 | 89.3% | 301 | 10.7% | 36 |
| Salem Township | 2.3% | 10 | 87.0% | 376 | 10.6% | 46 |
| <i>Vinton County Total</i> | 19.20% | 933 | 71.60% | 3,479 | 9.10% | 444 |
| Brown Township | 0.0% | 0 | 83.5% | 96 | 16.5% | 19 |
| Remainder of Clinton Township | 2.1% | 7 | 77.6% | 260 | 20.3% | 68 |
| Hamden Village | 2.5% | 9 | 94.1% | 334 | 3.4% | 12 |
| Remainder of Elk Township | 42.2% | 205 | 49.4% | 240 | 8.4% | 41 |
| McArthur Village | 95.40% | 671 | 3.80% | 27 | 0.70% | 5 |
| Jackson Township | 0.0% | 0 | 89.8% | 238 | 10.2% | 27 |
| Knox Township | 0.0% | 0 | 97.2% | 205 | 2.8% | 6 |
| Remainder of Madison Township | 6.7% | 12 | 74.9% | 134 | 18.4% | 33 |
| Zaleski Village | 1.4% | 2 | 97.2% | 139 | | |
| Richland Township | 2.9% | 16 | 91.9% | 508 | 5.2% | 29 |
| Swan Township | 1.4% | 4 | 85.8% | 247 | 12.8% | 37 |
| Vinton Township | 2.4% | 5 | 72.5% | 153 | 25.1% | 53 |
| Remainder of Wilkesville Township | 0.7% | 2 | 84.1% | 227 | 15.2% | 41 |
| Wilkesville | 0.00% | 0 | 100.00% | 85 | 0.00% | 0 |
| <i>Ohio</i> | 77.60% | 3,392,785 | 21.50% | 940,943 | 0.90% | 38,217 |

Source: U.S. Bureau of the Census, 1990

Entries in bold are partially located in the watershed. Shaded entries are completely located in the watershed.

Ohio EPA's Southeast District office has developed a list of priority villages that are unsewered and in need of treatment facilities. These include Hamden, Zaleski and Vinton in the watershed. Proposed projects in these villages will help reduce the number

of failing on-lot septic systems. Figure 13 reflects the number of people to be served in these villages and the status of the projects.

**Figure 13
Proposed Projects in OEPA Priority Villages**

| OEPA Priority Village | Number of Households to be Served | Status of Project |
|------------------------------|--|--|
| Hamden | 450 | Hamden will be connecting to the Wastewater treatment plant in Wellston. Estimated start of the project is in 2003. |
| Zaleski | 210 | The County Commissioners have authorized \$10,000 for a preliminary engineering study. |
| Vinton | 160 | Seventy-six percent grant funding secured for the project. Project will be bid out in the fall of 2003. OEPA has approved a Biolac lagoon/ mechanical combination for the village. |

Natural Gas and Oil Byproducts

In addition to effluent from households and treatment facilities, byproducts from gas and oil drilling also impair portions of the watershed. Ohio EPA’s 305b Report lists oil and grease as causes of impairment to four Raccoon Creek tributaries, Russell Run, Flat Run, Opposum Run and Long Run. Brine, underground trapped sea water, is circulated to the earth’s surface during well drilling. Although most of the brine, once separated from the fuel, is re-injected into the ground, inspectors must make sure the saline does not seep into the wells and contaminate the groundwater. The metals and chlorides in brine hinder vegetation growth and are difficult to remove from the soil once contaminated.

Industrial Point Sources

According to Ohio EPA’s 305b Report and Raccoon Creek’s Basin study in 1995, industrial point sources have impaired three Raccoon Creek tributaries. The Austin Powder Corp. has contributed unionized ammonia, nitrate, and nitrite to the Austin

Powder Tributary to Elk Fork. The Pillsbury/General Mills plant in Wellston has discharged unionized ammonia to Meadow Run and also has impaired Little Raccoon Creek.

BIOLOGICAL HEALTH

About 166 fish species call Ohio home, and at least 148 of these are found in inland waters. Twenty-four species of fish are listed as endangered, with at least 18 of these found in inland waters. An annual average of more than 9.2 million angler hours are spent fishing inland waters (ODNR 2001).

But aquatic species serve another purpose in the Raccoon Creek watershed aside from recreation; they are gauges in determining stream water quality. Macroinvertebrates, which include insects, molluscs and crustaceans, are the group most frequently used in the biological monitoring of water quality. Assessment of fish and macroinvertebrate populations within polluted streams can provide comprehensive data on the health of a watershed and offer water quality information not readily detected by chemical means. It is the biology of the stream that ultimately reveals the water's true health, both before and after restoration efforts.

Field researchers look for "indicator species," which include macroinvertebrates and fish that are either sensitive to specific types of pollution (intolerant) or can persist despite pollution (tolerant). Those that are sensitive to the effects of acid mine drainage (AMD) pollution cannot exist in waters with high metals or acidity caused by AMD. The presence of these species indicates a relatively low impact of acid mine drainage upon the stream. The black redhorse and the mimic shiner fish provide two examples of species intolerant to pollution. The three orders of aquatic insects that are most often used as sensitive indicators of pollution include the Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies), which are commonly referred together as the "EPT taxa." These intolerant fish and macroinvertebrates species are found in very low populations along the Raccoon Creek basin, indicating poor water quality in the creek's main stem (OEPA 2001).

At the other extreme are species such as the alderfly larvae and midges, which can tolerate waters with higher acid mine drainage impact, such as those found in Little

Raccoon Creek or the headwaters. The following list provides a general guide to common trends of macroinvertebrate distribution found in streams of differing water quality.

Macroinvertebrate Indicators of Good Water Quality (Pollution Sensitive)

Plecoptera (stoneflies), Trichoptera (caddisflies), Ephemeroptera (mayflies), riffle beetle adult, Mollusca – Gastropoda (gilled snail), planarian, water penny, hellgrammite

Macroinvertebrate Indicators of Moderate Water Quality

Decapoda (crayfish), Odonata (damselflies & dragonflies), Megaloptera (alderfly), crane fly, riffle beetle larva, sowbug, watersnipe fly, scud, whirligig beetle larva, fishfly, Mollusca – Pelecypoda (clams, mussels)

Macroinvertebrate Indicators of Poor Water Quality (Pollution Tolerant)

Diptera (bloodworms or midge fly larvae, black fly larvae), some leeches, alderfly larvae, crane fly larvae, sludgeworms, aquatic worm, lunged snail⁶

As pollution increases, the overall diversity and abundance of insects and fish would decrease. The macroinvertebrates that are found within impacted waters would shift from sensitive taxa to those more tolerant of pollution. Mayflies, stoneflies, crustaceans and molluscs would become rare or not present at all, while alderflies and chironomids would dominate.

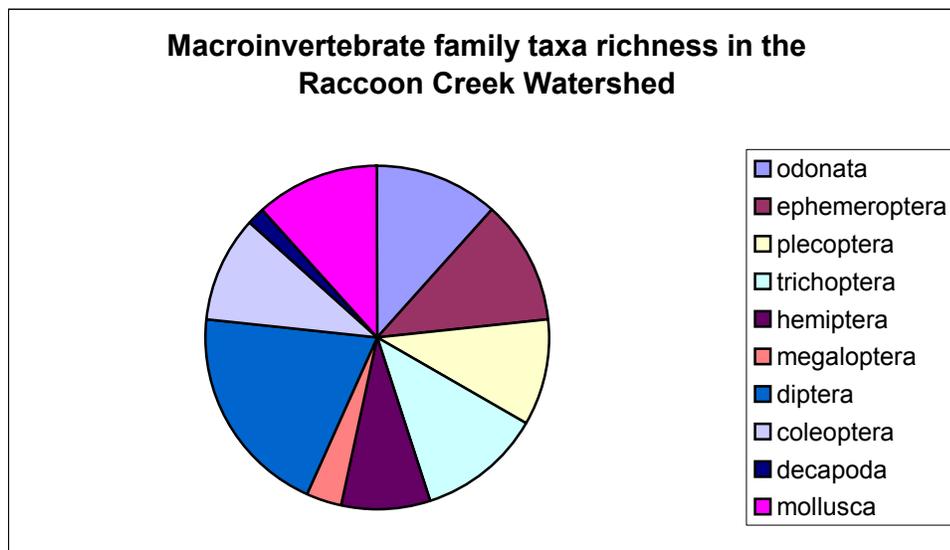
As part of the Biological and Water Quality Study of the Raccoon Creek Basin (1995), a total of 269 stream miles were assessed within the Raccoon Creek mainstem, Elk Fork, Puncheon Fork, Little Raccoon Creek, Meadow Run and the various tributaries associated with these areas. Additional stream miles located in the upper Raccoon Creek basin were assessed as part of the 1999-2000 Total Maximum Daily Load (TMDL) study. In the 1995 basin study, 31.5 percent of the stream miles assessed were in full attainment of the specified warmwater habitat or limited resource water-acid mine drainage designations. The remaining miles assessed were in either partial (52 percent) or non-attainment (16.5 percent). The 1999-2000 study revealed similar attainment status for the

⁶ Macroinvertebrate tolerance information was summarized from the Pennsylvania Department of the Environment's document, Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania, Chapter 4. <http://www.dep.state.pa.us/dep/deputate/minres/districts/cmdp/chap04.html>

upper basin, where eight out of 12 sites were in non-attainment of their respective use designation status (OEPA 1995, 2001).

A summary of the macroinvertebrate taxa observed in the watershed is found in Figure 14. This chart demonstrates the overall distribution of macroinvertebrates sampled throughout the watershed, where EPT taxa comprise approximately 30 percent of the overall taxa. This percentage would be much lower among impacted sites, particularly those receiving AMD. The single most dominant order found throughout the watershed is Diptera, which is comprised primarily of pollution tolerant species.

Figure 14

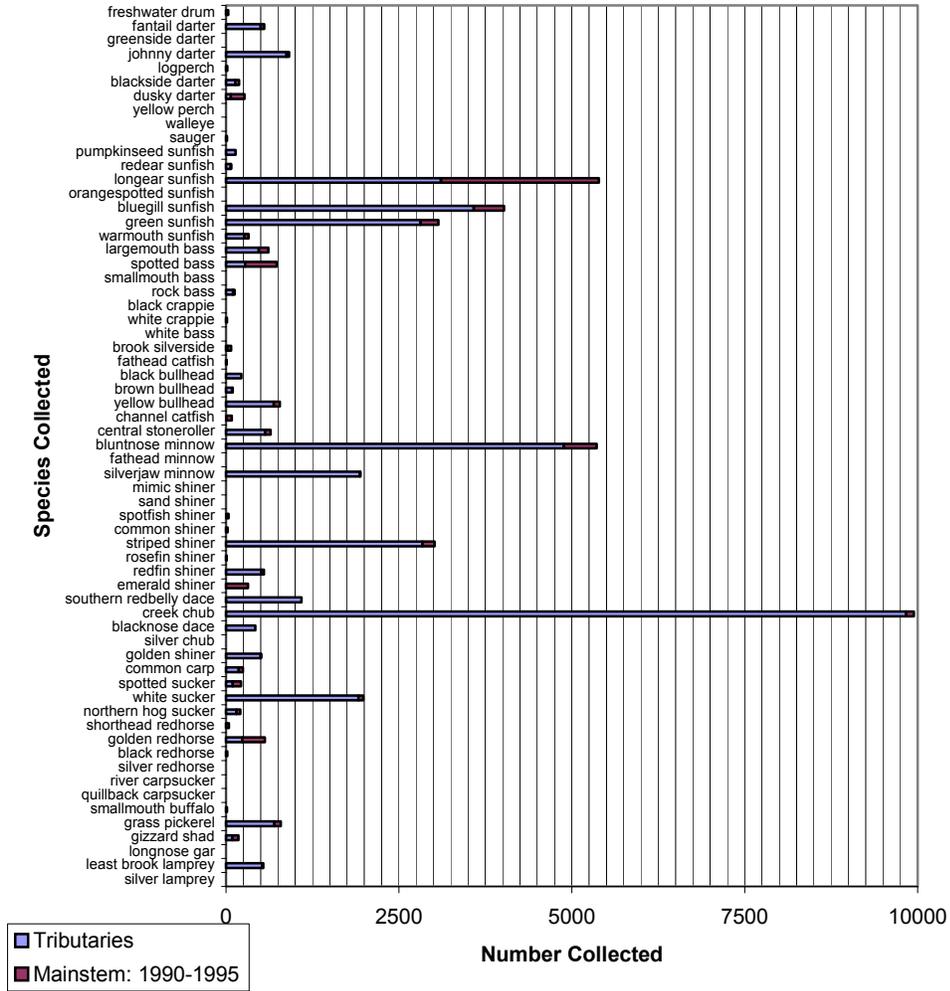


Source: Ohio EPA, Division of Surface Water, Ecological Assessment Section. Raccoon Creek basin fish and macroinvertebrate inventory, unpublished findings from 1981-2000.

A table summarizing the total fish species collected by OEPA from 1981 to 2000 within the Raccoon Creek watershed is seen in Figure 15. The dominant species found throughout the watershed is the pollution tolerant creek chub. The other dominating species such as the longear sunfish, bluegill sunfish, green sunfish, bluntnose minnow and white sucker are all moderately to very tolerant of pollution. The species found in the smallest numbers are those that are very pollution sensitive, such as the black redhorse and the mimic shiner. See Appendix K for a complete list of fish species in the watershed.

Figure 15

Raccoon Creek Basin: Total Fish Abundance Collected, 1981-2000 (OEPA)



A summary of use designations and biological community performances for specific stream sites in the Raccoon Creek watershed can be found in Appendix F. Overall, the northern part of the watershed, at the headwaters, experiences a poor biological community performance because of acid mine drainage. Middle and lower portions of the watershed, however, range from fair to good in supporting aquatic life.

FORESTS AND PARKS

Of Ohio's 26.1 million acres of land, about 25 million once were covered with forests. By 1940, however, the amount of forested land had shrunk to an all-time low of 1.6 million acres. As a result of numerous environmental initiatives, almost 8 million acres were forested in 1996 or about 30 percent of the state (Griffith et al. 1992).

Ohio has an interesting mix of northern and southern tree species. The state's primary forest type is mixed central hardwoods, with the red maple comprising 12 percent of all species (Palone 1995). Although this is a commercially sold species, it is not as valuable as oak. The red maple is gradually dominating forests because fire, once prevalent with Native Americans, is not a component of our forests in Ohio. Oak species, rather than maple, seem to tolerate fire. Foresters and others are studying ways to re-establish the oak component in our forests (Whyte 2002). Encouraging oak reproduction will benefit many species of wildlife, both game and non-game, which are dependent on oaks for food and shelter.

Other common species in this region include beech, sugar maple, white ash, black locust, black cherry and black walnut. The white pine, hemlock, yellow birch, beech and sugar maple are indicative of a northern forest, while southern species include blackjack oak, Spanish oak, sourwood, and the more rare shortleaf pine, bigleaf magnolia and rhododendron (Ohio State University Extension, Ohio Trees, Bulletin 700-00).

About 120 tree species are native to the state, and southeast Ohio has the greatest number of these species, according to an Ohio Department of Natural Resources, Division of Forestry study. A total of 87 species were found growing in a ten-county area of southeast Ohio, including the more uncommon blackjack oak and Spanish oak (Ohio State University Extension, Ohio Trees, bulletin 700-00).

Management of forests in the state comes from a variety of entities, including private citizens and government at the national, state and local levels. The vast majority (93 percent) of state timberland is privately owned. The state owns 4.4 percent of the remaining public timberland, and 2.5 percent lies within the U.S. Forest Service's Wayne National Forest (Palone 1995). Forest land is the primary land use in all six counties containing the Raccoon Creek watershed. This forest land totals 452 square miles or 66

percent of the watershed (Ohio Department of Natural Resources 1994). The majority is owned privately or by the state (See Map 8 in Appendix D for a description of forests, parks, wildlife areas and streams).

Federally Managed Lands

Of the 180,000 acres in Wayne National Forest, about 7,270 acres lie in the watershed (Wayne National Forest 2002). The federal government is a large public landowner in southeast Ohio, and the forest attracts visitors from many surrounding states for fishing, hunting and other recreational activities. Wildlife species that are common in the forest and throughout the watershed include white-tailed deer, turkey, ruffed grouse, gray squirrel, opossum and gray fox.

State Managed Lands

A variety of forests, lakes and wildlife areas within the watershed allow residents diverse opportunities for recreation, hunting or outdoor activities. Zaleski State Forest, covering about 28,000 acres in Vinton and Athens counties, is the second largest state forest in Ohio and contains a 23.5-mile backpack trail, a 50-mile horse trail and a hunting camp. State forests, owned and managed by the Ohio Department of Natural Resources, Division of Forestry, provide multiple public benefits that include being a source of aesthetics, forest products, recreational opportunities, quality streams and diverse wildlife habitats.

The 3,103-acre Lake Hope State Park lies within the Zaleski State Forest and is an example of how tourism can both stimulate the local economy and preserve historic and cultural artifacts. Located in the heart of the Hanging Rock Region, a section of Ohio and Kentucky known for its iron ore, the park's Hope Furnace was a bustling center of activity more than a century ago. Buyers of the resulting iron used the product for many purposes, including ammunition for Union troops in the Civil War (Ohio Department of Natural Resources, Lake Hope). By 1900, many of Ohio's furnaces had shut down, including Hope Furnace. Fuel for furnaces like this consumed much of the forests of

Ohio, as did farming, so many of the trees growing now are relatively young. The foundation and chimney are all that remain of the Hope Furnace today.

The Lake Alma State Park, located one mile northeast of Wellston, contains 219 acres surrounding the 63-acre lake. Visitors can fish, hunt, hike, picnic, swim and camp in the park. Also nearby is Vinton County's 1,298-acre Wellston Wildlife Area, which includes the 325-acre Lake Rupert. Both lakes, impaired by storm sewers, wastewater treatment, agriculture and mining, have been given priority for improvement by the Ohio EPA (Palone 1994).

Another wildlife area in the watershed is the Waterloo Wildlife Area, which holds the Ohio Department of Natural Resources Waterloo Wildlife Research Station. The area, established in 1944, has been used primarily for studying squirrels to determine the duration and intensity of squirrel hunting in the state (Ohio Department of Natural Resources, Waterloo Wildlife Area). The 5,146-acre area is adjacent to Zaleski State Forest in Athens County and is prime ground for turkey and deer hunting.

Gallia County's Tycoon Lake Wildlife Area includes 684 acres and began in 1957 to provide fishing and hunting opportunities. The wildlife area has habitat for both upland and forest game and limited waterfowl hunting. A boat ramp and parking are open to the public.

Threatened, Rare, or Endangered Species

The Wayne National Forest, located on the outskirts of the Raccoon Creek watershed, is habitat to 38 rare species of plants and animals. Forest personnel must take precautions to ensure any development or forestry projects will not further jeopardize these species, which are on lists of either state or federally protected species (Flegel 2002). Examples of these include the bald eagle, river otter and yellow-fringed orchid. Appendix L lists the animal and plant species within the Wayne National Forest that are either federally threatened or endangered. nally sensitive.

Of about 130 endangered species in the state, two have received significant attention in southeast Ohio and in the watershed. The Indiana bat (*Myotis sodalis*) is more commonly found in the northern and western regions of Ohio, but the species has been

seen sparingly in the Wayne National Forest. The Indiana bat is one of 13 bat species in Ohio and is listed on the state and federal endangered species list. According to the Ohio Department of Natural Resources, these bats migrate south—likely to Kentucky—to hibernate for winter, and their hibernation clusters can have up to 300 bats per square foot (Ohio Department of Natural Resources, Indiana bat 2001). Nearly half of this species' population returns to seven caves in Kentucky for the winter, making any disturbance to these caves—whether natural, such as flooding, or as a result of human influence—a significant threat for the population.

The timber rattlesnake (*Crotalus horridus horridus*) is on the state's endangered species list and is designated as endangered or threatened in 17 other states. The U.S. Fish and Wildlife Service is considering it for special designation (Ohio Department of Natural Resources, Timber rattlesnake 2001). This species is one of two native rattlesnakes in Ohio and is one of three poisonous snakes in the state, though the species is not aggressive unless provoked. Because of their long life span, potentially longer than 20 years, females do not breed until between five and 11 years of age. This makes their reproductive rate low, especially since only two or three of their eight young survive the first year. In the early 1800s, the species was found in 24 counties; now they only live in eight. An inhabitant of the MeadWestvaco Experimental Forest, the elusive timber rattlesnake is a topic of scientific research and educational tours.

Wildlife Management

The counties included in the Raccoon Creek watershed have some of the highest white-tailed deer harvest rates in the state. Athens County came in the highest of the six Raccoon Creek counties in the 2000-2001 hunting season with 4,649 deer harvested, while Vinton County had the fewest taken at 3,643 (Ohio Department of Natural Resources, Deer Harvest). The average harvest for these counties remained constant between the 2000-2001 season and the 1999-2000 season.

Deer, wild turkey and ruffed grouse thrive in woodlands with early successional habitat. Although reclaimed mine land is prevalent in the watershed, it is often not a suitable habitat for these species. Toxins in the soil that inhibit tree growth and the soil compaction common with heavy equipment use slow the land's return to its original state.

Hunting is a popular sport, both for residents of the watershed and for those who visit from urban areas. Deer hunting typically begins with archery season in early October. Archery season extends through late January, while gun season runs from late November to late December. The fall portion of turkey season begins in mid-October and continues until late October; the spring season starts again in late April and runs until mid-May. Rabbit season runs for about a month from early November to early December. Other game species in the watershed include doves and various waterfowl.

Privately Managed Land

Owned by MeadWestvaco and co-managed by the U.S. Forest Service, the Vinton Furnace Experimental Forest devotes 1,200 of its 16,000 acres to research on the forest ecosystem and timber harvesting methods. This forest, located about 10 miles south of McArthur, has been a center of research conducted by universities and state and federal agencies since 1952. Demonstrations about forest management practices are conducted there in an effort to educate private landowners so they can make informed decisions that promote sustainable forestry. MeadWestvaco personnel, along with instructors from Hocking College, conduct workshops to certify loggers in best management practices.

Beginning in 2002, through its new Sustainable Forestry Initiative, MeadWestvaco is making biodiversity a priority. Although many of its practices encourage sustainability, the corporation now will find ways to assess and quantify biodiversity living in its forests. Partnerships with the U.S. Forest Service and The Nature Conservancy will help achieve these goals.

Another large landowner is the Bob Evans Farm in Rio Grande. The original homestead of the restaurant founder, the house is now on the National Register for Historic Places. Visitors travel to the 1,000-acre working farm to recreate and see the craft barn and homestead, once a stagecoach stop and inn. The farm offers canoeing down Raccoon Creek, horseback riding and camping, in addition to touring the grounds. Crops of hay, corn, sorghum, wheat and tobacco are grown on the farm, which also is home to 40 horses and 100 cattle.

There are several other large landowners along Raccoon Creek who farm the land and raise livestock in the southern part of the watershed. Recently two local landowners with land adjacent to the creek have approached the Raccoon Creek partners with an interest in developing local camping sites and canoe liveries along the stream.

SOCIAL RESOURCE INVENTORY

HISTORY OF HUMAN DEVELOPMENT IN THE AREA

Native American Settlement

The first evidence of a human presence in the Raccoon Creek Watershed comes from relics of the Adena Indians. The Adenas dominated the Ohio River Valley for several centuries, from about 1,000 B.C. to 100 A.D. They were known for their artistic skill, creating hundreds of burial mounds and ceremonial earthworks throughout southern Ohio. The Adenas are credited with being the first in this region to cultivate vegetables, even though they were primarily hunters and gatherers (Roseboom and Weisenburger 1986).

The Hopewell Indians followed the Adenas, living in the Ohio River Valley from approximately 150 B.C. to 500 A.D. The Hopewells also constructed burial mounds, using a design that was even more complex than that used by the Adenas. The remains of the Hopewell mounds indicate they established a well-organized community by hunting, gathering, fishing and trading. Their mounds often contained materials imported from great distances, such as fresh water pearls, fossil shark teeth, obsidian, conch shells and hammered copper and gold (Woodward and McDonald 1986).

The Shawnee and Delaware Indians were the next to inhabit this area. The Shawnee Indians had reached the region by 1720, trying to escape enemies. The two united with other tribes to resist the encroaching white settlement; however, in 1795 the Delawares signed the Treaty of Greenville, which obliged the Indians to give up their land in Ohio (Roseboom and Weisenburger 1986).

European Settlement

In 1748, a British company in Virginia formed the Ohio Company to extend the settlements of Virginia westward into the Ohio Valley. Meanwhile, the French also were organizing to move south from Canada into the Ohio Valley. The French acted first, and in 1749 Celeron de Blainville claimed the land for France. But the British conquered the

French through the French and Indian War (1754-1763) and forced them to concede all their North American settlements.

Shortly thereafter, the American Revolution broke out. After nine years of fighting, the Treaty of Paris of 1783 was written and the Americans were granted independence from England. They now owned the Ohio Valley.

In 1787 the Northwest Territory was officially established. The ordinance creating the territory also organized a formal government and outlined the process by which land could be sold to settlers. The Ohio Company of Associates, a group of veterans who were interested in land speculation, purchased 1.5 million acres of land in southeast Ohio (Ferguson 1987). A contract was later signed which gave the Ohio Company the right to obtain land between the Ohio and Scioto rivers. Together these purchases include most of the Raccoon Creek watershed.

In 1803, Ohio was admitted as the 17th state of the United States of America. Shortly thereafter, on April 30, 1803, Gallia County was formed from Washington County and the new county's first settlement, known as Gallipolis, was created. This colony succeeded in being the third permanent settlement in Ohio.

On March 1, 1805, Athens became the second county formed in the Raccoon Creek watershed, also created from Washington County. The first settlers were New Englanders from the Ohio Company who selected Athens County to house the first university in the Northwest Territory—originally Northwestern University, but now known as Ohio University.

Jackson County, known for its abundance of minerals, was organized in March 1816. When Ohio was admitted as a state, Congress had set aside six square miles in what would become Jackson County to be used solely for producing salt (Collins and Webb 1966).

Ross, Athens and Fairfield counties split to create Hocking County on March 1, 1818. Fishing was excellent in the Hocking River, and it provided a lush habitat for bears, deer and beavers. Impressive landforms, including Ash Cave, Rock House, Old Man's Cave and Cedar Falls also are found in the area.

A year later, parts of Athens and Gallia counties combined to establish Meigs County. Settlers found clayey soils and countless deposits of coal in this region. Salt was

also an important mineral in the county, and the first salt well opened in Pomeroy in 1850.

Vinton County, the last county formed in the Raccoon Creek watershed, was not created until March 23, 1850, though people had settled there 50 years earlier. Burrstone had been discovered in the region, and a quarry was built to mine it; several others built subsequent mills and quarries. Coal and iron deposits were found later, which led to furnaces and other development. The area became so prosperous that the inhabitants wanted to establish their own county, so portions of Gallia, Athens, Hocking, Jackson and Ross counties were taken to create Vinton County. The iron ore industry continued to grow, with towns forming around the mines.

Transportation and Economic Growth

Clay, salt, timber, iron ore and coal were all abundant in the Raccoon Creek watershed. But before the area could begin to thrive, transportation was needed to get the resources to a market.

The Ohio River provided the earliest solution to distributing the area's resources. As early as 1806, mines in Meigs County shipped coal down the river on log rafts (Crowell 1995). In 1825, the Ohio legislature recognized the industrial potential of the state and passed the Canal Law to finance the construction of the Miami Canal and the Ohio Canal. Smaller canals, such as the Hocking Canal, also continued to open across the state. But problems soon arose. In addition to the canals needing frequent repairs, areas along the Ohio Canal frequently flooded and caused the canal to intermittently close. In July 1855, newspapers said the canal was in a "deplorable" state, and by 1860 the railroad had put the canal almost entirely out of business. Even when the Ohio Canal finally reached its destination in Portsmouth in 1887, only one boat had passed through (Collins and Webb 1966).

Beginning in the 1840s, railways spread across Ohio, replacing water travel as the primary mode of transportation. The first railway to reach the Raccoon Creek watershed was the Scioto and Hocking Valley Railroad, which began in 1849. In 1854, during the height of iron furnace operations, the rail line arrived at Hamden and connected with a branch of the Marietta and Cincinnati Railroad. In 1856 the main line of the Marietta and

Cincinnati Railroad was completed, which ran from Cincinnati to Athens (Wright 1953). As a result, Zaleski began to expand, establishing itself as a railroad town by the mid-1860s. Large shops were built that supported the town long after its coal and iron industries failed.

The Hocking Valley Mineral Railroad reached Athens County in 1869 and was the first line to reach Hocking County. The Hocking Valley and Baltimore and Ohio Railroad arrived in McArthur on August 17, 1880. Soon afterward, Hamden and McArthur began to prosper and eventually surpassed Zaleski, whose population began to plummet by 1900.

The Scioto and Hocking Valley Railroad became the Ohio and West Virginia Railroad during the late 1870s. The completion had an immediate effect on the already thriving town of McArthur. During its first year, more than 12 million pounds of coal and iron ore were shipped through the town (Collins and Webb 1966).

In 1881, the Ohio and West Virginia Railroad consolidated with the Columbus and Toledo Railroad and Columbus and Hocking Valley Railroad to become the Columbus, Hocking Valley and Toledo Railroad. This new rail ran from Columbus through Lancaster and Athens to Parkersburg. In 1883 the Columbus, Hocking Valley and Toledo Railroad boasted the largest net profit per mile in the state, carrying more than 1 million tons of coal annually—easily exceeding the total amount by boat on the Hocking Canal from 1840 to 1860 (Crowell 1995).

Railroads continued to be the primary way to ship coal until trucks began to dominate in 1975. As early as the 1930s trucks began to play a role in the distribution of Ohio's coal (Crowell 1995). The significance of the role of shipping by trucks slowly increased as interstate highways developed throughout the state.

DEMOGRAPHICS

Population

The Raccoon Creek watershed lies within the 29-county Appalachian region of Ohio. Known for its rolling hills, mineral deposits and recreation, the region also is the least populated in the state. As Figure 16 illustrates, the state population has nearly tripled in the last century, while county populations in the watershed have remained relatively constant.

With the exception of the 2000 Census, Jackson County's highest population occurred in 1900. Hocking County saw a slow decline from 1900 until 2000, while Gallia County has had a nearly constant population count. Population in Athens County had two distinct peaks in 1920 and 1970. Both Meigs and Vinton counties had population jumps between 1970 and 1980, likely because of the opening of the Meigs Mine and employment peaks at the Austin Powder Corporation between 1976 and 1979.⁷

Figure 16
Historical Population Growth

| | Population in 1900 | Population in 1930 | Population in 1970 | Population in 2000 |
|--------------------|--------------------|--------------------|--------------------|--------------------|
| Athens Co. | 38,730 | 44,175 | 54,889 | 62,223 |
| Gallia Co. | 27,918 | 23,050 | 25,239 | 31,069 |
| Hocking Co. | 24,398 | 20,407 | 20,322 | 28,241 |
| Jackson Co. | 34,248 | 25,040 | 27,174 | 36,641 |
| Meigs Co. | 28,620 | 23,961 | 19,799 | 23,072 |
| Vinton Co. | 15,330 | 10,287 | 9,420 | 12,806 |
| Appalachia | 971,844 | 1,075,512 | 1,237,660 | 1,455,313 |
| Ohio | 4,157,545 | 6,646,697 | 10,652,017 | 11,353,140 |

Source: U.S. Bureau of the Census

Educational Attainment

Educational attainment levels in Appalachian Ohio and in the watershed are significantly lower than in other areas in the state (Figure 17). Fewer people in the

⁷ The company began in 1833 and is the longest continually operating corporation in Ohio. Its highest employment was 240 in the late 1970s, though today it employs about 150 (Rupert 2001).

watershed have completed high school or have gone on to higher education. The exception to this is Athens County, influenced by Ohio University, which follows the state pattern and outranks it significantly in the number of residents who complete graduate school.

Figure 17

Educational Attainment for Adults 25 and Older, 2000

| | < 9th | 9-12th | High School Graduate | Some College | Associate's Degree | Bachelor's Degree | Graduate School |
|--------------------|-------|--------|----------------------|--------------|--------------------|-------------------|-----------------|
| Athens Co. | 4.3% | 12.8% | 34.2% | 16.5% | 6.5% | 12.6% | 13.2% |
| Gallia Co. | 9.1% | 17.2% | 41.7% | 15.1% | 5.4% | 7.0% | 4.6% |
| Hocking Co. | 5.5% | 16.6% | 46.2% | 15.6% | 6.4% | 6.1% | 3.6% |
| Jackson Co. | 8.9% | 17.5% | 43.1% | 14.6% | 4.8% | 7.1% | 4.0% |
| Meigs Co. | 8.1% | 18.7% | 46.6% | 13.4% | 5.9% | 4.9% | 2.5% |
| Vinton Co. | 9.0% | 20.3% | 47.6% | 12.5% | 4.6% | 3.9% | 2.2% |
| Appalachia | 6.9% | 14.9% | 43.7% | 16.6% | 5.6% | 7.9% | 4.4% |
| Ohio | 4.6% | 12.5% | 36.1% | 19.9% | 5.9% | 13.7% | 7.5% |

Source: U.S. Bureau of the Census, 2000

Economic Characteristics

The Appalachian region is the most economically depressed section of the state, and that is reflected in the poverty rate of the counties comprising the Raccoon Creek watershed (Figure 18). About 11 percent of all Ohioans live below the poverty rate, but those figures approach, and exceed 20 percent in Athens County. There was a substantial drop in the number of individuals living in poverty in Meigs County from 26 percent in 1989 to 19.8 percent in 1999. Other counties also experienced a decline in the number living in poverty including, Vinton, Gallia and Jackson.

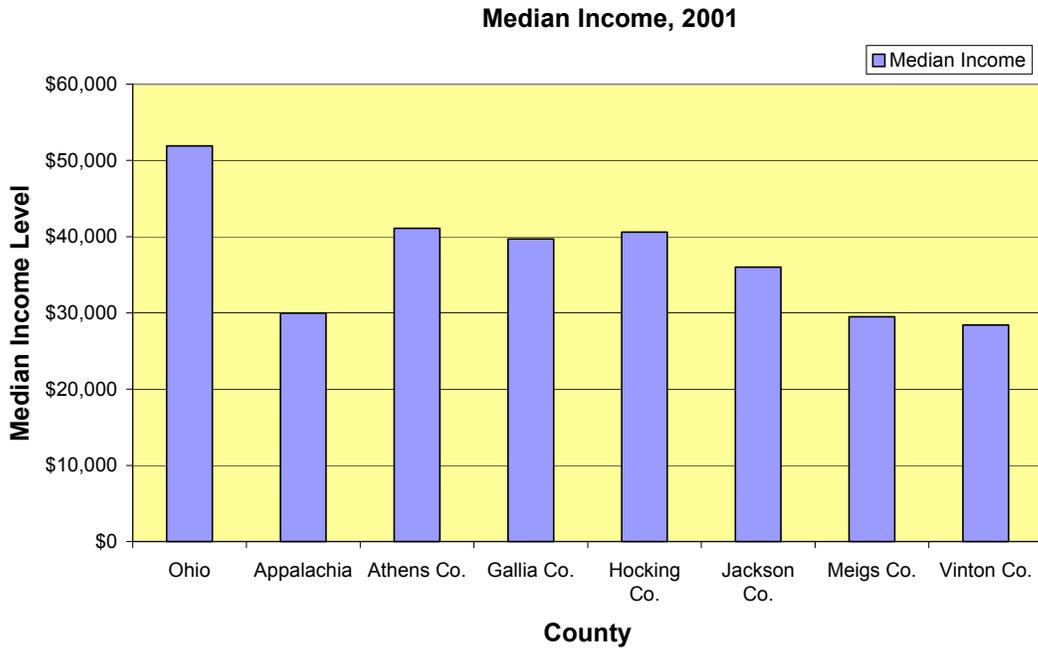
Figure 18
Poverty Rates, 1989 and 1999

| | Percent of all in poverty 1989 | Percent of all in poverty 1999 |
|--------------------|---|---|
| Athens Co. | 28.7% | 27.4% |
| Gallia Co. | 22.5% | 18.1% |
| Hocking Co. | 15.7% | 13.5% |
| Jackson Co. | 24.2% | 16.5% |
| Meigs Co. | 26.0% | 19.8% |
| Vinton Co. | 23.6% | 20.0% |

Source: U.S. Census Bureau

The annual median income for these counties tells a similar story (Figure 19). According to the U.S. Department of Housing and Urban Development, the estimated median family incomes in fiscal year 2001 in Athens and Hocking counties come closest to the state median of \$51,900, likely because of the colleges and industry there. Meigs and Vinton counties, formerly centers for coal mining, now have the lowest median incomes in the state at \$29,500 and \$28,400, respectively.

Figure 19



Source: U.S. Dept. of Housing and Urban Development.
<http://www.huduser.org:80/datasets/il/fmr00/index.html>

Employment by Industry

The most prevalent employment industries across the state are the service, trade and manufacturing sectors (Figure 20). This data is mirrored in the Raccoon Creek watershed, in which government also is a dominant employer.

Resource-related employment also is relatively high across the state. Nationwide, the forest products industry employs more than 1.6 million people in forest and paper production, or 1.2 percent of the national workforce. In Ohio, there are more than 70,000 jobs in forest-related employment or 1.3 percent of the workforce. Ohio's forest industry adds more than \$7 billion to the state's economy, and for every job that is directly forest-related, another two jobs are created that are indirectly related. Such jobs are in transportation, distribution and sales of forest products (Ohio Forestry Association 2002).

Figure 20
Employment by Industry, 2000

| | Manufacturing | Transport & Utilities | Government | Services | Finance | Trade | Construction |
|--------------------|----------------------|----------------------------------|-------------------|-----------------|----------------|--------------|---------------------|
| Athens Co. | 1,138 | 366 | 6,960 | 4,193 | 653 | 4,989 | 422 |
| Gallia Co. | 1,035 | 1,234 | 1,967 | 3,770 | 376 | 2,961 | 353 |
| Hocking Co. | 1,568 | 185 | 1,645 | 1,083 | 184 | 1,380 | 363 |
| Jackson Co. | 3,587 | 388 | 1,471 | 1,530 | 353 | 2,472 | 319 |
| Meigs Co. | 142 | 69 | 1,133 | 750 | 172 | 1,075 | 284 |
| Vinton Co. | 539 | 91 | 830 | 297 | 133 | 301 | 62 |
| Ohio | 1,046,127 | 240,597 | 672,955 | 1,488,583 | 301,253 | 1,319,393 | 219,035 |

Source: Ohio Department of Development, County Profiles, December 2000

Mining and agriculture are other economically important industries in southeast Ohio, but figures for those were not available in Raccoon Creek counties specifically. The phased closure of the American Electric Power coal mines in Meigs County has had a significant effect on Raccoon Creek watershed counties. The mines had 760 employees, of which 183 were salaried and 577 were United Mine Workers of America union members. More than 82 percent of those employees live in Athens, Gallia, Jackson, Meigs, and Vinton counties. Closing these mines cut the total mining employment in Gallia and Jackson counties by half (ILGARD 2000). The official closing date was March 6, 2002, but reclamation work will continue for several months.

Major County Employers

The following information, collected from county chambers of commerce, supports the data in Figure 20, showing that the bulk of employment lies in the service, government and manufacturing industries. Mining is still a large employer in Athens, Gallia and Vinton counties.

Athens County

Ohio University: Government
Athens County Government: Government
Southern Ohio Coal Company: Mining
Hocking Technical College: Government
Career Connections: Service

Athens City Board of Education: Government
O'Bleness Hospital: Service
TS Trim Industries: Manufacturing
McBee Systems: Manufacturing
Doctor's Hospital: Service
Rocky Shoes and Boots: Manufacturing⁸
Kroger Co.: Trade
State of Ohio: Government

Gallia County

Southern Ohio Coal Company: Mining
Holzer Medical Center: Service
Toyota: Manufacturing
Holzer Clinic: Service
Rockwell Automation: Manufacturing
InfoCision Management Corp.: Service
Ohio Valley Supermarkets: Service
AEP/ Ohio Power: Utility
GKN Sinter Metals, Inc.: Manufacturing
Gallia County Local Board of Education: Government
Gallipolis City Board of Education: Government
University of Rio Grande: Service

Hocking County

General Electric Co.: Manufacturing
Hocking Valley Community Hospital: Service
Kroger Co.: Trade
Logan City Board of Education: Government
Logan Clay Products Co.: Manufacturing
Smead Manufacturing Co.: Manufacturing
Hocking County: Government
Selkirk Metalbestos: Manufacturing
Kilbarger: Manufacturing
Amanda Bent Bolt: Manufacturing

Jackson County

Pillsbury/ General Mills, Inc.: Manufacturing
Luigino's Inc.: Manufacturing
Meridian Automotive Systems, Inc.: Manufacturing
Merillat Industries: Manufacturing
Millennium Teleservices: Service
A.J. Stockmeister: Service
Jackson City Board of Education: Government
Lancaster Colony Corp./Jackson Corp.: Manufacturing

⁸ The company announced in September 2001 that many jobs would relocate to Latin America.

Oak Hill Hospital: Service
Osco Ind.: Manufacturing

Meigs County

Meigs County school districts: Government
Meigs County government: Government
Rocksprings Rehab. Center: Service
Millennium Teleservices: Service
Holzer's Clinic: Service
Tye Brinegar & Sons: Service
Overbrook Center: Service
Kroger Co.: Service
Imperial Electric Co.: Utility

Vinton County

Vinton County Local Board of Education: Government
Austin Powder Co.: Manufacturing
Sands Hill Coal Co.: Mining
Southern Ohio Coal Co.: Mining
Huston's Nursing Home: Service
McArthur Super Valu: Trade
McArthur Lumber and Post Co.: Manufacturing
State of Ohio: Government
Twin Maples Nursing Home: Service
Vinton County National Bank: Finance

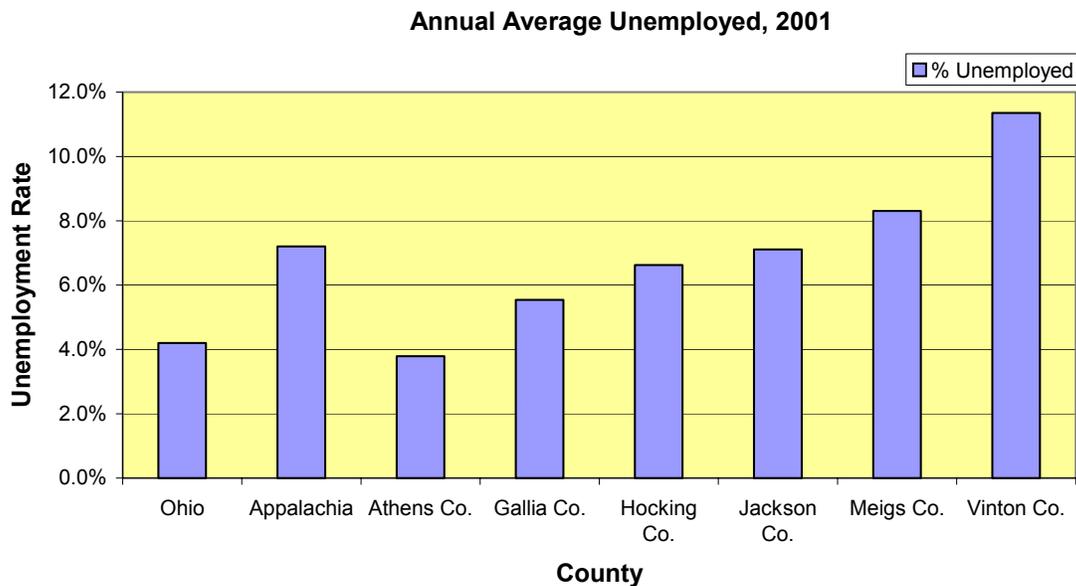
Travel Time to Work

About one-third of the workers in the watershed travel within the state average of 10 to 19 minutes to work each day (U.S. Bureau of the Census, 2000). Vinton county employees travel farther to their jobs than do other workers in the watershed, with a higher percentage in the 45-to-90-minute category. Almost 30 percent of workers 16 years or older in Vinton County traveled an hour or more to work in 2000. Because of the relatively low volume of traffic in this more rural county, workers can commute greater distances within a given time period than would be the case in more metropolitan counties.

Unemployment

While the Raccoon Creek watershed was a booming center of industry and mining a century ago, the “boom and bust” cycles have taken their toll on the employment opportunities now available to local residents (Figure 21). The state average unemployment rate was above 4.0 percent for 2001, but Meigs and Vinton counties have rates about twice that level.

Figure 21



Source: Ohio Department of Job and Family Services, based on Bureau of Labor Market Information <http://lmi.state.oh.us/ASP/LAUS/vbLAUS.asp>

Housing and Infrastructure

About 71 percent of residents within the watershed counties own their own home, while 29 percent rent (Figure 22). The Ohio University student population boosts Athens County’s rental units, though the township containing the university does not lie in the Raccoon Creek watershed. Townships that do, however, reflect similar housing patterns as the other five counties listed below. The other five counties are more rural, and tend to have residents whose families have lived in the county for generations. Information by townships in the watershed can be found in Appendix M.

Figure 22
Housing Ownership, 2000

| | Occupied Housing Units | Owned | Rented |
|--------------------|-------------------------------|--------------|---------------|
| Athens Co. | 22,501 | 13,605 | 8,896 |
| Gallia Co. | 12,060 | 9,033 | 3,027 |
| Hocking Co. | 10,843 | 8,204 | 2,639 |
| Jackson Co. | 12,619 | 9,328 | 3,291 |
| Meigs Co. | 9,234 | 7,332 | 1,902 |
| Vinton Co. | 4,892 | 3,808 | 1,084 |
| Ohio | 4,087,546 | 2,758,131 | 1,329,415 |

Source: U.S. Bureau of the Census, 2000,
<http://www.ilgard.ohiou.edu/data/index.asp>

Summary

As a whole, the counties in the Raccoon Creek watershed do not follow state averages in terms of population growth, education and infrastructure. With the exception of Athens County, there has not been a sizable population increase in the watershed for more than a century. Although mining and other extractive industries made these counties prosperous in the early 1900s, no significant industries have filled the void when many of these operations went out of business. As a result, poverty rates are significantly higher in the watershed, especially for children—reaching up to 28 percent in Meigs County compared to Ohio’s 16 percent. Service, government and manufacturing jobs dominate, while most residents own their own home. Little of this rural watershed is serviced with a wastewater treatment facility; most rely upon poorly maintained private septic systems.

SOCIAL AND CULTURAL RESOURCES

The six-county area bordering Raccoon Creek has a wealth of culturally and historically significant sites and traditions, including Native American burial mounds, iron furnaces and community festivals. These historic sites, and the community gatherings that celebrate them, serve to commemorate the past and teach lessons for the future. In conjunction with environmental restoration of the creek itself, this management plan addresses the public's concern about how to protect these sites and safely foster tourism for local economies. Map 9 in Appendix D outlines historically and culturally significant locations in the watershed. The following information was collected from county chambers of commerce and visitors centers.

Athens County

Community events in Athens County include the Spring Literary Festival and International Street Fair in May, the Hockhocking Folk Festival in early June and a series of "Under the Elms" musical concerts on the Ohio University campus throughout the summer. Fall activities include the Albany Independent Fair in September, the Paul Bunyan Show in Nelsonville in early October, The Plains Indian Mound Festival also in October and a variety of holiday parades and gatherings in December.

While the city of Athens has several places listed on the National Register of Historic Places, none of these lie within the watershed.

Gallia County

Gallia County hosts the River Recreation Festival on July the Fourth weekend, the Gallia County Junior Fair in August and the Bob Evans Farm Festival in October. Other annual events include September's Emancipation Celebration and the Christmas parade.

The watershed's historic sites in Gallia County are Davis Mill in Patriot, the Evans House in Vinton and the Wood Old Homestead in Rio Grande.

Hocking County

New Straitsville's Moonshine Festival in May is Hocking County's primary festival. The Hocking Hills State Park offers a variety of yearlong events, including outdoor photography workshops, hikes, antique car shows and an assortment of music and art exhibits.

No sites on the National Register of Historic Places lie in this portion of the watershed.

Jackson County

Jackson County has a variety of community events throughout the spring and summer months, including the Trout Festival in April, the Festival of Flags on Memorial Day weekend, the Jackson County Fair in July and Pig Iron Days in early August. Fall activities include the Wellston Coal Festival and the Apple Festival in September and the Foothills Art Festival in October.

The county has several historic sites on the National Register of Historic Places in the Raccoon Creek watershed. The Buckeye Furnace and a covered bridge of the same name, the Clutts House and the Morgan Mansion in Wellston and the Keystone Furnace in Pattonville are tourist attractions with cultural significance to the region.

Meigs County

The most popular annual events in Meigs County include the Racine Flower Festival in April, the Battle of Buffington Island in July, Chester Shade Days in July and the Pomeroy Blues and Jazz Society Festival, also in July. In August, the Meigs County Fair is popular, followed by the Town and Country Expo and the Sternwheel River Fest in September. Fall and winter activities include the Eastern Arts and Crafts Fair in November and the Fur Peace holiday celebrations in December.

No registered historic places lie within the watershed.

Vinton County

Community members and visitors to Vinton County can attend McArthur's Wild Turkey Festival in early May, the Hamden Heritage Festival in May, the Vinton County Junior Fair in late July, the Shiloh Homecoming in early September or Lake Hope's Fall Hike in October. The Ravenwood Castle also hosts several fairs, including a medieval fair in mid-May and a Celtic festival in early August. ReUse Industries, located in Vinton County, also hosts a variety of workshops to promote environmental education. The Ohio Environmental Protection Agency awarded the group \$50,000 in 2000 to support its Recyclabration! Festival. This event involves about 300 students and 20 adults who create prototype products from donated and recycled material (Ohio Environmental Protection Agency 2000).

The county contains three covered bridges on the National Register of Historic Places, including the Eakin Mill, Mount Olive and Ponn Humpback bridges.

COMMUNITY INVOLVEMENT

Community involvement is perhaps the single most significant element in successful watershed restoration. Scientific experts can analyze water samples and agency officials can help make project decisions, but without public support these efforts will have little effect. As critical as it is to clean up polluted waterways, it is equally necessary to educate and involve community members in the goals and activities that will improve their quality of life.

CITIZEN PARTICIPATION

Public Meetings

An important element in public education is a sense of place and context. Showing people the concerns they have are justified and shared by many others in their region begins a network of shareholders who all have similar goals. Restoration is a lengthy process, and maintaining a close working relationship with the public is the only way to make short-term objectives into long-term realities. In developing this management plan, the public played a vital role through public meetings, focus groups and writing the document itself.

Six public meetings were held from October 2000 to June 2001 in the towns of Carbondale, McArthur, Rio Grande, Vinton, Wellston, and Wilkesville. Each meeting was publicized through local newspapers, public announcements on the radio and mailed flyers. ILGARD also created a postcard brochure highlighting some of the attractions in the watershed. The brochure included a response survey about activities of interest including stream walks and tours, community education programs and watershed gatherings. Half of the respondents chose not to participate in these activities, while the other half expressed interest in one to three of the listed activities.

Each meeting began with a brief open house that allowed attendees to look at informational displays and fill out a survey prioritizing their concerns about Raccoon Creek. Although the surveys primarily served to guide group discussion during the meetings, they also helped determine the issues examined in this plan.

The meetings involved speakers representing local government officials and agencies who addressed topics such as riparian health, fish and biodiversity, non-point source pollution and zoning. The surveys were collected and tabulated during the speaker presentation, and those results helped direct the discussion that followed. Residents voiced their concerns for the watershed, including helpful information about where in their community these problems occurred.

Each meeting ended with the opportunity for participants to prioritize environmental concerns themselves. Participants were given five red dots to place beside their top concerns on a wall-mounted chart. One could choose to place all five next to one issue or they could distribute the dots next to up to five issues.

More than 250 community members attended these meetings, with an average attendance of about 30. Appendix N includes the minutes from each of the six public meetings.

Focus Groups

Participants in the public meetings provided valuable information on concerns and priorities. Beginning in September 2001, small focus groups of approximately 5 to 10 people met to discuss the primary areas of concern in the Raccoon Creek watershed that will be addressed in the remainder of this plan. While the public meetings provided an excellent avenue to gauge public opinion in general terms, it was necessary to gather small groups of key stakeholders to outline goals, objectives, action strategies and measurable indicators. The plan, which has been developed through this process, will provide a “roadmap” for future restoration projects that have community input as their foundation. Please see Appendix N for summaries of the focus group meetings.

Leadership Review Board

The management plan’s Leadership Review Board, a group of 18 community leaders, met twice to help shape and edit this document. The first meeting, held in December 2001, was an informational meeting to acquaint board members with the watershed and the purpose for this management plan. The second meeting, held in March

2002, was an opportunity for members to provide valuable feedback on the draft document.

Raccoon Creek Forum

Several state agencies, local businesses and corporations provided invaluable advice, funding, and technical expertise for ongoing projects. Many of these groups participate in the Raccoon Creek Forum, which meets monthly to discuss project activities and future initiatives in the watershed. The Raccoon Creek watershed coordinator, who was hired by the Institute for Local Government Administration and Rural Development in 2000 as part of the watershed coordinator grant program, facilitates this group.

WATERSHED ISSUES AND ACTION STRATEGIES

This section presents a detailed description of issues facing the watershed and goals produced by watershed residents and project partners to actively begin to develop solutions to these problems. The purpose of this section is to:

- 1) Describe prioritized issues based on Ohio EPA 305 b and 303 d lists, specifically focusing on acid mine drainage and sediment issues in the watershed.
- 2) Describe other issues identified through a process of public meetings and ranking by watershed residents and project partners.
- 3) State a goal and its objectives for each issue.
- 4) Identify specific action strategies to address each issue.
- 5) Identify a timeline and partners who will participate in activities.
- 6) Link each goal and objectives with appropriate indicators to be used for measuring progress.

ISSUE ONE: ACID MINE DRAINAGE

Problem Statement:

Acid mine drainage (AMD) flowing from abandoned underground and surface coal mines causes the most severe degradation to the living resources and aquatic habitat in the Raccoon Creek watershed. Ohio EPA's 1995 Basin study and the recently completed TMDL in 2000 list a total of 36 stream segments that are in non-attainment of Warmwater Habitat use designation. The main source of impairment to each of these segments is acid mine drainage. The main causes of impairment are metals and pH. The gravity of the problem ranges from a reduction in the diversity and quantity of fish in most of the main stem to the complete loss of wildlife and quality habitat in some of the tributaries.

Raccoon Creek partners have had an opportunity during the past four years to conduct other planning processes to identify AMD problems in the watershed. The Acid Mine Drainage Abatement and Treatment (AMDAT) plans for Little Raccoon Creek and the headwaters, which are funded by ODNR, Division of Mineral Resources Management, identify key AMD producers in the watershed and prioritize restoration projects according to their ability to reduce the acid load to the stream. In addition Ohio EPA completed the TMDL for the upper reaches of Raccoon Creek, which looks at all impaired stream segments and the causes and sources of impairment, recommending solutions for restoration (see the Natural Resource Inventory, pgs 37-42 for targets and load calculations). At this time, the estimated total project costs to restore streams impaired by acid mine drainage is approximately \$6.5 million. (See Appendix H for AMDAT and TMDL plans, findings and priority project areas.)

AMD Goal: Reduce the effects of acid mine drainage in the 36 impaired stream segments in an effort to achieve warmwater habitat designation.

Goal indicators:

1) Stream segments that meet the following targets should meet water quality standards and attain warmwater habitat: pH 6.5-9.0, net alkalinity 20 mg/l, iron 1000 ug/l, aluminum 750 ug/l, manganese 2000 ug/l, and total dissolved solids 1,500,000 ug/l.

2) Acid load reduction: In the East Branch of Raccoon Creek the load must be reduced by 275, in the West Branch of Raccoon Creek by 37, in the Middle Section to Brushy Creek by 48, in Brushy Creek by 29, in the Middle Section to Lake Hope by 31, in Hewett Fork by 116, and in the Middle section to Bolin Mills by 242. These numbers correspond with the TMDL and were developed without specific weight units. (See Natural Resource Inventory section, pg. 40 for a description of load reductions). The AMDAT plans detail load reductions in pounds/day. These numbers are in the tables below.

Objective 1: Implement 100% of the projects proposed in the AMDAT and TMDL plans, averaging 2 projects every 3 years.

Objective indicators:

- 1) Every three years, two AMD projects will be completed.
- 2) Targets will be met at each project site during post project monitoring.

Activities: The two tables that follow give a description of each of the AMD restoration projects to be accomplished, including location, best management practices to be used and cost.

1a) Proposed AMD Treatment Sites for the Raccoon Creek Headwaters Best Management Practices Selection and Costs

| Site | BMPs & Cost | BMP Description and Notes |
|---|---|--|
| East Branch: EB sites 191, 193, 194, 195, 200, 220, 240, 260 and 280 ⁹ | Limestone: \$436,950 Revegetation: 22,990 Mobilization: 65,542 Design: 78,822 Monitoring: 15,480 Subtotal: \$619,784 | All of these East Branch sites will be receiving open alkaline channels. Cost has been developed into one lump sum. Average cost of removal for one ton of acid over the life of these projects: \$46.33/ton. |
| | EB 162 EB 169.4 (White House seep) EB 169 | Kiln dust: \$300,136 Design: 45,024 Monitoring: 2,640 Kiln dust: 319,337 Design: 47,901 Monitoring: \$2,640 Slag ARS: 40,566 Design: 6,084 Monitoring: 1,760 Subtotal: \$766,188 |
| East Branch Total | \$1,385,972 | |
| East Branch Projected Load Reduction: 2,693 lbs/day ¹⁰ | | |

⁹ Site numbers can be reviewed on project maps that are a part of the Headwaters and Little Raccoon Creek AMDAT plan.

¹⁰ All projected load reductions are based on the assumption that we will have zero acid load at the discharge of the project site after the implementation of the project described in the table.

| Site | BMPS & Cost | BMP Description and Notes |
|---|--|--|
| West Branch: WB 060, 070, 100 | Limestone: \$149,575 Revegetation: 4,800 Mobilization: 23,156 Design: 38,629 Monitoring: 6160 Subtotal: \$223,320 | These West Branch sites will all be receiving open alkaline channels. Cost has been developed into one lump sum. |
| | | Average cost of removal for one ton of acid over the life of these projects: \$39.98/ton. |
| WB 050 – Orland Gob Pile | \$80,000 | Cap toxic coal refuse, recontour for positive drainage and revegetate. 3.95/tons per year abated from West Branch |
| West Branch Total | \$303,320 | |
| West Branch Projected Load Reduction: 642.97 lbs/day | | |
| Mainstem to Brushy Creek: MSBC 090, 110, 120 | Limestone: \$28,975 Revegetation: 3,000 Mobilization: 4,796 Design: 9,193 Monitoring 5,280 | All of these MSBC sites will be receiving open alkaline channels. Cost has been developed into one lump sum. |
| | | Average cost of removal for one ton of acid over the life of these projects: \$35.15/tons. |
| MSBC total | \$51,244 | |
| MSBC Projected Load Reduction: 484.55 lbs/day | | |
| Brushy Creek: BC: 060, 070, 090, 111, 113, 114, 150 | Limestone: \$406,965 Revegetation: 10,800 Mobilization: 61,089 Earthwork: 99,472 Design: 61,301 Monitoring: 9,680 | All of these BC sites will be receiving open alkaline channels. Cost has been developed into one lump sum. |
| | | Average cost of removal for one ton of acid over the life of these projects: \$58.10/ton. |
| Brushy Creek total | \$649,307 | |
| Brushy Creek Projected Load Reduction: 1,920 lbs/days | | |
| Mainstem to Lake Hope MSLH 121 | Limestone: \$90,350 Revegetation: 3,000 Design: 16,102 Mobilization: 14,000 Monitoring: 2,640 | MSLH site will be receiving open alkaline channels. |
| | | Average cost of removal for one ton of acid over the life of this project: \$39.94/ton. |
| MSLH total | \$126,092 | |
| MSLH Projected Load Reduction: 303 lbs/day | | |

| Site | BMPS & Cost | BMP Description and Notes |
|---|---|--|
| Hewett Fork: HF 114 HF 115 HF 116 | Slag ARS: \$9840 Design: 2,460 Monitor: 1,760 SAPS: \$190,708 Design: 28,606 Monitoring: 3,520 Subtotal: \$ 236,624 | Slag ARS above Kennard Seep, SAPS downstream to abate load from seeps at HF 115 and 116 SAPS. |
| | | Average cost of removal for one ton of acid over the life of these projects: \$55.29/ton. |
| HF 120 | Kiln dust: \$163,942 Design: 24,951 Monitoring: 3,520 Subtotal: \$192,413 | Alkaline Dosing Unit. |
| | | Average cost of removal for one ton of acid over the life of this project: \$224.24/ton. |
| | | Currently in design; construction 2002. This includes both capital and 15 year maintenance and operation cost. |
| HF131 | Carbondale wetland: \$436,427 | Average cost of removal for one ton of acid over the life of this project: \$176.25/ton. |
| | | Dr Dew Site : Average cost of removal for one ton of acid over the life of this project: \$246.00/ton. |
| HF 140 | Slag ARS: \$96,432 Design: 14,465 Monitoring: 3,520 Subtotal: \$114,417 | |
| Hewett Fork Total: | \$979,881 | |
| Hewett Fork Projected Load Reduction: 3,563 lbs/day | | |
| Project Total: | \$3,495,816 | |

**2a) Proposed AMD Treatment Sites for Little Raccoon Creek
Best Management Practice Selection and Cost**

| Site / BMP Selection | Cost |
|---|---------------------|
| Middleton Run | |
| 3A - Lake Rice | |
| Wetland | \$20,000.00 |
| Revegetation | 10,000.00 |
| Sediment control | 10,000.00 |
| Fill lake | 36,300.00 |
| Earthwork | 67,760.00 |
| Resoiling | 31,950.00 |
| Slag bedded channels | 81,389.00 |
| Slag filters | 14,650.00 |
| 5B - Lake Farley | |
| Limestone dike | \$90,278.00 |
| Open limestone channels | 5,787.00 |
| Wetland | 37,037.00 |
| Earthwork | 14,520.00 |
| Resoiling | 4,792.00 |
| Revegetation | 3,000.00 |
| Site/ BMP Selection | |
| 3B | |
| Open limestone channel | \$33,333.00 |
| Resoiling | 3,195.00 |
| Revegetation | 1,000.00 |
| Subtotal Construction | \$464,991.00 |
| Mobilization | 46,500.00 |
| Design | 76,723.00 |
| Monitoring | 18,400.00 |
| Middleton Run Projected Load Reduction: 290 lbs/day | |
| Total Project Cost | \$606,614.00 |

| Goose Run | |
|---|---------------------|
| Site/BMP Selection | Cost |
| 3B | |
| Excavation and limestone basin | \$17,834.00 |
| Open limestone channel | 1,389.00 |
| 2F | |
| Limestone splash stack | \$6,111.00 |
| Open limestone channel | 3,189.00 |
| 3C | |
| Limestone rip rap | \$2,315.00 |
| Open limestone channel | 833.00 |
| 3A | |
| Open limestone channel | \$9,259.00 |
| Subtotal Construction | \$40,750.00 |
| Revegetation | 3,000.00 |
| Sediment control | 4,000.00 |
| Mobilization | 10,663.00 |
| Design | 17,223.00 |
| Goose Run Projected Load Reduction: 367 lbs/day | |
| Total Project Cost | \$75,636.00 |
| Mulga Run | |
| Site/BMP Selection | Cost |
| 4 | |
| Slag leach bed (inc. excavation) | \$12,481.00 |
| Wetland | 9,259.00 |
| 14 | |
| Open limestone channel | \$48,611.00 |
| Wetland | 10,000.00 |
| 6 | |
| Slag leach bed | \$13,669.00 |
| Wetland | 9,259.00 |
| Subtotal | \$103,279.00 |
| Revegetation | 3,000.00 |
| Resoiling | 9,585.00 |
| Sediment control | 3,000.00 |
| Mobilization | 17,830.00 |
| Design | 34,174.00 |
| Monitoring | 18,400.00 |
| Wetland Improvement | 50,000.00 |
| Mulga Run Projected Load Reduction: 1,120 lbs/day | |
| Total Project Cost | \$239,268.00 |

| Flint Run | |
|---|-----------------------|
| Site/ BMP Selection | Cost |
| All | |
| Cap refuse pile (1.5' x 140 ac.) | \$847,000.00 |
| Paper mill sludge | 100,750.00 |
| Revegetation | 116,250.00 |
| Fill lakes | 187,500.00 |
| Slag bedded channels | 329,444.00 |
| Slag filters | 131,000.00 |
| Sediment control | 20,000.00 |
| Mobilization | 86,597.00 |
| Design | 320,000.00 |
| Monitoring | 15,840.00 |
| Flint Run Projected Load Reduction: 2,000 lbs/day | |
| Total Project Cost | \$2,154,381.00 |
| Little Raccoon Creek –Hydrologic Unit Estimate Total | \$3,075,899.00 |

Objectives 2: By June 2004 a long-term sampling plan for water quality (quarterly) and for biology (every five years) to gauge the effectiveness of past treatment projects will be established throughout the watershed.

Objective indicators:

- 1) Long-term sampling sites have been identified for water quality and biology by June 2004.
- 2) Water quality sampling is being done quarterly and biological sampling is being conducted every five years.

Activities:

- a) Review existing monitoring cycles developed for AMDAT plans to assist in developing a long-term monitoring plan.
 - o Establish minimum number of sites on the main stem, downstream of main tributaries.
 - o Evaluate sampling techniques for quality assurance and control
 - o Group I sampling and flow to be taken at each site
 - o Establish frequency of sampling
- b) Establish location of biologic sampling with assistance from OEPA and Midwest Biodiversity Institute.
 - o Establish qualitative assessment of habitat sites – QHEI.

- Establish frequency of sampling

c) Create a strategy for long-term funding of the monitoring plan.

Objective 3: Develop a research agenda to further Raccoon Creek partners' knowledge of AMD impacts on the stream with the assistance of the Appalachian Watershed Faculty Research Group at Ohio University.

Objective indicators:

- 1) Further research is being conducted to assess AMD impact on stream biology.
- 2) Biological indicators have been developed and used to track stream health.
- 3) Sediment research is being conducted and indicators are being developed to determine sediment contribution from abandoned coal mines.

Activities:

- a) More research is needed to assess AMD effects on the biology in the creek, including physical and chemical and developing indicators.
 - Presence of macroinvertebrates and different AMD components
- b) Research iron and aluminum floc as a recoverable resource. What are the economic possibilities for this? Review Pennsylvania and other studies.
- c) Identify sediment indicators where past coal mining has contributed to the degradation of the stream.
 - Look at previous research, including that on the West Branch of Shade River, M. Trautman's Fishes of Ohio and EPA sediment studies in Maryland.
 - Nature, source and movement studies are needed for sediment to determine largest contributors.
 - Identify AML sites and map them

Objective 4: Explain benefits of reclamation to the local community; evaluate two of our past projects bi-annually and write case studies for wide distribution.

Objective indicators:

- 1) Bi-annual review of two past projects is completed
- 2) Case studies are written and distributed.

- 3) Economic indicators have been developed to track the benefits of restoration projects.

Activities:

- a) Develop case studies of clean streams and their economic impacts on an area (PA, MD), including industries and recreational activities that locate there.
- b) Interview interest groups, such as the Small Mouth Bass Alliance
- c) Research the community's willingness to pay; a cost/benefit analysis for the funding they will contribute to stream restoration.
- d) Research demographic information in the watershed to see if there is an environmental justice correlation with dead streams or healthy streams.
- e) Look at the Rivers Unlimited program that guides stakeholders through a process to connect a dollar value to clean water.

Objective 5: Educate the local population about stream degradation from AMD through three public presentations per year.

Objective indicators:

- 1) Three public presentations per year on stream degradation from AMD are completed.
- 2) Raccoon Creek partners have established the capacity to conduct long-term monitoring with local citizens and other interested groups.

Activities:

- a) Develop volunteer sampling efforts, both for water quality and biology.
- b) Continue to hold tours of AMD project sites.
- c) Develop RC forum and citizen groups' capacity to do water quality and biological sampling with assistance from OU faculty, watershed coordinator, the Midwest Biodiversity Institute and the Center for Applied Biodiversity and Bioassessment.

Objective 6: By 2005 Raccoon Creek partners will develop a partnership with three additional funding programs, public and private.

Objective indicators:

- 1) By 2005 three additional funding programs are being accessed to help fund AMD restoration projects.

2) Additional private and public partners have joined the partnership.

Activities:

- a) Research private funding options; look at models such as the Virginia Endowment.
- b) Develop a private funding initiative and emphasize to contributors the importance of AMD restoration as a community development project.
- c) Add three new organizations/businesses to the existing Raccoon Creek partnership.
- d) Stay connected to the Eastern Coal Region Roundtable as a source of information for funding AMD work.

Acid Mine Drainage Activities Timeline

| Activity | Time Frame | Partners |
|---|------------------------|--|
| 1a | Years 1-10-3 projects | RC Forum, Ohio EPA, ODNR MRM, Ohio University |
| 1b | Years 1-10- 3 projects | “ ” |
| 2c | Years 1-2 | “ ” |
| 3a | Years 3-7 | Ohio University, Hocking College, Midwest Biodiversity Institute |
| 3b | Year 5 | RC Forum |
| 3c | Years 2-4 | Ohio University, Hocking College, Midwest Biodiversity Institute (MBI), Ohio EPA |
| 4 a-e | Years 3-10 | RC Forum, Ohio University, OSU extension |
| 5a | Year 1 | RC Forum, Vinton SWCD, Raccoon Creek Improvement Committee (RCIC) |
| 5b | Years 1-10 | RC Forum |
| 5c | Years 2-5 | RC Forum, MBI, Center for Applied Biodiversity and Bioassessment (CABB), RCIC |
| 6a | Year 1 | Ohio University students, RC Forum |
| 6b-d | Years 3-5 | RCIC, RC Forum |
| 6c | Years 1-6 | RCIC, RC Forum |
| <p>Potential Funding Sources¹¹: Acorn Foundation; Ben & Jerry’s Foundation; Challenge Grants; Clean Ohio Fund; Community Assistance Program; Conservation Technical Support Program; Drinking Water Assistance Fund; EPA Environmental Justice; EPA Environmental Education; Environmental Statistics Center; ESRI Community Development Grant; ESRI Environmental Protection Grant; Ford Motor Company; IBM; J. C. Downing Foundation; Nathan Cummings Foundation; Five-Star Restoration Challenge Grant; AML Program (federal); AML Program (state); AMD Set-Aside Program; ODNR Non-point Source Watershed Program; Appalachian Clean Streams Initiative; Wildlife Diversity Grant; Ohio Environmental Education Fund; OEPA 319 Program; Partners for Fish and Wildlife Program; Rural Abandoned Mine Program; Sustainable Agriculture Research & Education; NRCS Flood Prevention; NRCS Wetland Reserve; W. Alton Jones Foundation; Watershed Cooperation Agreement Program; Watershed Resource Development Act</p> | | |

¹¹ See Appendix O for a full description of each funding source.

ISSUE TWO: FLOODING

Problem Statement:

Flooding is a common and natural event in the Raccoon Creek watershed. Throughout the management plan process, citizens have emphasized the need for improved education and communication to effectively protect humans and property in flood events.

Flooding is the leading cause of property loss from natural disasters in this country (Floodplain Management Association 1996), and several factors contribute to flooding in the watershed. The watershed's steep hills and narrow valleys make floodplains the most economical and convenient locations for development. But developing in the floodplain reduces its ability to function properly, ultimately threatening property and, more importantly, the safety of local residents. Weak local floodplain ordinances and the lack of time and resources to enforce them make construction difficult to control. The lack of alternative building sites leaves many residents who have grown up living in the floodplain with few options for relocation.

Perhaps freshest in the minds of southeast Ohio residents is the March 1997 flood that killed five in the region and necessitated evacuating 20,000 people (Davis 1998). All six counties in the Raccoon Creek watershed qualified for federal and state disaster assistance, and the combined infrastructure loss in the watershed was \$13.8 million.

Restricting floodplain development and advocating floodplain insurance for those living near waterways are best management practices local governments can implement to lessen the impact a flood has on their economy (Map 7 – Appendix D).

Flooding Goal: Reduce the detrimental effects of flooding in the Raccoon Creek watershed.

Goal indicators:

- 1) Number of structures (trailers/homes) moved out of floodplain
- 2) Number of new homes that are built outside of the floodplain
- 3) Money spent on mitigation per year (track through FEMA)
- 4) Number of villages that qualify for or are in compliance with NFIP.

Objective 1: Identify and map land practices that exacerbate flooding.

Objective indicators:

- 1) GIS is created that shows flood prone areas.
- 2) Land practices are identified in the watershed that exacerbate flooding.

Activities:

- a) Identify areas of land in use that perpetually flood and develop large-scale mapping.
 - Identify roads that are often under water during floods.
- b) Identify land uses that exacerbate flooding and the percentage of the watershed land area affected.
 - Produce fact sheets for public distribution on the activities that perpetuate flooding.

Objective 2: Identify and educate floodplain landowners, managers and county health officials on floodplain regulations.

Objective Indicators:

- 1) Percentage of landowners reached through workshops.
- 2) Percentage of managers reached through workshops.
- 3) Number/percentage of practices (BMPs) implemented.

Activities:

- a) Identify floodplain managers.
- b) Develop a floodplain workshop in coordination with ODNR's Floodplain Management Program.
 - Present zoning options, both pros and cons, to local planning officials.
 - Look at other states that are implementing rural zoning.
 - Utilize geographic information systems (GIS) as a tool to show locations of floodplains and land use practices.
- c) Identify floodplain landowners.
- d) Develop workshops geared toward local citizens to emphasize watershed dynamics. Emphasize best management practices:

- Structures moved out of the floodplain;
- New homes built outside of the floodplain;
- Villages qualify and participate in the National Flood Insurance program;
- Roads are raised out of the floodplain; and
- Educational signage designating flood prone areas and floodplain is placed throughout the watershed.

e) Facilitate a forum with floodplain administrators and county officials to discuss the importance and improvement of county building permitting systems.

f) Work with local insurance agents to help convey to citizens the requirements of national floodplain insurance programs.

g) Identify successful programs and resources in other counties and across the country.

- Create a list of online resources, newsletters and publications about flood risk reduction.

h) Work with ODOT and other agencies to develop signs for bridges as an educational tool to show that development should occur above the 100-year flood stage.

Objective 3: Increase safety or emergency access during flood events.

Objective Indicators:

1) Number acres or areas with improved safety or emergency access.

2) Number of access modifications (raised roads, improved structural practices).

Activities:

a) Identify areas with safety and access issues and map them to help reduce life threatening situations.

b) Develop a volunteer and student monitoring program that involves placing rain gauges around the watershed.

c) Research and determine the feasibility of using watershed modeling systems, such as the HEC, to model rainfall runoff throughout the watershed.

d) Research use of early warning systems.

Objective 4: Increase the use of structural (dry dams, reservoirs, bridges, culverts, wetland construction) and non-structural (land use practices, tree plantings, wetland restoration, acquisition and flood proofing) practices to lessen the effects of flooding to humans and their property.

Objective Indicator:

1) Number of structural/non-structural practices implemented.

2) Funds received for flood protection and education projects.

Activities:

a) Research studies about the displacement of water during floods and the use of dry dams; share with stakeholders.

b) Assist local communities with floodplain management plans through the funding available from ODNR's floodplain management program.

c) Research funding options for communities for flood mitigation activities (look into the Legacy program for stream bank restoration projects).

Flooding Activities Timeline

| Activity | Time Frame | Partners |
|---|-------------------|--|
| 1a | Years 1-5 | RC Forum, RCIC, ODNR Floodplain Mgmt program, County engineers, OVRDC, ILGARD-OU, ODOT |
| 1b | Years 3-5 | OVRDC, ILGARD-OU, RC Forum, RCIC |
| 2a | Year 3 | RC Forum, Ohio University, ILGARD, county governments |
| 2b | Year 4-6 | ODNR Floodplain Mgmt. program, RC Forum, ILGARD |
| 2c | Years 1-2 | RCIC, ILGARD, RC Forum |
| 2d | Years 8-10 | RC Forum, Ohio EPA, ODNR SWCDS, Ohio University, Farm Bureau |
| 2e | Years 4-6 | RC Forum, SWCDS, RCIC |
| 2f | Years 2-3 | RC Forum, Ohio University students, Rio Grande students |
| 2g | Years 4-6 | ODOT, RC Forum, Ohio University students, Rio Grande students |
| 3a | Year 1-2 | RC Forum, RCIC, ODNR Floodplain Mgmt program, County engineers, OVRDC, ILGARD-OU, ODOT |
| 3b | Years 3-4 | RCIC, RC Forum, Local school systems, OEPA |
| 3c | Years 8-9 | RC Forum, ILGARD-OU, Ohio University Students |
| 3d | Years 5-7 | RC Forum, ILGARD-OU, Ohio University Students |
| 4a | Years 8-9 | RC Forum, Ohio University students, Rio Grande students, OVRDC |
| 4b | Years 1-2 | ODNR Floodplain Mgmt Program, Local Communities, ILGARD-OU |
| 4c | Years 4-6 | RC Forum, ILGARD-OU, Ohio University Students |
| Potential Funding Sources: Flood Hazard Mitigation & Ecosystem Restoration Program; Flood Mitigation Assistance Program; Hazard Mitigation Grant Program; Project Impact Grant Program | | |

ISSUE THREE: HOUSEHOLD ON-LOT SEWAGE SYSTEMS

Problem Statement:

Professionals at county health departments located within the watershed estimate that failing on-lot septic systems might be as high as 40 to 50 percent in some areas, and up to 80 percent in Vinton County. Using these percent estimates for failing systems from local health departments, the number could be as high as 2,805 within the watershed based on 1990 Census data.¹² Because of the watershed's rural setting, private systems dominate—leaving maintenance and repair in the hands of the homeowner. Many do not have the finances to maintain or replace their on-site systems, and local health departments do not have the staff and funding to adequately inspect systems or enforce solutions. There is a lack of education in the general population about the health risks of untreated wastewater and the steps one must take to guarantee a functioning treatment system.

Sewage Goal: Increase the number of properly working home sewage systems by 20% over the next 10 years and reduce the sewage discharge into Raccoon Creek.

Goal indicators:

- 1) Results of fecal coliform tests
- 2) Number of complaints
- 3) Results of Biological Oxygen Demand test
- 4) Decrease in the number of straight pipes discharging raw sewage into the creek.

Objective 1: Work with Ohio EPA and local government officials to ensure effective sewage treatment, based on state standards in the Ohio EPA priority villages of Hamden, Zaleski and Vinton.

Objective indicators:

- 1) Percentage of villages with effective treatments
- 2) Percentage of households served by new treatment systems
- 3) Dollars spent on sewer improvements

¹² 2000 Census figures do not detail the number of households with septic/cesspool systems as the 1990 data provided. The 2000 Census only details the lack of plumbing in a household.

4) Number of new septic permits and/or upgrades for households outside of area that new treatment facilities will service.

5) Number of NPDES permits and violations

Activities:

- a) Identify the water quality status and review state standards.
 - Conduct fecal coliform testing through health departments to see how the level compares with state standards. Look at both drinking water and recreational use standards.
- b) Develop a volunteer program for monitoring and tracking failed systems.
 - Conduct water sampling to fill in data gaps where county health departments are not meeting needs.
- c) Identify unsewered areas with county health departments and assist with mapping.
- d) Work with county health departments, local development districts and RC&D councils to assist with household sewage plans.
 - Identify GIS/mapping needs within the county plans and other health department mapping needs related to household sewage systems.
- e) Identify households that will not be served by wastewater treatment systems and that would like to consider septic replacement/upgrades in the three OEPA priority villages.
 - Make list of households not being served by potential projects in Hamden, Zaleski, and Vinton.
 - Contact households to determine interest in septic replacement/upgrades
 - Work with OEPA's Division of Environmental and Financial Assistance, to apply for Water Pollution and Control Loan Funds for interested households.
- f) Identify and map straight pipes discharging raw sewage into Raccoon Creek.
- g) Research different types of septic systems, policy, funding sources and maintenance options.
 - Research what other counties, states and countries are doing to track failed systems.

- Research options for extending sewer lines versus implementing new systems.
- Research low-cost alternatives to treating sewage, such as case studies in other states, countries.

Objective 2: Improve education and public awareness of the adverse effects of untreated sewage.

Objective Indicators:

- 1) “Awareness” measure, potentially through a survey
- 2) Media exposure, e.g., stories in newspapers, radio.
- 3) Number of new bills/rules proposed
- 4) Number of BMPs implemented

Activities:

- a) Work with Small Communities Environmental Infrastructure Group and Ohio State University Extension to promote training and disseminate information.
 - Visit facilities where innovative practices have been implemented, such as Farm Science Review.
 - Conduct workshops for municipal officials, builders, real estate agents, and township trustees for grant writing, funding sources, innovative systems and maintenance and overall best management practices, such as:
 - **Monitoring:** On-site wastewater systems in most of southeast Ohio are not monitored on a regular basis for several reasons. First, regular monitoring is not yet required by law. Currently, health departments only inspect a site or a system if there is new construction, if the property is being transferred to another owner or if there is a nuisance call. Even if routine inspections were required, many local health departments do not have the staff or the money to implement monitoring programs. Finally, private property rights complicate monitoring private systems because some residents oppose mandatory maintenance or inspections of their systems.
 - **Unsuitable soils or unsuitable sites:** Soils are the most important component of the wastewater treatment and disposal process. The soil serves as a natural buffer to filter many of the harmful agents present

in sewage before it reaches groundwater. Many parts of the Raccoon Creek watershed are characterized by clay soils, which retain water instead of allowing it to drain. As a result, the soil saturates quickly, and an on-site system may fail prematurely. Shallow depth to bedrock, too much slope and lots that are too small to accommodate an on-site system also contribute to a system's failure because they cannot adequately treat the effluent.

- Appropriately sized systems: This is a common problem, especially since homes change owners so often. An onsite system is designed to last 20 to 30 years, but the system may not be able to accommodate heavier use if a larger family moves in.
- Outdated systems: Water-intensive appliances, such as automatic washers and hot tubs, may overtax an old or insufficiently sized system.
- Maintain good records: Often, there are no records of on-site systems that were installed before monitoring began. As a result, homeowners and health departments are often unaware of the character and integrity of their systems.
- Encourage proper maintenance: The U.S. EPA cites neglect as one of the most significant factors contributing to the failure of onsite systems. Septic tanks need to be pumped and inspected regularly. Mechanical systems and systems that are more technologically advanced need additional attention as they have more components that are prone to fail. Unfortunately, many homeowners do not maintain their systems until there is a problem and, by that time, significant damage to the environment already may have occurred.

b) Develop a media campaign working with local newspapers and radio.

- Write stories about innovative projects and volunteer monitoring programs around the state and nation for general public.
- Circulate existing fact sheets or create new ones as needed for circulation to real estate agents, builders, landowners and local government about:
 - Treatment options, innovative systems, composting toilets
 - Health impacts to human and aquatic life
 - Proper maintenance of septic systems
 - Businesses/contacts for assistance that offer septic maintenance services
 - Legislative options, regulatory issues and initiatives in other states

c) Plan and facilitate meetings for manufacturers, system distributors, installers and county sanitarians on a regular basis to exchange ideas and to talk about new technology.

Sewage Activities Timeline

| Activity | Time Frame | Partners |
|---|------------|---|
| 1a | Year 2-6 | RC Forum, Ohio EPA, County Health Departments, RCIC |
| 1b | Years 1-5 | SCEIG, OWDA, Governor's Office of Appalachia, RCIC, County Health Departments, ILGARD |
| 1c | Years 2-5 | RC&D Councils, Local Development Districts, RC Forum, ILGARD |
| 1d | Years 1-5 | Ohio University, Hocking College, Rio Grande |
| 1e | Years 2-6 | RC Forum, RCIC, Health Departments |
| 1f | Years 2-6 | RC Forum |
| 1g | Years 1-10 | RC Forum |
| 2a | Years 1-10 | OSU Extension, SCEIG, RC Forum, County Health Departments, OEPA |
| 2b | Years 3-5 | RC Forum, Ohio University, OSU Extension, SCEIG, OEPA |
| 2c | Year 4-10 | County Health Departments, RC Forum, OSU Extension |
| <p>Potential Funding Sources: Appalachian Regional Commission; Ben & Jerry's Foundation; Community Assistance Program; Great Lakes Rural Community Assistance Program; Ohio Water & Sewer Rotary Commission; Rural Hardship Grant Program; Small Community Environmental Infrastructure Group; Village Capital Improvement Fund; W. Alton Jones Foundation; Water Environmental Resources Foundation Endowment for Innovation in Applied Water; Water Pollution Control Loan Foundation; Water Quality Special Resources Grants Program; Water & Sanitary Sewer Program; Water & Wastewater Disposal Systems for Rural Communities; Water & Wastewater Disposal Loans and Grants; W. K. Kellogg Foundation</p> | | |

ISSUE FOUR: LITTERING AND ILLEGAL DUMPING

Problem Statement:

A variety of sources contribute to litter and illegal dumping in Raccoon Creek. While some are inadvertent, others will require a fundamental change in attitude and responsibility. According to the Solid Waste Management Plan, written by the Gallia, Jackson, Meigs, and Vinton Solid Waste Management District in 2000, open dumping and littering in the four county area continues to be a significant problem. The district has identified 232 open dumps in the district, approximately 96 of these lie within the Raccoon creek watershed.

For those living near the creek and its tributaries, heavy rain often washes light debris and other trash material into the water. Others view the creek as a disposal facility that conveniently washes their eyesore away, making it someone else's problem downstream. In addition to trash directly disposed into Raccoon Creek and surrounding areas, citizens voiced concern about several illegal dump sites that some residents favor rather than paying for trash pickup.

Goal: Reduce the amount of trash and prevent illegal dumping throughout the Raccoon Creek watershed.

Goal Indicator:

1) Decrease in the number of illegal dumpsites around the watershed.

Objective 1: Educate local citizens about the negative effects of illegal trash dumping in an effort to increase their awareness of the problem and its implications.

Objective Indicators:

1) Number of complaints to county health departments.

2) Creation of a survey to measure awareness.

3) Increase of people using recycling and waste hauler services.

Activities:

- a) Develop media campaign using existing information from sources such as ODNR's Litter and Recycling program and other necessary literature for the illegal trash dumping problem.

- Best Management Practices that will be highlighted include:
 - Using recycling and trash services.
 - Developing neighborhood watch groups to prevent illegal dumping.
 - Using preventive signage for public education.
 - Encouraging volunteer cleanup efforts.
 - Educate people about different alternatives to littering through comprehensive lists of local haulers and recycling alternatives.
 - Distribute to landowners on the creek, school kids, township trustees and commissioners.
 - Educate people on recycling efforts in local communities.
 - Gallia, Vinton and Meigs have drop-off locations.
 - Jackson has curbside and drop off.
 - Educate local officials with photos and presentations of the situation in their county.
 - Give presentations to construction companies, home improvement contractors, hunters and landowners who provide fill dirt.
 - Prepare a slide show of dump sites.
 - Collaborate with solid waste districts on their educational program with school trips to landfills and tours of sites.
 - Create fact sheets as needed and use existing information developed through Project Green Sweep.
 - Leave informational flyers with homeowners who are having work done.
 - Identify and develop information sheets on funding sources that landowners can access to help defray costs of disposal of certain large items such as tires.
- b) Create workshops for:
- Offenders, specifically focusing on watershed and water quality issues
 - Judges who are responsible for assigning community service work
- c) Develop incentive programs for people who recycle and use local waste haulers

d) Research townships that have levies to support trash dumpsters and clean up efforts

Objective 2: Identify and plan cleanup activities to further reduce illegal dumping.

Objective indicators:

1) Number of people involved in cleanup activities.

2) Number of cleanup events.

Activities:

- a) Utilize the EPA Illegal Dumping Economic Assessment (IDEA) model to realistically quantify the costs associated with cleanup.
- b) Plan cleanup events in collaboration with the solid waste districts, keeping the following target audiences in mind: school kids and 4-H, Kiwanis, environmental groups, Lions, canoe groups, fishing clubs, scout troops
 - o Research developing an “environment” Scout badge or work with troop leaders to devise activities to support one.
- c) Advertise scheduled cleanup events hosted by other organizations or local entities.
 - o Identify key locations where dumpsters could be placed on a limited, special event basis.
 - o Work with township trustees to identify locations for people to dump items that haulers and recycling centers do not accept.
- d) Discuss planning a “Raccoon Creek Sweep” that would take place annually in targeted areas.
 - o Distribute information about and get people involved in an “Adopt a Stream” program.
 - o Target areas where recreational opportunities are high.
 - o Create incentives for being involved in the cleanups. Raffle items, such as a canoe.
- e) Work with ReUse Industries to develop a waste exchange database with local industries.

Objective 3: Identify and make the public aware of the number of dumpsites throughout the watershed.

Objective Indicator:

- 1) Creation of a survey to measure awareness
- 2) Increase in volunteer efforts to cleanup dump sites

Activity:

- a) The solid waste district has mapped all illegal dump sites in a four-county area. Use this information as part of a media campaign to increase local awareness.
 - o Identify key sites to clean up along the creek with the solid waste district.
- b) Identify sites on abandoned strip mined lands, commercial lands and public lands.

Littering and Illegal Dumping Activities Timeline

| Activity | Time Frame | Partners |
|---|-------------------|--|
| 1a | Years 1-3 | RCIC, RC Forum, Ohio EPA, County Health Department, Solid Waste District, ReUse Industries |
| 1b | Years 2-5 | Solid Waste District, County Health Departments, Civic Groups, RC Forum, RCIC |
| 1c | Years 4-7 | Local municipalities, County Health Department, Solid Waste District |
| 1d | Years 2-3 | Ohio University, Hocking College, Rio Grande |
| 2a | Years 1-10 | Solid Waste District, ReUse Industries, RCIC, RC Forum, County Health Departments |
| 2b | Years 1-10 | RC Forum, RCIC |
| 2c | Years 4-7 | RCIC, RC Forum, Solid Waste District |
| 2d | Years 5 | ReUse Industries, Solid Waste District, RC Forum |
| 3a | Year 3 | RC Forum, Solid Waste District, RCIC |
| 3b | Years 3-5 | RC Forum, MeadWestvaco, State Land Owners |
| Potential Funding Sources: Canon U.S.A. Inc.; FishAmerica Foundation; Ford Motor Company; George Gund Foundation; Wildlife Diversity Grant Program; Ohio Environmental Education Fund; EPA Office of Water Environmental Education Grants; Public Welfare Foundation; Recycle Ohio!; Take Pride in Ohio Schools; In-kind services provided by Solid Waste District | | |

ISSUE FIVE: STREAM DEBRIS

Problem Statement:

Stream debris, primarily in the form of logjams, concerns residents in the watershed because they potentially damage property, limit recreation and reduce the overall aesthetics of Raccoon Creek. Logjams trap sediment and prevent other debris from flowing freely downstream.

But a misconception exists that logjams cause flooding in the watershed, leading citizens to advocate widespread logjam removal when that might not be the most effective solution. As an important habitat for beaver and other wildlife, logjams serve purposes in the aquatic ecosystem, and education on this aspect is lacking. When logjam removal is sometimes necessary, systems to identify and monitor problem areas do not yet exist.

Goal: Educate local citizens about natural stream functions and potential sources of impairment, such as stream debris.

Goal Indicator:

1) Awareness of natural stream functions has increased and people are more aware of the distinction between “good” and “bad” stream debris (through a survey)

Objective 1: Inventory stream debris and use geographic information systems (GIS) to map problem areas.

Objective Indicators:

1) GIS is being used to monitor and track problem areas with stream debris.

Activities:

- a) Create an inventory of major problem areas.
 - Distinguish between private and public land
- b) Map county logjam removal projects throughout the watershed.
 - Facilitate a forum to discuss developing a logjam evaluation and monitoring program. Involve SWCD, county officials, and planning units to create scientific criteria to determine whether to remove debris and how to best do that.

Objective 2: Develop an education program on natural stream functions and best management practices for local citizens.

Objective Indicator:

- 1) Workshops are developed and implemented on natural stream function.
- 2) BMPs discussed in educational program are implemented.

Activities:

- a) Research other county programs and their success.
 - Acquire local feedback about how citizens perceive logjams.
- b) Educate the population on the natural function of the creek so that citizens can make informed decisions.
 - Organize stream workshops.
 - Develop brochures, commercials and videos.
 - Educate the population on beaver dams, specifically understanding habitat advantages versus how they cause problems (disrupt drainage, flood properties, road in floodplain). Discuss how to take care of beavers, such as winter trapping and benefits of them in wetlands.
 - Focus on new clients to SWCDs for education programs.
- c) Encourage student research on logjams and the subsequent trapping of sediment and other debris moving downstream.
- d) Explore the possibility of doing a logjam removal demonstration project with a local Soil and Water Conservation office in the watershed.

Stream Debris Activities Timeline

| Activity | Time Frame | Partners |
|--|------------|--|
| 1a | Years 3-4 | RCIC, RC Forum, SWCDs, Private Landowners, ILGARD |
| 1b | Years 3-4 | SWCDs, ILGARD RC Forum, RCIC |
| 2a | Years 5-6 | Local municipalities, SWCDs, County Engineers, Ohio University Students, Hocking College |
| 2b | Years 3-5 | ODNR, OEPA, Ohio University, MBI |
| 2c | Years 1-10 | OhioUniversity, Hocking College, Rio Grande, RC Forum |
| 2d | Years 3-7 | SWCDs, ODNR, Private Landowners, RC Forum, RCIC |
| <p>Potential Funding Sources: Acorn Foundation; Challenge Grants; Challenge Grant for Conservation; Clean Water Action Plan Fund; Conservation Works of Improvement; Environmental Statistics Center; EPA Office of Water Environmental Education Grants; FishAmerica Foundation; Five-Star Challenge Restoration Grants; Ford Motor Company; Great Lakes Basin Program for Soil Erosion & Sedimentation Control; Hardwood Forestry Fund; IBM; J. C. Downing Foundation; Keep the Wild Alive’s Species Recovery Fund; NSF Geoscience Education; NPS Education Grants; ODNR “Nature Works” Grant; Ohio Environmental Education Fund; Partners for Fish & Wildlife Program; Public Welfare Foundation; Sustainable Agriculture Research & Education; NRCS Environmental Quality Incentive Program; NRCS Flood Prevention; NRCS Forestry Incentive Program; NRCS Wetland Reserve Program; Water Quality Species Research Grants Program; Watershed Protection & Flood Prevention; Watershed Resource Restoration Sponsor Program</p> | | |

ISSUE SIX: EROSION AND SEDIMENTATION

Problem Statement:

Ohio EPA's Ohio Resource Inventory, 305b Report lists siltation as a cause of water quality impairments. Identified sources include subsurface and surface mining, removal of riparian habitat, pastureland, oil and gas activities and non-irrigated crop production. The following stream segments are listed as impaired due to siltation in the Ohio EPA TMDL for the upper reaches of Raccoon Creek: Sandy Run, Lake Hope, Honey Fork, Wheelabout Creek, Elk Fork, Meadow Run, Opossum Run, Strongs Run, and Williams Run (See Appendix F for a list of sources for each stream segment). At this time there is insufficient data to determine the extent of the problem or which sources are contributing to poor water quality. This goal area focuses on data collection and further research to identify the key problem areas. The Raccoon Creek Forum will coordinate with Ohio EPA, NRCS, USGS and ODNR SWCDs to establish a procedure for data collection and analysis.

Russell Run, Flat Run, and Long Run in the middle basin of Raccoon Creek do not meet their use designation due to oil and gas activities. These segments will be included with this goal area because siltation could be a problem associated with oil and gas activities.

Goals:

- 1) Gather field data in impaired stream segments to document and quantify the sources that contribute to siltation in the creek over the next two to five years, or between 2003-2008.
- 2) Identify and reduce problem areas and land use practices that contribute to the amount of erosion and sediment in the creek.

Goal Indicators:

- 1) Specific programs have been designed to control sediment sources.
- 2) Reduction in sediment, enabling water quality standards to be met.
- 2) Transparency tube readings at 120+ cm. Turbidity tube readings five nephelometric turbidity units (NTU) or less.

3)QHEI Substrate Metric Endpoint for WWH streams: 13-14; QHEI Embeddedness Measure: Low-None.

4)Increased biological diversity.

Objective 1: Identify and research key problems areas that are increasing the sediment load to the creek.

Objective Indicators:

1)Natural sediment loads have been identified.

2)Current sediment loads have been identified.

3)Turbidity and Transparency readings pinpoint problem areas.

Activities:

a) Research sediment loadings to the stream and the amount it should be carrying naturally.

- In 2003 complete turbidity and transparency study to assist partners in identifying key problem areas.
- By the end of 2004 update Qualitative Habitat Evaluation Index (QHEI) forms for the 10 impaired stream segments with assistance from certified Ohio EPA staff.
- Research soil types and their soil loss factors in the Western Allegheny Plateau Ecoregion of Ohio.
- Research studies on soil loss due to different activities, such as logging and agriculture.
- Look at other agency and company research from MeadWestvaco and other sources.

b) Analyze sediment causes from listed sources to the stream.

Example: How much sediment load is coming from abandoned mine lands or reclaimed lands?

- Identify and prioritize specific sites that seem to be causing the sediment problem in the stream by the end of 2004.
- Design appropriate projects to reduce sediment at two sites per year starting in 2005 using best management practices used for timber, agriculture and abandoned mine lands.

- Identify projects around the country that do sediment studies, such as USDA Cochocton Research Station: how they collect/analyze data; how they are funded.
 - Visit other watersheds that have implemented successful streamside management (Indiana).
- c) Analyze stream segments listed with oil and gas activities as a cause of impairment by the end of 2003.
- Work with Ohio EPA Ecological Assessment Unit to determine main cause for listing stream segments and re-visit sites for further analysis.
 - Identify wells and work to resolve problem areas with assistance from ODNR, which has regulated brine, a point source, since 1978.
 - Take soil samples at sites to measure metals and chlorides as a cause for vegetation loss in the area.

Objective 2: Educate people about best management practices and implement 2 projects per year to decrease erosion and sedimentation into the creek.

Objective Indicators:

- 1) Decrease in sediment load with completion of 2 projects per year.
- 2) Increased use of logging, agriculture, and riparian health BMPs
- 3) Increased media coverage
- 4) Increased use of USDA/NRCS easement programs

Activities:

- a) Identify different target audiences for sediment problem education.
 - Kids: water quality problems
 - Adults: laws, policies, enforcement
 - Loggers, landowners, local officials, farmers
- b) Work with agencies to develop two workshops per year for BMP use in:
 - Forestry/Timber practices
 - Best management practices: establishing or retaining riparian forest; proper road construction, drainage and management; planning of sites to be developed.

- Agriculture
 - Best management practices: Tree planting, riparian management/restoration/buffer zone establishment, runoff management systems (e.g. wood chip trenches); waste management practices; and critical area management, planned grazing systems, heavy use area protection, fencing off woodlots, and pasture and hayland improvement.
 - Livestock grazing in riparian areas and watering of livestock in the stream
 - Abandoned mine land restoration
 - Best Management Practices: Anoxic limestone drains, reclamation, constructed and restored wetlands, surface stabilization, stream protection, tree planting
- c) Promote stakeholder awareness of sediment problems through:
- Establishing a volunteer monitoring program to assist with sediment studies.
 - Working with OSU Extension and other agencies to increase number of farm tours to highlight BMPs.
 - Organizing one tree planting per year for local citizens.
 - Planning more recreational activities, e.g., canoe trips-to point out stream problems.
- d) Work with ODNR Division of Forestry to get a watershed forester to assist local landowners.
- Division of Forestry could offer office space, clerical support and a vehicle. Work with other project partners to leverage funds.
- e) Repackage of educational material from different sources to simplify and condense the information that is available. Develop a simple one page/one stop fact sheet.
- f) Encourage greater use of existing conservation easement programs such as CRP.

Erosion and Sedimentation Activities Timeline

| Activity | Time Frame | Partners |
|--|------------|---|
| 1a | Years 1-5 | RC Forum, Ohio EPA, ODNR, Ohio University, Hocking College, Rio Grande |
| 1b-c | Years 1-6 | OEPA, ODNR, Office of Surface Mining, RC Forum |
| 2a | Years 1-2 | OEPA, RC Forum, NRCS, SWCDs |
| 2b | Years 3-7 | OEPA, RC Forum, NRCS, SWCDs |
| 2c | Years 1-10 | RCIC, RC Forum, OSU Extension, SWCDs, ODNR, MeadWestvaco, Bob Evans Farms |
| 2d | Years 1-10 | ODNR- Division of Forestry, RC Forum |
| 2e | Years 3-5 | Ohio University, Hocking College, RCIC, RC Forum, NRCS, SWCDs |
| 2f | Years 1-10 | NRCS, SWCDs, RC Forum |
| <p>Potential Funding Sources: Acorn Foundation; Challenge Grants; Challenge Grants for Conservation; Clean Water Action Plan Fund; Conservation Works of Improvement; Environmental Statistics Center; EPA Office of Water Environmental Education Grants; FishAmerica Foundation; Five-Star Challenge Restoration Grants; Ford Motor Company; Great Lakes Basin Program for Soil Erosion & Sedimentation Control; Hardwood Forestry Fund; IBM; J. C. Downing Foundation; Keep the Wild Alive’s Species Recovery Fund; NSF Geoscience Education; NPS Education Grants; ODNR “Nature Works;” Ohio Environmental Education Fund; Partners for Fish and Wildlife Program; Public Welfare Foundation; Sustainable Agriculture Research & Education; NRCS Conservation Reserve Program; NRCS Environmental Quality Incentive Program; NRCS Flood Prevention; NRCS Forestry Incentive Program; Water Quality Special Research Grants Program; Watershed Protection & Flood Prevention; Watershed Research Restoration Sponsor Program</p> | | |

ISSUE SEVEN: LOSS OF HISTORICAL RESOURCES

Problem Statement:

Although the Raccoon Creek watershed has a rich, historic past, many are unaware of the culturally significant sites and stories that have shaped the region. By identifying, protecting and publicizing these valuable assets, watershed villages can take advantage of valuable economic benefits. Ohio travelers spent \$25.7 billion in 2000, a per-resident spending of \$2,273. Southeast Ohio ranked the lowest of five regions in per-person spending, at \$1,897 (Ohio Division of Travel and Tourism 2002). Attracting tourists to historical resources in the Raccoon Creek watershed can jumpstart tourism in a region that needs sustainable economic development.

Highlighting historical points will boost local economies while educating residents and tourists about the natural resources that have played such a vital role in the watershed's history.

Goal: Increase local awareness and interest in the preservation of watershed historical resources.

Goal indicator:

- Increase in local interest and awareness of historical resources, identified through a survey.

Objective 1: Identify points of interest and their historical significance in the watershed.

Objective indicators:

- 1)Historic resources in the watershed are mapped.
- 2)Driving and biking tours are available to visitors.
- 3)Community members are aware of economic incentives for historic preservation.

Activities:

- a) Identify points of interest in Raccoon Creek to help create an identity for the watershed for a driving tour and a bike tour.
 - Sites could include both historical and natural.

- Work with Ohio Historical Society to make sure all sites on its registry are noted and well documented.
- b) Map sites of interest and assist with written and audio information about them.
- c) Offer tours of historical sites throughout the watershed and provide watershed maps so that people begin to connect historical sites with natural features.
- d) Work with Vinton County Visitor's Bureau and other interested partners on the Rails to Trails initiative from Mineral to Zaleski.

Objective 2: Work with local historical societies to help prepare for upcoming Ohio bicentennial events.

Activities:

- a) Some of the bicentennial events that need assistance include:
 - Wallpaper project: Residents throughout the six-county area of the watershed are being interviewed to collect oral histories.
 - Mailbox project: This will involve getting the word out to people to decorate their mailboxes for the bicentennial.

Objective 3: Work with the Ohio Arts Council and county historical societies to assist with the implementation of Ohio's Hill Country Heritage Area Strategic Plan.

Activities:

- a) Help fill gaps in identifying community historic and other significant resources through public gatherings.
- b) Invite representatives from the Ohio Historic Preservation Office to attend watershed meetings to discuss economic incentives for historic preservation and to discuss the development of local historic preservation programs.

Loss of Historical Resources Activities Timeline

| Activity | Time Frame | Partners |
|---|------------|---|
| 1a | Years 4-10 | RCIC, RC Forum, Local historical societies, Local travel and tourism boards. |
| 1b | Years 5 | ILGARD, RC Forum, RCIC |
| 1c | Years 5-10 | RCIC, RC Forum, Local historical societies |
| 1d | Years 2-7 | Vinton County Visitor's Bureau, Ohio University, County planning commissions, Rails to Trails, ODNR |
| 2a | Years 1-4 | RCIC, Local historical societies |
| 3a | Years 4-6 | Ohio Arts Council, Rural Action, RCIC |
| 3b | Years 4-6 | RCIC, Ohio Historic Preservation Office, Local historical societies |
| <p>Potential Funding Sources: Alcoa Foundation; Ohio Legacy Program; Certified Local Government Program; Investment Tax Credit for Rehabilitation of Historic Properties; Ford Foundation; George Gund Foundation; National Main Street Center; Ohio Division of Travel & Tourism; Ohio Heritage Area Program; Surdna Foundation</p> | | |

ISSUE EIGHT: STABILITY OF STREAM BANKS

Problem Statement:

Citizens who participated in the public meetings and focus groups ranked this issue as one of the top concerns in the watershed. For this reason it is being identified as a separate issue; although the goals and objectives may be similar to parts of the erosion and sedimentation goal area. We also believe there could be some connection to removal of riparian vegetation which is listed on Ohio EPA's 305 b list as a source of impairment to Raccoon Creek. After further investigation and data collection it may be appropriate to merge this issue with the erosion and sedimentation goal area or it may remain here with more emphasis on riparian removal.

A healthy riparian habitat is essential for a successful stream ecosystem. Buffer zones filter and prevent soil, nutrients, and other pollutants from entering the water. The trees, shrubs, vines, and other vegetation common in riparian zones provide habitat for bird, animals, and aquatic organisms, while reducing erosion and sedimentation. Vegetation also regulates stream temperature and supplies organic matter that feeds organisms there and downstream.

For those living, working and recreating near the banks of Raccoon Creek, education about how human intervention affects the stream is imperative. Agriculture and livestock too close to the banks loosen soil and encourage erosion. Logging without implementing best management practices (BMPs) and recreation, including off-road vehicles and other high-impact equipment, all contribute to unstable stream banks. Ohio EPA's Ohio Resource Inventory, 305b Report lists thermal modifications as a cause of impairment to the water quality in Raccoon Creek; one of the identified sources for this impairment is the removal of riparian vegetation.

Educating the public about landowner and ecosystem benefits of healthy riparian zones, what buffers to use and available funding sources is vital in improving Raccoon Creek for the long term.

Goal:

1)Gather data and map existing riparian coverage throughout the watershed.

2) Identify appropriate projects for stream bank stabilization and appropriate coverage to protect and improve the health of the stream.

Goal indicators:

- Riparian conditions are documented and mapped
- Appropriate projects are designed for streambank and riparian health.
- Percentage of increased cover or dedicated buffer along the stream.
- Increased aquatic diversity of the stream.

Objective 1: Identify and map existing riparian coverage and set benchmark for desired stream bank coverage.

Objective indicator:

- 1) Existing riparian conditions are identified and mapped.
- 2) Benchmark for desired streambank coverage is set.

Activities:

- a) Work with Raccoon Creek Partners and volunteers to identify current streambank problems along the creek. Catalog specific problem sites and suspected source of the problem.
- b) Use aerial photos and remote sensing data to calculate current coverage along the creek.
- c) Review literature and discuss with appropriate agency personnel the desired coverage for Raccoon Creek to set benchmark.

Objective 2: Increase technical assistance to landowners to educate them on stream bank stabilization techniques and importance of riparian health.

Objective indicator:

- 1) Increase in local technical assistance to landowners for stream bank BMPs.

Activities:

- a) Work with key agency experts and landowners to provide educational workshops to citizens, targeting those who live adjacent to the stream. The following list represents some important best management practices and other items that need to be addressed through workshops:
 - Impacts of poor land management upstream and their effects on downstream landowners.
 - Discussion of incentive programs—tax incentives, CAUV, CRP.

- NRCS guidelines for buffer widths—size stream = size buffer. Discuss what is a “good buffer” with various types of land use.
- Stream functions using the Rosgen technique.
- Contract development with loggers. Landowners need to understand the implications of a logger’s work and their responsibility under H.B. 88.
- Impacts of uncontrolled access of livestock to the stream; discuss how H.B. 88 and OEPA 319 funds can be used for a cost share to develop alternative watering systems.
- Offering BMP workshops for loggers to private landowners.
- Making landowners and loggers aware of Master Logger Program.
- Impacts on the biology of a stream as it relates to different stream bank coverages.

Objective 3: Improve public access to existing and new educational materials and local models of good stream bank protection practices.

Objective indicator:

1) Educational materials are easily accessible to the public through the media and in handouts.

Activities:

- a) Work with NRCS media campaign—expand this buffer initiative to improve water quality into Raccoon Creek.
- b) Compile existing information to create a toolbox of information from various organizations—NRCS, SWCDs, OSU Extension, “Tread Lightly.” Distribute information to school libraries and local village libraries.
- c) Work with organizations like “Tread Lightly,” a national movement that encourages low-impact outdoor recreational activities. They have produced educational materials for off-road vehicle use and hunters.
- d) Explore the development of a trust for Raccoon Creek for conservation easements; look at Hocking River Commission as a model.
- e) Research the development of other incentive programs for private landowners, such as local tax breaks for the development of local water quality plans on their property. Look at what other states are doing.

- f) Develop a list of locations and landowners who have implemented BMPs to serve as models for local tours:
 - Identify model farms with good buffer management.
 - Highlight riparian planting at Gifford on Opossum Creek on State Route 377.
 - Visit farms where rural water systems are being developed to provide another source of water for livestock. For example, a local landowner in Margaret's Creek does a seasonal dairy, rotational grazing and stable access program, all of which are part of an effort to control erosion.
 - Look at Northwest Ohio NRCS program as a model of stream-side tree plantings.
- g) Plan tree planting events throughout the watershed, encouraging school and volunteer participation.

Stability of Stream Banks Activities Timeline

| Activity | Time Frame | Partners |
|---|------------|---|
| 1a | Year 2-3 | RC Forum, Ohio EPA, ODNR, NRCS, SWCDs |
| 1b | Year 3 | RC Forum, Ohio EPA, ODNR, NRCS, SWCDs |
| 1c | Year 3 | RC Forum, Ohio EPA, ODNR, NRCS, SWCDs |
| 2a | Years 1-10 | RCIC, RC Forum, Ohio EPA, ODNR, NRCS, SWCDs |
| 3a | Years 1-3 | NRCS, RC Forum, RCIC, SWCDs |
| 3b | Years 3-5 | NRCS, SWCDs, ODNR, Local municipalities, County schools, Ohio University students, ILGARD |
| 3c | Years 2-7 | Tread Lightly, SWCDs, Other local organizations, clubs |
| 3d | Years 4-7 | RC&D, RCIC, RC Forum, National Land Trust |
| 3e | Years 4-5 | RC Forum, Ohio University, Hocking College students |
| 3f | Years 1-10 | RCIC, RC Forum, OSU Extension, Local SWCDs, NRCS, ODNR |
| 3g | Years 1-10 | US Forest Service, ODNR, RC Forum, RCIC, Local schools, MeadWestvaco |
| <p>Potential Funding Sources: Acorn Foundation; Challenge Grants; Challenge Grants for Conservation; Clean Water Action Plan Fund; Conservation Works of Improvement; Environmental Statistics Center; EPA Office of Water Environmental Education Grants; FishAmerica Foundation; Five-Star Challenge Restoration Grants; Ford Motor Company; Great Lakes Basin Program for Soil Erosion & Sediment Control; Hardwood Forestry Fund; IBM; J. C. Downing Foundation; Keep the Wild Alive’s Species Recovery Fund; NSF Geoscience Education Grant; NPS Education Grants; ODNR “Nature Works;” Ohio Environmental Education Fund; Partners for Fish & Wildlife Program; Public Welfare Foundation; Sustainable Agriculture Research & Education; NRCS Conservation Reserve Program; NRCS Environmental Quality Incentive Program; NRCS Flood Prevention; NRCS Forestry Incentive Program; NRCS Wetland Reserve Program; Water Quality Species Research Grants Program; Watershed Protection & Flood Prevention; Watershed Research Restoration Sponsor Program</p> | | |

GETTING STARTED: ACTION PLANNING TO IMPLEMENTATION

The action planning process allows for substantial community input from watershed residents who have a variety of concerns and interests. It provides a learning opportunity for all involved to discuss water resource problems and understand the interface between humans, their activities and the impacts they have on the watershed. An awareness of this interconnectedness of all systems in a watershed, be it social, cultural or ecological, has helped watershed residents and project partners begin to identify solutions to our problems. With community and partner participation and ownership of the plan, we hope it can serve as a blueprint for restoration activities for years to come.

Activity Timeline

Each goal in the plan represents a potential group of projects, both large and small, to be coordinated by the agency, group, organization or individual best suited to do so. An activity timeline follows each of the eight priority issues in the Watershed Issues and Action Strategies section. The timeline prioritizes activities by year, recognizes potential partners and identifies applicable funding sources.

Funding

Once action planning is complete, securing funding is the next step in implementing activities to reach our goals and objectives for watershed restoration.

Through extensive research, ILGARD staff and students already have completed a comprehensive guide to public and private resources. Those funding sources mentioned in the timelines correspond to those found in Appendix O, a guide categorized by the eight priority issues in the watershed. These entries include a brief overview of the sources' missions and funding interests, application dates where available and contact information.

Researching and applying for funding on a continual basis with the activity timelines in mind will keep projects on track and prevent delays because of unavailable money.

Public Information and Education

Many of the activities in the Watershed Issues and Action Strategies section emphasize research and education needs throughout the watershed. These recognize the necessity for decisions to be based upon good science and reliable data, especially for complex issues such as sewage and sedimentation. None of these issues can be considered independently of the others, and research that provides perspective for this particular watershed's needs is necessary.

But gathering the information is just the first step. For community members to be fully involved, this information must be accessible and understandable on a larger scale. Numerous other activities focus on disseminating information to various subsets of the watershed's population. Local government officials, health department employees, educators, streamside landowners, farmers, youth and the media are some of the groups of interest.

Through a variety of targeted workshops, cleanup activities, presentations and print and electronic material, these groups and others can learn about environmental concerns and what they can do to aid in restoration. In some cases, it might be helpful to conduct surveys of residents' knowledge and feelings on issues or visit other communities that have found particularly creative or economical solutions to similar problems.

Maintaining ongoing relationships with residents, administrators and reporters can ensure that all are aware of the important work in Raccoon Creek. Frequently updating the Web site at www.raccooncreek.org with new developments and creating a more versatile executive summary of this document for mailing are also ways to spark interest in our projects.

Throughout public education activities, it is essential to present information in an interesting, non-technical way that draws curiosity and commitment to the project.

Measuring Success

Monitoring the success of the Raccoon Creek management plan is an important part of the planning process. In order to adequately evaluate progress, key stakeholder

groups must be involved as well as the general public. Contingent upon the availability of resources, achieving goals and objectives will occur in the following manner:

- The plan will be subject to continual review by the Raccoon Creek Forum, the Raccoon Creek Improvement Committee and the Leadership Review Board. When it seems necessary to modify the plan because of environmental, economic, technical or social trends, the plan will be amended. Any significant amendments, such as an added issue area, will involve a public participation process.
- It is intended that an “information festival” will be held yearly to share information and progress with stakeholders and determine the need for revisions to the plan. Surveys will be distributed to citizens, stakeholder groups and focus groups that attend the festivals to assess their knowledge of completed activities, and any attitude changes will be noted. Notice will be given in local newspapers to provide the opportunity of the general public to provide input and review.
- Defined indicators in the plan will be tracked for progress in a report card format to determine the overall success of goals and objectives.

Tracking the performance and success of the management plan activities to achieve the stated objectives will be achieved through the following process:

- Updates will be done to the natural resource inventory and presented to the various stakeholders to analyze changes to the overall quality of resources in the watershed.
- Water quality sampling data and biological data will be collected and analyzed to determine changes in overall health of the creek.

Contingent upon the availability of funding, a tracking system will be designed and implemented with the assistance of the Raccoon Creek Forum. A hybrid of two models may be considered:

- *Bennett’s Hierarchy* (Bennett & Rockwell 1995) is a planning and evaluation model, which focuses on the following components: Inputs, Activities, People involvement, Reactions, KASA (knowledge, attitudes, skills, and aspirations change), practice change, and end results.
- *Ongoing Plan Management*, produced by ILGARD, September 2000. This model was designed to assist counties implementing Community Plans for Welfare

Reform. This is similar to Bennett's performance measurement framework with increased emphasis on outputs and overall project outcomes.

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APPENDIX A: GLOSSARY

Acidity: the measurement of a condition where the concentration of positively charged hydrogen ions is high, and the pH is less than 7.0.

Acid Mine Drainage (AMD): a condition formed when water reacts with the coal bedrock of underground mines. Acid mine drainage is usually associated with the following characteristics:

- Low pH (high acidity)
- High metals concentrations
- Elevated sulfate levels
- Excessive sediment and siltation

Acid concentrations in streams can kill many life forms and stunt the growth of others. Acidic water can also break down the metallic compounds of iron, sulfur, manganese and aluminum found in nearby rock or earthen waste piles. The precipitation of iron III is responsible for the characteristic orange coloring of the water also known as “yellow-boy.”

Alluvium: material deposited by rivers; forms floodplains and deltas.

Aquifer Gradient: the slope of the underground layer of porous rock, sand or other material that allows the movement of water between layers of nonporous rock or clay.

Bedrock: any solid rock exposed at the earth’s surface or overlain by unconsolidated material.

Best Management Practices (BMPs): a practice or combination of practices that are determined by a state or a designated planning agency to be the most effective and practicable means of controlling point and nonpoint source pollutants at levels compatible with environmental quality goals.

Biological Criteria (Biocriteria): a direct measure of the attainment or non-attainment of aquatic life use designations for Ohio’s streams. It is based on the numbers and types of aquatic organisms inhabiting a particular stream or river sampling site.

Biological Indicator (Bioindicator): aquatic organisms that represent the overall function of the stream ecosystem and are indicative of stress and disturbance upon that system. This includes fish, macroinvertebrates and periphyton.

Biota: refers to any and all living organisms and the ecosystems in which they exist.

Buffering ability or capacity: refers to the amount of acid that may be neutralized by a given amount of buffer from the receiving waters. Calcium carbonate found in bedrock is a common buffer for acid mine drainage.

Colluvium: eroded sediment that accumulates at the base of a slope.

Degradation: the act of lowering the quality, usefulness or overall health of a stream ecosystem.

Dissolved Solids: solid material carried by water.

Endangered Species: a federal designation for a species population that has declined to relatively low levels; a trend that, if continued, will result in extinction.

End-of-pipe Standards: the specific standards set forth that determine the permissible levels of pollutants and/or contaminants at a specific discharge point.

Erosion: the process of soil particles being carried away by wind or water.

Fragipan: refers to the presence of a soil horizon that restricts moisture movement and plant root depth development; formed under low pH in humid areas

Full Attainment: designation given to specific stream and river miles in which the applicable aquatic life goals and standards (“uses”) are being met.

Geographic Information Systems (GIS):

Gob Piles: an area covered by low-grade coal waste. Gob piles range greatly in size, from very small areas to dozens of acres and are known contributors to acid mine drainage.

Lacustrine: deposited lake sediment.

Limited Resource Water-Acid Mine Drainage (LRW-AMD): designation given to specified stream and river miles that are adversely impacted from the effects of acid mine drainage.

Loess: salt deposits brought by wind; primarily formed in areas bordering continental glaciers.

Macroinvertebrates: refers to species lacking a backbone (invertebrates), including crustaceans, insects and worms that assemble in semi-permanent populations. Determining presence or absence of various macroinvertebrates provides a good environmental indicator of stream health because many species are known to be either pollution tolerant or intolerant.

Non-attainment: Designation given to specified stream and river miles in which the applicable aquatic life goals and standards (“uses”) are not being met. Indicates impairment of aquatic life assemblages.

Non-point-source Pollution: water pollution that results from a variety of human land uses, such as agriculture, surface mines, forestry activities, home wastewater systems and construction sites, among others. These pollution sources cannot be controlled at a single location and can only be curbed by implementing land management practices at multiple levels.

Partial Attainment: a designation given to specific stream and river miles in which the applicable aquatic life goals and standards (“uses”) are partially being met. Indicative of some impairment.

Permeability: the capacity of material to transmit water and other fluids.

pH: scale measurement of hydrogen ion concentration (0-14) used to designate acidity or basicity (alkalinity) of solutions or soil. A pH of 7 is neutral; values decreasing from 7 indicate increasing acidity; values increasing from 7 indicate increasing basicity. Each unit from 7 indicates a tenfold increase over the preceding unit.

Plume: the movement of water along flow lines from a point source of ground water pollution toward its eventual emergence at the surface; ground water pollution are sources of drinking water contamination.

Point-source Pollution: pollutants originating from specific points, such as factory discharges or sewage outlets.

Porosity: the percentage of material occupied by pore space.

Riparian Zone: the habitat area in and directly adjacent to a river and/or stream channel.

Room-and-Pillar Mining: a technique in which coal was cleared from a coal seam using pillars of unexcavated coal to support the tunnel. As time progressed, the remaining coal pillars have contributed to acid mine drainage and/or have subsided.

Sedimentation: the filling of water bodies, such as lakes and stream channels, with sand, silt and other soil particles. These particles come from erosion, usually the result of poor soil conservation practices associated with agriculture, mining and /or development.

Soil Association: types of soil found in a particular region.

Strata: a layer of specific type of rock.

Stratigraphy: the succession and age relation of layered rocks.

Subsidence: a collapse of an underground mine, which is characterized by a dip in the overburden.

Threatened Species: a designation for a species population that is declining due to direct or indirect human impacts.

Total Maximum Daily Load: the Total Maximum Daily Load (TMDL) program, established under Section 303(d) of the Clean Water Act, focuses on identifying and restoring polluted rivers, streams, lakes and other surface water bodies. A TMDL is a written, quantitative assessment of water quality problems in a water body and contributing sources of pollution. It specifies the amount a pollutant needs to be reduced to meet water quality standards, allocates pollutant load reductions and provides the basis for taking actions needed to restore a water body.

Watershed: the total land area that drains directly or indirectly into a particular stream or river. Typically named from the main stream or river into which it drains.

**APPENDIX B: PROJECT PARTNERS & LEADERSHIP REVIEW
BOARD MEMBERS**

Project Partners

Bob Evans Farms, Rio Grande, Ohio

Green Mountain Institute for Environmental Democracy, Montpelier, Vermont

Institute for Local Government Administration and Rural Development (ILGARD),
Athens, Ohio

MeadWestvaco Corporation, Chillicothe, Ohio

Natural Resource Conservation Service, Columbus, Ohio

Ohio Department of Natural Resources, Columbus, Ohio

Division of Mineral Resources Management, Columbus, Ohio and Jackson
Field Office

Soil and Water Conservation districts in Athens, Gallia, Hocking, Jackson,
Meigs and Vinton counties

Division of Forestry, Athens District

Ohio Environmental Protection Agency, Columbus, Ohio

Ohio State University Extension, Columbus, Ohio

Ohio University, Athens, Ohio

Ohio Valley Resource Conservation and Development, Sardinia, Ohio

Raccoon Creek Improvement Committee, contact Vinton County Soil and Water
Conservation District office

Rural Action, Trimble, Ohio

U.S. Environmental Protection Agency, Washington, D.C.

U.S. Forest Service, Washington, D.C.

U.S. Office of Surface Mining, Washington, D.C.

Leadership Review Board

Jackie Bird, Coal Director, Ohio Coal Development Office

Stuart Bruny, Southeast District Chief, Ohio EPA

John Carey, Ohio House of Representatives, 94th District

Donna Dewitt, Mayor, Village of Vinton

Bob Eichenberg, Athens County planner; floodplain administrator

Jess Goode, Field Director for the office of U.S. Rep. Ted Strickland

Wayne Lashbrook, Forest Stewardship Manager, MeadWestvaco Corporation

Max Luehrs, Appalachian Clean Streams Initiative coordinator, Office of Surface Mining

Christi Lynch, Field Representative for the office of U.S. Rep. Ted Strickland

Don McFeeters, Ohio State University Extension Director-South Centers

Ray McKinniss, Farm Manager, Bob Evans Farm

Joy Padgett, Director, Governor's Office of Appalachia

Harry Payne, Acid Mine Drainage Program Manager, ODNR Div. of Mineral Resources Management

Ken Reed, Vinton County Community Development Director

John Stabler, Mayor, City of Wellston

Jerry Wager, Administrator, ODNR Div. of Soil & Water Conservation

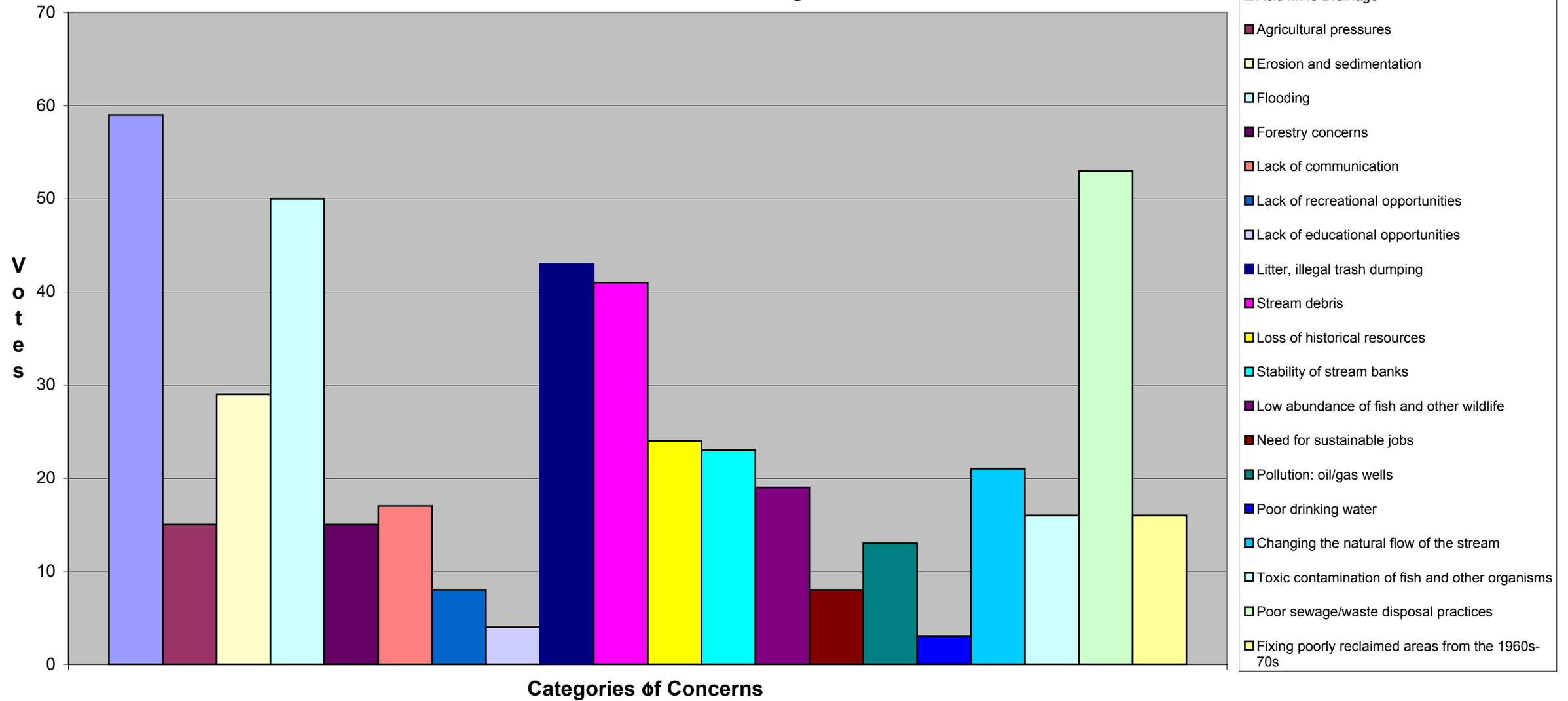
Brenda Weber, Sands Hill Coal Company

Paul Whyte, District Manager, ODNR Forestry

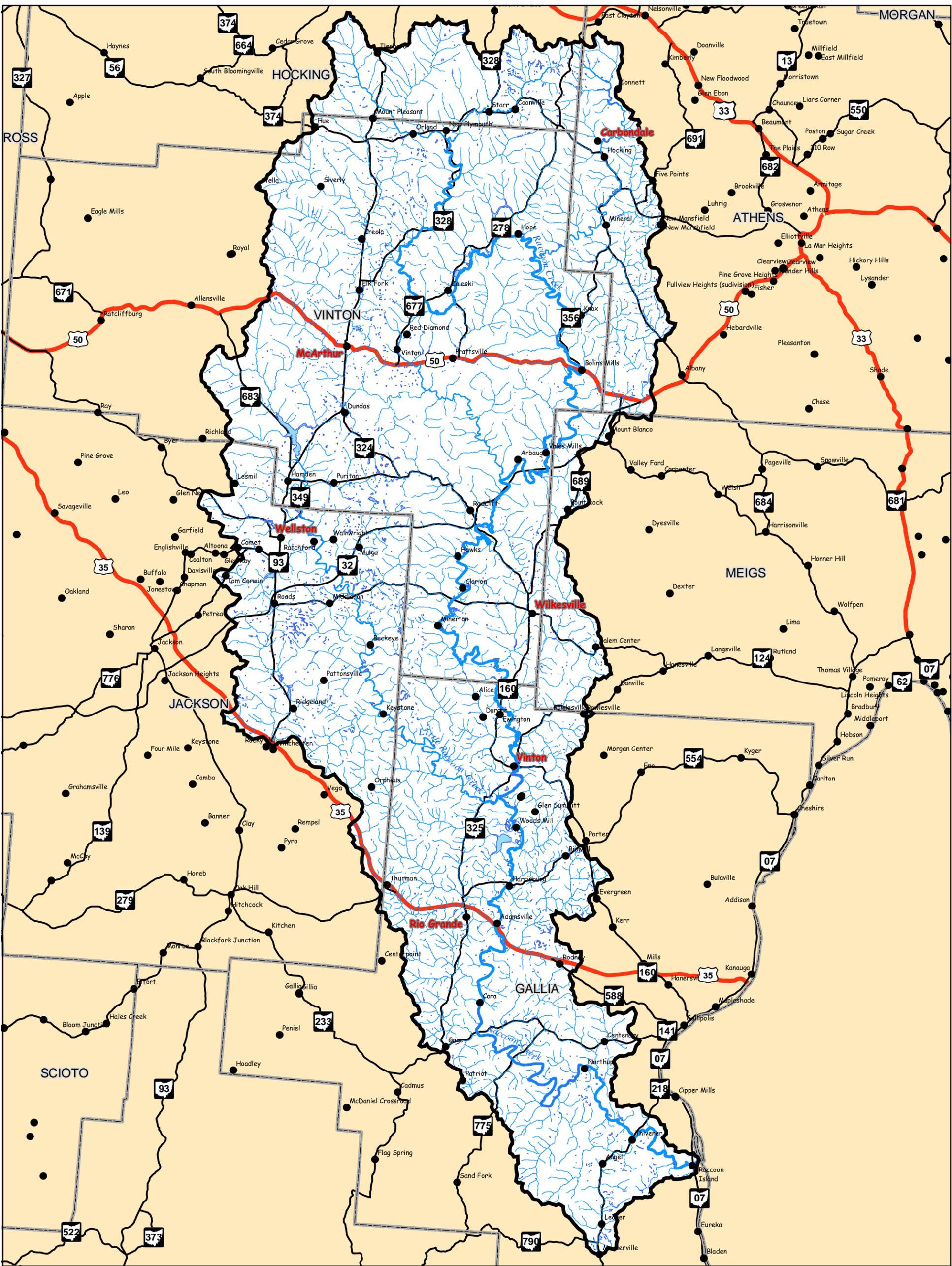
Gary Willison, Group Leader for watersheds, Wayne National Forest

Raccoon Creek Management Plan

Ranked Concerns from Public Meetings



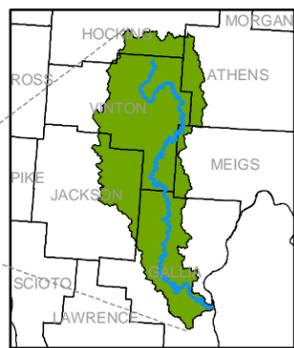
APPENDIX D: WATERSHED MAPS



Map Features

| | | |
|--------------------|---------|----------------|
| Watershed Boundary | Streams | State Highways |
| County Boundary | Lakes | US Highways |
| Places | | |

Watershed Location



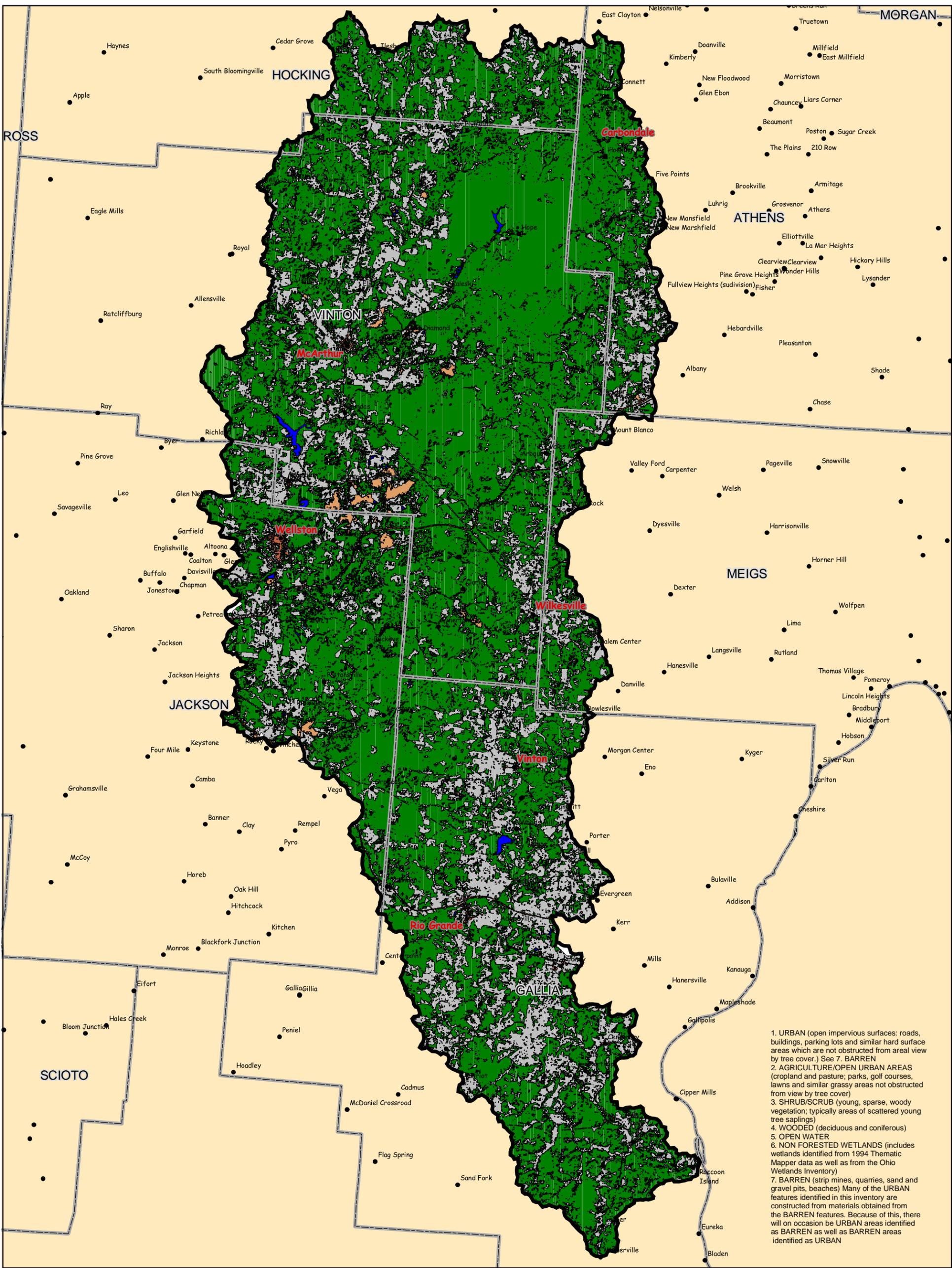
Map 1
Watershed Profile
The Raccoon Creek Watershed



OHIO UNIVERSITY

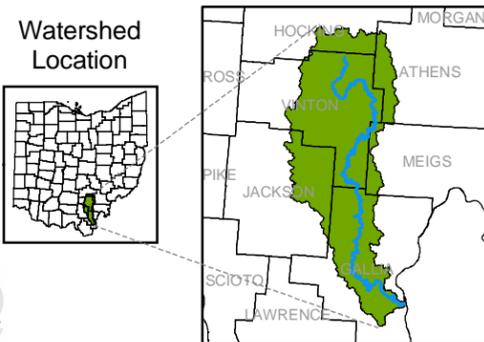
Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (11x17_1.mxd)

ILGARD
OHIO UNIVERSITY
Institute for Local Government Administration and Rural Development



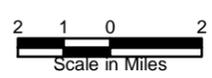
1. URBAN (open impervious surfaces: roads, buildings, parking lots and similar hard surface areas which are not obstructed from aerial view by tree cover.) See 7. BARREN
2. AGRICULTURE/OPEN URBAN AREAS (cropland and pasture; parks, golf courses, lawns and similar grassy areas not obstructed from view by tree cover)
3. SHRUB/SCRUB (young, sparse, woody vegetation; typically areas of scattered young tree saplings)
4. WOODED (deciduous and coniferous)
5. OPEN WATER
6. NON FORESTED WETLANDS (includes wetlands identified from 1994 Thematic Mapper data as well as from the Ohio Wetlands Inventory)
7. BARREN (strip mines, quarries, sand and gravel pits, beaches) Many of the URBAN features identified in this inventory are constructed from materials obtained from the BARREN features. Because of this, there will on occasion be URBAN areas identified as BARREN as well as BARREN areas identified as URBAN

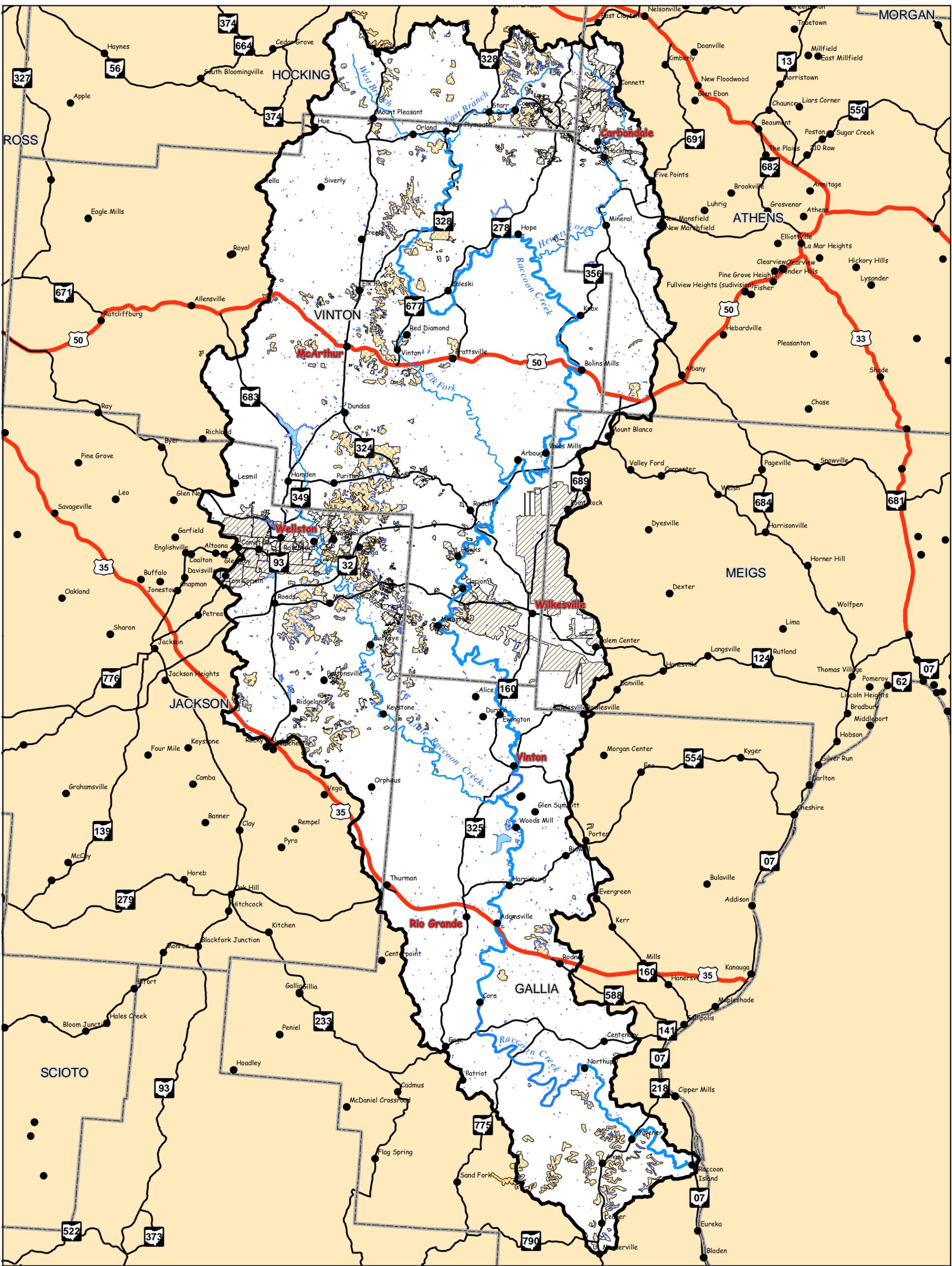
| Map Features | |
|--------------|-----------------------|
| | Urban |
| | Wooded |
| | Agricultural/Urban |
| | Open Water |
| | Shrub/Scrub |
| | Non-forested Wetlands |
| | Barren |



Map 2
Land Use Characterization
The Raccoon Creek Watershed

This map of the Raccoon Creek Watershed was created for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_2.mxd)

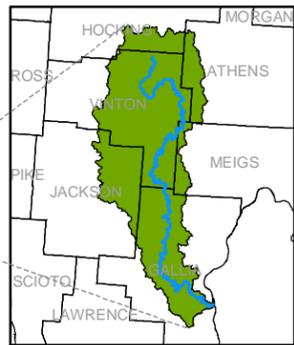




Map Features

| | |
|----------------|--------------------|
| Deep Mines | Watershed Boundary |
| Surface Mines | County Boundary |
| State Highways | Places |
| US Highways | |

Watershed Location



Map 3
Underground and Surface Mines
The Raccoon Creek Watershed



Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_2.mxd)



Map Features

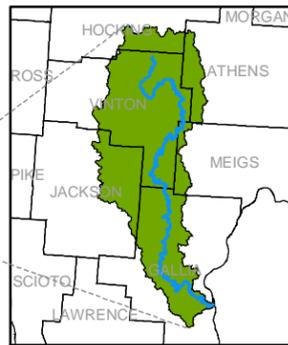
- State Highways
- US Highways
- Watershed Boundary
- County Boundary
- Places

1122 Feet
520 Feet

Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_2.mxd)

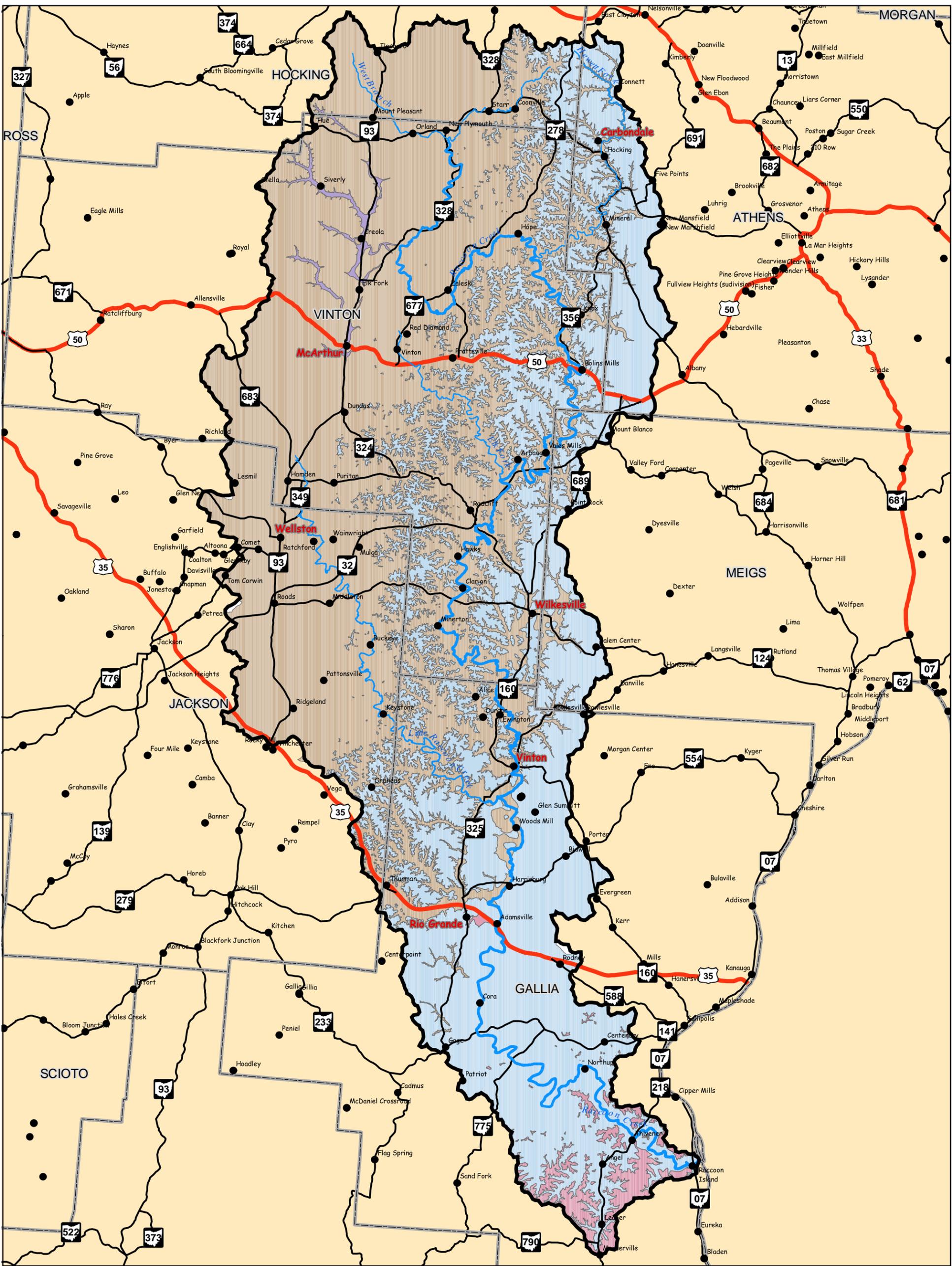
ILGARD
OHIO UNIVERSITY
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Watershed Location



Map 4
Shaded Relief
The Raccoon Creek Watershed





Map Features

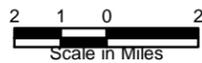
Geologic Unit

- Mlc: Logan and Cuyahoga Formations undivided
- Pap: Allegheny and Pottsville Groups undivided
- Pc: Conemaugh Group
- Pm: Monongahela Group

Watershed Location

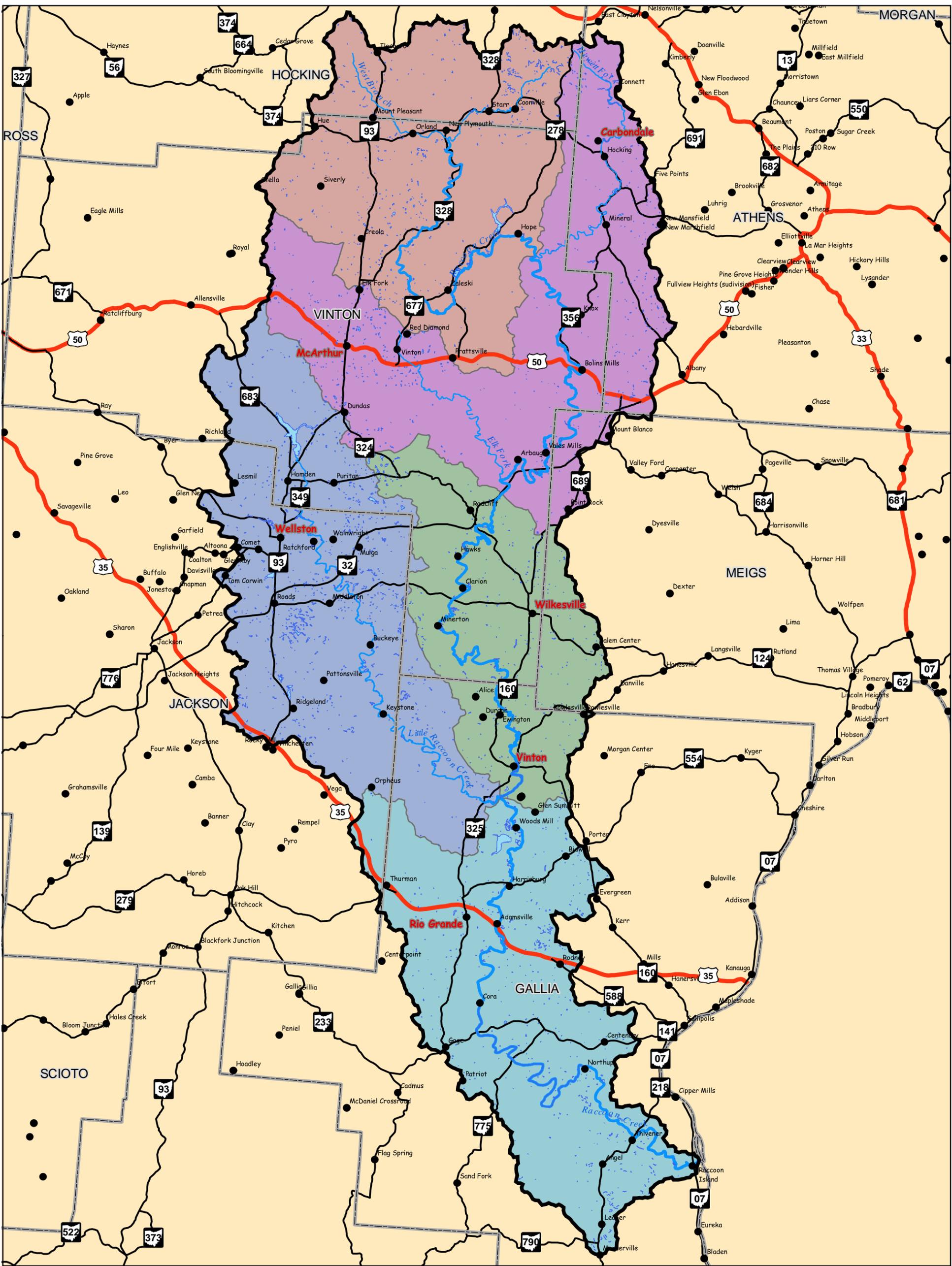


Map 5
Bedrock Geology
The Raccoon Creek Watershed



Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_6.mxd)



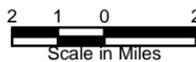


| Map Features | |
|--------------|----------------------------|
| | State Highways |
| | US Highways |
| | Watershed Boundary |
| | County Boundary |
| | Places |
| | Central - 060 |
| | Above Elk Fork - 050 |
| | Head Waters - 045 |
| | Little Raccoon Creek - 070 |
| | Southern - 080 |

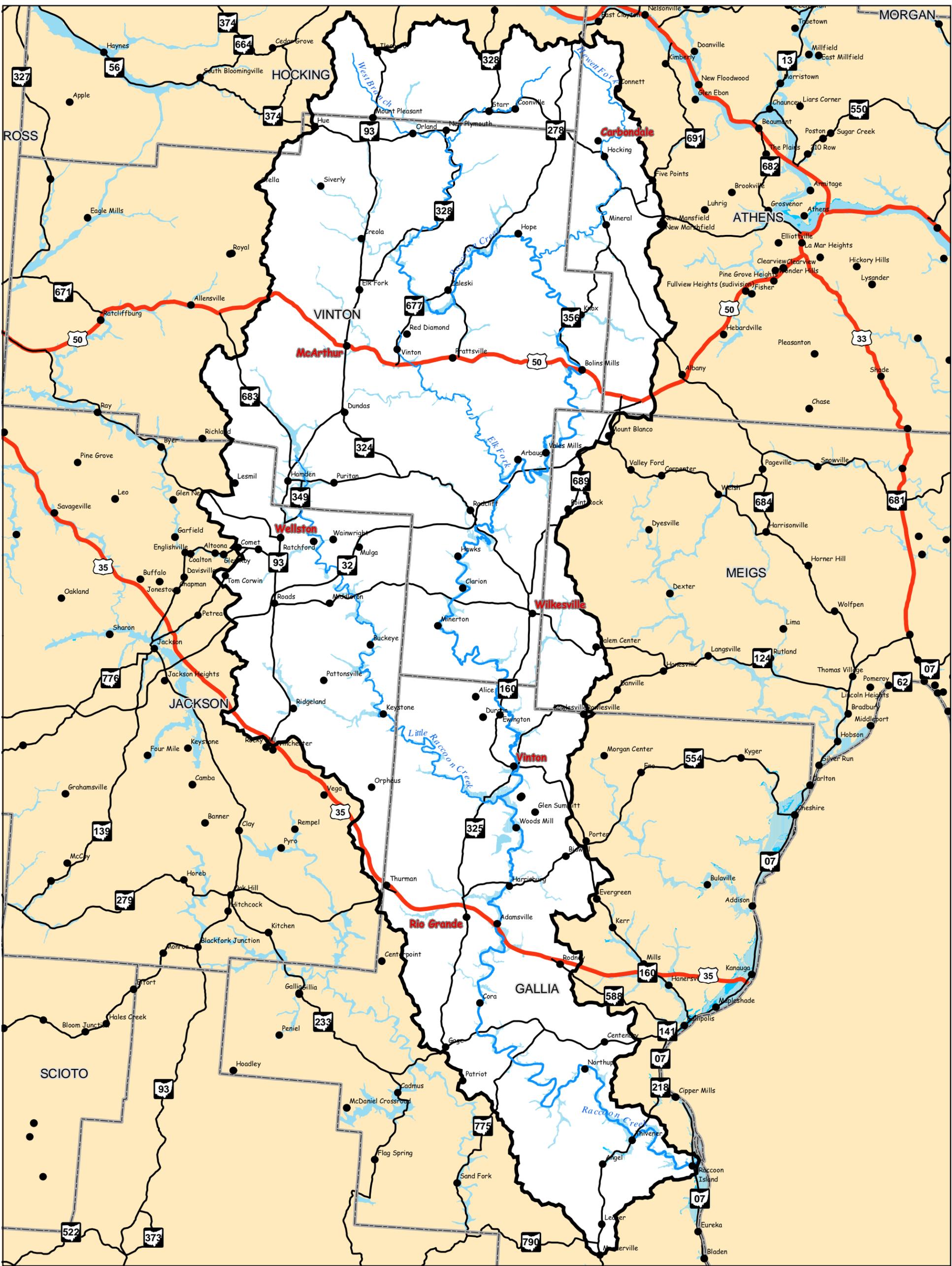
Watershed Location



Map 6
EPA Designated Sub Watersheds
The Raccoon Creek Watershed



Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_6.mxd)



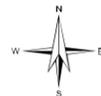
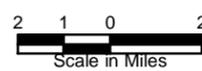
Map Features

| | |
|----------|--------------------|
| 100 Year | US Highways |
| 500 Year | State Highways |
| | Watershed Boundary |
| | County Boundary |
| | Places |

Watershed Location

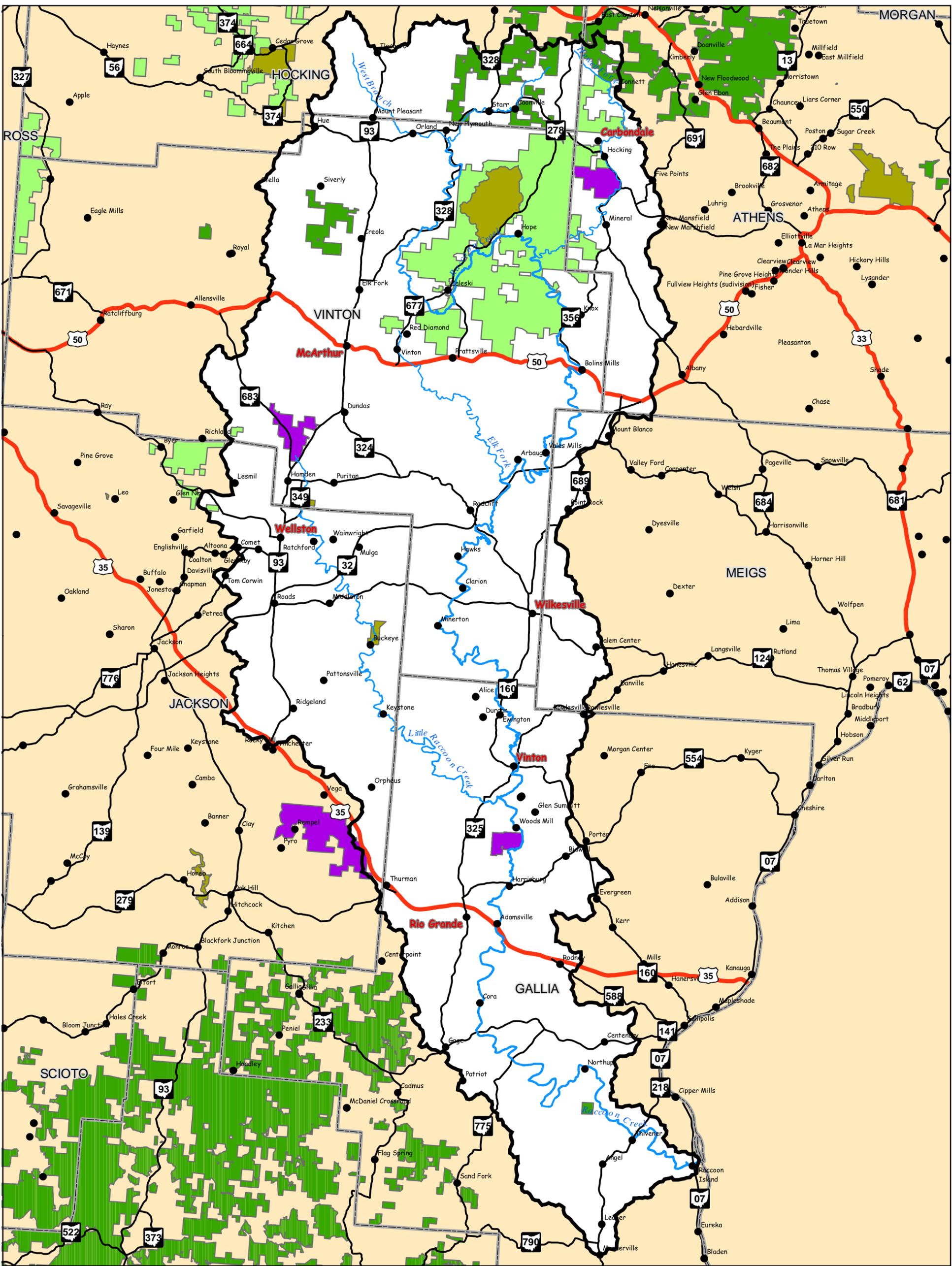


Map 7
Flood Plane Designation
The Raccoon Creek Watershed



Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, FEMA and USCB TIGER data. (mrgmplan_7.mxd)





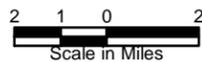
Map Features

| | |
|-----------------|--------------------|
| National Forest | US Highways |
| State Forest | State Highways |
| State Park | Watershed Boundary |
| Wildlife Area | County Boundary |
| | Places |

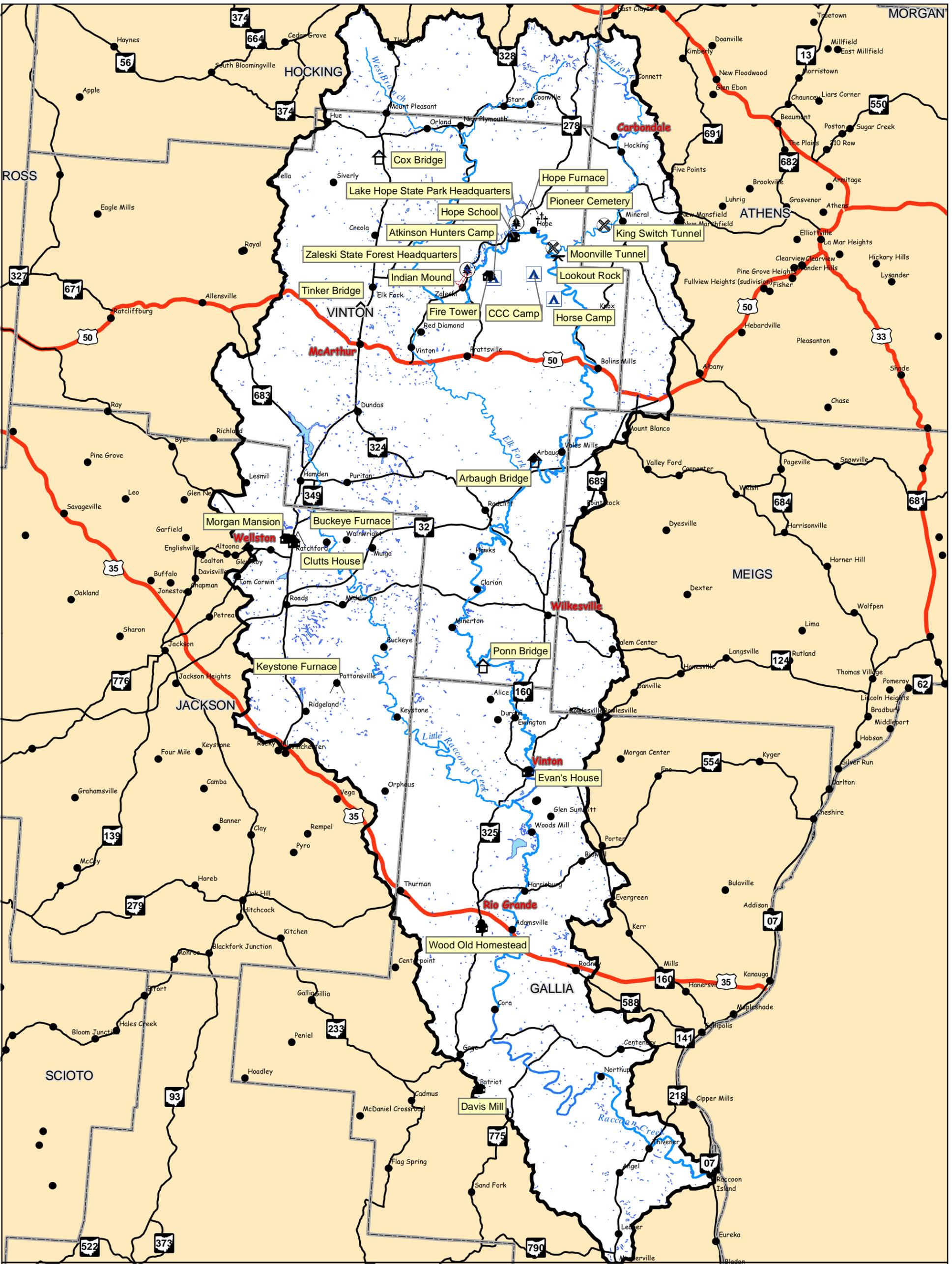
Watershed Location



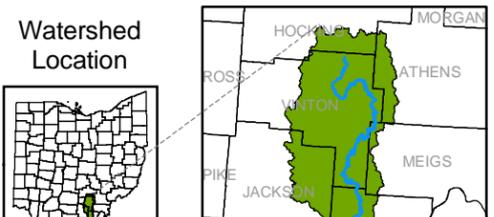
Map 8
Public Park-Lands and Forests
The Raccoon Creek Watershed



Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University, September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, FEMA and USCB TIGER data. (m8mplan_8.mxd)



| Map Features | | | | | |
|--------------|---------------------|--|----------------|--|--------------|
| | Archaeological Site | | Covered Bridge | | Natural Site |
| | Camping Area | | Furnace | | Park Office |
| | Cemetery | | Historic Site | | Rail Tunnel |

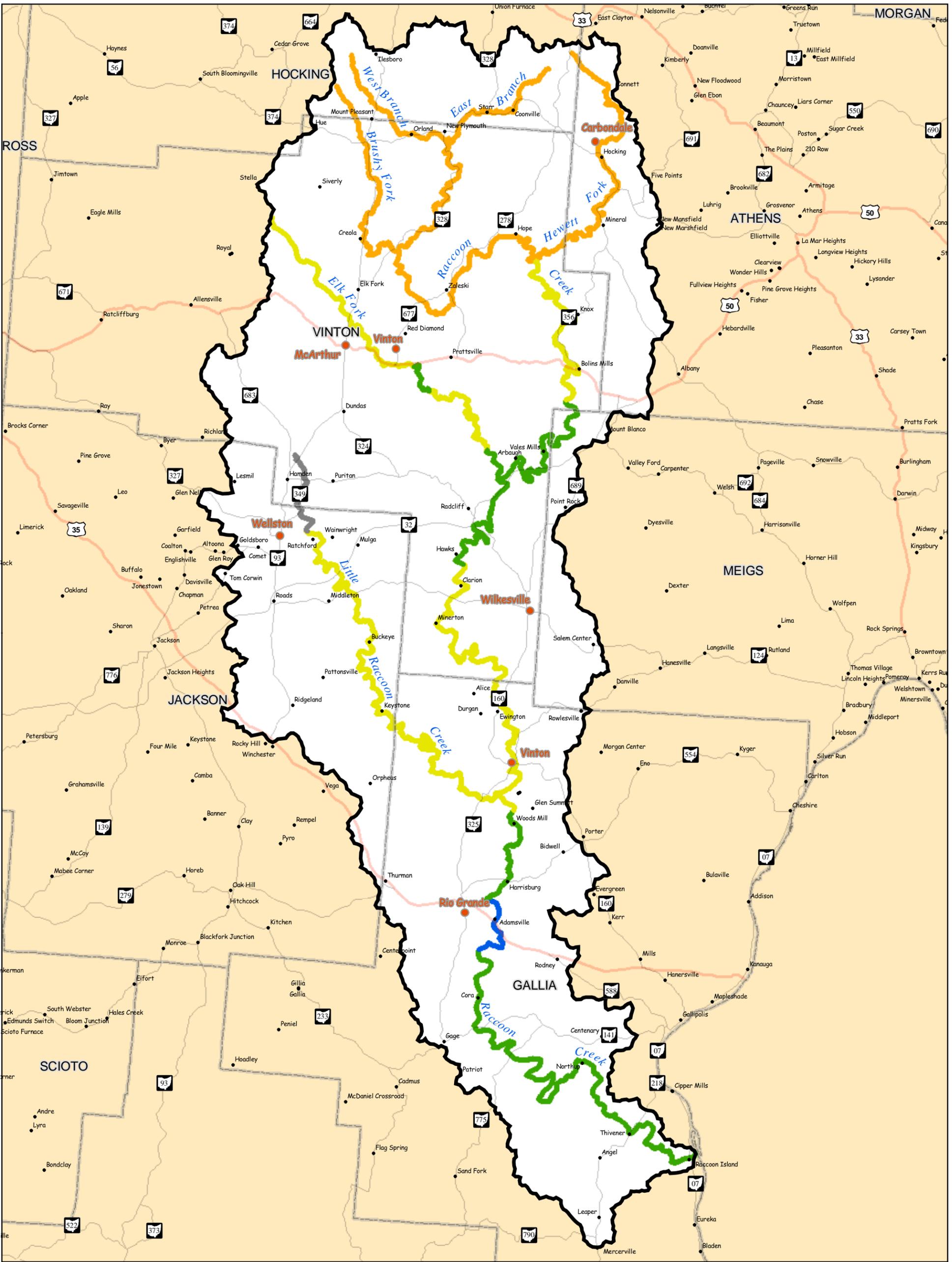


Map 9
Social and Historic Landmarks
**The Raccoon Creek
Watershed**

Map created for the Raccoon Creek Improvement Committee for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, FEMA and USCB TIGER data. (mgimplan_8.mxd)



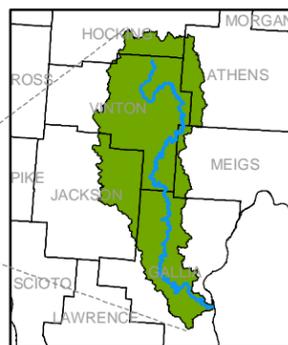
2 1 0 2
Scale in Miles



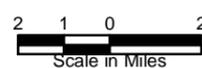
Biologic Community Performance

- █ Exceptional
- █ Good
- █ Fair
- █ Poor
- █ Not Assessed

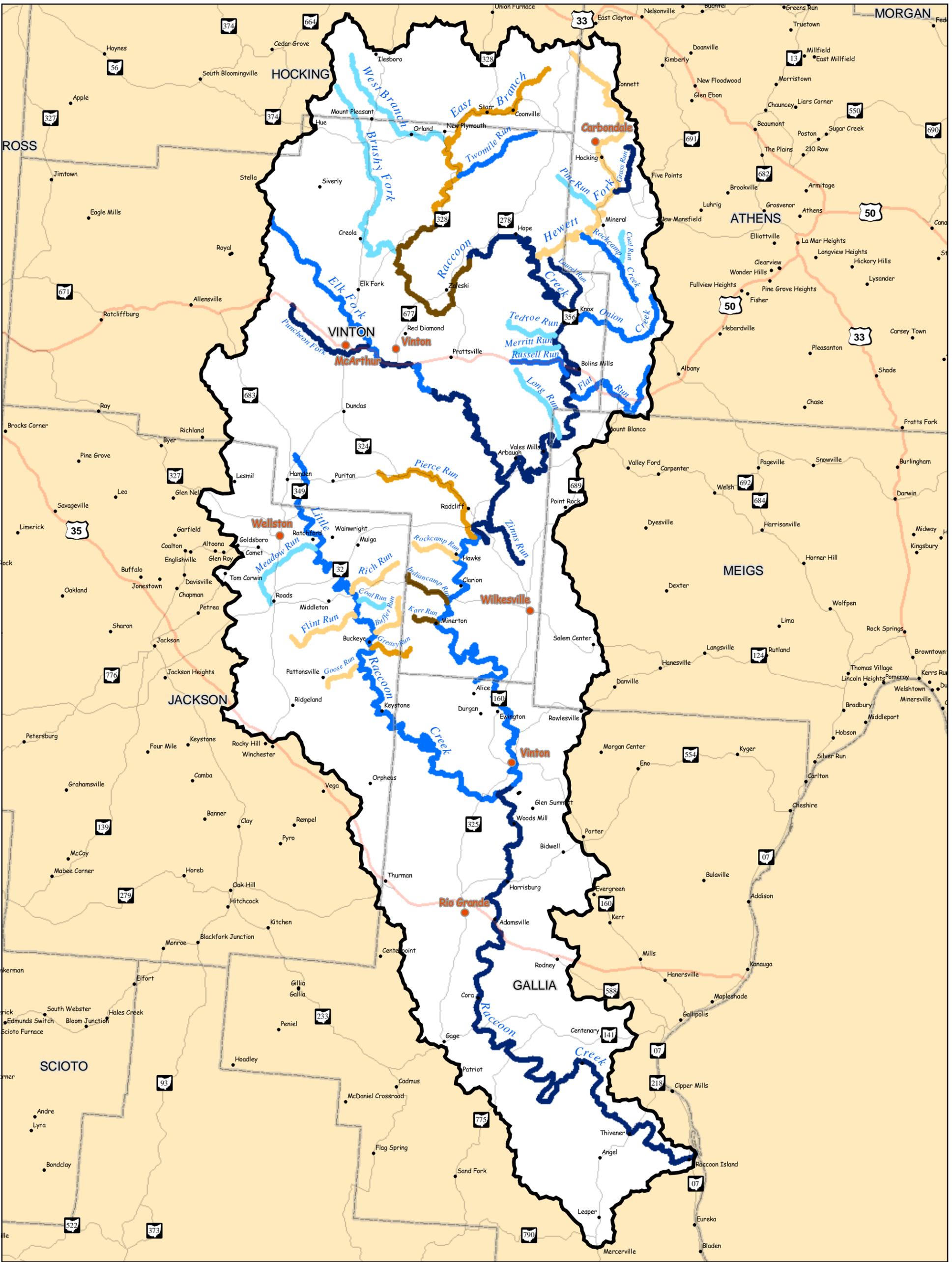
Watershed Location



Map 10
Biologic Community Performance
The Raccoon Creek Watershed



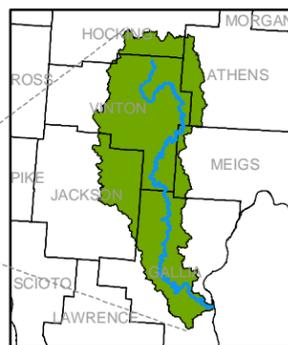
Map created for the Raccoon Creek Management Plan (not for legal use). Cartography by J.B. Hoy - ILGARD, Ohio University, September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_10.mxd)



Stream Habitat Designation, Attainment

- LRW-AMD, Full
- LRW-AMD, Partial
- LRW-AMD, Non-Attainment
- WWH, Full
- WWH, Partial
- WWH, Non-Attainment

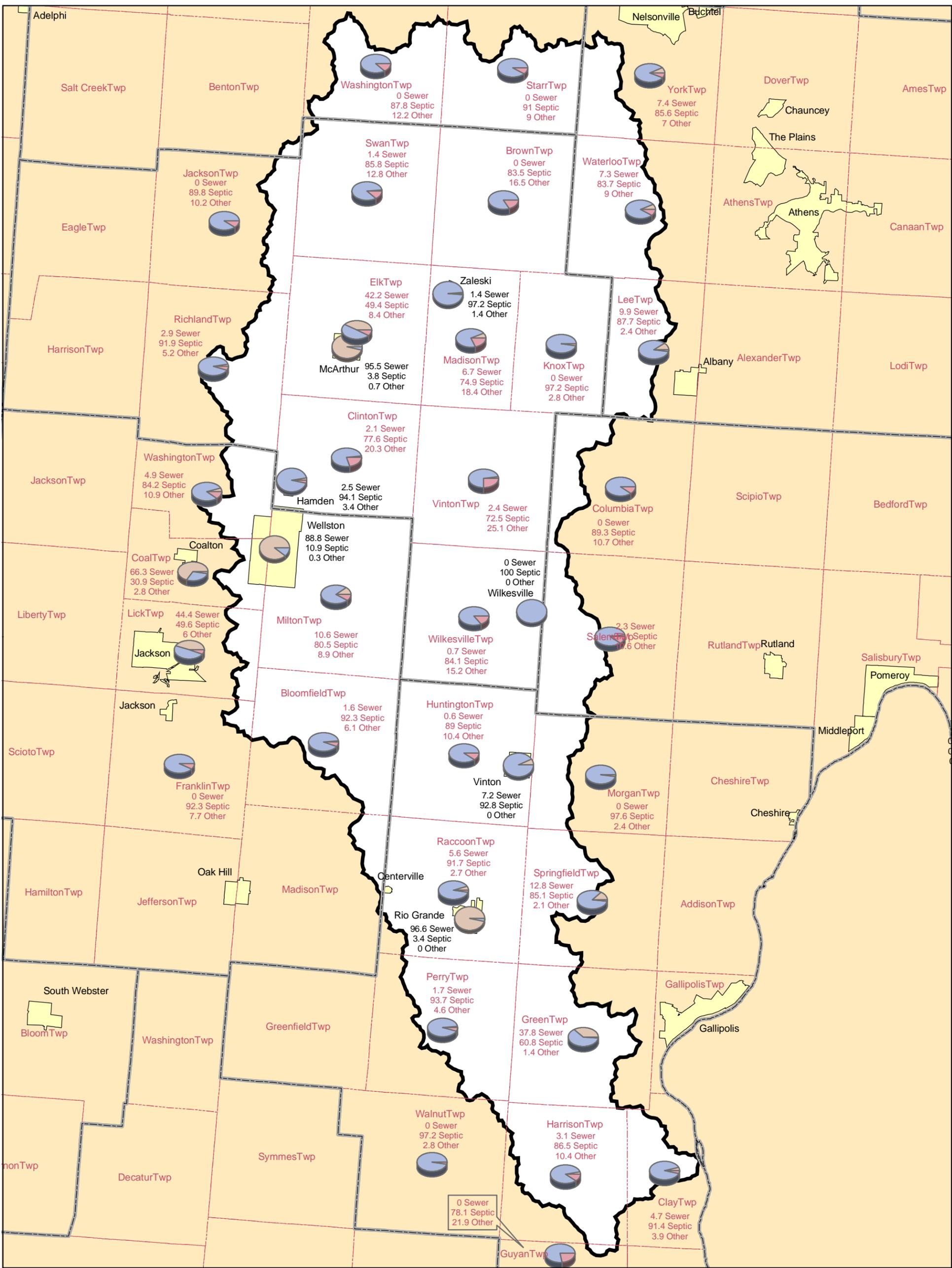
Watershed Location



Map 11
Stream Habitat Designation and Attainment Status
The Raccoon Creek Watershed

Map created for the Raccoon Creek Management Plan (not for legal use). Cartography by J.B. Hoy - ILGARD, Ohio University, September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_11.mxd)





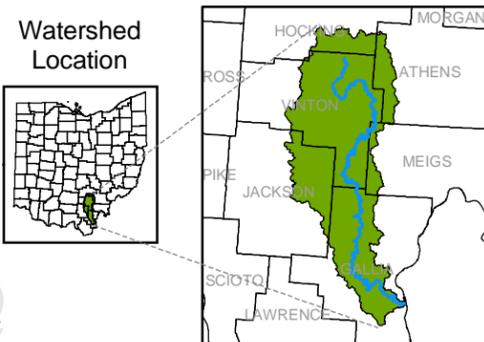
Method of sewage treatment and percentage by township

Numbers in red represent the township data minus municipal data (shown in black) where applicable.

Percentage of households with public sewage

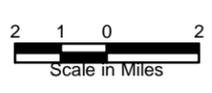
Percentage of households with septic system

Percentage of households with other process



Map 12
Sewage System by Township and Village
The Raccoon Creek Watershed

This map of the Raccoon Creek Watershed was created for planning purposes only. Cartography by J.B. Hoy - ILGARD, Ohio University. September 15, 2000. Source: USGS 7.5 minute series maps, EPA, PUCO, and USCB TIGER data. (mgmplan_12.mxd)



APPENDIX E: RACCOON CREEK WATERSHED PROJECTS

Project Timeline and Activities

1980s – Raccoon Creek Improvement Committee founded in Gallia County (by-laws and 501C3 achieved, projects such as trash pick ups, stream sweeps and log jam removals have been accomplished).

1994 – Completion of the Little Raccoon Creek management plan prepared by USDA and Soil Conservation Service.

1997 – Vinton SWCD receives an OEPA 319 implementation grant for two AMD projects (Buckeye Furnace and 124 Strip pit); 15 cost share projects with landowners, 15 stream fencing projects. (Matching funds were provided by ODNR Division of SWC and Mineral Resources Management)

1998 – The Raccoon Creek Forum is formed. This technical group meets monthly to discuss project issues and updates.

1999 – Vinton SWCD receives an OEPA 319 implementation grant for the Headwaters of Raccoon creek for the AMD project at the Carbondale Wetland, riparian tree plantings, and other environmental education activities. (Matching funds provided by ODNR Mineral Resources Management).

2000- Vinton SWCD receives an OEPA 319 implementation grant for Little Raccoon Creek watershed projects including two AMD projects at Mulga Run and Hiram Road. (Matching funds provided by ODNR Mineral Resources Management. Other federal match was provided by the Appalachian Clean Streams Initiative).

2000 – In June Ohio University faculty, ODNR MRM staff, and ILGARD produce an Acid Mine Drainage Abatement and Treatment plan (AMDAT) for the Little Raccoon Creek subwatershed. Funding was provided by the ODNR MRM.

2000- In July ILGARD receives an OEPA 319 planning grant to write a comprehensive management plan for the Raccoon Creek watershed.

2000- In October ILGARD receives an ODNR/EPA funded grant to support a watershed coordinator in the Raccoon Creek Watershed.

2001 – In October the Vinton SWCD is awarded an OEPA 319 implementation grant for Middleton Run, volunteer monitoring program.

2001 – In December ILGARD, ODNR MRM staff and the Ohio Valley RC&D produced an AMDAT Plan for the Headwaters of Raccoon Creek. Funding was provided by the ODNR MRM.

2002- ILGARD will begin a Middle Basin AMDAT plan starting in January. Funding will be provided by ODNR MRM.

2002 – December is the expected completion date of the Raccoon Creek management plan.

**Raccoon Creek Watershed
Designated Aquatic Life Use and Attainment Summary**

| | Reach River Mile (RM) | Use Designation | Attainment Status | Location | Biological Community Performance | Causes of Impairment | Sources of Impairment |
|------------------------------|--------------------------------------|------------------------|------------------------------|---|---|---------------------------------|----------------------------------|
| Headwaters of Raccoon | | | | | | | |
| East Branch | Entire length | LRW-AMD | Partial | Athens, Hocking counties | Poor | Al, Fe, Mn, pH, Zn | AMD |
| West Branch | Entire length | WWH (recommended) | Non-attainment | Hocking, Vinton counties | Poor | Mn, Zn | AMD |
| Main Stem | | | | | | | |
| Raccoon Creek | 112 (confluence) to 109 | LRW-AMD | Partial | Downstream of East and West Branch confluence | Poor | Al, Mn, pH, Zn | AMD |
| | 109 to 98 | LRW-AMD | Full | Upstream of Lake Hope (Sandy Run) | Poor | | |
| | 98 to 84 | WWH | Partial | Lake Hope to Upstream of Onion Creek | 98.3-92.3: poor 92.3-84.1 fair | Mn, Zn | AMD |
| | 84 to 63 | WWH | Full | Onion Creek to Upstream of Pierce Run | 84.1--80: fair ~80-72.2: good | | |
| | 63 to 40 | WWH | Partial | Pierce Run to the Village of Vinton | 63.8--60: good ~60-40: fair | Metals | AMD |
| | 40 to 0 (mouth) | WWH | Full | Vinton to Discharge into Ohio River | 40~36: fair ~36~30: good ~32~10: very good ~10-0: good | | |
| Major Tributaries | | | | | | | |
| Tributary to Raccoon Creek | 2.3 to mouth | WWH | Non-attainment | | Fair | Habitat | Natural |
| Elk Fork | Headwaters | WWH | Partial | Upstream of | Fair | Fe, Mn, pH, Zn | AMD, mining |

| | | | | | | | |
|--|--------------|----------------------|----------------|--------------------------------|---------------------------------|---|--|
| | to 14 | | | Puncheon Fork | | | |
| | 14 to 13 | WWH (recommended) | Partial | Downstream of Puncheon fork | Fair | Fe, Mn, pH, Zn | AMD, mining |
| | 13 to 11 | WWH | Full | Downstream of Austin Powder | Fair | | |
| | 11 to 8.6 | WWH | Partial | Adjacent to TWP Rd 8 | Good | Fe, Mn, pH, Zn | AMD, mining |
| | 8.6 to 2.2 | WWH | Full | Adjacent to TWP Rd 8 | Fair | | |
| | 2.2 to mouth | WWH | Full | Mouth | Good | | |
| | | | | | | | |
| Austin Powder Tributary to Elk Fork | 3 to mouth | WWH | Non-attainment | | Not biologically assessed | Nitrate, nitrite | Austin Powder Corp. |
| Meadow Run | 5.1 to mouth | WWH | Non-attainment | | Poor-Fair | Ammonia, BOD, DO; dioxin, Mn in sediment | Pillsbury, Wellston WWTP; AMD |
| Twomile Run | 4.3 to mouth | WWH | Partial | | Fair | Mn | AMD |
| Grass Run | 2.8 to mouth | WWH | Partial | | Fair | Fe, Mn | AMD |
| Pine Run | 2.1 to mouth | WWH | Non-attainment | | Not biologically assessed | Metals, pH | AMD |
| Rockcamp Creek | 5.1 to mouth | WWH | Partial | | Good | Unknown | Natural |
| Coal Run | 1.6 to mouth | WWH | Non-attainment | | Fair | Metals, pH | AMD |
| Onion Creek | 6 to mouth | WWH | Partial | | Fair | None cited | None cited |
| Tedroe Run | 2.5 to mouth | WWH | Non-attainment | | Fair | Mn | AMD |
| Merrit Run | 2.1 to mouth | WWH | Non-attainment | | Fair | Unknown | Possible AMD; oil and gas activities |
| Russell Run | 3 to mouth | WWH | Partial | | Fair | Oil and grease | Oil and gas operations |
| Flat Run | 7.3 to mouth | WWH | Partial | | Fair | Oil and grease | Oil and gas operations |
| Long Run | 3.8 to mouth | WWH | Non-attainment | | Fair | Oil and brine | Oil and gas operations |

| | | | | | | | |
|---|-----------------------|----------------------|----------------|--|---|---|--|
| Pierce Run | 8.5 to mouth | LRW-AMD | Partial | | Fair | Fe, Mn, pH, Zn | AMD |
| Rockcamp Run | 2.1 to mouth | LRW-AMD | Non-attainment | | Very Poor | Mn, sulfates | AMD |
| Indiancam Run ¹ | 2.4 to mouth | LRW-AMD | Full | | Fair | pH | AMD |
| Karr Run ¹ | 1.2 to mouth | LRW-AMD | Full | | Fair | Metals, pH | AMD |
| Opossum Run | 1.4 to mouth | WWH | Partial | | M. Good | Fe, Mn, pH; siltation; oil and grease | Possible AMD; oil and gas activities |
| Little Raccoon Creek | Headwaters to 24.6 | WWH | Partial | Upstream of AMD- impacted tributaries | Headwaters- ~30: Not biologically assessed ~30-24.6: fair | Mn, Al, Fe, Organic enrichment | AMD, Wellston WWTP and Pillsbury effluents |
| | 24.6 to mouth | WWH (recommended) | Partial | From AMD-impacted tributaries | Fair | Al, Fe, Mn | AMD |
| Little Raccoon Creek Tributaries | | | | | | | |
| Rich Run | 4 to mouth | LRW-AMD | Non-attainment | | Very Poor | Al, Mn, pH | AMD |
| Coal Run | 1.4 to mouth | WWH | Non-attainment | | Fair | Fe, Mn | AMD |
| Flint Run | 2.2 to mouth | LRW-AMD | Non-attainment | | Very Poor | Metals, pH | AMD |
| Buffer Run | 2.4 to mouth | LRW-AMD | Non-attainment | | Very Poor | Al, Fe, Mn, Ni, pH, Zn | AMD |
| Greasy Run | 2.6 to mouth | LRW-AMD | Partial | | Fair | Metals, pH | AMD |
| Goose Run | 1.8 to mouth | LRW-AMD | Non-attainment | | Very Poor | Metals, pH | AMD |
| Brushy Fork | 24.6 to mouth | WWH | Non-attainment | | (Poor-Fair) | (Al, Fe, Mn, pH) | (AMD) |
| Hewett Fork | 24.6 to mouth | LRW-AMD* | Non-attainment | | (Poor) | (Al, Fe, Mn, pH) | (AMD) |

Source: Biological and Water Quality Study of The Raccoon Creek Basin (1995). Ohio EPA, 1997.

¹This tributary fully attains the limited resource water-acid mine drainage (LRW-AMD) use designation. A study on the Raccoon Creek middle basin currently is being conducted that might prioritize this tributary for restoration, which may upgrade the use designation to non-attainment of warmwater (WWH) habitat.

*This stream did not receive field assessment from the Ohio EPA. The 1995 Technical Support Document states that the Ohio EPA justified the LRW designation using information other than results of their biological field assessment. No mention to data used is given.

The table below represents stream segment information that has been extracted from the Ohio EPA TMDL report. The impaired stream segments listed below were not included in the 1995 Basin Study.

Summary of 1998 303 (d) Listed Segments Included in the Ohio EPA TMDL Study, 2002

| Waterbody Segment Description | 303 (d) Status | | Major Causes 303 (d) | Included in TMDL |
|-------------------------------|----------------|------|-------------------------|------------------|
| | 1998 | 2002 | | |
| Dunkle Creek | | X | Metals | X |
| | | x | Habitat Alteration | No |
| Sandy Run | | X | Metals | X |
| | | X | pH | X |
| | | X | Siltation | No |
| Lake Hope | X | X | pH | X |
| | X | X | Siltation | No |
| | X | X | Metals | X |
| Honey Fork | | X | Siltation | No |
| Wheelabout Creek | | X | Siltation | No |
| Carbondale Creek | | X | Metals | X |
| | | X | pH | X |
| Wolf Run | | X | Nutrients | No |
| | | X | Organic Enrichment/D.O. | No |
| | X | X | pH | X |
| | X | X | Metals | X |
| Strong's Run | X | X | pH | X |
| | X | X | Organic Enrichment/DO | No |
| | X | X | Metals | X |
| | X | X | Salinity/TDS/Chloride | No |
| | X | X | Siltation | No |
| | | X | Other Inorganics | No |

| | | | | |
|--------------|---|---|-----------|----|
| Williams Run | X | X | pH | X |
| | X | X | Siltation | No |

APPENDIX G: WATER CHEMISTRY DATABASE

| NEW ID NO. | HISTORIC ID NO. | SAMPLE DATE | BASIN | pH | COND. μ S/cm | DISCHARGE ft ³ /sec. | ACIDITY mg/l | ALK. mg/l | ACIDITY LOADING lbs/day negative value reflects alkaline load | SULFATE mg/l | IRON mg/l | ALUMINU M mg/l | MANGANESE mg/l | METALS LOADING lbs/day |
|------------|-----------------|-------------|-------|------|------------------|---------------------------------|--------------|-----------|--|--------------|-----------|----------------|----------------|------------------------|
| EB010 | | 3/27/2000 | EBRC | 4.98 | 588.00 | 28.9700 | 30.80 | 1.56 | 4559.42 | 249.00 | 0.94 | 2.14 | 2.83 | 923.57 |
| EB010 | 33 | 6/24/1996 | EBRC | 4.49 | 507.00 | 25.3700 | 19.00 | 0.00 | 2594.52 | 271.00 | 0.70 | 2.59 | 3.28 | 899.12 |
| EB010 | | 11/15/2000 | EBRC | 6.34 | 480.00 | 3.3640 | 7.33 | 19.10 | -213.12 | 167.00 | 0.53 | 2.04 | 6.18 | |
| EB020 | | 5/30/2000 | EBRC | 5.37 | 106.00 | 0.0422 | 6.43 | 3.80 | 0.60 | 31.30 | 0.05 | 0.25 | 0.05 | 0.08 |
| EB030 | | 4/12/2000 | EBRC | 6.55 | 179.00 | 0.5002 | 5.69 | 10.60 | -13.22 | 51.00 | 1.88 | 1.51 | 0.37 | 10.15 |
| EB030 | | 9/25/2000 | EBRC | 6.06 | 236.00 | 0.0532 | 2.87 | 14.90 | -3.44 | 74.10 | 0.06 | 0.29 | < 0.050 | 0.10 |
| EB040 | | 4/12/2000 | EBRC | 6.32 | 197.00 | 2.7174 | 3.60 | 7.11 | -51.34 | 57.60 | 1.86 | 1.38 | 0.36 | 52.83 |
| EB040 | | 9/25/2000 | EBRC | 5.83 | 313.00 | 0.6255 | 5.12 | 13.50 | -28.21 | 114.00 | 0.48 | 0.39 | 0.33 | 4.07 |
| EB040 | 32 | 6/21/1996 | EBRC | 6.59 | 156.00 | 2.6700 | 2.67 | 0.00 | 38.37 | 59.00 | 0.16 | 0.10 | 0.11 | 5.33 |
| EB050 | | 4/20/2000 | EBRC | 6.79 | 194.00 | 0.0511 | 0.00 | 39.20 | -10.78 | 28.30 | 0.85 | 0.66 | 0.05 | 0.43 |
| EB060 | | 4/20/2000 | EBRC | 6.07 | 121.00 | 0.0526 | 5.87 | 5.74 | 0.04 | 27.20 | 0.72 | 0.47 | 0.05 | 0.35 |
| EB060 | | 10/3/2000 | EBRC | | | NF | | | 0.00 | | | | | |
| EB070 | | 4/20/2000 | EBRC | 6.30 | 128.00 | 1.1420 | 8.72 | 9.03 | -1.91 | 33.80 | 0.74 | 0.53 | 0.05 | 8.08 |
| EB070 | | 10/3/2000 | EBRC | 6.38 | 238.00 | 0.0343 | 3.28 | 47.30 | -8.12 | 51.90 | 0.42 | 0.35 | 0.36 | 0.21 |
| EB080 | 31 | 6/20/1996 | EBRC | 4.33 | 654.00 | 30.7600 | 64.00 | 0.00 | 10596.20 | 400.00 | 0.76 | 5.18 | 4.59 | 1747.22 |
| EB090 | | 4/12/2000 | EBRC | 6.42 | 231.00 | 5.2777 | 4.12 | 11.50 | -209.65 | 79.00 | 1.84 | 1.07 | 0.69 | 102.35 |
| EB090 | 30 | 6/20/1996 | EBRC | 6.49 | 202.00 | 7.7100 | 0.00 | 13.00 | -539.49 | 84.00 | 0.38 | 0.37 | 0.46 | 50.32 |
| EB091 | 29 | 6/20/1996 | EBRC | 6.51 | 102.00 | 5.0900 | 0.00 | 8.00 | -219.18 | 37.00 | 0.96 | 0.31 | 0.43 | 46.68 |
| EB092 | 28 | 6/19/1996 | EBRC | 6.99 | 364.00 | 7.3000 | 0.00 | 25.00 | -982.31 | 150.00 | 0.25 | 0.90 | 0.89 | 80.33 |
| EB100 | | 4/20/2000 | EBRC | 5.49 | 341.00 | 0.5202 | 8.77 | 2.14 | 18.56 | 130.00 | 0.57 | 0.29 | 0.35 | 3.40 |
| EB100 | | 10/3/2000 | EBRC | | | NF | | | | | | | | |
| EB110 | | 4/21/2000 | EBRC | 4.73 | 879.00 | 11.2514 | 60.70 | 0.65 | 3636.66 | 427.00 | 2.20 | 9.17 | 4.87 | 985.66 |
| EB110 | 27 | 6/20/1996 | EBRC | 3.85 | 849.00 | 18.7500 | 83.00 | 0.00 | 8376.51 | 470.00 | 1.57 | 7.43 | 6.70 | 1587.94 |
| EB120 | 26 | 6/19/2026 | EBRC | 4.86 | 721.00 | 2.3000 | 54.00 | 0.00 | 668.51 | 355.00 | 2.33 | 5.40 | 5.10 | 159.18 |
| EB120 | | 4/11/2000 | EBRC | 4.70 | 981.00 | 0.6721 | 47.90 | 0.00 | 173.28 | 759.00 | 5.33 | 7.23 | 7.61 | 73.13 |
| EB120 | | 10/2/2000 | EBRC | 4.34 | 1540.00 | 0.0832 | 49.30 | 0.00 | 22.08 | 955.00 | 1.78 | 7.94 | 15.30 | 11.23 |
| EB121 | | 10/2/2000 | EBRC | 6.11 | 2000.00 | 0.0352 | 15.00 | 38.80 | -4.51 | 1358.00 | 8.44 | 1.40 | 20.40 | 5.74 |
| EB122 | | 10/2/2000 | EBRC | 3.18 | 1400.00 | 0.0476 | 130.00 | 0.00 | 33.29 | 743.00 | 1.04 | 19.70 | 13.30 | 8.73 |
| EB130 | 25 | 6/20/1996 | EBRC | 3.84 | 842.00 | | 82.00 | 0.00 | 0.00 | 500.00 | 1.57 | 7.92 | 6.40 | 0.00 |

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|---------|----|------------|------|------|---------|----------|---------|--------|---------|---------|--------|-------|-------|---------|
| EB140 | | 4/21/2000 | EBRC | 4.16 | 945.00 | 0.1520 | 88.70 | 0.00 | 72.57 | 499.00 | 1.03 | 10.10 | 4.84 | 13.09 |
| EB140 | | 10/3/2000 | EBRC | 3.86 | 1200.00 | 0.0084 | 74.30 | 0.00 | 3.37 | 694.00 | 0.65 | 12.60 | 11.50 | 1.13 |
| EB150 | | 4/20/2000 | EBRC | 4.72 | 880.00 | 9.6489 | 51.90 | 0.60 | 2664.27 | 435.00 | 2.50 | 8.14 | 4.50 | 788.02 |
| EB160 | 73 | 6/19/1996 | EBRC | 3.95 | 865.00 | 4.6600 | 85.00 | 0.00 | 2132.01 | 385.00 | 6.10 | 5.40 | 2.76 | 358.46 |
| EB160 | 73 | 7/9/1996 | EBRC | 2.90 | 2130.00 | 0.8900 | 345.00 | 0.00 | 1652.70 | 1341.00 | 28.20 | 25.50 | 7.40 | 293.34 |
| EB160 | | 4/11/2000 | EBRC | 4.77 | 756.00 | 4.1934 | 32.10 | 0.46 | 714.15 | 353.00 | 4.33 | 5.91 | 2.22 | 281.85 |
| EB160 | | 9/25/2000 | EBRC | 3.22 | 1210.00 | 0.7294 | 83.80 | 0.00 | 329.00 | 649.00 | 0.23 | 13.10 | 0.40 | 54.03 |
| EB160 | | 2/1/2001 | EBRC | 5.21 | 572.00 | 5.754254 | 22.30 | 1.30 | 650.42 | 212.00 | 2.00 | 3.10 | 1.56 | 206.73 |
| EB161 | 24 | 6/19/1996 | EBRC | 4.83 | 1029.00 | 0.9050 | 50.00 | 0.00 | 243.56 | 580.00 | 0.49 | 3.40 | 2.72 | 32.27 |
| EB161 | | 2/1/2001 | EBRC | 4.92 | 733.00 | 0.51565 | 16.80 | 2.40 | 39.97 | 347.00 | 0.63 | 1.56 | 1.76 | 10.98 |
| EB162 | 75 | 7/3/1996 | EBRC | 2.51 | 3720.00 | 0.0870 | 1476.00 | 0.00 | 691.18 | 2923.00 | 322.00 | 48.80 | 9.10 | 178.29 |
| EB163 | 23 | 6/19/1996 | EBRC | 3.97 | 749.00 | 1.9900 | 87.00 | 0.00 | 931.87 | 245.00 | 8.60 | 9.10 | 2.10 | 212.55 |
| EB163 | | 2/1/2001 | EBRC | 4.78 | 502.00 | 1.56254 | 30.00 | 2.03 | 235.24 | 164.00 | 4.44 | 4.04 | 1.02 | 80.07 |
| EB164 | | 2/1/2001 | EBRC | 4.77 | 1250.00 | 0.1300 | 49.40 | 2.38 | 32.90 | 710.00 | 0.53 | 7.88 | 6.17 | 10.23 |
| EB165 | | 2/1/2001 | EBRC | 7.01 | 1080.00 | 0.1200 | 8.27 | 113.00 | -67.65 | 4878.00 | 0.08 | 0.33 | 0.17 | 0.38 |
| EB166 | | 2/1/2001 | EBRC | 3.48 | 1000.00 | 0.0130 | 137.00 | 0.00 | 9.59 | 421.00 | 4.42 | 15.10 | 5.47 | 1.75 |
| EB167 | | 2/1/2001 | EBRC | 5.84 | 1280.00 | 0.0408 | 53.40 | 16.70 | 8.06 | 719.00 | 35.90 | 3.24 | 13.00 | 11.48 |
| EB168 | | 2/1/2001 | EBRC | 5.15 | 292.00 | 0.1450 | 11.90 | 1.90 | 7.80 | 182.00 | 0.19 | 1.26 | 2.08 | 2.76 |
| EB169 | | 2/1/2001 | EBRC | 6.30 | 180.00 | 0.2663 | 5.55 | 21.20 | -22.44 | 42.00 | 0.48 | 0.69 | 0.29 | 2.11 |
| EB169.1 | | 2/1/2001 | EBRC | 6.35 | 338.00 | 1.49676 | 6.35 | 26.40 | -161.53 | 74.90 | 0.54 | 0.68 | 0.16 | 11.09 |
| EB169.2 | | 2/1/2001 | EBRC | 6.33 | 231.00 | 0.0917 | 8.34 | 33.60 | -12.47 | 231.00 | 0.30 | 0.50 | 0.22 | 0.50 |
| EB169.3 | | 2/1/2001 | EBRC | 6.84 | 430.00 | 0.0917 | 5.30 | 47.20 | -20.68 | 33.80 | 0.41 | 0.73 | 0.16 | 0.64 |
| EB170 | 22 | 6/20/1996 | EBRC | 4.08 | 795.00 | 12.9600 | 70.00 | 0.00 | 4883.00 | 414.00 | 0.83 | 7.42 | 7.20 | 1080.11 |
| EB170 | 22 | 7/9/1996 | EBRC | 3.99 | 1300.00 | 1.3800 | 123.00 | 0.00 | 913.62 | 808.00 | 0.44 | 13.50 | 14.10 | 208.73 |
| EB180 | | 4/20/2000 | EBRC | 4.52 | 1080.00 | 0.1800 | 84.20 | 0.00 | 81.58 | 587.00 | 0.52 | 8.21 | 5.46 | 13.78 |
| EB180 | | 10/3/2000 | EBRC | | | NF | | | | | | | | |
| EB190 | 21 | 6/18/1996 | EBRC | 4.28 | 1078.00 | 1.8140 | 131.00 | 0.00 | 1279.06 | 590.00 | 0.28 | 14.00 | 10.60 | 243.46 |
| EB190 | 21 | 4/11/2000 | EBRC | 4.67 | 1010.00 | 3.6469 | 58.60 | 0.00 | 1150.28 | 539.00 | 1.78 | 9.07 | 7.94 | 369.64 |
| EB190 | 21 | 8/30/2000 | EBRC | 4.29 | 1200.00 | 0.1870 | 84.00 | 0.00 | 84.55 | 701.00 | 0.15 | 12.40 | 15.10 | 27.89 |
| EB190 | | 2/19/2001 | EBRC | 4.91 | 905.00 | 2.2742 | 50.30 | 1.83 | 593.32 | 533.00 | 0.51 | 2.61 | 8.21 | 139.03 |
| EB191 | 20 | 6/18/1996 | EBRC | 4.31 | 1233.00 | 0.5160 | 132.00 | 0.00 | 366.61 | 655.00 | 0.10 | 14.00 | 7.30 | 59.57 |
| EB191 | | 10/2/2000 | EBRC | 3.98 | 1360.00 | 0.0182 | 56.40 | 0.00 | 5.53 | 802.00 | 0.15 | 8.83 | 6.75 | 1.55 |
| EB191 | | 2/19/2001 | EBRC | 4.63 | 1010.00 | 0.1950 | 34.40 | 2.33 | 33.66 | 609.00 | 0.25 | 5.45 | 4.62 | 10.86 |
| EB192 | 19 | 6/18/1996 | EBRC | 4.06 | 1192.00 | 1.4800 | 158.00 | 0.00 | 1258.64 | 515.00 | 0.56 | 18.00 | 13.20 | 253.56 |
| EB193 | 18 | 6/18/1996 | EBRC | 3.78 | 1264.00 | 0.5300 | 199.00 | 0.00 | 567.69 | 635.00 | 0.40 | 21.00 | 17.70 | 111.79 |
| EB193 | | 10/2/2000 | EBRC | 3.20 | 1410.00 | 0.0568 | 115.00 | 0.00 | 35.16 | 787.00 | 4.55 | 11.00 | 23.00 | 11.81 |
| EB193 | | 12/13/2000 | EBRC | 3.88 | 1530.00 | 0.0119 | 115.00 | 0.00 | 7.37 | 938.00 | 2.74 | 14.40 | 26.50 | 2.80 |

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|-------|----|------------|------|------|---------|---------|--------|-------|----------|---------|-------|-------|-------|--------|
| EB193 | | 2/19/2001 | EBRC | 4.55 | 1090.00 | 0.2850 | 76.30 | 0.96 | 115.57 | 667.00 | 1.22 | 5.31 | 13.50 | 30.79 |
| EB194 | 17 | 6/18/1996 | EBRC | 4.01 | 1229.00 | 0.4440 | 152.00 | 0.00 | 363.25 | 550.00 | 0.40 | 17.00 | 12.20 | 70.89 |
| EB194 | | 2/19/2001 | EBRC | 4.46 | 956.00 | 0.3430 | 61.80 | 0.00 | 114.09 | 572.00 | 0.75 | 3.91 | 9.86 | 26.86 |
| EB195 | | 12/15/2000 | EBRC | 4.80 | 1300.00 | 0.0403 | 43.80 | 2.13 | 9.04 | 771.00 | 0.00 | 4.41 | 8.00 | 2.70 |
| EB195 | | 10/2/2000 | EBRC | 4.23 | 1270.00 | 0.0107 | 42.20 | 0.00 | 2.44 | 727.00 | 0.12 | 5.55 | 6.46 | 0.70 |
| EB195 | | 2/19/2001 | EBRC | 4.61 | 738.00 | 0.0713 | 43.30 | 2.03 | 15.84 | 410.00 | 0.34 | 6.06 | 5.66 | 4.64 |
| EB196 | | 12/13/2000 | EBRC | 5.40 | 1590.00 | 0.0390 | 62.20 | 3.14 | 12.40 | 1004.00 | 18.50 | 4.69 | 10.60 | 7.11 |
| EB196 | | 10/2/2000 | EBRC | 3.71 | 1410.00 | 0.0276 | 47.90 | 0.00 | 7.12 | 840.00 | 10.10 | 4.86 | 10.10 | 3.73 |
| EB197 | | 10/2/2000 | EBRC | 6.10 | 1300.00 | 0.0069 | 4.59 | 25.80 | -0.78 | 761.00 | 0.12 | 0.66 | 5.80 | 0.24 |
| EB200 | | 4/11/2000 | EBRC | 4.56 | 1420.00 | 0.4226 | 106.00 | 0.00 | 241.13 | 676.00 | 6.05 | 16.40 | 10.80 | 75.80 |
| EB200 | | 8/30/2000 | EBRC | 4.01 | 1650.00 | 0.0252 | 111.00 | 0.00 | 15.06 | 1004.00 | 0.14 | 16.20 | 15.10 | 4.27 |
| EB200 | | 2/6/2001 | EBRC | 4.14 | 1330.00 | 0.0964 | 143.00 | 0.00 | 74.16 | 766.00 | 2.78 | 21.10 | 12.90 | 19.12 |
| EB210 | 16 | 6/14/1996 | EBRC | 4.19 | 845.00 | 5.1500 | 104.00 | 0.00 | 2882.86 | 280.00 | 2.20 | 12.00 | 6.70 | 580.61 |
| EB210 | 16 | 4/20/2000 | EBRC | 4.76 | 780.00 | 3.3321 | 55.60 | 0.85 | 981.94 | 375.00 | 2.61 | 9.01 | 4.97 | 298.19 |
| EB220 | | 5/30/2000 | EBRC | 3.08 | 2120.00 | 0.1643 | 288.00 | 0.00 | 254.69 | 1317.00 | 7.08 | 37.10 | 22.40 | 59.01 |
| EB220 | | 8/30/2000 | EBRC | 2.99 | 2380.00 | 0.0418 | 336.00 | 0.00 | 75.56 | 1465.00 | 9.98 | 41.20 | 25.30 | 17.24 |
| EB220 | | 2/6/2001 | EBRC | 3.12 | 2080.00 | 0.1347 | 309.00 | 0.00 | 224.03 | 1251.00 | 6.99 | 37.30 | 23.40 | 49.18 |
| EB230 | 15 | 6/14/1996 | EBRC | 3.91 | 707.00 | 3.4200 | 98.00 | 0.00 | 1804.00 | 235.00 | 5.10 | 8.90 | 5.10 | 352.37 |
| EB230 | 15 | 4/16/2000 | EBRC | 3.94 | 905.00 | 1.3632 | 67.50 | 0.00 | 495.27 | 424.00 | 5.13 | 11.50 | 6.24 | 168.17 |
| EB240 | 13 | 6/14/1996 | EBRC | 3.35 | 1276.00 | 0.8230 | 201.00 | 0.00 | 890.39 | 560.00 | 3.80 | 19.00 | 10.90 | 149.61 |
| EB240 | 13 | 4/16/2000 | EBRC | 3.50 | 1380.00 | 0.3260 | 131.00 | 0.00 | 229.89 | 727.00 | 5.12 | 19.90 | 11.40 | 64.05 |
| EB240 | 13 | 10/2/2000 | EBRC | 3.17 | 1740.00 | 0.0224 | 157.00 | 0.00 | 18.93 | 1070.00 | 6.30 | 19.30 | 19.50 | 5.45 |
| EB240 | | 2/6/2001 | EBRC | 3.46 | 1220.00 | 0.2230 | 110.00 | 0.00 | 132.03 | 654.00 | 2.72 | 15.30 | 10.50 | 34.31 |
| EB250 | 14 | 6/14/1996 | EBRC | 3.89 | 636.00 | 2.2500 | 79.00 | 0.00 | 956.74 | 315.00 | 5.40 | 7.60 | 4.51 | 212.52 |
| EB260 | | 5/30/2000 | EBRC | 3.29 | 1020.00 | 0.0950 | 109.00 | 0.00 | 55.74 | 722.00 | 8.22 | 8.76 | 7.80 | 12.70 |
| EB260 | | 2/6/2001 | EBRC | 3.48 | 905.00 | 0.0710 | 91.80 | 0.00 | 35.08 | 400.00 | 11.10 | 12.30 | 7.99 | 12.02 |
| EB270 | | 4/11/2000 | EBRC | 5.88 | 461.00 | 2.2602 | 5.59 | 10.30 | -57.30 | 157.00 | 3.73 | 2.74 | 1.74 | 100.10 |
| EB280 | | 4/16/2000 | EBRC | 3.10 | 2070.00 | 0.0336 | 328.00 | 0.00 | 59.32 | 1218.00 | 15.30 | 41.20 | 15.50 | 13.05 |
| EB280 | | 8/31/2000 | EBRC | 2.91 | 2210.00 | 0.0045 | 270.00 | 0.00 | 6.55 | 1268.00 | 8.68 | 32.30 | 22.60 | 1.55 |
| EB280 | | 2/6/2001 | EBRC | 3.04 | 1830.00 | 0.0025 | 225.00 | 0.00 | 3.01 | 1045.00 | 9.75 | 27.60 | 14.70 | |
| EB290 | | 4/16/2000 | EBRC | 6.69 | 356.00 | 0.4604 | 0.00 | 29.80 | -73.85 | 81.50 | 2.21 | 2.10 | 0.88 | 12.89 |
| EB300 | | 4/16/2000 | EBRC | 5.56 | 603.00 | 0.0950 | 29.00 | 2.49 | 13.56 | 261.00 | 8.18 | 4.09 | 3.12 | 7.89 |
| EB300 | | 8/31/2000 | EBRC | 6.27 | 655.00 | 0.0532 | 6.52 | 37.70 | -8.93 | 181.00 | 1.41 | 0.53 | 2.62 | 1.31 |
| EB310 | | 4/11/2000 | EBRC | 6.99 | 264.00 | 0.9793 | 0.00 | 37.60 | -198.18 | 66.70 | 1.42 | 0.95 | 0.40 | 14.60 |
| EB320 | | 4/21/2000 | EBRC | 5.72 | 77.00 | 0.0640 | 12.80 | 2.92 | 3.40 | 13.20 | 0.99 | 0.80 | 0.10 | 0.65 |
| EB320 | | 9/25/2000 | EBRC | 6.37 | 308 | 0.0008 | 6.57 | 57.3 | -0.21 | 33.8 | 1.34 | 0.577 | 1.61 | 0.01 |
| WB010 | 7 | 6/21/1996 | WBRC | 6.51 | 219.00 | 34.7700 | 0.00 | 17.00 | -3181.54 | 72.00 | 0.55 | 0.18 | 1.50 | 418.26 |

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|---------|----|------------|-------------|------|---------|---------|--------|--------|----------|--------|-------|-------|-------|--------|
| WB010 | 7 | 3/27/2000 | WBRC | 6.13 | 277.00 | 27.5300 | 10.30 | 8.02 | 337.85 | 84.00 | 0.79 | 0.25 | 1.23 | 336.81 |
| WB010 | | 11/15/2000 | WBRC | 5.31 | 819.00 | 2.2790 | 22.50 | 2.26 | 248.28 | 412.00 | 0.22 | 0.17 | 3.05 | 42.33 |
| WB020 | | 5/16/2000 | WBRC | 7.00 | 450.00 | 0.0064 | 0.00 | 106.00 | -3.67 | 54.30 | 0.40 | 0.34 | 0.69 | 0.05 |
| WB030 | | 5/16/2000 | WBRC | 6.88 | 246.00 | 0.0639 | 0.00 | 24.30 | -8.36 | 77.40 | 0.41 | 0.30 | 0.64 | 0.46 |
| WB040 | 1 | 6/24/1996 | Honey Fork | 6.82 | 182 | 14.41 | 0 | 27 | -2094.17 | 49 | 0.33 | 0.10 | 0.23 | 51.30 |
| WB040 | 1 | 5/16/2000 | WBRC | 6.88 | 245.00 | 0.7964 | 0.00 | 38.10 | -163.32 | 52.70 | 0.35 | 0.48 | 0.14 | 4.17 |
| WB050 | | 5/16/2000 | WBRC | 7.00 | 450.00 | 0.0064 | 0.00 | 106.00 | -3.67 | 54.30 | 0.40 | 0.34 | 0.69 | 0.05 |
| WB050 | | 10/3/2000 | WBRC | 2.63 | 959.00 | 0.0200 | 201.00 | 0.00 | 21.64 | 328.00 | 24.60 | 17.50 | 2.67 | 4.83 |
| WB060 | 5 | 6/24/1996 | WBRC | 4.88 | 250.00 | 9.1300 | 14.00 | 0.00 | 687.99 | 104.00 | 0.25 | 0.99 | 1.43 | 131.50 |
| WB060 | 5 | 5/17/2000 | WBRC | 3.35 | 1410.00 | 0.0950 | 168.00 | 0.00 | 85.90 | 749.00 | 1.18 | 14.60 | 33.70 | 25.36 |
| WB060 | 5 | 10/3/2000 | WBRC | 3.11 | 696.00 | 0.0088 | 116.00 | 0.00 | 5.47 | 329.00 | 0.19 | 19.60 | 8.10 | 1.32 |
| WB070 | 6 | 6/24/1996 | WBRC | 3.22 | 388.00 | 0.1560 | 72.00 | 0.00 | 60.46 | 170.00 | 0.48 | 2.96 | 6.20 | 8.11 |
| WB070 | 6 | 5/16/2000 | WBRC | 3.74 | 477.00 | 0.0089 | 62.90 | 0.00 | 3.01 | 187.00 | 0.32 | 9.16 | 3.60 | 0.63 |
| WB070 | | 10/16/2000 | WBRC | 3.26 | 1630.00 | 0.0520 | 236.00 | 0.00 | 66.00 | 955.00 | 1.45 | 23.60 | 43.40 | 19.19 |
| WB078 | 3 | 6/25/1996 | WBRC | 5.12 | 266.00 | 5.9200 | 0.00 | 7.00 | -223.05 | 119.00 | 0.13 | 1.14 | 1.72 | 95.48 |
| WB080 | | 5/16/2000 | WBRC | 5.34 | 560.00 | 0.0106 | 19.30 | 3.40 | 0.91 | 180.00 | 0.35 | 5.35 | 4.25 | 0.57 |
| WB080 | | 10/3/2000 | WBRC | 5.50 | 454.00 | 0.0046 | 9.75 | 26.40 | -0.42 | 98.00 | 0.07 | 0.46 | 0.20 | 0.02 |
| WB090 | | 5/22/2000 | WBRC | 6.19 | 227.00 | 0.1080 | 0.00 | 8.02 | -4.66 | 76.60 | 0.05 | 0.25 | 0.05 | 0.20 |
| WB095 | 4 | 6/25/1996 | WBRC | 5.40 | 286.00 | 3.7500 | 0.00 | 8.00 | -161.47 | 121.00 | 0.09 | 1.47 | 1.67 | 65.34 |
| WB100 | 80 | 7/15/1996 | WBRC | 3.59 | 727.00 | 0.0830 | 153.00 | 0.00 | 68.35 | 325.00 | 0.81 | 17.60 | 13.30 | 14.20 |
| WB100 | 80 | 5/17/2000 | WBRC | 3.81 | 830.00 | 0.0383 | 185.00 | 0.00 | 38.14 | 479.00 | 0.34 | 26.70 | 13.70 | 8.42 |
| WB100 | 80 | 10/3/2000 | WBRC | 3.24 | 1340.00 | 0.0144 | 319.00 | 0.00 | 24.73 | 840.00 | 0.85 | 51.10 | 28.90 | 6.28 |
| WB110 | 79 | 7/15/1996 | WBRC | 4.35 | 431.00 | 0.1700 | 50.00 | 0.00 | 45.75 | 184.00 | 0.07 | 2.93 | 4.29 | 6.69 |
| WB110 | 79 | 5/22/2000 | WBRC | 4.54 | 503.00 | 0.0371 | 54.20 | 0.00 | 10.83 | 227.00 | 0.25 | 8.24 | 4.95 | 2.69 |
| WB110 | 79 | 10/3/2000 | WBRC | 4.38 | 628.00 | 0.0060 | 40.70 | 0.00 | 1.31 | 271.00 | 0.11 | 8.02 | 7.74 | 0.51 |
| WB115 | 2 | 6/25/1996 | WBRC | 5.63 | 275.00 | 2.3900 | 0.00 | 19.00 | -244.42 | 110.00 | 0.06 | 0.16 | 0.70 | 11.86 |
| WB120 | | 5/22/2000 | WBRC | 6.83 | 420.00 | 0.2850 | 0.00 | 32.80 | -50.32 | 109.00 | 0.05 | 0.25 | 0.05 | 0.54 |
| WB130 | | 6/5/2000 | WBRC | 4.32 | 262.00 | 0.0342 | 23.30 | 0.00 | 4.29 | 102.00 | 0.05 | 2.72 | 1.89 | 0.86 |
| WB140 | | 5/22/2000 | WBRC | 6.86 | 220.00 | 0.0511 | 0.00 | 25.30 | -6.96 | 72.40 | 0.05 | 0.25 | 0.05 | 0.10 |
| WB150 | | 5/22/2000 | WBRC | 6.56 | 158.00 | 0.0608 | 1.49 | 7.44 | -1.95 | 44.50 | 0.05 | 0.25 | 0.05 | 0.11 |
| WB160 | | 6/5/2000 | WBRC | 6.34 | 478.00 | 0.2230 | 2.21 | 20.80 | -22.31 | 163.00 | 0.14 | 0.26 | 3.75 | 5.00 |
| WB170 | | 10/16/2000 | WBRC | 5.54 | 878.00 | 0.0350 | 18.00 | 7.25 | 2.02 | 445.00 | 2.10 | 0.59 | 17.80 | 3.87 |
| MSBC010 | 34 | 6/28/1996 | RC | 5.01 | 457.00 | 23.9000 | 6.00 | 0.00 | 771.85 | 201.00 | 0.74 | 2.31 | 3.43 | 835.42 |
| MSBC010 | | 11/16/2000 | rc | 6.11 | 671.00 | 7.5028 | 9.99 | 9.12 | 35.13 | 300.00 | 0.32 | 1.35 | 5.00 | 269.79 |
| MSBC010 | | 3/27/2001 | RC | 5.43 | 370.00 | 15.3782 | 9.28 | 3.90 | 445.32 | 161.00 | 0.85 | 1.54 | 2.16 | 377.11 |
| MSBC020 | | 3/28/2000 | Twomile Run | 6.69 | 317.00 | 7.1280 | 0.00 | 19.80 | -759.66 | 92.20 | 0.63 | 0.25 | 0.29 | 45.03 |
| MSBC025 | 35 | 6/28/1996 | Twomile Run | 6.25 | 494.00 | 2.0300 | 0.00 | 29.00 | -316.87 | 186.00 | 0.73 | 0.63 | 1.34 | 29.57 |

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|---------|----|------------|-----------------|------|----------|---------|---------|--------|---------|---------|---------|-------|---------|--------|
| MSBC030 | | 6/26/2000 | Rocky Run | 6.52 | 105.00 | 0.0667 | 39.60 | 32.80 | 2.44 | 26.30 | 2.54 | 0.25 | 1.15 | 1.42 |
| MSBC030 | | 10/26/2000 | Rocky Run | 6.36 | 103.00 | 0.0601 | 9.04 | 27.20 | -5.87 | 17.30 | 0.54 | 0.45 | 0.10 | 0.35 |
| MSBC040 | | 6/26/2000 | Unnamed | 5.89 | 130.00 | 0.0168 | 14.80 | 7.85 | 0.63 | 34.60 | 0.25 | 0.25 | 0.52 | 0.09 |
| MSBC040 | | 10/26/2000 | Unnamed | 6.01 | 166.00 | 0.0109 | 15.70 | 12.50 | 0.19 | 49.40 | 0.17 | 0.37 | 0.20 | 0.04 |
| MSBC050 | | 6/26/2000 | Unnamed | 6.58 | 300.00 | 0.0055 | 6.51 | 17.60 | -0.33 | 70.80 | 0.05 | 0.25 | 0.05 | 0.01 |
| MSBC050 | | 10/26/2000 | Unnamed | 6.42 | 601.00 | 0.0030 | 9.68 | 40.40 | -0.50 | 160.00 | 0.07 | 0.38 | 0.06 | 0.01 |
| MSBC060 | | 7/11/2000 | Unnamed | 6.66 | 306.00 | 0.0016 | 12.00 | 88.90 | -0.64 | 26.30 | 2.44 | 0.25 | 10.70 | 0.11 |
| MSBC060 | | 10/26/2000 | Unnamed | 6.46 | 287.00 | 0.0024 | 19.40 | 59.00 | -0.52 | 50.20 | 1.78 | 0.38 | 1.57 | 0.05 |
| MSBC070 | | 7/11/2000 | Unnamed | 6.61 | 209.00 | 0.0046 | 7.52 | 18.80 | -0.28 | 48.60 | 0.91 | 0.25 | 1.17 | 0.06 |
| MSBC070 | | 10/26/2000 | Unnamed | 6.73 | 245.00 | 0.0066 | 7.82 | 24.30 | -0.58 | 54.30 | 2.59 | 0.49 | 0.91 | 0.14 |
| MSBC080 | | 6/26/2000 | Unnamed | 7.27 | 1340.00 | 0.0021 | 9.28 | 109.00 | -1.14 | 425.00 | 0.06 | 0.25 | 0.06 | 0.00 |
| MSBC080 | | 10/26/2000 | Unnamed | 6.76 | 1580.00 | 0.0099 | 10.90 | 106.00 | -5.04 | 536.00 | < 0.050 | 0.38 | < 0.050 | 0.02 |
| MSBC090 | 36 | 6/28/1996 | Mitchell Hollow | 4.45 | 574.00 | 0.4240 | 17.00 | 0.00 | 38.80 | 239.00 | 1.03 | 1.52 | 6.90 | 21.61 |
| MSBC090 | | 6/26/2000 | Mitchell Hollow | 5.13 | 888.00 | 0.0310 | 29.60 | 2.28 | 4.56 | 443.00 | 0.33 | 1.87 | 12.70 | 2.49 |
| MSBC090 | | 10/25/2000 | Mitchell Hollow | 4.28 | 1070.00 | 0.1630 | 86.00 | 0.00 | 75.45 | 597.00 | 0.43 | 7.50 | 16.40 | 21.39 |
| msbc091 | | 10/25/2000 | Mitchell Hollow | 4.59 | 1260.00 | 0.0601 | 94.70 | 1.58 | 30.12 | 735.00 | 0.21 | 8.31 | 19.10 | 8.95 |
| msbc092 | | 10/25/2000 | Mitchell Hollow | 3.70 | 794.00 | 0.0917 | 64.20 | 0.00 | 31.69 | 390.00 | 0.51 | 6.52 | 12.70 | 9.76 |
| MSBC100 | 99 | 7/22/1996 | RC | 4.80 | 723.00 | 10.2200 | 19.00 | 0.00 | 1045.17 | 356.00 | 0.37 | 0.82 | 4.83 | 331.88 |
| MSBC100 | 99 | 4/25/2000 | RC | 6.27 | 418.00 | 48.5635 | 5.57 | 5.16 | 107.17 | 148.00 | 0.38 | 0.60 | 2.35 | 872.61 |
| MSBC100 | | 3/27/2001 | RC | 5.89 | 326.00 | 27.6102 | 7.04 | 6.61 | 63.90 | 149.00 | 0.66 | 0.46 | 1.80 | 434.90 |
| MSBC110 | | 6/28/2000 | Unnamed | 3.38 | 1410.00 | 0.0468 | 85.70 | 0.00 | 21.59 | 724.00 | 2.43 | 6.62 | 13.80 | 5.77 |
| MSBC110 | | 10/25/2000 | Unnamed | 3.10 | 2440.00 | 0.0468 | 180.00 | 0.00 | 45.34 | 1457.00 | 4.51 | 20.60 | 23.30 | 12.22 |
| MSBC120 | | 6/28/2000 | Unnamed | 2.87 | 2160.00 | 0.1100 | 268.00 | 0.00 | 158.68 | 1227.00 | 4.89 | 26.90 | 30.90 | 37.20 |
| MSBC120 | | 10/25/2000 | Unnamed | 2.75 | 2450.00 | 0.09 | 347.00 | 0.00 | 171.27 | 1498.00 | 5.03 | 36.90 | 35.90 | 38.50 |
| BC010 | 12 | 7/1/1996 | Brushy Creek | 5.51 | 266.00 | 7.7600 | 0.00 | 10.00 | -417.68 | 98.00 | 0.65 | 0.19 | 2.07 | 121.81 |
| BC010 | | 3/27/2000 | Brushy Creek | 6.03 | 225.00 | 40.4311 | 11.30 | 6.23 | 1103.33 | 57.60 | 1.17 | 0.25 | 1.04 | 536.52 |
| BC010 | | 11/15/00 | Brushy Creek | 4.72 | 589.00 | 0.0000 | 37.00 | 0.64 | 0.00 | 252.00 | 0.20 | 3.67 | 7.86 | 0.00 |
| BC012 | | 11/20/2000 | Brushy Creek | 6.52 | 468.00 | 0.0740 | 8.34 | 108.00 | -39.70 | 50.20 | 0.96 | 0.17 | 0.73 | 0.74 |
| BC013 | | 11/20/2000 | Brushy Creek | 4.47 | 470.00 | 1.5220 | 27.20 | 2.40 | 203.17 | 183.00 | 0.91 | 2.40 | 4.87 | 67.18 |
| BC013 | | 2/21/2001 | Brushy Creek | 5.83 | 225.00 | 18.0399 | 10.50 | 6.60 | 378.69 | 74.90 | 1.06 | 1.55 | 1.47 | 397.03 |
| BC020 | 89 | 7/17/1996 | Brushy Creek | 6.70 | 208.00 | 0.1500 | 0.00 | 42.00 | -33.91 | 34.00 | 0.99 | 0.79 | 0.52 | 1.86 |
| BC020 | | 11/20/2000 | DUNKLE | 6.98 | 246.00 | 0.1520 | 6.60 | 44.70 | -31.17 | 37.00 | 0.45 | 0.00 | 0.10 | 0.45 |
| BC030 | | 6/21/2000 | Brushy Creek | 6.43 | 3445.00 | 0.0105 | 6.64 | 34.00 | -1.55 | 82.30 | 0.52 | 0.25 | 0.84 | 0.09 |
| BC040 | 88 | 7/16/1996 | Brushy Creek | 6.69 | 147.00 | 0.5000 | 0.00 | 35.00 | -94.19 | 20.00 | 0.51 | 0.14 | 0.05 | 1.89 |
| BC050 | 11 | 7/1/1996 | Brushy Creek | 3.25 | 498.00 | 3.2800 | 50.00 | 0.00 | 882.73 | 227.00 | 6.90 | 2.09 | 4.44 | 237.62 |
| BC060 | | 6/21/2000 | Brushy Creek | 2.74 | 3410.00 | 0.0300 | 1248.00 | 0.00 | 201.52 | 2363.00 | 403.00 | 59.40 | 35.80 | 80.62 |
| BC060 | | 10/18/2000 | Brushy Creek | 1.80 | 14700.00 | 0.0208 | 3088.00 | 0.00 | 345.72 | 2066.00 | 180.00 | 45.10 | 35.40 | 29.23 |

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|---------|------|------------|----------------|------|---------|--------|---------|-------|---------|---------|--------|---------|-------|---------|
| BC060 | | 2/21/2001 | Brushy Creek | 2.68 | 2180.00 | 0.9910 | 635.00 | 0.00 | 3387.12 | 1391.00 | 202.00 | 31.90 | 22.50 | 1370.65 |
| BC070 | | 6/21/2000 | Brushy Creek | 2.85 | 1790.00 | 0.0751 | 191.00 | 0.00 | 77.21 | 831.00 | 3.12 | 18.60 | 20.50 | 17.10 |
| BC070 | | 10/18/2000 | Brushy Creek | 2.91 | 2150.00 | 0.0674 | 265.00 | 0.00 | 96.14 | 1144.00 | 7.58 | 19.40 | 26.40 | 19.41 |
| BC070 | | 2/28/2001 | Brushy Creek | 3.02 | 1350.00 | 0.7800 | 242.00 | 0.00 | 1016.00 | 823.00 | 8.11 | 25.70 | 22.10 | 235.24 |
| BC080 | | 6/7/2000 | Brushy Creek | 6.80 | 188.00 | 0.0751 | 0.00 | 66.20 | -26.76 | 20.60 | 2.16 | 0.25 | 2.36 | 1.93 |
| BC090 | 72 | 7/1/1996 | Brushy Creek | 3.19 | 1159.00 | 0.1300 | 119.00 | 0.00 | 83.27 | 650.00 | 3.43 | 13.80 | 18.10 | 24.78 |
| BC090 | | 6/21/2000 | Brushy Creek | 2.95 | 1480.00 | 0.1870 | 171.00 | 0.00 | 172.12 | 687.00 | 3.16 | 16.20 | 17.50 | 37.18 |
| BC090 | | 10/18/2000 | Brushy Creek | 2.97 | 2220.00 | 0.0532 | 317.00 | 0.00 | 90.77 | 1292.00 | 11.10 | 27.50 | 33.40 | 20.66 |
| BC090 | | 2/21/2001 | Brushy Creek | 2.99 | 893.00 | 0.1860 | 139.00 | 0.00 | 139.16 | 480.00 | 5.12 | 17.50 | 11.50 | 34.23 |
| BC095 | 72A | 10/25/2000 | Brushy Creek | 2.89 | 1720.00 | 0.0128 | 219.00 | 0.00 | 15.05 | 763.00 | 8.62 | 10.20 | 41.90 | 4.18 |
| BC100 | | 6/7/2000 | Brushy Creek | 6.19 | 113.00 | 0.0168 | 0.79 | 25.10 | -2.20 | 19.80 | 1.09 | 0.25 | 0.56 | 0.17 |
| BC110 | 10 | 7/1/1996 | Brushy Creek | 3.29 | 520.00 | 1.0300 | 42.00 | 0.00 | 232.85 | 240.00 | 2.27 | 3.33 | 6.90 | 69.45 |
| BC110 | | 6/7/2000 | Brushy Creek | 3.68 | 564.00 | 0.5780 | 51.40 | 0.00 | 159.91 | 220.00 | 1.30 | 5.23 | 9.03 | 48.51 |
| BC110 | 76 | 10/24/2000 | Brushy Creek | 3.38 | 681.00 | 0.1300 | 75.70 | 0.00 | 52.97 | 293.00 | 2.05 | 6.67 | 12.20 | 14.67 |
| BC110 | | 2/21/2001 | Brushy Creek | 3.79 | 384.00 | 1.8260 | 57.20 | 0.00 | 562.19 | 184.00 | 0.60 | 7.72 | 4.24 | 123.71 |
| BC111 | 86 | 7/16/1996 | Brushy Creek | 4.79 | 335.00 | 0.0920 | 20.00 | 0.00 | 9.90 | 107.00 | 0.97 | 1.44 | 4.29 | 3.33 |
| BC111 | 076B | 10/24/2000 | Brushy Creek | 4.82 | 363.00 | 0.0065 | 31.60 | 2.80 | 1.00 | 146.00 | 0.31 | 2.12 | 3.94 | 0.22 |
| BC112 | 85 | 7/16/1996 | Brushy Creek | 3.39 | 809.00 | 0.1530 | 166.00 | 0.00 | 136.70 | 294.00 | 2.59 | 18.20 | 11.00 | 26.24 |
| BC113 | 84 | 7/16/1996 | Brushy Creek | 3.28 | 1781.00 | 0.0600 | 394.00 | 0.00 | 127.24 | 1260.00 | 1.91 | 46.30 | 19.40 | 21.88 |
| BC113 | | 10/24/2000 | Brushy Creek | 3.04 | 1060.00 | 0.0240 | 238.00 | 0.00 | 30.74 | 497.00 | 3.31 | 28.90 | 14.50 | 6.05 |
| BC114 | | 10/24/2000 | Brushy Creek | 3.34 | 489.00 | 0.0169 | 74.50 | 0.00 | 6.77 | 184.00 | 2.22 | 8.57 | 4.93 | 1.43 |
| BC120 | | 6/7/2000 | Brushy Creek | 5.59 | 197.00 | 0.1220 | 0.00 | 38.20 | -25.08 | 24.70 | 0.06 | 0.25 | 0.05 | 0.23 |
| BC130 | 9 | 6/25/1996 | Brushy Creek | 5.53 | 193.00 | 6.9700 | 0.00 | 15.00 | -562.74 | 68.00 | 0.76 | 0.51 | 2.23 | 131.59 |
| BC130 | | 6/7/2000 | Brushy Creek | 5.79 | 374.00 | 0.3699 | 14.30 | 8.68 | 11.19 | 121.00 | 0.10 | 0.25 | 4.38 | 9.43 |
| BC130 | | 2/28/2001 | Brushy Creek | 6.09 | 228.00 | 1.9830 | 8.99 | 2.95 | 64.47 | 92.20 | 0.44 | 1.39 | 2.68 | 48.20 |
| BC140 | | 6/21/2000 | Brushy Creek | 6.75 | 532.00 | 0.0078 | 5.02 | 63.20 | -2.46 | 59.30 | 0.07 | 0.31 | 0.70 | 0.05 |
| BC140 | | 10/18/2000 | Brushy Creek | 6.99 | 628.00 | 0.0021 | 9.37 | 72.90 | -0.71 | 628.00 | 0.40 | < 0.100 | 1.10 | 0.02 |
| BC150 | 82 | 7/16/1996 | Brushy Creek | 2.81 | 2500.00 | 0.0310 | 1019.00 | 0.00 | 170.03 | 1701.00 | 61.00 | 103.00 | 79.00 | 40.64 |
| BC150 | 82 | 6/7/2000 | Brushy Creek | 3.24 | 1640.00 | 0.0422 | 249.00 | 0.00 | 56.56 | 840.00 | 5.88 | 29.00 | 39.40 | 16.91 |
| BC150 | 82 | 10/25/2000 | Brushy Creek | 3.00 | 1860.00 | 0.0266 | 324.00 | 0.00 | 46.42 | 980.00 | 4.74 | 38.00 | 43.80 | 12.43 |
| BC151 | | 6/7/2000 | Brushy Creek | 3.01 | 2010.00 | 0.0172 | 620.00 | 0.00 | 57.37 | 1284.00 | 78.70 | 74.30 | 50.20 | 18.84 |
| BC151 | | 10/25/2000 | Brushy Creek | 2.91 | 2090.00 | 0.0113 | 636.00 | 0.00 | 38.58 | 1375.00 | 5.97 | 74.40 | 48.80 | 7.85 |
| BC160 | | 10/18/2000 | Brushy Creek | 7.15 | 160.00 | 0.1055 | 10.30 | 30.20 | -11.30 | 24.70 | 0.23 | 0.11 | 0.23 | 0.32 |
| BC170 | | 7/11/2000 | Brushy Creek | 5.11 | 279.00 | 1.1800 | 13.60 | 0.00 | 86.38 | 114.00 | 0.28 | 0.83 | 4.27 | 34.21 |
| BC180 | 8 | 6/25/1996 | Brushy Creek | 4.08 | 226.00 | 1.0200 | 33.00 | 0.00 | 181.17 | 96.00 | 0.45 | 2.95 | 3.27 | 36.70 |
| BC180 | | 10/16/2000 | Brushy Creek | 5.49 | 209.00 | 0.0233 | 15.10 | 7.33 | 0.97 | 86.40 | 0.36 | 1.34 | 3.41 | 0.64 |
| MSLH010 | 37 | 7/1/1996 | inamed RC trit | 6.39 | 621.00 | 0.0420 | 0.00 | 31.00 | -7.01 | 302.00 | 2.08 | 0.39 | 8.60 | 2.51 |

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|----------------|----|------------------|-----------------|-------------|---------------|----------------|-------------|-------------|----------------|---------------|-------------|-------------|-------------|---------------|
| MSLH010 | | 6/28/2000 | inamed RC trik | 5.98 | 693.00 | 0.0048 | 20.40 | 23.00 | -0.07 | 333.00 | 0.78 | 0.25 | 11.40 | 0.32 |
| MSLH020 | 90 | 7/17/1996 | RC | 4.32 | 870.00 | 14.2000 | 63.00 | 0.00 | 4815.18 | 347.00 | 0.41 | 4.75 | 7.10 | 939.10 |
| MSLH020 | 90 | 4/24/2000 | RC | 6.26 | 382.00 | 378.3730 | 5.53 | 5.14 | 794.27 | 143.00 | 0.18 | 0.61 | 2.32 | 6353.80 |
| MSLH020 | | 11/14/2000 | RC | 5.81 | 749.00 | 12.9690 | 17.60 | 3.54 | 981.47 | 366.00 | 0.13 | 2.02 | 6.08 | 576.04 |
| MSLH020 | | 3/27/2001 | RC | 5.82 | 268.00 | 29.3078 | 6.27 | 6.03 | 37.86 | 135.00 | 0.77 | 0.46 | 1.84 | 485.03 |
| MSLH030 | 38 | 7/1/1996 | inamed RC trik | 2.91 | 2360.00 | 0.1900 | 179.00 | 0.00 | 183.06 | 1447.00 | 7.80 | 16.50 | 35.20 | 60.98 |
| MSLH030 | 38 | 6/28/2000 | inamed RC trik | 3.03 | 2560.00 | 0.0674 | 219.00 | 0.00 | 79.45 | 1572.00 | 6.64 | 15.10 | 37.30 | 21.47 |
| MSLH040 | | 7/9/2000 | Unnamed | 6.03 | 649.00 | 0.0062 | 18.30 | 12.30 | 0.20 | 244.00 | 3.88 | 0.39 | 4.51 | 0.29 |
| MSLH040 | | 10/30/2000 | Unnamed | 5.48 | 818.00 | 0.0230 | 10.50 | 19.40 | -1.10 | 344.00 | 1.16 | 1.17 | 5.46 | 0.97 |
| MSLH050 | 39 | 7/1/1996 | RC | 5.62 | 433.00 | 76.3000 | 0.00 | 8.00 | -3285.48 | 207 | 0.27 | <.1 | 3.08 | #VALUE! |
| MSLH060 | 40 | 7/1/1996 | ebb-Mine Holk | 3.01 | 782.00 | 0.2280 | 110.00 | 0.00 | 134.99 | 405.00 | 1.96 | 10.90 | 2.49 | 18.88 |
| MSLH060 | 40 | 7/5/2000 | ebb-Mine Holk | 3.27 | 910.00 | 0.1410 | 132.00 | 0.00 | 100.18 | 392.00 | 1.53 | 15.10 | 2.51 | 14.56 |
| MSLH060 | | 10/30/2000 | ebb-Mine Holk | 3.08 | 738.00 | 0.0532 | 114.00 | 0.00 | 32.64 | 373.00 | 0.44 | 22.30 | 3.46 | 7.52 |
| MSLH070 | | 7/5/2000 | Unnamed | 5.89 | 172.00 | 0.0047 | 11.00 | 13.70 | -0.07 | 56.00 | 2.56 | 2.58 | 1.97 | 0.18 |
| MSLH070 | | 10/30/2000 | Unnamed | 3.04 | 525.00 | NF | 56.30 | 0.00 | 0.00 | 183.00 | 4.17 | 14.40 | 2.50 | NA |
| MSLH 080 | 41 | 7/2/1996 | oalmont Hollo | 3.25 | 352.00 | 0.1040 | 40.00 | 0.00 | 22.39 | 107.00 | 3.39 | 1.91 | 1.51 | 3.82 |
| MSLH080 | | 7/5/2000 | oalmont Hollo | 3.66 | 369.00 | NF | 48.00 | 0.00 | 0.00 | 123.00 | 10.20 | 1.50 | 1.87 | NA |
| MSLH080 | | 10/30/2000 | oalmont Hollo | 5.52 | 352.00 | NF | 33.20 | 22.80 | 0.00 | 118.00 | 12.70 | 1.36 | 3.17 | NA |
| MSLH090 | | 11/13/2000 | al/Bolster Wetl | 6.82 | 234.00 | 0.0066 | 27.10 | 86.40 | -2.09 | 24.50 | 27.60 | 0.81 | 8.54 | 1.31 |
| MSLH091 | 42 | 7/2/1996 | Bolster Hollow | 5.89 | 207.00 | 0.1450 | 10.00 | 0.00 | 7.80 | 95.00 | 7.00 | 0.88 | 2.49 | 8.11 |
| MSLH091 | | 7/5/2000 | Bolster Hollow | 3.76 | 446.00 | NF | 36.30 | 0.00 | 0.00 | 165.00 | 1.15 | 0.25 | 1.83 | NA |
| MSLH091 | | 10/30/2000 | Bolster Hollow | 6.75 | 209.00 | NF | 7.63 | 31.40 | 0.00 | 32.10 | 0.89 | 1.03 | 0.40 | NA |
| MSLH100 | | 7/12/2000 | Little Sandy | 6.56 | 343.00 | 0.0087 | 13.30 | 56.80 | -2.04 | 51.00 | 3.11 | 0.26 | 5.98 | 0.44 |
| MSLH100 | | 10/30/2000 | Little Sandy | 5.81 | 177.00 | NF | 7.26 | 12.20 | 0.00 | 64.20 | 0.87 | 0.99 | 3.02 | NA |
| MSLH110 | | 7/9/2000 | Pinney Hollow | 6.60 | 278.00 | 0.0017 | 13.50 | 59.80 | -0.41 | 51.90 | 1.49 | 0.36 | 2.09 | 0.04 |
| MSLH110 | | 11/13/2000 | Pinney Hollow | 6.66 | 284.00 | 0.0832 | 9.04 | 44.00 | -15.66 | 73.30 | 0.43 | 0.33 | 0.59 | 0.60 |
| MSLH120 | 43 | 6/27/1996 | Sandy Run | 6.15 | 112.00 | 4.5100 | 0.00 | 6.00 | -145.65 | 35.00 | 0.48 | 0.19 | 0.34 | 24.57 |
| MSLH120 | 43 | 3/28/2000 | Sandy Run | 6.33 | 116.00 | 18.9730 | 14.60 | 5.91 | 887.44 | 29.60 | 0.72 | 0.25 | 0.12 | 111.35 |
| MSLH121 | 44 | 6/27/1996 | Sandy Run | 5.63 | 205.00 | 2.0100 | 28.00 | 0.00 | 302.93 | 74.00 | 0.59 | 0.10 | 0.82 | 16.37 |
| MSLH122 | 74 | 6/27/1996 | Sandy Run | 4.13 | 272.00 | 0.4230 | 16.00 | 0.00 | 36.43 | 127.00 | 1.71 | 0.51 | 1.52 | 8.53 |
| MSLH122 | 74 | 7/17/1996 | Sandy Run | 3.60 | 414.00 | 0.1650 | 23.00 | 0.00 | 20.43 | 181.00 | 0.79 | 0.81 | 2.28 | 3.45 |
| MSLH130 | 45 | 6/27/1996 | RC | 5.97 | 308.00 | 73.6000 | 0.00 | 12.00 | -4753.82 | 129.00 | 0.48 | 0.11 | 2.04 | 1044.16 |
| MSLH130 | 45 | 4/10/2000 | RC | 6.10 | 247.00 | 151.9790 | 22.70 | 2.89 | 16205.10 | 77.40 | 1.62 | 1.17 | 1.33 | 3377.65 |
| MSLH130 | | 11/14/00 | RC | 6.60 | 715.00 | NF | 8.40 | 9.58 | 0.00 | 333.00 | 0.25 | 0.72 | 4.53 | NA |
| MSLH130 | | 36969.00 | RC | 6.42 | 289.00 | 68.56 | 7.03 | 8.43 | -516.65 | 106.00 | 0.28 | 0.31 | 1.41 | 740.05 |
| MSLH140 | 93 | 7/17/1996 | heelabout Cre | 6.70 | 288.00 | 0.7100 | 0.00 | 23.00 | -87.90 | 83.00 | 3.84 | 0.33 | 0.80 | 19.03 |
| MSLH140 | 93 | 3/28/2000 | heelabout Cre | 6.63 | 214.00 | 10.7977 | 18.90 | 13.40 | 319.65 | 56.00 | 0.60 | 0.25 | 0.22 | 62.61 |

| | | | | | | | | | | | | | | |
|---------|----|------------|--------------|------|---------|---------|---------|-------|----------|---------|--------|-------|------|---------|
| MSLH150 | | 6/28/2000 | Unnamed | 6.10 | 873.00 | 0.0113 | 15.10 | 18.10 | -0.18 | 455.00 | 0.77 | 0.25 | 6.14 | 0.44 |
| MSLH151 | | 7/9/2000 | Unnamed | 6.97 | 776.00 | 0.0015 | 7.99 | 75.90 | -0.53 | 261.00 | 1.32 | 0.72 | 3.66 | 0.04 |
| HF010 | 47 | 6/28/1996 | Hewett Fork | 4.10 | 492.00 | 14.8000 | 33.00 | 0.00 | 2628.81 | 234.00 | 0.58 | 4.69 | 2.89 | 651.46 |
| HF010 | 47 | 3/27/2000 | Hewett Fork | 6.21 | 257.00 | 46.3764 | 11.00 | 11.90 | -224.66 | 81.50 | 0.78 | 0.25 | 0.50 | 382.51 |
| HF010 | 47 | 8/21/2000 | Hewett Fork | 5.96 | 408.00 | 1.1831 | 6.82 | 3.75 | 19.55 | 167.00 | 0.19 | 0.74 | 1.87 | 17.90 |
| HF020 | 48 | 6/28/1996 | Hewett Fork | 3.85 | 530.00 | 13.6000 | 85.00 | 0.00 | 6222.16 | 246.00 | 1.01 | 5.38 | 2.88 | 680.07 |
| HF030 | 49 | 6/26/1996 | Hewett Fork | 5.69 | 125 | 1.32 | 0 | 23 | -163.41 | 33 | 2.42 | 0.36 | 1.39 | 29.69 |
| HF031 | | 5/1/2000 | King/Lop | 6.49 | 103.00 | 1.6151 | 13.30 | 16.00 | -23.47 | 32.10 | 0.98 | 0.36 | 0.56 | 16.57 |
| HF040 | | 4/30/2000 | Rock Cr | 6.71 | 192.00 | 2.4790 | 0.00 | 44.50 | -593.77 | 23.00 | 0.34 | 0.44 | 0.31 | 14.59 |
| HF050 | | 4/30/2000 | Mudlick Cr | 6.94 | 269.00 | 1.5271 | 0.00 | 63.40 | -521.12 | 34.60 | 0.19 | 0.41 | 0.17 | 6.35 |
| HF060 | 96 | 7/18/1996 | Hewett Fork | 3.49 | 621.00 | 10.8000 | 48.00 | 0.00 | 2790.29 | 263.00 | 2.04 | 3.69 | 2.99 | 508.01 |
| HF070 | | 5/1/2000 | Pine Run | 5.68 | 34.60 | 1.5462 | 13.90 | 14.80 | -7.49 | 29.60 | 1.98 | 0.40 | 0.89 | 27.31 |
| HF080 | | 4/30/2000 | Grassy Run | 6.74 | 206.00 | 1.2552 | 0.00 | 49.10 | -331.71 | 33.80 | 0.26 | 0.29 | 0.27 | 5.57 |
| HF090 | | 3/27/2000 | Hewett Fork | 4.53 | 384.00 | 28.8437 | 35.40 | 0.00 | 5495.89 | 141.00 | 4.88 | 0.93 | 1.10 | 1075.13 |
| HF090 | | 8/21/2000 | Hewett Fork | 3.33 | 914.00 | 1.9635 | 88.20 | 0.00 | 932.14 | 399.00 | 2.60 | 8.53 | 3.00 | 149.66 |
| HF090 | | 11/20/2000 | Hewett Fork | 6.86 | 194.00 | 21.6320 | 4.83 | 64.90 | -6994.20 | 20.60 | 0.22 | 0.13 | 0.00 | 39.91 |
| HF099 | 51 | 6/26/1996 | Hewett Fork | 2.83 | 1015.00 | 10.9000 | 140.00 | 0.00 | 8213.69 | 467.00 | 21.70 | 8.67 | 4.23 | 2034.40 |
| HF100 | | 4/30/2000 | Hewett Fork | 3.12 | 1660.00 | 0.0366 | 440.00 | 0.00 | 86.66 | 914.00 | 65.80 | 0.25 | 2.87 | 13.60 |
| HF100 | | 9/27/2000 | Hewett Fork | 2.90 | 1510.00 | 0.0295 | 336.00 | 0.00 | 53.35 | 819.00 | 46.90 | 30.40 | 2.63 | 12.72 |
| HF110 | | 4/10/2000 | Hewett Fork | 3.68 | 558.00 | 2.7570 | 63.30 | 0.00 | 939.34 | 173.00 | 19.80 | 0.48 | 0.99 | 316.30 |
| HF110 | | 8/30/2000 | Hewett Fork | 2.97 | 1230.00 | 0.2550 | 140.00 | 0.00 | 192.16 | 482.00 | 14.10 | 9.98 | 4.13 | 38.80 |
| HF111 | 52 | 6/26/1996 | Hewett Fork | 6.43 | 120.00 | 0.4760 | 0.00 | 12.00 | -30.74 | 43.00 | 1.84 | 0.10 | 1.04 | 7.65 |
| HF112 | 53 | 6/26/1996 | Trace Run | 2.58 | 1913.00 | 1.4700 | 465.00 | 0.00 | 3679.20 | 1031.00 | 128.00 | 24.90 | 4.43 | 1247.56 |
| HF112 | | 3/30/2000 | Trace Run | 3.67 | 828.00 | 0.9269 | 108.00 | 0.00 | 538.82 | 261.00 | 35.60 | 1.50 | 1.43 | 192.65 |
| HF112 | | 8/21/2000 | Trace Run | 2.80 | 1850.00 | 0.1870 | 262.00 | 0.00 | 263.71 | 802.00 | 25.20 | 12.30 | 7.38 | 45.27 |
| HF113 | 97 | 7/18/1996 | Hewett Fork | 2.81 | 1845.00 | 0.8000 | 413.00 | 0.00 | 1778.38 | 935.00 | 118.00 | 15.10 | 4.30 | 592.94 |
| HF114 | | 9/27/2000 | Kennard Seep | 3.81 | 3010.00 | 0.0276 | 1327.00 | 0.00 | 197.13 | 2453.00 | 567.00 | 49.60 | 7.74 | 92.95 |
| HF114 | | 12/5/2000 | Hewett Fork | 3.59 | 3130.00 | 0.0000 | 1380.00 | 0.00 | 0.00 | 2577.00 | 579.00 | 49.10 | 7.65 | |
| HF115 | | 12/5/2000 | Hewett Fork | 2.99 | 1540.00 | 0.1630 | 221.00 | 0.00 | 193.89 | 698.00 | 37.50 | 11.50 | 3.62 | 46.27 |
| HF116 | | 12/5/2000 | Hewett Fork | 3.32 | 3750.00 | 0.0000 | 1074.00 | 0.00 | 0.00 | 2774.00 | 525.00 | 9.42 | 7.56 | |
| HF120 | 54 | 6/21/1996 | Hewett Fork | 3.08 | 614.00 | 2.0700 | 109.00 | 0.00 | 1214.45 | 322.00 | 9.80 | 8.97 | 0.97 | 220.42 |
| HF120 | 54 | 4/26/2000 | Hewett Fork | 3.90 | 341.00 | 1.5158 | 43.40 | 0.00 | 354.08 | 129.00 | 7.95 | 4.22 | 1.50 | 111.77 |
| HF120 | | 12/11/2000 | Hewett Fork | 2.70 | 672.00 | 0.0285 | 90.50 | 0.00 | 13.88 | 283.00 | 7.54 | 15.10 | 1.05 | 3.64 |
| HF121 | | 4/26/2000 | Hewett Fork | 5.96 | 109.00 | 0.0950 | 2.96 | 14.80 | -6.05 | 23.00 | 0.23 | 0.25 | 1.09 | 0.80 |
| HF130 | 56 | 6/21/1996 | Hewett Fork | 5.52 | 374.00 | 11.3000 | 0.00 | 6.00 | -364.93 | 192.00 | 1.12 | 0.65 | 2.61 | 266.98 |
| HF130 | | 12/11/2000 | Hewett Fork | 3.25 | 658.00 | | 25.30 | 0.00 | 0.00 | 294.00 | 4.47 | 4.86 | 2.74 | |
| HF131 | | 12/11/2000 | Hewett Fork | 2.46 | 1860.00 | 0.4880 | 354.00 | 0.00 | 929.84 | 1062.00 | 65.60 | 32.10 | 6.94 | |

| | | | | | | | | | | | | | | |
|----------------|----|------------------|-------------|-------------|------------|----------------|-------------|-----------|-------------------|-------------|--------------|--------------|-------------|----------------|
| HF131 | 55 | 6/21/1996 | Hewett Fork | 2.85 | 1957.00 | 1.6900 | 295.00 | 0.00 | 2683.44 | 1200.00 | 21.70 | 19.80 | 8.80 | 458.55 |
| HF140 | 57 | 6/13/1996 | Hewett Fork | 3.13 | 1351.00 | 5.4300 | 368.00 | 0.00 | 10755.52 | 635.00 | 3.04 | 22.00 | 6.20 | 915.05 |
| HF140 | 57 | 4/26/2000 | Hewett Fork | 3.42 | 684.00 | 0.4996 | 66.60 | 0.00 | 179.09 | 274.00 | 12.20 | 5.16 | 2.88 | 54.55 |
| HF140 | 57 | 8/21/2000 | Hewett Fork | 3.60 | 885.00 | 0.0352 | 106.00 | 0.00 | 20.08 | 441.00 | 26.70 | 6.27 | 3.46 | 6.92 |
| HF140 | | 12/11/2000 | Hewett Fork | 3.69 | 846.00 | 0.0056 | 70.20 | 0.00 | 2.11 | 437.00 | 27.90 | 11.30 | 4.56 | 1.32 |
| HF150 | 58 | 6/13/1996 | Hewett Fork | 4.03 | 555.00 | 0.3590 | 80.00 | 0.00 | 154.59 | 105.00 | 2.13 | 3.90 | 2.89 | 17.27 |
| HF150 | 58 | 4/26/2000 | Hewett Fork | 6.17 | 291.00 | 7.4218 | 2.00 | 18.70 | -667.13 | 94.70 | 2.95 | 0.40 | 1.87 | 209.14 |
| HF150 | 58 | 8/30/2000 | Hewett Fork | 5.30 | 570.00 | 0.6121 | 39.20 | 0.00 | 129.15 | 271.00 | 12.20 | 0.88 | 2.92 | 52.84 |
| HF160 | | 4/26/2000 | Hewett Fork | 6.24 | 220.00 | 6.3590 | 0.00 | 18.90 | -646.89 | 89.70 | 2.01 | 0.66 | 1.69 | 149.52 |
| HF170 | | 4/25/2000 | Hewett Fork | 7.51 | 226.00 | 2.1528 | 0.00 | 30.50 | -353.41 | 43.60 | 0.16 | 0.46 | 0.64 | 14.57 |
| HF180 | 59 | 6/13/1996 | Hewett Fork | 3.37 | 593.00 | 8.3400 | 125.00 | 0.00 | 5611.25 | 185.00 | 6.90 | 7.40 | 2.55 | 758.05 |
| HF180 | 59 | 3/30/2000 | Hewett Fork | 4.44 | 444.00 | 1.7214 | 43.80 | 0.00 | 405.83 | 156.00 | 6.16 | 2.26 | 2.54 | 101.77 |
| HF180 | 59 | 8/21/2000 | Hewett Fork | 4.25 | 810.00 | 0.2850 | 135.00 | 0.00 | 207.09 | 419.00 | 49.00 | 4.32 | 4.25 | 88.51 |
| HF190 | 50 | 6/26/1996 | Hewett Fork | 3.08 | 809.00 | 7.7800 | 91.00 | 0.00 | 3810.70 | 405.00 | 5.90 | 6.71 | 4.37 | 712.61 |
| MSBM010 | 46 | 6/27/1996 | RC | 5.68 | 318.00 | 89.6700 | 0.00 | 6.00 | -2895.89 | 144.00 | 0.44 | 0.76 | 2.06 | 1576.88 |
| MSBM010 | 46 | 4/10/2000 | RC | 6.12 | 270.00 | 188.5300 | 21.60 | 8.46 | 13333.97 | 78.20 | 1.60 | 1.09 | 1.19 | 3945.90 |
| MSBM010 | | 11/14/2000 | RC | 6.1 | 675 | NF | 9.29 | 8.23 | 0.00 | 317 | 0.315 | 1.01 | 3.67 | NA |
| MSBM010 | | 3/19/2001 | RC | 6.52 | 281 | 95.1347 | 7.73 | 11 | -1674.44 | 94.7 | 0.493 | 0.406 | 1.18 | 1066.91 |
| MSBM020 | | 5/1/2000 | Laurel Run | 6.62 | 168.00 | 0.2520 | 0.00 | 32.90 | -44.63 | 38.70 | 0.70 | 0.42 | 0.77 | 2.56 |
| MSBM030 | 95 | 7/17/1996 | Onion Creek | 6.90 | 284.00 | 0.4400 | 0.00 | 66.00 | -156.31 | 50.00 | 1.12 | 0.32 | 0.19 | 3.87 |
| MSBM030 | 95 | 4/30/2000 | Onion Creek | 7.09 | 254.00 | 2.2549 | 0.00 | 59.50 | -722.16 | 34.60 | 0.12 | 0.46 | 0.13 | 8.61 |
| MSBM040 | 67 | 7/2/1996 | RC | 4.39 | 468.00 | 76.3000 | 23.00 | 0.00 | 9445.74 | 192.00 | 0.99 | 1.93 | 2.95 | 2416.00 |
| MSBM040 | | 11/15/2000 | RC | 6.13 | 659 | | 4.36 | 8.3 | #VALUE! | 321 | 0.242 | 0.629 | 3.54 | #VALUE! |
| MSBM040 | | 3/19/2001 | RC | 6.57 | 286 | 148.395 | 7.29 | 13 | -4560.7791 | 95.5 | 0.495 | 0.411 | 1.15 | 1645.80 |

Table 1: Water Quality Data Collected at Sites in the Little Raccoon Creek Basin during current study (1997-2000) and by Wilson (1985).

| LRC SAMPLE SITES | SAMPLE ID# | SAMPLE DATE | BASIN | pH | S. COND. umho/cm | DISCHARGE ft ³ /sec. | TOTAL ACIDITY mg/l as CaCO ₃ | ACID LOADING lbs/DAY | TOTAL ALKALINITY mg/l as CaCO ₃ | TOTAL IRON mg/l | IRON LOADING lbs/DAY | TOTAL Al mg/l | Al LOADING lbs/DAY | TOTAL Mn mg/l | Mn LOADING lbs/DAY | SULFATE mg/l |
|------------------|----------------|-------------|--------------------------------------|--------|------------------|---------------------------------|---|----------------------|--|-----------------|----------------------|---------------|--------------------|---------------|--------------------|--------------|
| 1 | | | LITTLE RACCOON CR. BELOW LAKE RUPERT | | | | | | | | | | | | | |
| | | *6/15/79 | | 7.30 | 195.00 | 3.00 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | | *9/4/79 | | 7.70 | 220.00 | 5.00 | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| | | *11/2/83 | | 7.50 | 160.00 | 1.50 | 5.00 | 40.46 | 40.00 | 0.14 | 1.13 | 0.13 | 1.05 | 0.24 | 1.94 | 46.00 |
| | | 1/22/97 | | 7.30 | 186.00 | 11.60 | 0.00 | 0.00 | 27.00 | 0.27 | 16.89 | < 0.1 | NA | 0.33 | 20.65 | 50.00 |
| | 3/24/98 | | 7.00 | 141.00 | 6.65 | 0.00 | 0.00 | 18.00 | 0.67 | 24.03 | 0.40 | 14.35 | 0.32 | 11.48 | 63.00 | |
| | OUBLO28 | 10/14/98 | | 6.98 | 492.00 | NA | 0.00 | NA | 23.00 | 0.10 | NA | <0.1 | NA | 0.10 | NA | 235.00 |
| 2 | | | SUGAR RUN | | | | | | | | | | | | | |
| | | *09/15/80 | | 3.80 | 750.00 | 4.90 | 70.00 | 1850.24 | 0.00 | 4.75 | 125.55 | 3.47 | 91.72 | 6.30 | 166.52 | 320.00 |
| | | *05/16/81 | | 3.30 | 895.00 | 6.30 | 102.00 | 3466.37 | 0.00 | 6.90 | 234.49 | 5.80 | 197.11 | 6.95 | 236.19 | 430.00 |
| | | *07/21/81 | | 3.40 | 1100.00 | 3.40 | 164.00 | 3007.85 | 0.00 | 13.39 | 245.58 | 13.89 | 254.75 | 11.44 | 209.82 | 425.00 |
| | | *07/20/82 | | 2.80 | 1900.00 | 0.28 | 228.00 | 344.37 | 0.00 | 7.10 | 10.72 | 19.00 | 28.70 | 21.00 | 31.72 | 900.00 |
| | | *11/2/83 | | 3.20 | 1570.00 | 0.74 | 159.00 | 634.69 | 0.00 | 6.80 | 27.14 | 10.00 | 39.92 | 16.00 | 63.87 | 780.00 |
| | | 1/22/97 | | 7.00 | 940.00 | 3.90 | 0.00 | 0.00 | 47.00 | 3.27 | 68.79 | 2.09 | 43.97 | 3.12 | 65.64 | 256.00 |
| | | 2/27/98 | | 7.50 | 1193.00 | 4.03 | 0.00 | 0.00 | 80.00 | 0.47 | 10.21 | 0.40 | 8.69 | 0.81 | 17.60 | 502.00 |
| | | 3/24/98 | | 7.40 | 543.00 | 6.65 | 0.00 | 0.00 | 31.00 | 0.47 | 16.86 | 0.10 | 3.59 | 0.70 | 25.12 | 209.00 |
| | | OUBL017 | 10/13/98 | | 7.49 | 1994.00 | 0.25 | 0.00 | 0.00 | 119.00 | 0.24 | 0.32 | 0.20 | 0.26 | 0.47 | 0.62 |
| 3 | | | LITTLE RACCOON CR. BELOW LAKE ALMA | | | | | | | | | | | | | |
| | | *7/27/81 | | 6.30 | 360.00 | 1.70 | NA | NA | 28.00 | 0.114 | 1.05 | 0.08 | 0.69 | 2.59 | 23.75 | 135.00 |
| | | *7/23/82 | | 6.70 | 302.00 | 1.50 | NA | NA | 25.00 | NA | NA | NA | NA | NA | NA | 84.00 |
| | | 1/22/97 | | 7.00 | 335.00 | 20.10 | 0.00 | 0.00 | 37.00 | 0.72 | 78.07 | 0.29 | 31.44 | 0.92 | 99.75 | 87.00 |
| | | 3/24/98 | | 7.10 | 193.00 | 101.92 | 0.00 | 0.00 | 21.00 | 0.41 | 225.41 | 0.30 | 164.93 | 0.25 | 137.44 | 60.00 |
| | OUBL037 | 10/14/98 | | 7.18 | 666.00 | NA | 0.00 | 0.00 | 67.00 | 0.39 | NA | 0.30 | NA | 0.29 | NA | 300.00 |
| | DMR-LRC-017-BL | 6/22/99 | | 6.61 | 443.00 | 0.0888 | 0.00 | 0.00 | 63.50 | 0.48 | 0.23 | 1.74 | 0.83 | 0.95 | 0.45 | 189.00 |
| 4 | | | MEADOW RUN | | | | | | | | | | | | | |
| | | 1/29/97 | | 7.20 | 334.00 | 26.90 | 0.00 | 0.00 | 54.00 | 0.51 | 74.00 | 0.29 | 42.08 | 0.38 | 55.14 | 60.00 |
| | 3/24/98 | | 7.30 | 343.00 | 17.25 | 0.00 | 0.00 | 62.00 | 0.36 | 33.50 | 0.50 | 46.53 | 0.25 | 23.26 | 79.00 | |
| 5 | | | LITTLE RACCOON CR. AT U.S. ROUTE 32 | | | | | | | | | | | | | |
| | | 2/12/97 | | 5.70 | 294.00 | NA | 0.00 | 0.00 | 46.00 | 0.73 | NA | 0.58 | NA | 0.65 | NA | 67.00 |
| | | 3/24/98 | | 7.00 | 232.00 | 174.55 | 0.00 | 0.00 | 31.00 | 0.63 | 593.19 | 0.30 | 282.47 | 0.30 | 282.47 | 85.00 |
| | OUBL033 | 10/14/98 | | 7.33 | 573.00 | NA | 0.00 | 0.00 | 133.00 | 0.54 | NA | 0.10 | NA | 0.39 | NA | 137.00 |
| 6 | | | MULGA RUN | | | | | | | | | | | | | |
| | | *11/2/83 | | 3.20 | 1120.00 | 1.50 | 243.00 | 1966.22 | 0.00 | 14.00 | 113.28 | 18.00 | 145.65 | 11.00 | 89.01 | 910.00 |
| | | 1/29/97 | | 6.40 | 634.00 | 19.60 | 0.00 | 0.00 | 22.00 | 6.10 | 644.94 | 4.54 | 480.01 | 1.94 | 205.11 | 301.00 |
| | 2/27/98 | | 6.70 | 849.00 | 4.51 | 0.00 | 0.00 | 16.00 | 7.30 | 177.60 | 3.30 | 80.28 | 2.17 | 52.79 | 461.00 | |

* U.S. Geological Survey: Water Resources Investigations Report 85-4060, 1985

** Sampled By BBC ENGINEERING INC.

*** U.S. Geological Survey: Water Resource Investigations Report 88-4022, 1988

| LRC SAMPLE SITES | SAMPLE ID# | SAMPLE DATE | BASIN | pH | S. COND. umho/cm | DISCHARGE ft ³ /sec. | TOTAL ACIDITY mg/l as CaCO ₃ | ACID LOADING lbs/DAY | TOTAL ALKALINITY mg/l as CaCO ₃ | TOTAL IRON mg/l | IRON LOADING lbs/DAY | TOTAL AI mg/l | AI LOADING lbs/DAY | TOTAL Mn mg/l | Mn LOADING lbs/DAY | SULFATE mg/l |
|------------------|----------------|-------------|--|------|------------------|---------------------------------|---|----------------------|--|-----------------|----------------------|---------------|--------------------|---------------|--------------------|--------------|
| | | 3/24/98 | MULGA RUN | 6.50 | 626.00 | 7.88 | 14.00 | 595.10 | 0.00 | 3.50 | 148.77 | 2.20 | 93.52 | 0.99 | 42.08 | 502.00 |
| | OUBL027 | 10/14/98 | | 3.45 | 2760.00 | 2.49 | 130.00 | 1746.13 | 0.00 | 29.20 | 392.21 | 12.00 | 161.18 | 11.20 | 150.44 | 1850.00 |
| | DMR-LRC-001-BL | 4/28/99 | | 4.00 | 1270.00 | 7.85 | 79.70 | 3374.91 | 0.00 | 14.90 | 630.94 | 5.90 | 249.84 | 3.64 | 154.14 | 616.00 |
| | DMR-LRC-018-BL | 6/22/99 | | 3.39 | 2540.00 | 0.233 | 126.00 | 158.37 | 0.00 | 3.42 | 4.30 | 10.40 | 13.07 | 11.30 | 14.20 | 1358.00 |
| 7 | | | LITTLE RACCOON CR. AT HOLLINSHEAD ROAD | | | | | | | | | | | | | |
| | | 2/12/98 | | 5.60 | 293.00 | NA | 0.00 | 0.00 | 46.00 | 0.76 | NA | 0.46 | NA | 0.67 | NA | 69.00 |
| | | 3/24/98 | | 7.00 | 257.00 | NA | 0.00 | 0.00 | 32.00 | 0.80 | NA | 0.60 | NA | 0.39 | NA | 99.00 |
| 8 | | | MIDDLETON RUN | | | | | | | | | | | | | |
| | | *9/15/80 | | 3.10 | 1600.00 | 0.63 | 437.00 | 1485.10 | 0.00 | 27.60 | 93.80 | 36.00 | 122.34 | 16.40 | 55.73 | 740.00 |
| | | *7/21/80 | | 3.00 | 1200.00 | 0.92 | 288.00 | 1429.27 | 0.00 | 12.97 | 64.37 | 33.11 | 164.32 | 13.14 | 65.21 | 530.00 |
| | | *7/12/82 | | 2.90 | 1650.00 | 0.38 | 427.00 | 875.28 | 0.00 | 23.00 | 47.15 | 41.00 | 84.04 | 17.00 | 34.85 | 760.00 |
| | | *11/2/83 | | 2.90 | 1660.00 | 0.43 | 477.00 | 1106.42 | 0.00 | 22.00 | 51.03 | 44.00 | 102.06 | 22.00 | 51.03 | 890.00 |
| | | 1/29/97 | | 3.50 | 727.00 | 5.30 | 166.00 | 4745.89 | 0.00 | 7.80 | 223.00 | 19.70 | 563.22 | 6.60 | 188.69 | 293.00 |
| | | 2/27/98 | | 3.10 | 1002.00 | 2.36 | 217.00 | 2762.52 | 0.00 | 17.40 | 221.51 | 26.00 | 330.99 | 8.10 | 103.12 | 427.00 |
| | | 3/24/98 | | 3.20 | 959.00 | 3.20 | 219.00 | 3780.32 | 0.00 | 15.80 | 272.74 | 23.00 | 397.02 | 8.20 | 141.55 | 370.00 |
| | OUBL029 | 10/14/98 | | 3.27 | 1524.00 | 0.06 | 353.00 | 114.25 | 0.00 | 16.60 | 5.37 | 49.00 | 15.86 | 6.00 | 1.94 | 915.00 |
| | | 6/23/99 | | | | DRY | | | | | | | | | | |
| 8A | | | 124 STRIP PIT | | | | | | | | | | | | | |
| | | 1/12/98 | | 3.20 | 888.00 | NA | 220.00 | NA | 0.00 | 32.60 | NA | 10.00 | NA | 3.20 | NA | 374.00 |
| | | 2/4/98 | | 2.90 | 1353.00 | NA | 546.00 | NA | 0.00 | 78.00 | NA | 44.00 | NA | 8.80 | NA | 630.00 |
| | | 3/24/98 | | 3.10 | 1049.00 | 0.074 | 236.00 | 94.21 | 0.00 | 31.20 | 12.45 | 17.00 | 6.79 | 3.84 | 1.53 | 434.00 |
| 9 | | | RICH RUN | | | | | | | | | | | | | |
| | | 2/12/97 | | 3.60 | 522.00 | 3.10 | 35.00 | 585.28 | 0.00 | 3.00 | 50.17 | 3.50 | 58.53 | 2.60 | 43.48 | 201.00 |
| | | 3/25/98 | | 5.30 | 315.00 | 8.88 | 0.00 | 0.00 | 15.00 | 0.55 | 26.35 | 0.10 | 4.79 | 0.84 | 40.24 | 202.00 |
| | OUBL030 | 10/14/98 | | 3.20 | 1406.00 | 0.03 | 229.00 | 37.06 | 0.00 | 10.60 | 1.72 | 25.00 | 4.05 | 3.50 | 0.57 | 800.00 |
| | DMR-LRC-023-BL | 6/22/99 | | 3.58 | 723.00 | 0.00405 | 76.40 | 1.67 | 0.00 | 21.40 | 0.47 | 2.56 | 0.06 | 5.46 | 0.12 | 292.00 |
| 10 | | | LITTLE RACCOON CR. AT STATE ROUTE 124 | | | | | | | | | | | | | |
| | | ***7/27/81 | | 6.30 | 560.00 | 17.00 | 10.00 | 917.03 | 43.00 | 6.53 | 598.82 | 3.00 | 275.11 | 4.41 | 404.41 | 235.00 |
| | | ***7/12/82 | | 6.60 | 428.00 | 19.00 | 0.00 | 0.00 | 40.00 | NA | NA | NA | NA | NA | NA | 140.00 |
| | | ***11/2/83 | | 5.90 | 705.00 | 12.00 | 30.00 | 1941.94 | 14.00 | 0.61 | 39.49 | 0.05 | 3.24 | 55.00 | 3560.23 | 320.00 |
| | | ***9/27/84 | | 7.20 | 810.00 | 3.60 | 0.00 | 0.00 | 150.00 | 0.08 | 1.55 | < 0.10 | NA | 1.60 | 31.07 | 200.00 |
| | | ***10/17/84 | | 7.00 | 840.00 | 4.50 | 0.00 | 0.00 | 115.00 | 0.47 | 11.41 | 0.30 | 7.28 | 4.40 | 106.81 | 250.00 |
| | | ***4/23/85 | | 6.00 | 460.00 | 46.00 | 9.90 | 2456.56 | 8.00 | 0.29 | 71.96 | 0.10 | 24.81 | 1.80 | 446.65 | 190.00 |
| | | ***6/18/85 | | 7.10 | 535.00 | 23.00 | 0.00 | 0.00 | 39.00 | 0.21 | 26.05 | 0.20 | 24.81 | 2.60 | 322.58 | 190.00 |
| | | ***9/24/85 | | 8.00 | 620.00 | 4.00 | 0.00 | 0.00 | 130.00 | 0.09 | 2.03 | NA | NA | 0.34 | 7.34 | 140.00 |
| | | ***12/18/85 | | 6.00 | 350.00 | 79.00 | 20.00 | 8522.97 | 14.00 | 0.58 | 247.17 | 0.10 | 42.61 | 1.30 | 553.99 | 250.00 |
| | | ***4/10/86 | | 6.80 | 560.00 | 34.00 | 0.00 | 0.00 | 42.00 | 0.45 | 82.53 | 0.06 | 11.00 | 2.50 | 458.51 | 200.00 |

* U.S. Geological Survey: Water Resources Investigations Report 85-4060, 1985

** Sampled By BBC ENGINEERING INC.

*** U.S. Geological Survey: Water Resource Investigations Report 88-4022, 1988

Table 1: Water Quality Data Collected at Sites in the Little Raccoon Creek Basin during current study (1997-2000) and by Wilson (1985).

| LRC SAMPLE SITES | SAMPLE ID# | SAMPLE DATE | BASIN | pH | S. COND. umho/cm | DISCHARGE ft ³ /sec. | TOTAL ACIDITY mg/l as CaCO ₃ | ACID LOADING lbs/DAY | TOTAL ALKALINITY mg/l as CaCO ₃ | TOTAL IRON mg/l | IRON LOADING lbs/DAY | TOTAL Al mg/l | Al LOADING lbs/DAY | TOTAL Mn mg/l | Mn LOADING lbs/DAY | SULFATE mg/l |
|------------------|----------------|-------------|---|------|------------------|---------------------------------|---|----------------------|--|-----------------|----------------------|---------------|--------------------|---------------|--------------------|--------------|
| | | ***6/25/86 | | 7.40 | 500.00 | 9.40 | 0.00 | 0.00 | 75.00 | 0.09 | 4.56 | 0.10 | 5.07 | 0.87 | 44.11 | 110.00 |
| 10 | | | LITTLE RACCOON CR. AT STATE ROUTE 124 | | | | | | | | | | | | | |
| | | ***8/28/86 | | 6.70 | 640.00 | 12.00 | 0.00 | 0.00 | 48.00 | 0.17 | 11.00 | 0.05 | 3.24 | 3.10 | 200.67 | 240.00 |
| | | 2/12/97 | | 5.80 | 356.00 | 109.05 | 0.00 | 0.00 | 24.00 | 1.72 | 1011.78 | 1.22 | 717.66 | 1.23 | 723.54 | 99.00 |
| | | 3/25/98 | | 6.80 | 287.00 | 231.13 | 0.00 | 0.00 | 15.00 | 1.09 | 1358.99 | 0.60 | 748.07 | 0.74 | 922.62 | 117.00 |
| | OUBL024 | 10/14/98 | | 7.03 | 941.00 | 5.85 | 0.00 | 0.00 | 71.00 | 1.09 | 34.38 | 0.40 | 12.62 | 1.99 | 62.77 | 320.00 |
| | OUBL032 | 10/15/98 | | 7.03 | 768.00 | 5.85 | 0.00 | 0.00 | 79.00 | 1.22 | 38.48 | 0.80 | 25.23 | 1.98 | 62.45 | 338.00 |
| | DMR-LRC-021-BL | 6/22/99 | | 7.07 | 567.00 | 6.71 | 0.00 | 0.00 | 134.00 | 0.725 | 26.24 | 2.05 | 74.20 | 1.09 | 39.45 | 230.00 |
| 11 | | | COAL RUN | | | | | | | | | | | | | |
| | | 2/5/97 | | 6.90 | 434.00 | 2.80 | 0.00 | 0.00 | 54.00 | 0.53 | 8.01 | 1.00 | 15.10 | 0.43 | 6.49 | 163.00 |
| | | 3/25/98 | | 7.50 | 554.00 | 0.79 | 0.00 | 0.00 | 58.00 | 0.36 | 1.53 | 0.20 | 0.85 | 0.36 | 1.53 | 263.00 |
| 12 | | | FLINT RUN | | | | | | | | | | | | | |
| | | *** 4/23/85 | | 2.60 | 1650.00 | 2.40 | 596.00 | 7715.99 | 0.00 | 64.00 | 828.56 | 31.00 | 401.33 | 5.30 | 68.62 | 830.00 |
| | | ***6/18/85 | | 2.60 | 2490.00 | 1.30 | 1040.00 | 7293.07 | 0.00 | 150.00 | 1051.89 | 44.00 | 308.55 | 12.00 | 84.15 | 1400.00 |
| | | ***9/24/85 | | 2.70 | 3200.00 | 4.00 | 1290.00 | 27834.51 | 0.00 | 120.00 | 2589.26 | NA | NA | 17.00 | 366.81 | 1800.00 |
| | | ***6/25/86 | | 2.50 | 2900.00 | 0.50 | 997.00 | 2689.05 | 0.00 | 140.00 | 377.60 | 62.00 | 167.22 | 16.00 | 43.15 | 1500.00 |
| | | ***8/28/86 | | 2.50 | 2900.00 | 0.71 | 1310.00 | 5017.23 | 0.00 | 240.00 | 919.19 | 72.00 | 275.76 | 17.00 | 65.11 | 2100.00 |
| | | 2/12/97 | | 2.70 | 1015.00 | 4.00 | 187.00 | 4034.93 | 0.00 | 35.20 | 759.52 | 10.90 | 235.19 | 4.47 | 96.45 | 379.00 |
| | | 3/25/98 | | 3.30 | 707.00 | 4.98 | 137.00 | 3680.31 | 0.00 | 12.70 | 341.17 | 4.60 | 123.57 | 1.69 | 45.40 | 714.00 |
| | OUBL040 | 10/16/98 | | 2.82 | 1908.00 | 0.41 | 363.00 | 795.00 | 0.00 | 38.70 | 84.76 | 20.00 | 43.80 | 10.90 | 23.87 | 1108.00 |
| | DMR-LRC-024-BL | 6/23/99 | | 2.74 | 1780.00 | 0.24 | 365.00 | 478.45 | 0.00 | 28.20 | 36.96 | 21.20 | 27.79 | 12.50 | 16.39 | 1029.00 |
| 12a | | | LITTLE RACCOON CREEK BELOW FLINT RUN CONFLUENCE | | | | | | | | | | | | | |
| | | ***10/18/84 | | 4.80 | 950.00 | 4.60 | 30.00 | 744.41 | 0.00 | 0.32 | 7.94 | 25.00 | 620.34 | 6.00 | 148.88 | 380.00 |
| | | ***4/23/85 | | 5.10 | 500.00 | 48.00 | 30.00 | 7767.77 | 2.00 | 0.45 | 116.52 | 10.00 | 2589.26 | 3.00 | 776.78 | 210.00 |
| | | ***6/18/85 | | 4.70 | 587.00 | 29.00 | 42.00 | 6570.24 | 2.00 | 0.51 | 79.78 | 23.00 | 3597.99 | 3.20 | 500.59 | 240.00 |
| | | ***9/24/85 | | 5.60 | 770.00 | 4.30 | 9.90 | 229.63 | 7.00 | 0.36 | 8.35 | 15.00 | 347.93 | 2.00 | 46.39 | 290.00 |
| | | ***12/18/85 | | 5.40 | 350.00 | 95.00 | 20.00 | 10249.14 | 6.00 | 3.60 | 1844.85 | 0.30 | 153.74 | 1.80 | 922.42 | 160.00 |
| | | ***6/25/86 | | 7.00 | 540.00 | 12.00 | 0.00 | 0.00 | 38.00 | 0.52 | 33.66 | 0.20 | 12.95 | 1.50 | 97.10 | 160.00 |
| | | ***8/28/86 | | 5.10 | 680.00 | 14.00 | 21.00 | 1585.92 | 4.00 | 0.46 | 34.74 | 0.76 | 57.40 | 3.40 | 256.77 | 290.00 |
| 13 | | | GREASY RUN | | | | | | | | | | | | | |
| | | 2/5/97 | | 5.50 | 275.00 | 3.30 | 10.00 | 178.01 | 0.00 | 8.10 | 144.19 | 0.90 | 16.02 | 0.40 | 7.12 | 107.00 |
| | | 3/24/98 | | 5.90 | 415.00 | 0.17 | 1.00 | 0.91 | 0.00 | 5.40 | 4.89 | 0.10 | 0.09 | 0.41 | 0.37 | 227.00 |
| | OUBL023 | 10/13/98 | | 6.41 | 1240.00 | 0.17 | 0.00 | 0.00 | 24.00 | 7.60 | 6.85 | <0.1 | | 2.11 | 1.90 | 975.00 |
| | DMR-LRC-028-BL | 6/23/99 | | 6.16 | 1220.00 | 0.05 | 22.80 | 6.28 | 15.00 | 1.04 | 0.29 | 1.77 | 0.49 | 2.62 | 0.72 | 802.00 |
| 14 | | | TARR CAMP | | | | | | | | | | | | | |
| | | *9/16/80 | | 6.20 | 170.00 | 0.78 | NA | NA | 18.00 | 0.26 | 1.09 | 0.20 | 0.84 | 0.83 | 3.49 | 56.00 |
| | | *8/19/81 | | 6.50 | 210.00 | 0.26 | NA | NA | 16.00 | 0.18 | 0.25 | 0.08 | 0.11 | 0.42 | 0.59 | 52.00 |

* U.S. Geological Survey: Water Resources Investigations Report 85-4060, 1985

** Sampled By BBC ENGINEERING INC.

*** U.S. Geological Survey: Water Resource Investigations Report 88-4022, 1988

Table 1: Water Quality Data Collected at Sites in the Little Raccoon Creek Basin during current study (1997-2000) and by Wilson (1985).

| LRC SAMPLE SITES | SAMPLE ID# | SAMPLE DATE | BASIN | pH | S. COND. umho/cm | DISCHARGE ft ³ /sec. | TOTAL ACIDITY mg/l as CaCO ₃ | ACID LOADING lbs/DAY | TOTAL ALKALINITY mg/l as CaCO ₃ | TOTAL IRON mg/l | IRON LOADING lbs/DAY | TOTAL Al mg/l | Al LOADING lbs/DAY | TOTAL Mn mg/l | Mn LOADING lbs/DAY | SULFATE mg/l |
|------------------|----------------|-------------|---|------|------------------|---------------------------------|---|----------------------|--|-----------------|----------------------|---------------|--------------------|---------------|--------------------|--------------|
| | | *7/22/82 | TARR CAMP | 6.60 | 145.00 | 0.18 | NA | NA | 5.00 | NA | NA | NA | NA | NA | NA | 52.00 |
| | | 2/5/97 | | 5.40 | 90.00 | 12.50 | 10.00 | 674.29 | 0.00 | 1.94 | 130.81 | 2.60 | 175.31 | 0.52 | 35.06 | 29.00 |
| | | 3/24/98 | | 6.50 | 103.00 | 6.05 | 0.00 | 0.00 | 8.00 | 0.38 | 12.40 | 0.80 | 26.11 | 0.31 | 10.12 | 38.00 |
| 15 | OUBL020 | 10/13/98 | GOOSE RUN | 6.30 | 136.00 | 0.04 | 0.00 | 0.00 | 12.00 | 0.61 | 0.13 | 0.30 | 0.06 | 0.56 | 0.12 | 46.00 |
| | | *11/1/83 | | 2.80 | 1840.00 | 0.28 | 745.00 | 1125.25 | 0.00 | 94.00 | 141.98 | 66.00 | 99.69 | 5.40 | 8.16 | 1100.00 |
| | | 2/19/97 | | 3.80 | 690.00 | 0.70 | 125.00 | 472.00 | 0.00 | 25.30 | 95.53 | 10.40 | 39.27 | 1.16 | 4.38 | 277.00 |
| | | 3/24/98 | | 4.10 | 445.00 | 1.05 | 55.00 | 311.52 | 0.00 | 7.60 | 43.05 | 2.90 | 16.43 | 0.31 | 1.76 | 387.00 |
| | OUBL022 | 10/13/98 | | 3.04 | 1647.00 | 0.13 | 447.00 | 315.87 | 0.00 | 39.00 | 27.56 | 33.00 | 23.32 | 2.94 | 2.08 | 950.00 |
| | DMR-LRC-030-BL | 6/24/99 | | 2.94 | 1250.00 | 0.175 | 288.00 | 271.87 | 0.00 | 14.90 | 14.07 | 25.80 | 24.36 | 3.16 | 2.98 | 234.00 |
| 16 | | | LITTLE RACCOON CR. ON KEYSTONE ROAD ABOVE DICKASON RUN CONFLUENCE | | | | | | | | | | | | | |
| | | *11/13/75 | | 3.70 | 700.00 | 57.00 | 94.00 | 28902.58 | 1.00 | NA | NA | NA | NA | NA | NA | 290.00 |
| | | *8/19/81 | | 4.20 | 730.00 | 14.00 | 50.00 | 3776.00 | 0.00 | 0.69 | 52.03 | 2.47 | 186.31 | 3.27 | 246.95 | 315.00 |
| | | *7/22/82 | | 3.70 | 745.00 | 15.00 | 50.00 | 4045.71 | 0.00 | 11.00 | 890.06 | 4.00 | 323.66 | 3.60 | 291.29 | 320.00 |
| | | *11/1/83 | | 3.40 | 975.00 | 18.00 | 179.00 | 17380.39 | 0.00 | 6.70 | 650.55 | 8.40 | 815.62 | 6.20 | 602.00 | 430.00 |
| | | 2/19/97 | | 6.10 | 387.00 | NA | 14.00 | NA | 15.00 | 3.12 | NA | 1.70 | NA | 1.52 | NA | 124.00 |
| | | 3/24/98 | | 6.60 | 253.00 | 265.48 | 0.00 | 0.00 | 12.00 | 1.82 | 2606.40 | 1.30 | 1861.71 | 0.69 | 988.14 | 130.00 |
| 17 | | | DICKASON RUN MAINSTREAM ALONG KEYSTONE ROAD | | | | | | | | | | | | | |
| | | 2/12/97 | | 5.90 | 241.00 | 22.20 | 3.00 | 359.26 | 18.00 | 0.40 | 47.90 | 0.15 | 17.96 | 0.66 | 79.04 | 62.00 |
| | | 3/25/98 | | 7.00 | 217.00 | 21.88 | 0.00 | 0.00 | 17.00 | 0.38 | 44.85 | < 0.1 | | 0.57 | 67.28 | 69.00 |
| | OUBL021 | 10/13/98 | | 6.65 | 658.00 | 0.60 | 0.00 | 0.00 | 24.00 | 0.56 | 1.80 | < 0.1 | | 2.57 | 8.25 | 310.00 |
| 18 | | | DIXON RUN CONFLUENCE | | | | | | | | | | | | | |
| | | *9/24/80 | | 5.10 | 770.00 | 0.84 | 35.00 | 158.59 | 3.00 | 3.70 | 16.77 | 0.72 | 3.26 | 5.40 | 24.47 | 410.00 |
| | | 8/19/81 | | 4.30 | 800.00 | 0.31 | 65.00 | 108.69 | NA | 1.58 | 2.64 | 3.60 | 6.02 | 5.21 | 8.71 | 430.00 |
| | | 7/22/82 | | 3.50 | 925.00 | 0.26 | 65.00 | 91.16 | 0.00 | 3.40 | 4.77 | 4.90 | 6.87 | 6.00 | 8.42 | 430.00 |
| | | 2/12/97 | | 5.40 | 446.00 | 3.30 | 12.00 | 213.61 | 16.00 | 4.32 | 76.90 | 1.48 | 26.35 | 1.91 | 34.00 | 170.00 |
| | | 3/25/98 | | 6.30 | 406.00 | 4.11 | 0.00 | 0.00 | 12.00 | 4.29 | 95.11 | 1.30 | 28.82 | 1.72 | 38.13 | 195.00 |
| | OUBL034 | 10/14/98 | | 6.27 | 678.00 | 0.34 | 0.00 | 0.00 | 20.00 | 3.02 | 5.46 | 0.10 | 0.18 | 4.11 | 7.43 | 320.00 |
| 19 | | | DICKASON RUN BELOW DIXON RUN CONFLUENCE | | | | | | | | | | | | | |
| | | 2/12/97 | | 5.30 | 269.00 | 27.80 | 0.00 | 0.00 | 16.00 | 1.03 | 154.46 | 0.36 | 53.99 | 0.77 | 115.47 | 81.00 |
| | | 3/25/98 | | 6.80 | 248.00 | 27.08 | 0.00 | 0.00 | 10.00 | 0.94 | 137.32 | 0.30 | 43.83 | 0.60 | 87.65 | 90.00 |
| | OUBL026 | 10/14/98 | | 6.38 | 713.00 | 0.40 | 0.00 | 0.00 | 24.00 | 1.72 | 3.73 | 0.20 | 0.43 | 2.93 | 6.35 | 305.00 |
| 20 | | | KYGER RUN | | | | | | | | | | | | | |

* U.S. Geological Survey: Water Resources Investigations Report 85-4060, 1985

** Sampled By BBC ENGINEERING INC.

*** U.S. Geological Survey: Water Resource Investigations Report 88-4022, 1988

Table 1: Water Quality Data Collected at Sites in the Little Raccoon Creek Basin during current study (1997-2000) and by Wilson (1985).

| LRC SAMPLE SITES | SAMPLE ID# | SAMPLE DATE | BASIN | pH | S. COND. umho/cm | DISCHARGE ft ³ /sec. | TOTAL ACIDITY mg/l as CaCO ₃ | ACID LOADING lbs/DAY | TOTAL ALKALINITY mg/l as CaCO ₃ | TOTAL IRON mg/l | IRON LOADING lbs/DAY | TOTAL Al mg/l | Al LOADING lbs/DAY | TOTAL Mn mg/l | MnLOADING lbs/DAY | SULFATE mg/l |
|------------------|------------|-------------|---|------|------------------|---------------------------------|---|----------------------|--|-----------------|----------------------|---------------|--------------------|---------------|-------------------|--------------|
| 20 | | 2/12/97 | KYGER RUN | 5.40 | 129.00 | 4.60 | 0.00 | 0.00 | 18.00 | 0.38 | 9.43 | 0.23 | 5.71 | 0.29 | 7.20 | 34.00 |
| | | 3/25/98 | | 6.90 | 120.00 | 5.60 | 0.00 | 0.00 | 12.00 | 0.39 | 11.78 | 0.40 | 12.08 | 0.22 | 6.65 | 36.00 |
| | OUBL025 | 10/14/98 | | 7.29 | 247.00 | 0.074 | 0.00 | 0.00 | 59.00 | 0.13 | 0.05 | 0.20 | 0.08 | 0.03 | 0.01 | 66.00 |
| 21 | | | DICKASON RUN CONFLUENCE | | | | | | | | | | | | | |
| | | *8/9/81 | | 6.10 | 460.00 | 0.91 | 20.00 | 98.18 | 16.00 | 0.23 | 1.11 | 0.08 | 0.37 | 2.07 | 10.16 | 185.00 |
| | | *7/22/82 | | 6.20 | 480.00 | 0.98 | 10.00 | 52.86 | 10.00 | NA | NA | NA | NA | NA | NA | 180.00 |
| | | *11/1/83 | | 5.10 | 595.00 | 3.10 | 60.00 | 1003.34 | 4.00 | 0.96 | 16.05 | 20.00 | 334.45 | 55.00 | 919.73 | 300.00 |
| | | 2/12/97 | | 6.40 | 266.00 | 27.00 | 11.00 | 1602.10 | 13.00 | 0.93 | 135.45 | 0.40 | 58.26 | 0.90 | 131.08 | 87.00 |
| | | 3/25/98 | | 6.90 | 233.00 | 37.07 | 0.00 | 0.00 | 12.00 | 0.87 | 173.97 | 0.20 | 39.99 | 0.61 | 121.98 | 75.00 |
| | OUBL039 | 10/15/98 | | 6.63 | 635.00 | 0.38 | 0.00 | 0.00 | 12.00 | 0.86 | 1.76 | 0.10 | 0.20 | 2.47 | 5.06 | 328.00 |
| 22 | | | LITTLE RACCOON CR.ON KEYSTONE ROAD BEFORE SPRING RUN | | | | | | | | | | | | | |
| | | 2/19/97 | | 6.40 | 359.00 | NA | 13.00 | 0.00 | 15.00 | 2.41 | NA | 1.29 | NA | 1.35 | NA | 133.00 |
| 23 | | | CONFLUENCE OF LITTLE RACCOON CR. AT INTERSECTION OF STATE ROUTE 325 AND WOODS MILL ROAD | | | | | | | | | | | | | |
| | | *9/24/80 | | 5.00 | 460.00 | 87.00 | 25.00 | 11732.57 | 2.00 | 0.180 | 84.47 | 1.45 | 680.49 | 3.09 | 1450.15 | 191.00 |
| | | *8/20/81 | | 5.30 | 620.00 | 19.00 | 45.00 | 4612.11 | 5.00 | 0.192 | 19.68 | 3.08 | 315.67 | 3.22 | 330.02 | 275.00 |
| | | *8/24/82 | | 4.80 | 640.00 | 13.00 | 30.00 | 2103.77 | 0.00 | 0.084 | 5.89 | 1.90 | 133.24 | 3.80 | 266.48 | 270.00 |
| | | *11/2/83 | | 3.50 | 870.00 | 28.00 | 124.00 | 18728.96 | 0.00 | 2.900 | 438.02 | 0.04 | 6.04 | 4.70 | 709.89 | 350.00 |
| | | ***9/26/84 | | 4.20 | 770.00 | 1.40 | 20.00 | 151.04 | 0.00 | 0.150 | 1.13 | 1.00 | 7.55 | 2.90 | 21.90 | 280.00 |
| | | ***10/17/84 | | 3.50 | 975.00 | 3.50 | 89.00 | 1680.32 | 0.00 | 0.910 | 17.18 | 11.00 | 207.68 | 6.00 | 113.28 | 410.00 |
| | | ***11/14/84 | | 4.10 | 570.00 | 73.00 | 40.00 | 15751.31 | 0.00 | 2.500 | 984.46 | 3.70 | 1457.00 | 2.80 | 1102.59 | 230.00 |
| | | ***12/18/84 | | 4.30 | 445.00 | 105.00 | 30.00 | 16992.00 | 0.00 | 0.340 | 192.58 | 3.10 | 1755.84 | 2.10 | 1189.44 | 180.00 |
| | | ***3/12/85 | | 4.70 | 350.00 | 720.00 | 30.00 | 116516.57 | 3.00 | 0.900 | 3495.50 | 2.70 | 10486.49 | 1.50 | 5825.83 | 130.00 |
| | | ***4/17/85 | | 4.20 | 405.00 | 171.00 | 40.00 | 36896.91 | 0.00 | 0.600 | 553.45 | 3.10 | 2859.51 | 1.40 | 1291.39 | 180.00 |
| | | ***5/14/85 | | 3.90 | 540.00 | 81.00 | 50.00 | 21846.86 | 0.00 | 0.490 | 214.10 | 5.00 | 2184.69 | 2.60 | 1136.04 | 230.00 |
| | | ***6/18/85 | | 4.20 | 532.00 | 42.00 | 40.00 | 9062.40 | 0.00 | 0.190 | 43.05 | 2.50 | 566.40 | 2.90 | 657.02 | 210.00 |
| | | ***9/23/85 | | 6.90 | 610.00 | 5.80 | 0.00 | 0.00 | 16.00 | 0.020 | 0.63 | < 0.1 | NA | 1.30 | 40.67 | 240.00 |
| | | ***9/30/85 | | 6.10 | 595.00 | 8.70 | 11.00 | 516.23 | 8.00 | 0.150 | 7.04 | 0.30 | 14.08 | 2.00 | 93.86 | 240.00 |
| | | ***10/17/85 | | 5.00 | 750.00 | 12.00 | 18.00 | 1165.17 | 2.00 | 0.020 | 1.29 | 1.40 | 90.62 | 2.90 | 187.72 | 320.00 |
| | | ***11/19/85 | | 5.40 | 295.00 | 488.00 | 17.00 | 44750.99 | 3.00 | 1.100 | 2895.65 | 0.10 | 263.24 | 1.00 | 2632.41 | 110.00 |
| | | ***4/8/86 | | 6.60 | 390.00 | 87.00 | 0.00 | 0.00 | 6.00 | 0.160 | 75.09 | 0.03 | 14.08 | 1.60 | 750.88 | 160.00 |
| | | ***6/25/86 | | 6.80 | 455.00 | 4.90 | 0.00 | 0.00 | 19.00 | 0.150 | 3.96 | 0.02 | 0.53 | 2.00 | 52.86 | 160.00 |
| | | ***8/27/86 | | 6.70 | 680.00 | 9.40 | 0.00 | 0.00 | 17.00 | 0.040 | 2.03 | 0.03 | 1.52 | 3.50 | 177.47 | 280.00 |
| | | 2/19/97 | | 6.50 | 333.00 | NA | 12.00 | NA | 15.00 | 2.70 | NA | 0.93 | NA | 1.24 | NA | 116.00 |
| | | 3/24/98 | | 4.80 | 183.00 | 402.34 | 2.00 | 4340.67 | 0.00 | 1.01 | 2192.04 | 1.10 | 2387.37 | 0.46 | 998.35 | 60.00 |

* U.S. Geological Survey: Water Resources Investigations Report 85-4060, 1985

** Sampled By BBC ENGINEERING INC.

*** U.S. Geological Survey: Water Resource Investigations Report 88-4022, 1988

Table 1: Water Quality Data Collected at Sites in the Little Raccoon Creek Basin during current study (1997-2000) and by Wilson (1985).

| LRC SAMPLE SITES | SAMPLE ID# | SAMPLE DATE | BASIN | pH | S. COND. umho/cm | DISCHARGE ft ³ /sec. | TOTAL ACIDITY mg/l as CaCO ₃ | ACID LOADING lbs/DAY | TOTAL ALKALINITY mg/l as CaCO ₃ | TOTAL IRON mg/l | IRON LOADING lbs/DAY | TOTAL AI mg/l | AI LOADING lbs/DAY | TOTAL Mn mg/l | Mn LOADING lbs/DAY | SULFATE mg/l |
|------------------|----------------|-------------|--|------|------------------|---------------------------------|---|----------------------|--|-----------------|----------------------|---------------|--------------------|---------------|--------------------|--------------|
| | OUBL031 | 10/14/98 | | 7.18 | 969.00 | 9.49 | 0.00 | 0.00 | 40.00 | 0.40 | 20.48 | <0.1 | NA | 0.71 | 36.35 | 460.00 |
| | OUBL041 | 10/17/98 | | 7.16 | 1027.00 | 9.49 | 0.00 | 0.00 | 44.00 | 0.41 | 20.99 | 0.30 | 15.36 | 0.49 | 25.08 | 565.00 |
| | DMR-LRC-029-BL | 6/24/99 | | 7.16 | 581.00 | 7.76 | 0.00 | 0.00 | 69.20 | 0.46 | 19.30 | 2.39 | 100.04 | 0.379 | 15.86 | 128.00 |
| 24 | | | RACCOON CREEK AT ADAMSVILLE | | | | | | | | | | | | | |
| | | 2/19/97 | | 6.80 | 289.00 | 200.00 | 4.00 | 4315.43 | 17.00 | 1.10 | 1186.74 | 0.71 | 765.99 | 0.99 | 1068.07 | 88.00 |
| 25 | | | 124 SEEP | | | | | | | | | | | | | |
| | | 2/12/97 | | 3.20 | 579.00 | 2.40 | 51.00 | 660.26 | 0.00 | 3.37 | 43.63 | 4.51 | 58.39 | 2.84 | 36.77 | 205.00 |
| | | 1/12/98 | | 2.70 | 3260.00 | NA | 2263.00 | NA | 0.00 | 470.00 | NA | 2200.00 | NA | 10.10 | NA | 2715.00 |
| | | 2/27/98 | | 3.10 | 1014.00 | 0.158 | 198.00 | 168.75 | 0.00 | 22.60 | 19.26 | 14.00 | 11.93 | 2.97 | 2.53 | 401.00 |
| | | 3/25/98 | | 3.20 | 959.00 | 0.34 | 173.00 | 321.02 | 0.00 | 26.00 | 48.25 | 15.00 | 27.83 | 3.82 | 7.09 | 307.00 |
| | DMR-LRC-022-BL | 6/22/99 | | 2.53 | 1900.00 | 0.0102 | 421.00 | 23.16 | 0.00 | 26.20 | 1.44 | 31.40 | 1.73 | 8.48 | 0.47 | 762.00 |
| 26 | | | DEER CREEK | | | | | | | | | | | | | |
| | | 2/19/97 | | 6.60 | 131.00 | NA | 0.00 | 0.00 | 23.00 | 0.32 | NA | 0.23 | NA | 0.25 | NA | 25.00 |
| | | 3/24/98 | | 7.00 | 114.00 | 6.56 | 0.00 | 0.00 | 21.00 | 0.38 | 13.45 | <0.1 | | 0.19 | 6.72 | 27.00 |
| | OUBL038 | 10/15/98 | | 7.12 | 206.00 | 0.005 | 0.00 | 0.00 | 79.00 | 3.37 | 0.09 | 0.10 | 0.003 | 1.79 | 0.05 | 38.00 |
| 27 | | | LITTLE RACCOON CR. ABOVE BUFFER RUN CONFLUENCE | | | | | | | | | | | | | |
| | | **2/9/96 | | 6.10 | 473.00 | 102.30 | 0.00 | 0.00 | 15.00 | 4.56 | 2516.37 | 2.58 | 1423.74 | 2.13 | 1175.41 | 60.00 |
| 28 | | | BUFFER RUN | | | | | | | | | | | | | |
| | | *9/16/80 | | 3.10 | 2300.00 | 0.69 | 596.00 | 2218.35 | 0.00 | 133.00 | 495.03 | 29.60 | 110.17 | 12.80 | 47.64 | 1280.00 |
| | | *8/19/81 | | 3.00 | 2000.00 | 0.30 | 571.00 | 924.04 | 0.00 | 88.39 | 143.04 | 28.04 | 45.38 | 11.71 | 18.95 | 1340.00 |
| | | *7/12/82 | | 2.50 | 2550.00 | 0.40 | 695.00 | 1499.61 | 0.00 | 160.00 | 345.23 | 37.00 | 79.84 | 13.00 | 28.05 | 1400.00 |
| | | *11/2/83 | | 2.70 | 2660.00 | 0.35 | 993.00 | 1874.78 | 0.00 | 140.00 | 264.32 | 60.00 | 113.28 | 17.00 | 32.10 | 1900.00 |
| | | **2/9/96 | | 3.50 | 1332.00 | 3.70 | 202.00 | 4031.69 | 0.00 | 61.00 | 1217.49 | 16.00 | 319.34 | 3.84 | 76.64 | 305.00 |
| | | 3/25/98 | | 3.20 | 914.00 | 2.81 | 171.00 | 2592.01 | 0.00 | 22.50 | 341.05 | 6.80 | 103.07 | 1.03 | 15.61 | 294.00 |
| | DMR-LRC-027-BL | 6/23/99 | | 2.88 | 2100.00 | 0.169 | 300.00 | 273.49 | 0.00 | 8.84 | 8.06 | 25.10 | 22.88 | 8.34 | 7.60 | 238.00 |
| | DMR-LRC-032-BL | 8/9/99 | | 2.69 | 2660.00 | 0.169 | 321.00 | 292.63 | 0.00 | 14.20 | 12.95 | 26.90 | 24.52 | 8.58 | 7.82 | 1202.00 |
| 29 | | | LITTLE RACCOON CR. BELOW BUFFER RUN CONFLUENCE | | | | | | | | | | | | | |
| | | **2/9/96 | | 6.80 | 491.00 | 107.20 | 0.00 | 0.00 | 19.00 | 6.50 | 3758.74 | 4.09 | 2365.11 | 2.19 | 1266.41 | 110.00 |
| | | 3/25/98 | | 6.40 | 269.00 | NA | 0.00 | 0.00 | 8.00 | 1.22 | NA | 0.60 | NA | 0.49 | NA | 144.00 |
| 30 | | | LITTLE RACCOON CR. BELOW GOOSE RUN CONFLUENCE | | | | | | | | | | | | | |
| | | ***9/27/84 | | 3.60 | 845.00 | 4.30 | 35.00 | 811.84 | 0.00 | 0.36 | 8.35 | 1.30 | 30.15 | 3.40 | 78.86 | 310.00 |
| | | ***10/17/84 | | 3.30 | 1060.00 | 6.40 | 104.00 | 3590.44 | 0.00 | 1.30 | 44.88 | 6.10 | 210.59 | 5.30 | 182.97 | 420.00 |
| | | ***11/14/84 | | 3.60 | 740.00 | 43.00 | 74.00 | 17164.62 | 0.00 | 5.90 | 1368.53 | 6.20 | 1438.12 | 3.50 | 811.84 | 270.00 |

* U.S. Geological Survey: Water Resources Investigations Report 85-4060, 1985

** Sampled By BBC ENGINEERING INC.

*** U.S. Geological Survey: Water Resource Investigations Report 88-4022, 1988

Table 1: Water Quality Data Collected at Sites in the Little Raccoon Creek Basin during current study (1997-2000) and by Wilson (1985).

| LRC SAMPLE SITES | SAMPLE ID# | SAMPLE DATE | BASIN | pH | S. COND. umho/cm | DISCHARGE ft ³ /sec. | TOTAL ACIDITY mg/l as CaCO ₃ | ACID LOADING lbs/DAY | TOTAL ALKALINITY mg/l as CaCO ₃ | TOTAL IRON mg/l | IRON LOADING lbs/DAY | TOTAL Al mg/l | Al LOADING lbs/DAY | TOTAL Mn mg/l | Mn LOADING lbs/DAY | SULFATE mg/l |
|------------------|----------------|-------------|---|------|------------------|---------------------------------|---|----------------------|--|-----------------|----------------------|---------------|--------------------|---------------|--------------------|--------------|
| | | ***12/19/84 | | 4.10 | 535.00 | 76.00 | 55.00 | 22548.11 | 1.00 | 1.90 | 778.93 | 4.30 | 1762.85 | 2.80 | 1147.90 | 210.00 |
| | | ***3/13/85 | | 4.50 | 310.00 | 518.00 | 30.00 | 83827.20 | 0.00 | 2.10 | 5867.90 | 1.40 | 3911.94 | 1.10 | 3073.66 | 120.00 |
| | | ***4/18/85 | | 4.10 | 465.00 | 105.00 | 40.00 | 22656.00 | 0.00 | 1.10 | 623.04 | 4.60 | 2605.44 | 1.70 | 962.88 | 210.00 |
| | | ***5/14/85 | | 4.20 | 530.00 | 54.00 | 35.00 | 10195.20 | 0.00 | 0.58 | 168.95 | 2.30 | 669.97 | 2.60 | 757.36 | NA |
| | | ***6/18/85 | | 3.90 | 605.00 | 3.70 | 45.00 | 898.15 | 0.00 | 0.71 | 14.17 | 2.80 | 55.88 | 3.10 | 61.87 | 240.00 |
| | | ***9/24/85 | | 5.10 | 800.00 | 3.60 | 25.00 | 485.49 | 3.00 | 0.14 | 2.72 | 2.40 | 46.61 | 2.60 | 50.49 | 310.00 |
| | | ***10/16/85 | | 3.80 | 890.00 | 3.80 | 33.00 | 676.44 | 0.00 | 0.82 | 16.81 | 2.20 | 45.10 | 3.10 | 63.54 | NA |
| | | ***11/20/85 | | 5.10 | 370.00 | 169.00 | 27.00 | 24614.13 | 2.00 | 1.80 | 1640.94 | 0.40 | 364.65 | 1.60 | 1458.61 | 140.00 |
| | | ***4/10/86 | | 5.60 | 570.00 | 40.00 | 13.00 | 2805.03 | 4.00 | 1.20 | 258.93 | 0.36 | 77.68 | 2.60 | 561.01 | 220.00 |
| | | ***6/25/86 | | 5.70 | 570.00 | 8.00 | 5.00 | 215.77 | 3.00 | 0.50 | 21.58 | 0.07 | 3.02 | 2.10 | 90.62 | 200.00 |
| | | ***8/28/86 | | 3.60 | 870.00 | 14.00 | 51.00 | 3851.52 | 0.00 | 0.89 | 67.21 | 4.50 | 339.84 | 4.60 | 347.39 | 390.00 |
| 30 | | | LITTLE RACCOON CR. BELOW GOOSE RUN CONFLUENCE | | | | | | | | | | | | | |
| | DVR-LRC-031-BL | 6/24/99 | | 6.82 | 608.00 | 6.938 | 0.00 | 0.00 | 0.00 | 0.55 | 20.55 | 3.79 | 141.84 | 1.12 | 41.92 | 746.00 |
| 31 | | 10/13/98 | JOHNSON RUN | | | DRY | | | | | | | | | | |
| 32 | | 10/13/98 | LEW JONES TRIBUTARY | | | | | | | | | | | | | |
| | OUBL018 | 10/13/98 | | 6.67 | 342.00 | 0.10 | 0.00 | 0.00 | 20.00 | 0.53 | 0.30 | 0.20 | 0.11 | 1.23 | 0.69 | 145.00 |
| 33 | | 10/15/98 | KEYSTONE MNE TRIBUTARY | | | DRY | | | | | | | | | | |
| 34 | | 10/13/98 | TRIPP RUN | | | | | | | | | | | | | |
| | OUBL016 | 10/13/98 | | 7.21 | 650.00 | 0.012 | 0.00 | 0.00 | 93.00 | 0.60 | 0.04 | 0.20 | 0.01 | 0.69 | 0.05 | 248.00 |
| 35 | | 10/13/98 | SPRING RUN | | | | | | | | | | | | | |
| | OUBL019 | 10/13/98 | | 7.27 | 217.00 | 0.32 | 0.00 | 0.00 | 71.00 | 1.20 | 2.07 | 0.20 | 0.35 | 0.58 | 1.00 | 48.00 |
| 36 | | 10/15/98 | WAINWRIGHT TRIBUTARY | | | | | | | | | | | | | |
| | | 10/15/98 | | 7.12 | 58.00 | | | | | | | | | | | |

* U.S. Geological Survey: Water Resources Investigations Report 85-4060, 1985

** Sampled By BBC ENGINEERING INC

*** U.S. Geological Survey: Water Resource Investigations Report 88-4022, 1988

APPENDIX H: AMDAT & TMDL PLAN RESULTS

1) The Total Maximum Daily Loads for the Upper Raccoon Creek report was completed by Ohio EPA in 2002. To receive a copy please contact Dan Imhoff at Ohio EPA Southeast District Office at 740-385-8501.

2) The results of two Acid Mine Drainage Abatement and Treatment (AMDAT) plans are available and have been approved for distribution. These plans can be downloaded from the Raccoon Creek web site at www.raccooncreek.org or at ILGARD's website at www.ilgard.ohiou.edu. Or, please call Rachael Hoy at 740-597-2507 at ILGARD for a copy of each report.

**APPENDIX I: LOCAL PROFESSIONALS DISCUSS WASTEWATER &
FLOODING ISSUES**

The following interviews were conducted by ILGARD graduate students during the 2000-2001 academic year.

WASTEWATER ISSUES

**Athens County Health Department, Athens, OH
January 18, 2001**

Q1: What role does the sanitarian, the county health department and the EPA play in enforcing the law or regulations?

A1: The sanitarian monitors on-lot or on-site treatment systems. Contractors install a septic system. The EPA is in charge of monitoring wastewater treatment plants. He said that all calls concerning litter or sewage treatment on private lots are sent to the county health department since they must be the enforcers, they are seen as “the bad guys.”

Q2: What are the laws and regulations concerning wastewater treatment for residents of southeastern Ohio? What are the penalties for violations?

A2: This information can be found in the Ohio State University Extension Fact Sheet *Wastewater Treatment Principles and Regulations*. According to this document, “Discharging raw sewage from a dwelling is considered a public nuisance (Ohio Revised Code 3767.13).” For systems serving a one, two or three-family dwelling, the local health department is the responsible regulatory agency. The penalty for creating a public nuisance is a third-degree misdemeanor, which is punishable by not more than 60 days in jail and/or a \$500 fine. In addition, the violator may be required “to remove the sewage from public or private property or the waters of the state.”

Q3: Are new incoming residents given any information concerning their responsibilities to make sure that their sewage/wastewater is effectively treated and disposed?

A3: No, and he said this is a major problem. He said *education* is needed to inform people of their responsibilities. People need to know what their options are and how to maintain an effective on-site treatment system. They need to have a simple list of “do’s and don’ts” for their septic system. They also need to care. He said a lot of people don’t know the facts simply because they don’t want to. Wastewater is not a comfortable thing to talk about, and people prefer to have it “out of sight, out of mind.”

Q4: Are homes regularly inspected?

A4: Homes are only inspected if a homeowner reports that a system has failed or if there is a public nuisance or logistical complaint from a homeowner. He spoke at length about how disappointed he was about the failure of Ohio House Bill 105, which would have mandated on-site systems, and thus would also have ostensibly created an opportunity to

have regular inspection of homes. He said it took about three or four years to get this bill put together so it was a great loss to have it fail.

Q5: What are the most common methods of dealing with sewage in the rural, residential areas in the Raccoon Creek Watershed? What are the most cost-effective and most reliable methods?

A5: He stated that septic tanks + aerobic aeration systems or lagoons are the most common on-site systems. Unfortunately, he estimates that 60 percent to 80 percent of them aren't working properly. Failing motors are the most common problem. Unfortunately, it costs about \$800 to fix the problem, and a new system costs about \$6,000 to install. He said that he thinks sand filters would be a much better option because they don't fail as often, but they are more expensive.

Q6: Are there any opportunities for residents to receive financial assistance to make sure that their on-site system is safe and effective?

A6: He mentioned a Rural Hardship Program that offered funding a few years ago, but other than that, assistance is hard to identify and it also very sporadic.

Q7: Do you think most people know the laws? If no, why not? If yes, why don't some people adhere to them?

A7: He and his co-worker said people don't know the laws/regulations, nor do they know what their responsibilities are. As far as why people don't adhere to the laws, he mentioned that a big factor in this is that people are likely to do what their parents and grandparents did. For a lot of people, Raccoon Creek has always been polluted, and those perspectives are passed on from generation to generation as long as no one feels motivated or too overwhelmed to change things. If people started getting sick from their contact with the polluted creek, people might start paying a little more attention to the problem. Even if people do get sick, it is hard to prove that the polluted creek was the cause.

Gallia County Health Department, Gallipolis, OH
April 13, 2001

- Money is obviously a big issue in this county, as it is in the other counties comprising the Raccoon Creek watershed. People simply cannot afford to install expensive, high-tech wastewater treatment systems and he finds it difficult to justify spending, for example, \$8,000 on an on-lot system for a \$1,500 trailer. He said the most he could justify spending is about \$3,500 to \$4,000. He also said that it is nearly impossible to solve this problem without forcing the residents to go bankrupt. Essentially, they just need to find a system that is economically feasible.
- As with the other counties, on-lot systems are only inspected if there is a nuisance call or if someone is selling a home.
- He estimates that 60 percent of calls to the health department are related to sewage, 25 percent are related to litter.

System Logistics:

- He said that he thinks that it is best to keep systems on-lot if at all possible.
- He thinks that it is better to rotate leach fields with a bivalve instead of using a distribution box because it is more difficult to monitor/accommodate the level of saturation in the fields with the latter.
- Gallia County has clay soils, which is typical for the area. Unfortunately this prevents effective absorption.

Policy:

- He cited Rural Hardship Grants as a useful funding source, apparently Meigs County has used these. EPA guides the use of these funds.
- An entity within southeast Ohio is proposing new sewage rules. The rules will go into effect, as their revision is apparently mandated every five years; however, the specific components of the rules must be discussed. Meetings are being held throughout the area to discuss the rules. Mandatory inspections for systems are proposed, though he thinks that there is not sufficient personnel to do this.
- I asked him what he thought about failed House Bill 105, which proposed that all on-lot systems should be inspected. He said that if he were required to go on to people's property to inspect systems, he would need protection, such as a police escort, since people are not likely to tolerate intrusions upon their private

property. They think that it's their land and therefore they should be able to do whatever they want.

- He mentioned House Bill 110, which was passed four or five years ago. This bill involved a contract between the EPA and health departments. Local county health departments would definitely need assistance to carry out regular, mandatory inspections.
- He stated that people must understand that activities conducted by the health department concerning their wastewater treatment systems are for their own benefit. It is difficult to get this idea across to people.

**Logan-Hocking County Health Department, Logan, OH
February 16, 2001**

- To begin, I asked him some specific questions about his county. Depth to limiting layers (bedrock), in addition to poor soils in some areas, seems to be the biggest challenge in the counties of the Raccoon Creek watershed. From what I understand, limiting layers might be components such as the water table and layers of bedrock. If the water table is high, and the bedrock layer is located relatively close to the surface, then the effluent from septic tanks does not have enough opportunity to become "cleansed" by the organisms in the soil before it reaches the water table from which most people draw their drinking water. And as he stated, there is not a lot of "public water" in the county; most people use wells.
- Based on his inspections of on-lot systems, which he only does if the homeowner suspects that his system is failing or if there is a nuisance call, he estimates that 40 percent to 50 percent of these systems are failing. That was a very conservative estimate.
- In the case of a violation (nuisance), the property owner is ordered to correct the problem; they are given two chances or time limits to do so. If they still do not comply, they must appear before the board of health. The final action is prosecution.
- I asked him what he thought about the proposed House Bill 105, which failed last December. He said if proponents and drafters of this bill want to mandate regular inspections of on-lot systems, they will have to figure out another way to fund those inspections (e.g. the cost of manpower) because most people won't support the idea of having to pay to have their system regularly inspected. Either they don't recognize the significance of the activity, and thus do not make it a spending priority, or they just can't afford it. The representatives have to respect these thoughts and thus cannot go against the wishes of their constituents.
- The health department issues permits for the installation of septic/aeration systems when someone wants to build. The health department also locates and

designs a well and wastewater treatment system. Once the property acquires a permit, the property owner has to hire a contractor to install the system. The health department gives the owner a list of registered installers. If a property/house is being transferred/sold from one owner to another, lenders require an inspection, and, if necessary, the seller must upgrade the system before the property can be sold.

- Some facts about different on-lot systems: He said septic and aeration systems cost about \$3,000 to \$5,000 to install. He thinks septic systems are better if the soil is good because aeration systems have mechanical parts (motor and pump) which can break easily and thus are more expensive to maintain. It costs about \$600 to \$800 to replace a motor.
- As far as possible financial assistance available to homeowners, he mentioned Housing and Urban Development (HUD) offers low-interest loans at 1 percent. He wasn't clear about the details of these programs.
- I asked him if there were any "public" or central sewer systems in the county and he mentioned that Logan had a plant, and that Haydenville and Rockbridge had pump and lagoon systems.
- Staff at the Logan-Hocking County Health Department is working hard to upgrade their records. They have come a long way from the old index cards database system. With the help of interns, their department has created a system of folders, organized by address since property changes hands so often. Every address in the county has a folder with septic and well information. They also are putting together a computer database. All of the information from the old index cards and from new permits is entered into the database. This is the same information in the folders, but the folders are kept for illustrative purposes. That is, whenever a new on-lot system is installed, he does an illustration of the system so that they have some idea about where the system is located and how it is designed.
- I asked him why he thinks all county health departments are not updating their information in this way, and he said it really depends upon available resources (e.g. \$ to pay interns). He also mentioned that computers can be intimidating, and people may feel more in control of a system like the index cards.
- Some more information about systems: Septic tanks hold the wastewater/sewage for a period of time so that anaerobic bacteria can break it down. The remaining solids settle to the bottom of the tank and this must be pumped out regularly, depending upon the intensity of use. The effluent then exits the tank into trenches for the soil absorption process to take place. The number of trenches depends upon the soil type and the number of bedrooms in the house. Usually there is a minimum 400-foot trench. The effluent flows out into the trenches after exiting the tank. This process is gravity driven. The effluent moves only so far into the

trench. As it sits there, a biomat builds up. When the soil can't absorb anymore, the effluent moves further down the trench until the biomass builds up on the bottom and sides of the trench. Once this happens, a new trench must be built. This septic tank/absorption system has a lifespan of about 20 years, but this is only if it is well maintained, by giving the trenches a chance to rest, pumping out the tank, etc.

- Because aeration systems have an additional treatment mechanism (they use both anaerobic and aerobic organisms to cleanse the wastewater) the effluent is usually thought to be clean enough to discharge directly into a creek. The EPA is discouraging this sort of practice. Instead of discharging directly into the stream, the effluent would be more effectively disposed of through some sort of soil absorption system like drip irrigation or sand filters. Unfortunately, this sort of technology is very expensive. For drip irrigation, you need a large tank to hold the water while it slowly percolates. This sort of tank is called a time dosing tank and they usually cost about \$12,000 to \$15,000.
- As far as solid waste goes, Hocking County residents are served by private waste haulers who usually take the waste to the landfill in Nelsonville.

Jackson County Health Department, Jackson, OH
March 2, 2001

Data: The Jackson County Health Department uses field inspection reports to keep track of system layout illustrations and information required for a permit. They also enter this information into a computer database. Jackson keeps the hard copy for illustrative purposes; she thinks it would be a good idea to scan the illustrations so that they could be included in the database. Unfortunately such equipment is expensive. Information required for the permit application includes: number of bedrooms in the house, lot size, system layout design, soil information, septic tank size, etc. The field inspection report, performed by the sanitarian, evaluates the treatment methods, including information about trench width and depth, and the gravel size. For aeration systems, the motor serial number is recorded and the discharge point must be approved. Jackson County requires that the effluent from an aeration system be treated by tertiary treatment (sand filters). Each county has different requirements, though all counties are required to comply with state regulations.

Aeration systems are used on small lots, such as city or village lots, if the property is not hooked up to a central system. The aeration tank is the secondary treatment system, preceded by a septic tank. The effluent from an aeration system is often discharged directly into a stream or storm water sewer, which eventually goes into some body of water. Jackson County requires owners of aeration systems to have a tertiary treatment system as well, the most common method being sand filters. Septic tank/soil absorption (trench) systems are used on larger lots. There are "critical distance" requirements for septic systems, such as being 50 feet from the well, 10 feet from the house and 15 feet from the property line.

In order to determine if an aeration or septic system would be more appropriate for a property, the soil must be tested for leaching suitability and potential discharge points must be identified (for aeration systems). The leaching/soil absorption process requires non-clay soils so that the effluent can be absorbed properly. Leaching lines are perforated pipes surrounded by gravel. The gravel is typically about a half-inch, about the size of driveway gravel. The gravel is then covered by hay and soil. The leaching lines are placed in underground trenches, which have specific depth and width requirements.

She thinks aeration systems are not as effective as septic tanks because people have the power to control the power supply to the aeration system. Thus, if their electricity bill is too high, they often just cut off power to the motor in the aeration tank. As a result, the sewage is not treated properly.

There are about eight registered installers in Jackson County. They must be re-registered annually. She had an idea that the manufacturers should get together with the system distributors, installers and county sanitarians on a regular basis to exchange ideas and to talk about new technology. As it is now, distributors and installers usually just sell what they're used to, which may not be the best technology available.

She said a lot of education is needed concerning the proper treatment of wastewater. She suggested the local newspapers write articles about the topic. Local newspapers usually get a big readership, so perhaps some informative articles would really get people to thinking and maybe even acting to make sure that their on-lot system is working properly.

Wellston and Jackson are on central sewer systems, though public sewer systems are out of the local sanitarians' area of expertise. They are trained to deal specifically with private systems.

Small villages present a challenge when it comes to wastewater treatment options because the lots are too small for septic systems, and there is no place to discharge effluent from an aeration system. She mentioned a specific concern that she had about effluent discharged from aeration systems. She worked on the road maintenance crew for four years and she said that the workers often had to work in effluent discharged into ditches. She didn't think that was very safe. People have to get a discharge permit, but she doesn't think that they are monitored carefully enough.

The entire state of Ohio generally has a high water table; it is not a problem that is specific to certain counties.

House Bill 105/revised household sewage treatment rules: She thinks there is simply not enough manpower to inspect every system as proposed by House Bill 105. In addition, she doesn't see how you can possibly enforce the requirements set out in the bill. It is a complicated issue, especially when paired with private property rights.

Meigs County Health Department, Pomeroy, OH
May 11, 2001

New Sewage Treatment Rules

The Ohio Sanitary Code (Household Sewage Treatment Rules) is contained in section 3701-29 of the Ohio Administrative Code. Section 119.032 of the Ohio Revised Code stipulates that these rules must be reviewed every five years. The Ohio Department of Health and the Ohio Onsite Wastewater Association held public meetings throughout the first half of the year for health department officials, installers, haulers, suppliers and designers. The deadline for input on the first statewide draft of these rules is due by June 15, 2001; the final draft will be completed and introduced to the Public Health Council in August.

He cited several “problems” associated with the proposed rule revisions. First, he said that they encourage the use of leaching systems (as opposed to aeration/direct discharge systems) as the primary method of onsite wastewater treatment. I think this is in accordance with an EPA mandate discouraging the use of direct discharge/aeration systems in an effort to alleviate the problem of water pollution. The systems that these new rules are encouraging are high tech. systems such as drip irrigation and mound systems.

These systems have several caveats for southeast Ohio. First, they are much more expensive than “traditional” methods (e.g. septic tanks). In fact, they may even cost more than the housing unit it is serving. Second, they have more mechanical components, which could easily fail. Aeration systems typically only have one motor, which fail eventually, so using systems with more “weak spots,” as he called them, could really be an obstacle. Third, and perhaps most significantly, he thinks if you prohibit the use of aeration/mechanical systems (which don’t need as much room to function because they don’t require a leaching field), you would virtually halt development in this part of the state. Currently, developers are not required to make sure that lots can accommodate an effective leaching bed. Thus, even though the developer may be selling five-to-ten-acre lots, if the lot is on a hill, the lot may not have a flat enough area to accommodate a leach bed. Or, the people who buy the lot may want to build at the bottom of the hill, right next to the road, in which case the backyard uphill is the only place left for a leach field. This will simply not work for a gravity-driven system.

Seventy percent of the permits that the health department grants for wastewater treatment systems are for aeration/direct discharge systems as opposed to septic/soil absorption systems. Therefore, the new sewage treatment rules would make the sanitarians’ jobs very difficult, as they would not be able to grant permits. This would probably result in a large number of people simply bypassing the permitting process and just doing their own thing, without prior approval from the health department. This would result in many unapproved, inappropriate on-site systems.

He and his colleague said the essential problem with the new sewage treatment rules is that they address the systems that don't exist, instead of the ones that already do. Many of the current systems are failing for various reasons such as:

- Poor soil characteristics (sand is good, clay is bad)
- Inappropriately sized systems (e.g. a farmer and his wife may have lived in the house when the system was originally put in, but now a family with four kids lives there.)
- Old systems that cannot handle the increased water demands of new technology such as automatic washers, hot tubs, etc.
- Poor records—20 years ago, people didn't want the "government" interfering with their rights to do whatever they wished on their land, so they didn't get a permit and thus no data exists for the system.
- Lack of maintenance/pumping.

OTHER:

- Litter is a separate issue, but Meigs County does not have mandated countywide pick-up.
- In order to accommodate industry, wastewater must be commercially treated. This is out of the health department's jurisdiction, however.
- The health department keeps track of data using a yearly log.
- It's much better for a village to be on a central sewer system than on private systems, but the likelihood of this happening is slim since it is so expensive and because the terrain in southeast Ohio is such a challenge.
- Southeast Ohio has a lot of development going on because farmers are selling off their land.
- The problem with House Bill 105 is that it makes local governments (the county health departments) enforce federal/state rules. This turns the county health department officials into the "bad guys," and they do not have the resources to carry out the mandates of a bill like this.
- Ohio has one of the oldest septic tank regulations in the nation.
- Counties typically require Class 1 aeration systems, which are supposed to be 95 percent free of bacteria. Classes are determined by the quality of effluent discharged by the system.
- The new sewage treatment rules are also requiring NPDES permits, but the EPA does not have the resources to investigate every system, so they are probably just going to reject permit requests without even examining them. This also will contribute to the problem of people putting in systems without getting a permit.

Vinton County Health Department, McArthur, OH
February 7, 2001

- The physical characteristics of Vinton County are important when discussing wastewater management. Vinton County has very sandy soil, which is good for wastewater absorption from septic tanks. However he said the terrain can be a

challenge, probably because gravity draws the wastewater down the hill before it has a chance to absorb.

Additionally, high population densities in certain parts of the county cause the soils to become oversaturated.

Finally, Vinton County has a high water table, which is dangerous because if the wastewater does not absorb quickly enough, (from over-saturation), it could percolate down to the water table and contaminate drinking water.

- Only 10 percent of Vinton County is sewered. The village of McAurthur serves that 10 percent with a pump station and eight acres of lagoon fields.
- Only 20 percent of the county uses public water; the rest of the county has its own wells.
- The most common method of on-site treatment is septic tanks with a soil-absorption field. Septic systems usually have a lifespan of about 20 or 30 years, depending on how well they are maintained. Also, the more people there are in a household, the more the system is taxed. Insensitivity of use also makes a big difference. That is, if you use a lot of fat in your cooking, or you have a hot tub or a swimming pool or if you do a lot of laundry—all of these activities put more pressure on the septic system and could shorten its lifespan considerably.
- Aeration systems are also a common method of wastewater treatment. They are better than septic systems because they filter the water using both anaerobic AND aerobic organisms and sand filters to break down the sewage. Septic systems only use anaerobic organisms. As a result, aeration systems release a cleaner effluent than septic systems, so clean, in fact, that the effluent can be released into a storm water system where it would eventually drain into a lake or stream. Two disadvantages of the aeration system are that they are more expensive than septic systems (the latter usually run about \$2,000 to \$3,000) and they fail more often since they have a motor and a pump, both of which can easily break.
- He talked a lot about the city of Hamden. Hamden needs a central sewer system because it has a high population density that oversaturates the already poor soil. Hamden has applied for grants to fund a central sewer system. The city of Wellston would administer/service the system so that it could serve both communities.
- Because this central sewer system is a possibility, he said there really is no reason for people to spend a lot of money on their on-site systems right now if they are going to have to pay to be hooked up to the central system anyway.
- He said leaky water lines are a significant problem in Vinton County. He estimates that the city of Wellston loses about \$20,000 every year due to leaks in

the system. He said that water meters would solve this problem, since the way it is now, people pay a flat rate for their water use and thus don't conserve. He said the EPA really pushes for water meters in every household instead of flat rates since it encourages people to conserve.

- Some details about his job: The only time he inspects an on-site system is if there is a complaint about odor or about sewage coming up in the yard. He estimates that he puts in about 200 systems a year, and he keeps track of them on note cards specifically designed for this purpose where the inspector can list the date, the homeowner's name and a small illustration/drawing of the system. This system is very well organized and goes back many years. He also mentioned that "sewage treatment system" makes people feel a lot more comfortable than "sewage disposal system." Also, it helps reinforce the idea that everything is connected and that water is reused and thus must be well treated.
- As far as financial assistance for residents regarding effective wastewater treatment systems goes, he mentioned the Ohio Regional Development Commission offers low-interest loans to homeowners.
- Finally, I asked him about solid waste management in the county, and he said he has several independent haulers in the county who take garbage to the local landfills. People have to pay for this service.

FLOODING ISSUES

Floodplain Administrator Interviews

The following interviews represent the views of only a small sample of the floodplain professionals in the Raccoon Creek watershed.

Athens County: He emphasized that support from the county commissioners was crucial. If the counties are non-compliant, they risk losing their NFIP funding. He's been in his position for 21 years. It is in the best interest of the banks to make sure people are in compliance. They require people get permits before approving loans; this restriction began in the last decade. He thinks education is a must; sometimes they hold public meetings. Once the plat maps are digitized, it will be much easier to find out where properties and floodplains overlap and do mailings to those people. He felt, though, that mailings are the least effective way to reach people because they are often thrown away.

In areas of repeat losses, the FEMA has bought some properties, such as 23 in Doanville and 26 in Amesville. The county also bought two or three properties on Sugar Creek for mitigation. He thinks effective ways of reaching people include editorials, radio and working with reporters to do special stories. Any measure that encourages feedback will be good.

Gallia County: She sees her job as regulating development in the 100-year floodplain. She inspects all sites herself regularly before, during and after development. The biggest problem she faces is that people don't tell her when they're building; either they don't understand the rules or they don't want to deal with obeying them. Gallia County has no building regulations and no zoning laws. Floodplain rules came into effect in 1989 and were not enforced until 1991—therefore, everyone in the county is pretty much used to doing what they want in terms of building. Though people are required to inform her when they are building or renovating, most people don't. She finds out when the Department of Engineers reports a new address, when people call or when she drives by building sites herself. People then have to halt building so she can check for compliance.

If they are non-compliant, she reports to the prosecuting attorney and they then have preliminary hearings and try to settle. If they can't come to an agreement, they then have to go to court. Since her tenure began in 1996, she's been to preliminary hearings a half-dozen times and into court once. Gallia County enforces the minimum standards that ODNR delineates. The county does have a variance committee, but they rarely grant variances because FEMA is becoming more stringent on regulations and can take the county out of the NFIP program. That, and it sets a bad precedent. People would rather build how they want—they don't understand the consequences of losing their flood insurance.

The eastern coast of Gallipolis is on the Ohio River, in the floodplain. Unfortunately, that's an area where people like to build. There are few buyout programs going on in Gallia County. According to her, there have to be a certain number of homes affected in order to make it worthwhile for FEMA to buy homes in the floodplain and tear them down. Her two suggestions for maintenance of Raccoon Creek were to ensure proper development by establishing base flood elevations in the A-zones (none exist presently), and to dredge the creek periodically. She feels the education process is ongoing. They do news releases, ads, tax rollouts and other measures.

Meigs County: His primary responsibility is issuing permits for development and making sure builders are up to code for grading, etc. before they build. Meigs County follows the minimum standards for compliance that ODNR delineates, adopted in 1995. Changes to the regulations might be in the works because of new NFIP maps, but only for new structures and structures being worked on up to a certain amount of money. The 50 percent rule is in effect: Owners have to bring old structures into compliance with ODNR standards if renovations take place that cost 50 percent or more of the value of the building. Any mortgaged property in the floodplain has to have flood insurance. There are three zones that the NFIP outlines. The X zone is the non-flood zone, and applies to areas outside the 100-year flood area.

He thinks there are studies required for the upstream and downstream effects when builders bring in fill to raise the grade of an area. When he finds people in non-compliance, he generally tells them to stop building, which they often don't appreciate. Low-income residents generally don't want or can't afford to make the necessary changes to their land, especially when it might cost more than the price of the home.

Subdivisions along the river are non-compliant because they were built before the regulations came into effect. They can still get flood insurance, but at a higher premium. Flood insurance can be bought from any agent. The mitigation programs of tearing down houses, etc. exists in common flooding areas in Meigs County, such as Rutland Village.

NPDES Permits for Raccoon Creek Watershed

From OEPA's Feb. 2002 Permit List:

http://www.epa.state.oh.us/dsw/permits/NPDES_020702.pdf

GALLIA BIDWELL PORTER WWTP
1292 OH 4563 **OH0124664**
KENNETH FARMER 18 LOCUST STREET ROOM
GALLIPOLIS **OH # REC_ STRM**
OPG00068

GALLIA GALLIA COUNTY BD COMMISSION
RYAN RUN RODNEY VILLAGE II ROOM 1292 OH 4563 **OH0048526**
(740)- 446- 4612- JIM BELVILLE OPERATO 18 LOCUST ST.
GALLIPOLIS **OH # REC_ STRM**
OPG00054

GALLIA ODOT - DISTRICT 10
RACCOON CREEK SAFETY REST AR OH 4561 **OH0104019**
() - - - GLEN SOLES 2397 JACKSON PIKE
COLUMBUS **OH # REC_ STRM**
OPP00081

GALLIA VILLAGE OF RIO GRANDE
RACCOON CREEK BOARD OF PUBLIC A RIO GRANDE WAT OH 4567 **OH0041785**
RONALD MILLER, WATER 1030 LAKE DRIVE
RIO GRANDE **OH # REC_ STRM**
OIV00080

GALLIA VILLAGE OF RIO GRANDE
INDIAN CREEK MUNICIPAL BUILDIN RIO GRANDE SEW OH 4567 **OH0027278**
(614)- 245- 5822- RON MILLER, SUPT 401 COLLEGE ST PO. BOX 343
RIO GRANDE **OH # REC_ STRM**
OPB00035

HOCKING LOST HOLLOW PROP OWNER ASSN
UNNAMED STREAM T OH 4313
OH0099210
(614)-385-6320-
DANIEL LARIMER,W.W.O
16700 HARBLE GRIFFITH RD
LOGAN
OH #
REC_
STRM
OPX00005

JACKSON CITY OF WELLSTON
RACCOON CREEK NORTH WATER W OH 4569 **OH0031780**
(614)- 384- 2720- JEFFREY ARGABRIGHT S 203 E. BROADWAY
WELLSTON **OH # REC_ STRM**
OIV00120

JACKSON CITY OF WELLSTON WWTP
LITTLE RACCOON C OFFICE OF MAYOR WASTEWATER TR OH 4569 **OH0023507**
(740)- 384- 5447- M BOB PHILLIPS, CHIEF PLT. 203 EAST BROADWAY
WELLSTON **OH # REC_ STRM**

OPC00013

JACKSON JACKSON COUNTY COMMISSIONER
UTO DICKASON RUN GREEN ACRES SUB OH 4564 **OH0059773**
GARY RADABAUGH, OPE 200 MAIN ST.
JACKSON **OH # REC_ STRM**
OPG00039

JACKSON SANDS HILL WASTE SERVICES
LITTLE RACCOON BEECH HOLLOW S OH 4525 **OH0108171**
(513)- 741- 5227- JANET MANNING 10795 HUGHES RD
CINCINNATI **OH # REC_ STRM**
OIN00169

JACKSON
SCOTT SLAUGHTER HOUSE
MEADOW RUN DAVES CUSTOM B OH 4569
OH0008036
(740)-
384-
2340-
DAVE SPRAGUE OWNER BOX 53
WELLSTON
OH #
REC_
STRM
OIH00001

VINTON AUSTIN POWDER COMPANY
ELK FORK RED DIAMOND PLAN OH 4565 **OH0006173**
ROBERT J. BELOCK ENV P. O. BOX 317, SR 677
MCARTHUR **OH # REC_ STRM**
OIF00003

VINTON BUCKEYE AUTOMATIC DIV
ELKFORK CREEK VI OH 4565 **OH0094919**
HAROLD HAMMOND OPER BOX 479- ST RT 93 SOUTH
MCARTHUR **OH # REC_ STRM**
OIS00020

VINTON INDUSTRIAL TIMBER & LAND
UNNAMED TRIB TO OH 4412 **OH0090875**
(216)- 831- 3140- LARRY R. EVANS, VP MFG 23925 COMMERCE PARK
BEACHWOOD **OH # REC_ STRM**
OIN00114**VINTON** OHIO DEPT OF NAT RESOURCES
RACCOON CREEK LAKE HOPE STATE P OH 4565 **OH0091367**
MIKE REFFETT SUPT RR 2 BOX 3000
MCARTHUR **OH # REC_ STRM**
OPP00073

VINTON OHIO DEPT OF NATURAL RESOUR
RACCOON CREEK LAKE HOPE STATE P OH 4565 **OH0090981**
MICHAEL REFFETT RR2 BOX 3000
MCARTHUR **OH # REC_ STRM**
OPP00067

VINTON OHIO DEPT OF NATURAL RESOUR
LAKE HOPE LAKE HOPE STATE P OH 4565 **OH0090972**
(740)- 596- 4860- MIKE REFFETT SUPT. RR2 BOX 3000
MCARTHUR **OH # REC_ STRM**

OPP00066

VINTON SANDS HILL COAL COMPANY

UNNAMED TRIB TO COAL PREPARATI OH 4563 **OH0076431**

(740)- 384- 4211- ` BRENDA WEBER PO BOX 650

HAMDEN **OH # REC_ STRM**

OIL00074

VINTON SOUTHERN OHIO COAL COMPANY

RACCOON CREEK AN RACCOON MINE #3 OH 4570 **OH0041459**

(740)- 742- 1109- JAMES F TOMPKINS P. O. BOX 490

ATHENS **OH # REC_ STRM**

OIL00026

VINTON VILLAGE MCARTHUR

PUNCHEON FORK BOARD OF PUBLIC A MCARTHUR SEWA OH 4565 **OH0048241**

(614)- 596- 4060- MARK WALKER 124 WEST MAIN ST.

MC ARTHUR **OH # REC_ STRM**

OPB00080

VINTON WATERLOO COAL COMPANY

UNNAMED TRIB TO DUNDAS JOB DUNDAS PREP PL OH 4564 **OH0076465**

(740)- 384- 1378- RICHARD WALKER POST OFFICE BOX 626

JACKSON **OH # REC_ STRM**

OIL00075

APPENDIX K: RACCOON CREEK FISH SPECIES

| Total list of fish species collected by the Ohio EPA in the Raccoon Creek basin. | | | | | | | | Grand Total of All Streams | | |
|--|---------|-----------------------|-----------------|-------------------|-----------------|-------------|-----------------|----------------------------|----------------|--------|
| | | | | | | | | Date Range: 09/08/1981 | | |
| | | | | | | | | Thru: 08/21/2000 | | |
| No of Streams: 55 | | Dist Fished: 56.43 km | | No of Passes: 241 | | | | | | |
| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight | |
| Silver Lamprey | | P | N | 4 | 0.03 | 0.01 | 0.00 | 0.01 | 58.67 | |
| Least Brook Lamprey | | F | N | 537 | 4.17 | 1.14 | 0.04 | 0.21 | 7.64 | |
| Longnose Gar | | P | M | 6 | 0.05 | 0.01 | 0.00 | 0.01 | 19.50 | |
| Gizzard Shad | | O | M | 181 | 1.53 | 0.42 | 0.40 | 2.33 | 152.64 | |
| Grass Pickerel | | P | M | P | 791 | 6.80 | 1.86 | 0.24 | 33.11 | |
| Smallmouth Buffalo | C | I | M | 16 | 0.13 | 0.04 | 0.28 | 1.61 | 1,201.00 | |
| Quillback Carpsucker | C | O | M | 2 | 0.02 | 0.00 | 0.02 | 0.14 | 847.00 | |
| River Carpsucker | C | O | M | 1 | 0.01 | 0.00 | 0.02 | 0.10 | 1,250.00 | |
| Silver Redhorse | R | I | S | M | 4 | 0.03 | 0.01 | 0.02 | 397.75 | |
| Black Redhorse | R | I | S | I | 17 | 0.13 | 0.04 | 0.09 | 348.88 | |
| Golden Redhorse | R | I | S | M | 561 | 4.28 | 1.17 | 1.32 | 206.58 | |
| Shorthead Redhorse | R | I | S | M | 43 | 0.35 | 0.10 | 0.12 | 193.83 | |
| Northern Hog Sucker | R | I | S | M | 206 | 1.48 | 0.40 | 0.08 | 40.81 | |
| White Sucker | W | O | S | T | 1,985 | 17.12 | 4.67 | 1.61 | 99.06 | |
| Spotted Sucker | R | I | S | | 217 | 1.86 | 0.51 | 0.72 | 229.82 | |
| Common Carp | G | O | M | T | 245 | 2.13 | 0.58 | 5.29 | 1,447.80 | |
| Golden Shiner | N | I | M | T | 505 | 6.56 | 1.79 | 0.05 | 0.30 | 7.37 |
| Silver Chub | N | I | M | | 1 | 0.01 | 0.00 | 0.00 | 0.00 | 10.00 |
| Blacknose Dace | N | G | S | T | 423 | 3.62 | 0.99 | 0.00 | 0.01 | 1.32 |
| Creek Chub | N | G | N | T | 9,943 | 80.03 | 21.84 | 0.43 | 2.52 | 9.73 |
| South. Redbelly Dace | N | H | S | | 1,093 | 8.19 | 2.23 | 0.01 | 0.04 | 0.64 |
| Emerald Shiner | N | I | S | | 317 | 2.64 | 0.72 | 0.01 | 0.05 | 1.89 |
| Redfin Shiner | N | I | N | | 547 | 4.10 | 1.12 | 0.00 | 0.02 | 1.09 |
| Rosefin Shiner | N | I | S | M | 7 | 0.07 | 0.02 | | | |
| Striped Shiner | N | I | S | | 3,015 | 21.33 | 5.82 | 0.15 | 0.87 | 7.04 |
| Common Shiner | N | I | S | | 23 | 0.17 | 0.05 | | | |
| Spotfin Shiner | N | I | M | | 38 | 0.32 | 0.09 | 0.00 | 0.02 | 5.14 |
| Sand Shiner | N | I | M | M | 3 | 0.02 | 0.01 | 0.00 | 0.00 | 2.00 |
| Mimic Shiner | N | I | M | I | 2 | 0.02 | 0.00 | 0.00 | 0.00 | 1.00 |
| Silverjaw Minnow | N | I | M | | 1,943 | 13.56 | 3.70 | 0.01 | 0.06 | 1.76 |
| Fathead Minnow | N | O | C | T | 2 | 0.01 | 0.00 | 0.00 | 0.00 | 2.00 |
| Bluntnose Minnow | N | O | C | T | 5,359 | 38.22 | 10.43 | 0.05 | 0.29 | 1.64 |
| Central Stoneroller | N | H | N | | 644 | 4.41 | 1.20 | 0.02 | 0.10 | 5.32 |
| Cr Chub X S. Redbelly D | | | | | 1 | 0.01 | 0.00 | | | |
| Hybrid X Minnow | | | | | 1 | 0.01 | 0.00 | | | |
| Channel Catfish | F | | C | | 82 | 0.68 | 0.19 | 0.91 | 5.30 | 800.86 |
| Yellow Bullhead | | I | C | T | 777 | 5.93 | 1.62 | 0.49 | 2.84 | 76.95 |
| Brown Bullhead | | I | C | T | 95 | 0.82 | 0.22 | 0.23 | 1.35 | 166.35 |
| Black Bullhead | | I | C | P | 222 | 1.88 | 0.51 | 0.19 | 1.10 | 59.89 |
| Flathead Catfish | F | P | C | | 7 | 0.06 | 0.02 | 0.05 | 0.30 | 504.86 |
| Brook Silverside | | I | M | M | 75 | 0.61 | 0.17 | 0.00 | 0.01 | 0.88 |
| White Bass | F | P | M | | 2 | 0.02 | 0.00 | 0.01 | 0.05 | 279.50 |
| White Crappie | S | I | C | | 12 | 0.10 | 0.03 | 0.02 | 0.13 | 130.33 |
| Black Crappie | S | I | C | | 5 | 0.04 | 0.01 | 0.00 | 0.03 | 61.00 |
| Rock Bass | S | C | C | | 124 | 0.86 | 0.24 | 0.08 | 0.45 | 58.67 |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|-------------|-----|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Smallmouth Bass | F | C | C | M | 2 | 0.01 | 0.00 | 0.00 | 0.00 | 50.00 |
| Spotted Bass | F | C | C | | 730 | 5.62 | 1.53 | 0.49 | 2.89 | 62.29 |
| Largemouth Bass | F | C | C | | 613 | 4.85 | 1.32 | 0.54 | 3.14 | 77.74 |
| Warmouth Sunfish | S | C | C | | 326 | 2.61 | 0.71 | 0.14 | 0.82 | 35.45 |
| Green Sunfish | S | I | C | T | 3,069 | 24.63 | 6.72 | 0.22 | 1.29 | 10.56 |
| Bluegill Sunfish | S | I | C | P | 4,019 | 33.77 | 9.22 | 0.97 | 5.66 | 22.12 |
| Orangespotted Sunfish | S | I | C | | 2 | 0.02 | 0.01 | | | |
| Longear Sunfish | S | I | C | M | 5,392 | 41.64 | 11.36 | 1.24 | 7.22 | 21.21 |
| Redear Sunfish | E | I | C | | 72 | 0.59 | 0.16 | 0.03 | 0.15 | 32.27 |
| Pumpkinseed Sunfish | S | I | C | P | 136 | 1.16 | 0.32 | 0.08 | 0.48 | 46.82 |
| Bluegill X Pumpkinseed | | | | | 1 | 0.01 | 0.00 | 0.00 | 0.01 | 61.00 |
| Green Sf X Bluegill Sf | | | | | 146 | 1.05 | 0.29 | 0.04 | 0.25 | 25.95 |
| Green Sf X Pumpkinseed | | | | | 5 | 0.04 | 0.01 | 0.00 | 0.02 | 50.20 |
| Longear Sf X Bluegill Sf | | | | | 7 | 0.06 | 0.02 | 0.00 | 0.01 | 29.25 |
| Green Sf X Longear Sf | | | | | 36 | 0.27 | 0.07 | 0.02 | 0.12 | 56.46 |
| Green Sf X Warmouth Sf | | | | | 3 | 0.02 | 0.01 | 0.00 | 0.01 | 59.50 |
| Bluegill Sf X Redear Sf | | I | C | | 1 | 0.01 | 0.00 | 0.00 | 0.01 | 70.00 |
| Green Sf X Hybrid | | | | | 14 | 0.11 | 0.03 | | | |
| Hybrid X Sunfish | | | | | 23 | 0.20 | 0.05 | 0.02 | 0.10 | 68.76 |
| Sauger | F | P | S | | 14 | 0.12 | 0.03 | 0.04 | 0.24 | 204.93 |
| Walleye | F | P | S | | 1 | 0.01 | 0.00 | 0.02 | 0.11 | 1,020.00 |
| Yellow Perch | | | M | | 5 | 0.04 | 0.01 | 0.00 | 0.01 | 32.00 |
| Dusky Darter | D | I | S | M | 268 | 2.14 | 0.58 | 0.01 | 0.06 | 2.81 |
| Blackside Darter | D | I | S | | 190 | 1.47 | 0.40 | 0.00 | 0.03 | 2.87 |
| Logperch | D | I | S | M | 19 | 0.16 | 0.04 | 0.00 | 0.01 | 9.78 |
| Johnny Darter | D | I | C | | 913 | 6.83 | 1.86 | 0.00 | 0.02 | 0.94 |
| Greenside Darter | D | I | S | M | 1 | 0.01 | 0.00 | | | |
| Fantail Darter | D | I | C | | 553 | 4.29 | 1.17 | 0.00 | 0.03 | 1.15 |
| Sauger X Walleye | E | P | | | 4 | 0.03 | 0.01 | 0.02 | 0.12 | 343.75 |
| Freshwater Drum | | | M | P | 30 | 0.25 | 0.07 | 0.27 | 1.58 | 625.60 |
| No Fish | | | | | 0 | 0.00 | 0.00 | | | |
| <i>Grand Total</i> | | | | | 46,679 | 366.44 | | 17.13 | | |
| <i>Number of Species</i> | | | | | 63 | | | | | |
| <i>Number of Hybrids</i> | | | | | 12 | | | | | |

Species List

Page 1

| | | | | | | | | | |
|---------------------------|-----------------------------------|--|------------------|--|-----------------------------|--|--|--|--|
| River Code: 09-500 | Stream: Raccoon Creek | | | | River Segment Totals | | | | |
| Mile Range: 5.40 | Basin: Southeast Ohio River Tribs | | | | Date Range: 08/07/1990 | | | | |
| Thru: 109.10 | Time Fished: 105277 sec | | | | Thru: 09/07/1995 | | | | |
| | Dist Fished: 15.94 km | | No of Passes: 36 | | Sampler Type: A D | | | | |

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|-------------|-----|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Silver Lamprey | | P | N | | 3 | 0.17 | 0.05 | 0.01 | 0.03 | 58.67 |
| Least Brook Lamprey | | F | N | | 12 | 0.67 | 0.19 | 0.00 | 0.01 | 6.67 |
| Longnose Gar | | P | M | | 4 | 0.22 | 0.06 | 0.00 | 0.01 | 19.50 |
| Gizzard Shad | | O | M | | 90 | 5.00 | 1.42 | 0.72 | 2.37 | 143.82 |
| Grass Pickerel | | P | M | P | 89 | 4.75 | 1.35 | 0.17 | 0.56 | 35.36 |
| Smallmouth Buffalo | C | I | M | | 16 | 0.88 | 0.25 | 1.06 | 3.51 | 1,201.00 |
| Quillback Carpsucker | C | O | M | | 2 | 0.11 | 0.03 | 0.09 | 0.31 | 847.00 |
| River Carpsucker | C | O | M | | 1 | 0.06 | 0.02 | 0.07 | 0.23 | 1,250.00 |
| Silver Redhorse | R | I | S | M | 4 | 0.20 | 0.06 | 0.09 | 0.29 | 397.75 |
| Black Redhorse | R | I | S | I | 17 | 0.88 | 0.25 | 0.33 | 1.08 | 348.88 |
| Golden Redhorse | R | I | S | M | 327 | 17.91 | 5.08 | 4.92 | 16.20 | 276.33 |
| Shorthead Redhorse | R | I | S | M | 43 | 2.33 | 0.66 | 0.45 | 1.48 | 193.83 |
| Northern Hog Sucker | R | I | S | M | 55 | 2.96 | 0.84 | 0.13 | 0.42 | 42.17 |
| White Sucker | W | O | S | T | 71 | 3.90 | 1.11 | 1.03 | 3.41 | 263.45 |
| Spotted Sucker | R | I | S | | 120 | 6.64 | 1.88 | 1.21 | 3.98 | 182.67 |
| Common Carp | G | O | M | T | 60 | 3.32 | 0.94 | 7.06 | 23.26 | 2,126.30 |
| Golden Shiner | N | I | M | T | 3 | 0.14 | 0.04 | 0.00 | 0.00 | 5.00 |
| Silver Chub | N | I | M | | 1 | 0.06 | 0.02 | 0.00 | 0.00 | 10.00 |
| Blacknose Dace | N | G | S | T | 1 | 0.04 | 0.01 | 0.00 | 0.00 | 1.00 |
| Creek Chub | N | G | N | T | 109 | 4.61 | 1.31 | 0.03 | 0.08 | 5.08 |
| Emerald Shiner | N | I | S | | 317 | 17.61 | 5.00 | 0.03 | 0.11 | 1.89 |
| Redfin Shiner | N | I | N | | 39 | 2.16 | 0.61 | 0.00 | 0.01 | 1.15 |
| Striped Shiner | N | I | S | | 172 | 9.30 | 2.64 | 0.11 | 0.35 | 11.18 |
| Spotfin Shiner | N | I | M | | 35 | 1.94 | 0.55 | 0.01 | 0.03 | 5.06 |
| Sand Shiner | N | I | M | M | 1 | 0.06 | 0.02 | 0.00 | 0.00 | 2.00 |
| Mimic Shiner | N | I | M | I | 2 | 0.11 | 0.03 | 0.00 | 0.00 | 1.00 |
| Silverjaw Minnow | N | I | M | | 5 | 0.26 | 0.07 | 0.00 | 0.00 | 1.60 |
| Bluntnose Minnow | N | O | C | T | 474 | 25.84 | 7.34 | 0.04 | 0.12 | 1.47 |
| Central Stoneroller | N | H | N | | 79 | 3.43 | 0.97 | 0.02 | 0.06 | 5.22 |
| Channel Catfish | F | | C | | 79 | 4.38 | 1.24 | 3.51 | 11.55 | 800.86 |
| Yellow Bullhead | | I | C | T | 85 | 4.48 | 1.27 | 0.62 | 2.03 | 133.74 |
| Brown Bullhead | | I | C | T | 8 | 0.43 | 0.12 | 0.12 | 0.39 | 269.50 |
| Black Bullhead | | I | C | P | 2 | 0.11 | 0.03 | 0.02 | 0.06 | 153.50 |
| Flathead Catfish | F | P | C | | 7 | 0.39 | 0.11 | 0.20 | 0.65 | 504.86 |
| Brook Silverside | | I | M | M | 58 | 3.22 | 0.91 | 0.00 | 0.01 | 0.78 |
| White Bass | F | P | M | | 2 | 0.11 | 0.03 | 0.03 | 0.10 | 279.50 |
| White Crappie | S | I | C | | 10 | 0.56 | 0.16 | 0.08 | 0.26 | 139.70 |
| Black Crappie | S | I | C | | 3 | 0.17 | 0.05 | 0.01 | 0.03 | 61.67 |
| Rock Bass | S | C | C | | 23 | 1.22 | 0.35 | 0.10 | 0.32 | 77.00 |
| Smallmouth Bass | F | C | C | M | 1 | 0.06 | 0.02 | 0.00 | 0.01 | 50.00 |
| Spotted Bass | F | C | C | | 454 | 24.98 | 7.09 | 1.68 | 5.53 | 67.11 |
| Largemouth Bass | F | C | C | | 138 | 7.61 | 2.16 | 0.65 | 2.13 | 84.57 |
| Warmouth Sunfish | S | C | C | | 65 | 3.49 | 0.99 | 0.18 | 0.58 | 50.12 |
| Green Sunfish | S | I | C | T | 255 | 11.74 | 3.33 | 0.10 | 0.34 | 8.31 |
| Bluegill Sunfish | S | I | C | P | 435 | 23.86 | 6.77 | 0.74 | 2.44 | 30.95 |

Species List

River: 09-500 Raccoon Creek

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|-------------|-----|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Longear Sunfish | S | I | C | M | 2,283 | 125.56 | 35.64 | 3.38 | 11.13 | 26.75 |
| Redear Sunfish | E | I | C | | 5 | 0.26 | 0.07 | 0.02 | 0.07 | 80.40 |
| Green Sf X Bluegill Sf | | | | | 22 | 1.22 | 0.35 | 0.06 | 0.18 | 46.05 |
| Longear Sf X Bluegill Sf | | | | | 1 | 0.06 | 0.02 | 0.00 | 0.01 | 61.00 |
| Green Sf X Longear Sf | | | | | 10 | 0.52 | 0.15 | 0.05 | 0.16 | 90.80 |
| Green Sf X Warmouth Sf | | | | | 1 | 0.06 | 0.02 | 0.00 | 0.01 | 80.00 |
| Bluegill Sf X Redear Sf | | I | C | | 1 | 0.06 | 0.02 | 0.00 | 0.01 | 70.00 |
| Hybrid X Sunfish | | | | | 5 | 0.28 | 0.08 | 0.03 | 0.10 | 107.00 |
| Sauger | F | P | S | | 13 | 0.72 | 0.20 | 0.14 | 0.46 | 193.62 |
| Dusky Darter | D | I | S | M | 199 | 10.93 | 3.10 | 0.03 | 0.10 | 2.65 |
| Blackside Darter | D | I | S | | 57 | 3.16 | 0.90 | 0.01 | 0.02 | 2.42 |
| Logperch | D | I | S | M | 18 | 0.99 | 0.28 | 0.01 | 0.03 | 9.78 |
| Johnny Darter | D | I | C | | 38 | 2.01 | 0.57 | 0.00 | 0.01 | 1.08 |
| Fantail Darter | D | I | C | | 50 | 2.28 | 0.65 | 0.00 | 0.01 | 1.10 |
| Sauger X Walleye | E | P | | | 4 | 0.22 | 0.06 | 0.08 | 0.25 | 343.75 |
| Freshwater Drum | | | M | P | 29 | 1.61 | 0.46 | 0.94 | 3.09 | 585.10 |
| <i>Stream Total</i> | | | | | 6,513 | 352.26 | | 30.36 | | |
| <i>Number of Species</i> | | | | | 54 | | | | | |
| <i>Number of Hybrids</i> | | | | | 7 | | | | | |

Species List

Page 1

List of fish species collected by the Ohio EPA in tributaries to Raccoon Creek.

Grand Total of All Streams
Date Range: 09/08/1981
Thru: 08/21/2000

No of Streams: 54

Dist Fished: 40.49 km

No of Passes: 205

| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|-------------|-----|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Silver Lamprey | | P | N | | 1 | 0.01 | 0.00 | | | |
| Least Brook Lamprey | | F | N | | 525 | 4.79 | 1.30 | 0.05 | 0.38 | 7.67 |
| Longnose Gar | | P | M | | 2 | 0.01 | 0.00 | | | |
| Gizzard Shad | | O | M | | 91 | 0.92 | 0.25 | 0.29 | 2.30 | 161.55 |
| Grass Pickerel | | P | M | P | 702 | 7.16 | 1.94 | 0.27 | 2.12 | 32.58 |
| Golden Redhorse | R | I | S | M | 234 | 1.87 | 0.51 | 0.06 | 0.48 | 28.40 |
| Northern Hog Sucker | R | I | S | M | 151 | 1.22 | 0.33 | 0.07 | 0.53 | 40.15 |
| White Sucker | W | O | S | T | 1,914 | 19.46 | 5.27 | 1.81 | 14.45 | 85.58 |
| Spotted Sucker | R | I | S | | 97 | 1.02 | 0.28 | 0.55 | 4.43 | 292.00 |
| Common Carp | G | O | M | T | 185 | 1.92 | 0.52 | 4.67 | 37.37 | 1,224.11 |
| Golden Shiner | N | I | M | T | 502 | 7.69 | 2.09 | 0.07 | 0.56 | 7.38 |
| Blacknose Dace | N | G | S | T | 422 | 4.25 | 1.15 | 0.00 | 0.01 | 1.32 |
| Creek Chub | N | G | N | T | 9,834 | 93.34 | 25.30 | 0.57 | 4.58 | 9.88 |
| South. Redbelly Dace | N | H | S | | 1,093 | 9.63 | 2.61 | 0.01 | 0.08 | 0.64 |
| Redfin Shiner | N | I | N | | 508 | 4.45 | 1.20 | 0.00 | 0.03 | 1.08 |
| Rosefin Shiner | N | I | S | M | 7 | 0.08 | 0.02 | | | |
| Striped Shiner | N | I | S | | 2,843 | 23.45 | 6.36 | 0.17 | 1.32 | 6.59 |
| Common Shiner | N | I | S | | 23 | 0.20 | 0.06 | | | |
| Spotfin Shiner | N | I | M | | 3 | 0.03 | 0.01 | 0.00 | 0.00 | 8.00 |
| Sand Shiner | N | I | M | M | 2 | 0.01 | 0.00 | | | |
| Silverjaw Minnow | N | I | M | | 1,938 | 15.90 | 4.31 | 0.01 | 0.10 | 1.76 |
| Fathead Minnow | N | O | C | T | 2 | 0.02 | 0.00 | 0.00 | 0.00 | 2.00 |
| Bluntnose Minnow | N | O | C | T | 4,885 | 40.40 | 10.95 | 0.05 | 0.43 | 1.68 |
| Central Stoneroller | N | H | N | | 565 | 4.59 | 1.24 | 0.02 | 0.14 | 5.36 |
| Cr Chub X S. Redbelly D | | | | | 1 | 0.01 | 0.00 | | | |
| Hybrid-X Minnow | | | | | 1 | 0.01 | 0.00 | | | |
| Channel Catfish | F | | C | | 3 | 0.03 | 0.01 | | | |
| Yellow Bullhead | | I | C | T | 692 | 6.19 | 1.68 | 0.44 | 3.52 | 65.23 |
| Brown Bullhead | | I | C | T | 87 | 0.88 | 0.24 | 0.27 | 2.17 | 156.29 |
| Black Bullhead | | I | C | P | 220 | 2.19 | 0.59 | 0.25 | 1.99 | 58.90 |
| Brook Silverside | | I | M | M | 17 | 0.14 | 0.04 | 0.00 | 0.00 | 1.50 |
| White Crappie | S | I | C | | 2 | 0.02 | 0.01 | 0.00 | 0.02 | 83.50 |
| Black Crappie | S | I | C | | 2 | 0.02 | 0.01 | 0.00 | 0.02 | 60.00 |
| Rock Bass | S | C | C | | 101 | 0.80 | 0.22 | 0.07 | 0.57 | 53.94 |
| Smallmouth Bass | F | C | C | M | 1 | 0.01 | 0.00 | | | |
| Spotted Bass | F | C | C | | 276 | 2.21 | 0.60 | 0.08 | 0.65 | 43.08 |
| Largemouth Bass | F | C | C | | 475 | 4.37 | 1.18 | 0.50 | 4.00 | 74.97 |
| Warmouth Sunfish | S | C | C | | 261 | 2.46 | 0.67 | 0.13 | 1.03 | 31.06 |
| Green Sunfish | S | I | C | T | 2,814 | 26.91 | 7.29 | 0.26 | 2.09 | 10.94 |
| Bluegill Sunfish | S | I | C | P | 3,584 | 35.52 | 9.63 | 1.05 | 8.40 | 20.62 |
| Orangespotted Sunfish | S | I | C | | 2 | 0.02 | 0.01 | | | |
| Longear Sunfish | S | I | C | M | 3,109 | 26.83 | 7.27 | 0.49 | 3.91 | 14.76 |
| Redear Sunfish | E | I | C | | 67 | 0.65 | 0.18 | 0.03 | 0.21 | 27.35 |
| Pumpkinseed Sunfish | S | I | C | P | 136 | 1.36 | 0.37 | 0.11 | 0.88 | 46.82 |
| Bluegill X Pumpkinseed | | | | | 1 | 0.01 | 0.00 | 0.00 | 0.01 | 61.00 |

Species List

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| Species Name / ODNR status | IBI Grp | Feed Guild | Breed Guild | Tol | # of Fish | Relative Number | % by Number | Relative Weight | % by Weight | Ave(gm) Weight |
|----------------------------|---------|------------|-------------|-----|-----------|-----------------|-------------|-----------------|-------------|----------------|
| Green Sf X Bluegill Sf | | | | | 124 | 1.02 | 0.28 | 0.04 | 0.30 | 21.85 |
| Green Sf X Pumpkinseed | | | | | 5 | 0.04 | 0.01 | 0.00 | 0.03 | 50.20 |
| Longear Sf X Bluegill Sf | | | | | 6 | 0.07 | 0.02 | 0.00 | 0.01 | 18.67 |
| Green Sf X Longear Sf | | | | | 26 | 0.22 | 0.06 | 0.01 | 0.08 | 37.39 |
| Green Sf X Warmouth Sf | | | | | 2 | 0.02 | 0.00 | 0.00 | 0.00 | 39.00 |
| Green Sf X Hybrid | | | | | 14 | 0.13 | 0.04 | | | |
| Hybrid X Sunfish | | | | | 18 | 0.18 | 0.05 | 0.01 | 0.11 | 52.83 |
| Sauger | F | P | S | | 1 | 0.01 | 0.00 | 0.01 | 0.05 | 352.00 |
| Walleye | F | P | S | | 1 | 0.01 | 0.00 | 0.02 | 0.20 | 1,020.00 |
| Yellow Perch | | | M | | 5 | 0.05 | 0.01 | 0.00 | 0.02 | 32.00 |
| Dusky Darter | D | I | S | M | 69 | 0.58 | 0.16 | 0.00 | 0.03 | 3.37 |
| Blackside Darter | D | I | S | | 133 | 1.18 | 0.32 | 0.00 | 0.03 | 3.23 |
| Logperch | D | I | S | M | 1 | 0.01 | 0.00 | | | |
| Johnny Darter | D | I | C | | 875 | 7.68 | 2.08 | 0.00 | 0.03 | 0.92 |
| Greenside Darter | D | I | S | M | 1 | 0.01 | 0.00 | | | |
| Fantail Darter | D | I | C | | 503 | 4.65 | 1.26 | 0.01 | 0.04 | 1.16 |
| Freshwater Drum | | | M | P | 1 | 0.01 | 0.00 | 0.04 | 0.30 | 1,800.00 |
| No Fish | | | | | 0 | 0.00 | 0.00 | | | |
| <i>Grand Total</i> | | | | | 40,166 | 368.94 | | 12.51 | | |
| <i>Number of Species</i> | | | | | 52 | | | | | |
| <i>Number of Hybrids</i> | | | | | 10 | | | | | |

APPENDIX L: WAYNE NATIONAL FOREST RARE SPECIES

Federal Threatened or Endangered Animal Species

- *Indiana bat
- bald eagle
- American burying beetle
- fanshell
- pink mucket

State or Regional Endangered Animal Species or Species of Special Interest

- | | |
|----------------------|----------------------|
| evening bat | lake chubsucker |
| *sharp-skinned hawk | eastern sand darter |
| river otter | Wabash river cruiser |
| *red-shouldered hawk | grizzled skipper |
| *cerulean warbler | Olympia marble |
| Henslow’s sparrow | round hickorynut |
| *timber rattlesnake | lilliput |
| eastern hellbender | little spectaclecase |
| Ohio lamprey | salamander mussel |
| *Eastern box turtle | *bobcat |
| *black bear | |

Federal Threatened or Endangered Plant Species

- northern monkshood
- small whorled pogonia
- Virginia spiraea
- running buffalo clover

Regional Sensitive Plant Species

- juniper sedge
- Bicknell’s panicgrass
- yellow gentian
- striped gentian
- butternut
- umbrella magnolia
- Philadelphia panicgrass
- yellow-fringed orchid
- rock skullcap
- pigeon grape

*Indicates species verified in the Raccoon Creek watershed

•Indicates species verified in Raccoon Creek counties

Sources: Kathy Flegel, district wildlife biologist, Wayne National Forest, Ironton office
Dave Swanson, ODNR Division of Wildlife, Waterloo Research Station, New Marshfield

APPENDIX M: POPULATION & HOUSING BY TOWNSHIP

| Population | | | Occ. Hsg. | | Rented |
|--------------------|-----------|------------|-----------|-----------|-----------|
| | Pop1900 | Pop2000 | Units | Owned | |
| Ohio | 4,157,545 | 11,353,140 | 4,087,546 | 2,758,131 | 1,329,415 |
| Appalachia | 971,844 | 1,455,313 | | | |
| Athens Co. | 38,730 | 62,223 | 22,501 | 13,605 | 8,896 |
| Lee | | 2,531 | 1,040 | 809 | 231 |
| Waterloo | | 2,605 | 1,023 | 820 | 203 |
| York | | 7,740 | 3,045 | 1,744 | 1,301 |
| Gallia Co. | 27,918 | 31,069 | 12,060 | 9,033 | 3,027 |
| Clay | | 1,877 | 718 | 605 | 113 |
| Green | | 5,514 | 2,161 | 1,607 | 554 |
| Harrison | | 1,003 | 360 | 295 | 65 |
| Huntington | | 1,511 | 559 | 472 | 87 |
| Morgan | | 1,341 | 500 | 415 | 85 |
| Perry | | 1,276 | 453 | 384 | 69 |
| Raccoon | | 2,302 | 772 | 551 | 221 |
| Springfield | | 3,181 | 1,189 | 978 | 211 |
| Hocking Co. | 24,398 | 28,241 | 10,843 | 8,204 | 2,639 |
| Starr | | 1,477 | 546 | 451 | 95 |
| Washington | | 1,160 | 407 | 342 | 65 |
| Jackson Co. | 34,248 | 36,641 | 12,619 | 9,328 | 3,291 |
| Bloomfield | | 896 | 341 | 267 | 74 |
| Coal | | 2,078 | 780 | 601 | 179 |
| Lick | | 2,682 | 1,038 | 801 | 237 |
| Madison | | 2,171 | 836 | 632 | 204 |
| Milton | | 1,119 | 413 | 352 | 61 |
| Washinton | | 743 | 257 | 227 | 30 |
| Meigs Co. | 28,620 | 23,072 | 9,234 | 7,332 | 1,902 |
| Columbia | | 1,018 | 400 | 336 | 64 |
| Salem | | 944 | 355 | 290 | 65 |
| Vinton Co. | 15,330 | 12,806 | 4,892 | 3,808 | 1,084 |
| Brown | | 281 | 107 | 80 | 27 |
| Clinton | | 2,045 | 756 | 583 | 173 |
| Elk | | 3,134 | 1,230 | 779 | 451 |
| Jackson | | 714 | 273 | 236 | 37 |
| Knox | | 599 | 216 | 185 | 31 |
| Madison | | 682 | 264 | 210 | 54 |
| Richland | | 1,667 | 604 | 497 | 110 |
| Swan | | 796 | 308 | 257 | 51 |
| Vinton | | 558 | 226 | 195 | 31 |
| Wilkesville | | 888 | 358 | 313 | 45 |

APPENDIX N: PUBLIC MEETING & FOCUS GROUP SUMMARIES

Public Meeting Summaries

Raccoon Creek Management Plan Public Meeting

Carbondale, Ohio
December 6, 2000

6:00 – 6:30 Open house with displays (Athens SWCD, Raccoon Creek Improvement Committee (RCIC), ODNR Division of Mineral Resources Management, and ILGARD had displays and literature for local citizens). During the open house period ILGARD staff had an opportunity to discuss the watershed approach to planning and discuss any concerns on a one-to-one basis. The following handouts were available: description of current projects in the watershed, fact sheet on using a watershed approach, the Little Raccoon Creek Brochure, RCIC brochure and a survey to determine local concerns.

Citizens were given three ways in which to participate in the meeting and share their concerns including: 1) the completion of the survey, 2) one-to-one conversation during open house period, or 3) group discussion after the guest speaker. Overall, approximately 42 people participated in the meeting.

6:30 – 7:10 The meeting began by welcoming local citizens and discussing the purpose of the meeting. Local citizens were invited to the meeting to learn about the watershed planning process, the importance of their participation and how this plan will help direct future work in the watershed. Mitch Farley with the ODNR Division of Mineral Resources Management (MRM), gave a presentation on the commitment of MRM to work in partnership with watershed groups, government agencies and private industry to work on abandoned mines lands to restore water quality to pre-mining conditions. Acid mine drainage is one of the main causes of poor water quality in the Raccoon Creek watershed. He discussed several projects, past and present, in the watershed and various remediation techniques and funding sources used to support these projects.

7:10 – 9:00 The rest of the meeting was an open discussion to give participants an opportunity to express their concerns/issues. The following list was generated (not in any particular order of importance):

Logjams in Creek/Beaver dams: need for removal and to find the funding for it. Many questions were asked concerning funding sources to support logjam removal. Hewett Fork of the creek was mentioned as an area with a large number of logjams.

Silt – clogging stream flow and culverts—causing back up of water and flooding. Silt washing off of strip mines was one cause identified. Two specific areas were mentioned where flooding takes place: over st. rt. 278 and near the old Lake Hope General Store. The question of responsibility for culvert maintenance was also raised—many mentioned that there seems to be little to no maintenance by ODOT.

Flooding – on private property and on roadways

Litter/trash – residential trash was sited, particularly on small 1 acres or less lots.

Lack of sewage treatment systems – especially on small residential lots. Concerns were raised as to whether home sewage treatment policies were being properly followed in the area.

Lack of enforcement of policies/regulations – example given of an area that was strip mined very close to a local community. Some questions were raised about the policies or if there are laws that are not being enforced properly.

Floodplain development – many questioned if there are regulations that prohibit or limit floodplain development. If so, what are they?

Acid Mine Drainage – a couple of people stressed their concern about AMD and its effect on water quality. They also wanted to make it clear that the AMD problem is not from the old coal mines of the late 1800 –mid 1900s, but the mining of the 60s and 70s that they feel is causing a majority of the problem now.

No Swimming in the Creek on State Forest Park land – How can we change this?

Need Small-Mouthed Bass in the creek for fishing - one participant mentioned that there is funding for sport fishing available – Could this be used for some restoration work?

Need for increased and improved recreational opportunities

Need for access to and knowledge of funding sources

Need to get back more of the coal excise tax funding for AMD work

Need for better jobs in the area

Raw Sewage in Creek – some concerns were raised about the placement of septic systems too close to the creek. A question was raised as to Health Department regulations in terms of placement of septic tanks and if it varies by county. In addition, a question was asked about using a composting system.

Gray water in Creek

Need to remove debris along and within the entire

Education is needed on flooding issues – one participant mentioned that flooding of the stream is natural. Another person indicated that the stream floods more frequently now than in years past –the flow is more restricted due to development pressures.

Need for road elevation in some areas

More development, more runoff – land use changes

There is a need for some rural zoning

Lack of communication between local community and local elected officials

Loss of historical resources

Meeting Adjourned

Raccoon Creek Management Plan Public Meeting

McArthur, Ohio

March 28, 2001

6:30 – 7:00 Open house with displays from the Vinton County Soil & Water Conservation District, Raccoon Creek Improvement Committee, and ILGARD. During the open house period ILGARD staff had an opportunity to discuss the watershed approach to planning and discuss any concerns on a one-to-one basis. Two handouts were available, one describing current projects in the watershed and the other detailing information on using a watershed approach.

Citizens were given three ways in which to participate in the meeting and share their concerns including: 1) the completion of a survey, 2) one-to-one conversation during open house period, or 3) group discussion after the guest speaker. Overall, approximately 32 people participated in the meeting.

7:00–7:35 The meeting began by welcoming local citizens to participate in the planning process and a brief description of how this plan will help direct future work in the watershed. Bob Eichenberg, Athens County Planner, was the guest speaker providing information on the basic reasons for planning and the following:

- A planner's primary obligation is the public interest
- Many challenges faced by planning--including strong private property rights and the disappearance of the family farm
- Consequences of ignoring planning (e.g. building in the floodplain and floodway has led to property damage during major flood events)
- Comprehensive planning in a county is important –taking a holistic approach – looking at economic development initiatives to environmental restoration and smart growth

- Tools for planning--zoning (including floodplain management), building codes, subdivision regulations
- Planning issues and needs in southeastern Ohio, e.g. floodplain management, utility mapping (water)

7:35 – 8:25 An open discussion took place with local citizens to give them an opportunity to express their concerns. To encourage discussion, surveys were tallied during the guest presentation and presented to the group by major areas of concern. This allowed people to discuss specific issues, or pinpoint key areas that need to be addressed. Following is a list generated from the meeting (not in any particular order of importance):

- **County Planning:**
 - Important to get involved in planning commission
 - Issues to discuss – rural water, smart growth, revitalization of existing structures
 - A lot of planning is being done—people want to see work done, results
- **Recreation/Tourism**
 - help improve economic health of area
 - Bikeway extensions – Zaleski to Mineral and Lake Hope to McArthur
 - Canoe Livery on Raccoon Creek
- **Communication**
 - Better communication and networking between citizen groups and local government to come to consensus
 - More involvement by local media
 - Better communication with absentee landowners about projects
 - Engage local groups in projects –CCC camp, Union Operating Engineers (training site in Logan)
- **Funding**
 - Funding opportunities at the County level – CDG/ OVRDC
- **Logjams**
 - Logjams big problem in creek – however some logjams act as habitat due to heavy sediment in creek
- **Littering/Illegal dumping**
 - Roadside littering
 - Set up area dumpsters to address littering/dumping problem
 - Can local townships support litter clean up by bringing in a trash truck on a regular basis (monthly)?
 - Litter campaign in schools

- **Flooding**
 - along Elk Fork
- **Sediment in creek**
 - number of causes—poor logging practices, poorly reclaimed lands, beavers cutting trees on banks..

8:25 – 8: 30 Ranking of problems – Before closing the meeting participants were asked to rank their top five concerns. Each person was given 5 red dots –dots could be distributed according to their top concerns, e.g. – 5 dots on one item, 1 dot per item, etc. The list below was taken from the survey that participants completed at the beginning of the meeting. When the surveys were tallied most issues were checked at least once. For this reason we wanted to give everyone the full list for the ranking exercise. Below is a breakdown of the number of dots per issue in order of importance:

- Litter, illegal trash dumping -**14**
- Loss of historical resources – **11**
- Acid Mine Drainage (from past coal mining practices) – **9**
- Stream debris (logjams) – **9**
- Flooding - **7**
- Pollution from oil and gas wells and other hazardous materials – **6**
- Low abundance of fish and other wildlife - **5**
- Erosion and sedimentation - **4**
- Stability of stream banks (loss of trees, wetlands, floodplain development etc). - **4**
- Fixing areas that were poorly reclaimed in 1960's/70's - **4**
- Poor sewage/waste disposal practices – **4**
- Agricultural Pressures (soil loss, grazing, pesticide/fertilizer run-off, habitat loss) - **3**
- Forestry concern (soil and vegetation loss, habitat modification) – **3**
- Changing the natural flow of the stream (dredging, dry dams etc). - **2**
- Lack of recreational opportunities - **1**
- Toxic contamination of fish and other organisms – **1**
- Lack of communication between different levels of government and community organizations - **0**
- Need for sustainable jobs and industry in the area - **0**
- Lack of educational opportunities to learn about the Raccoon Creek -**0**
- Poor drinking water - **0**

Meeting Adjourned

Raccoon Creek Management Plan Public Meeting
Rio Grande, Ohio

June 13, 2001

6:30 – 7:00 Open house with displays and literature from the Gallia County Soil & Water Conservation District, Raccoon Creek Improvement Committee, and ILGARD. During the open house period ILGARD staff had an opportunity to discuss the watershed approach to planning and discuss any concerns on a one-to-one basis. Two handouts were available, one describing current projects in the watershed and the other detailing information on using a watershed approach.

Citizens were given three ways in which to participate in the meeting and share their concerns including: 1) the completion of a survey, 2) one-to-one conversation during open house period, or 3) group discussion after the guest speaker. Twenty-six people participated in the meeting.

7:00–7:45 The meeting began by welcoming local citizens to participate in the planning process and a brief description of how this plan will help direct future work in the watershed. Dan Kush with the ODNR, Division of Soil and Water Conservation, was the guest speaker providing information on the effects of habitat modifications and non point source pollution on a stream's water quality and aquatic resources. Throughout the state of Ohio the number 1 impairment to our streams is habitat modification (e.g., rechannelization of streams, excess sedimentation). In southeastern Ohio the main cause of impairment to our streams is acid mine drainage from old abandoned coal mines. Many things factor into the health of a stream such as temperature, pH, and the condition of the stream habitat (e.g. natural substrate and health, stabilizing riparian).

7:45 – 8:45 An open discussion took place with local citizens to give them an opportunity to express their concerns. To encourage discussion, surveys were tallied during the guest presentation and presented to the group by major areas of concern. This allowed people to discuss specific issues, or pinpoint key areas that need to be addressed. Following is a list generated from the meeting (not in any particular order of importance):

Poor Sewage and waste disposal practices

- Bidwell/Porter Water Improvement Project
 - Discharge into Barren Creek regardless of flow.
 - Discharge is black gooey substance—water in stream is black
 - Would like to see substance evaluated by independent laboratory and a sediment test done.
 - Village of Vinton

Flooding

- Around St. Rt. 35, above Bob Evans Farm between 554
- Filling of the floodplain along the Ohio River—who has jurisdiction to regulate this? Army Corps? Local government enacted floodplain regulations?

Past Coal Mining Practices

- Reclaimed lands are hard like concrete—water rushes over depositing sediment into stream
- Little Raccoon Creek—1/2 mile upstream from Sands Hill Coal Offices—AMD problem
- Need for forest mgmt practices-land was once forested—return to original land use

Stream Debris

- Log jams

8:45 – 9: 00 Ranking of problems – Before closing the meeting participants were asked to rank their top five concerns. Each person was given 5 red dots –dots could be distributed according to their top concerns, e.g. – 5 dots on one item, 1 dot per item, etc. The list below was taken from the survey that participants completed at the beginning of the meeting. When the surveys were tallied most issues were checked at least once. For this reason we wanted to give everyone the full list for the ranking exercise even though all topics did not come up during the open discussion. Below is a breakdown of the number of dots per issue in order of importance:

- Poor sewage/waste disposal practices – **28**
- Stability of stream banks (loss of trees, wetlands, floodplain development etc). – **10**
- Flooding – **6**
- Lack of communication between different levels of government and community organizations –**5**
- Acid Mine Drainage (from past coal mining practices) – **4**
- Erosion and sedimentation - **3**
- Litter, illegal trash dumping –**3**
- Lack of educational opportunities to learn about the Raccoon Creek -**2**
- Low abundance of fish and other wildlife - **2**
- Lack of recreational opportunities – **1**
- Changing the natural flow of the stream to the detriment of its health - **1**

Meeting Adjourned

Raccoon Creek Management Plan Public Meeting

Vinton, Ohio
October 30, 2000

6:30 – 7:15 Open house with displays (Gallia SWCD, OEPA, Raccoon Creek Improvement Committee, and ILGARD had displays and literature for local citizens). During the open house period ILGARD staff had an opportunity to discuss the watershed

approach to planning and discuss any concerns on a one-to-one basis. Two handouts were available, one describing current projects in the watershed and the other detailing information on using a watershed approach.

Citizens were given three ways in which to participate in the meeting and share their concerns including: 1) the completion of a survey, 2) one-to-one conversation during open house period, or 3) group discussion after the guest speaker. Overall, approximately 35 people participated in the meeting.

7:15 –8:15 The meeting began by welcoming local citizens to participate in the planning process and a brief description of how this plan will help direct future work in the watershed. Jim Grow, Environmental Specialist with OEPA, gave a presentation on various methods used to determine number of fish species/diversity within Ohio streams. Related to this topic, Jim discussed the negative impacts of certain practices and land use decisions made by humans that continue to have an adverse effect on the health of our streams and its aquatic life. Some impacts mentioned that our applicable to Raccoon Creek included unreclaimed abandoned mine lands; agricultural practices (livestock in streams); clearing of riparian zones; and removal of stream channel habitat.

8:15 – 9:00 The rest of the meeting was an open discussion to give participants an opportunity to express their concerns. The following list was generated (not in any particular order of importance):

Logjams in Creek: need for removal and to find the funding for it. The Village of Vinton was able to remove quite a few logjams in town; however, a need to organize local landowners along the creek in order to have a contiguous section of the creek to clean/remove logjams is difficult.

Sedimentation/debris clogging stream flow – dredging was expressed as a high priority

Bank erosion – bank stabilization projects can be labor intense and expensive—what are some funding sources

Flooding – much concern was noted by citizens – what is causing the flooding? Two projects were discussed: Army Corps of Engineers will be conducting a study to look at potential stream channel modifications. In addition, the Ohio EMA is conducting a study to look at resident buy-outs or raising homes in the floodplain.

Need for county planning/rural zoning – too easy to get a permit to build in the floodplain

Storm water runoff - Runoff behind St. Rt. 160 – debris/sediment clogging culverts preventing access to creek—homes are flooding
- concern-continuous maintenance is needed to clean drainage ditches, culverts- no one is stepping forward to do it—landownership issue at hand and there is a cost factor

Waste treatment/ Sewer system

Loss of recreational opportunities – pretty section of Raccoon Creek that runs through Vinton—can not be canoed because of all the logjams

Development pressures/ Land use changes - Less water today in tributaries to creek than years ago.

Lack of Environmental Education – need to promote best management practices, TMDL process

Land ownership conflicts between families – in terms of responsibility for maintenance work that is needed

Below is a breakdown of questions asked on the survey and responses.

1. Primary use of land: 1 A. Agriculture 11 B. Residential Only
 5 C. Commercial – non-agri
2. Is your property on the border of or adjacent to Raccoon Creek or one of its tributaries?
 - i. 11 Yes 2 No
3. Do you fish or hunt on or near Raccoon Creek or one of the tributaries of Raccoon Creek? 8 Yes 5 No
4. Do you use Raccoon Creek or one of its tributaries for recreational purposes, other than hunting or fishing? 6 Yes 7 No
5. Please list your main natural resource concerns or other issues that need to be addressed in the Raccoon Creek Watershed or any of its tributaries. (the number after the issue indicates the # of people that wrote this).

Erosion – 2

Logjams – 4 Comment: keeping the creek bed free of litter, fallen trees and foreign objects

Flooding – 8 Comment: what are the reasons behind the continual flooding?

Money – 1

Storm drain sewers – 1

Clogged Culverts – 1

Run off – 1

Clean Water- 1

Clean Environment – 1

Bank debris – 1

Meeting Adjourned

Raccoon Creek Management Plan Public Meeting

Wellston, Ohio

April 11, 2001

6:30 – 7:00 Open house with displays from the Jackson County Soil & Water Conservation District, Raccoon Creek Improvement Committee, and ILGARD. During the open house period ILGARD staff had an opportunity to discuss the watershed approach to planning and discuss any concerns on a one-to-one basis. Two handouts were available, one describing current projects in the watershed and the other detailing information on using a watershed approach.

Citizens were given three ways in which to participate in the meeting and share their concerns including: 1) the completion of a survey, 2) one-to-one conversation during open house period, or 3) group discussion after the guest speaker. Eleven people participated in the meeting.

7:00–7:35 The meeting began by welcoming local citizens to participate in the planning process and a brief description of how this plan will help direct future work in the watershed. John Husted with the ODNR, Division of Mineral Resources Management, was the guest speaker providing information on the Abandoned Mine Land (AML) program in Ohio. The main purpose of the program is to investigate citizen’s complaints related to mining (primarily coal) that occurred prior to May 7, 1977. The program staff work on the development, design and construction of the highest priority abandoned mine land sites based on public health and safety and environmental criteria. They strive to develop new and innovative reclamation technologies and reforest abandoned mine lands.

Husted explained that AML problems are classified in three categories based on their seriousness.

- Emergencies (highest priority) - An immediate threat to the safety of the public;
- Health and Safety Problems (second priority) - A high risk of personal injury or significant property damage;
- Land and Water Restoration (third priority) - Nuisance situations or purely environmental problems.

Mine Subsidence is often a high priority when an immediate threat to the safety of the public is identified. There are 37 counties in Ohio (primarily in the eastern and southeastern part of the state) with underground mines, which can be higher risk areas for subsidence due to the deterioration and collapse of rock into the underground mines.

Husted indicated that local land use planning could help prevent problems if citizens considered some of the following items:

- Site Reviews
 - –Subdivision regulations and building permits can require land capability analysis
 - –Planning can require that certain land uses not be permitted over unstable mines
- Discuss mining history with knowledgeable local people and ODNR staff
- Review available resources
 - Mine maps from ODNR

- –Well logs from ODNR

ODNR has recently completed an internet based underground mine locator system which allows people to create maps showing the locations of old underground coal mines in Ohio. You can create a map by zip code or county. You can now access this program on-line at their web site - <http://content.ag.ohio-state.edu/dmr/aml/index.html>

7:35 – 8:45 An open discussion took place with local citizens to give them an opportunity to express their concerns. To encourage discussion, surveys were tallied during the guest presentation and presented to the group by major areas of concern. This allowed people to discuss specific issues, or pinpoint key areas that need to be addressed. Following is a list generated from the meeting (not in any particular order of importance):

Environmental Education

- Fact sheets with information, which describes what is good and bad –many people see things that are visually unappealing, but it could be okay.
- Stream signage, kiosks describing stream processes
- Vandalism –unfortunately some good efforts to educate people through signage has seen the brunt of abuse by vandals—we need to see more enforcement assistance in terms of increased fines, etc. to reduce these problems.

Acid Mine Drainage

Erosion and sediment load in the creek

Litter and illegal dumping activities

- Specific sites - Broken Aro, Mulga Run road
- Need to increase public awareness of problem
- Increased enforcement of local litter laws is needed - more involvement from the Solid Waste District

Logjams

- Difficult for recreation

Recreation

- Canoeing on the creek
- Start a Canoe Day or Club – this will help to increase public awareness of the creek

Pollution of oil and gas wells

- More research needs to be done to identify sources of pollution
- Division of Mineral Resources Mgmt has an orphan well program for the capping of abandoned wells.

Amount of land in reclaimed strip mined ground –need for Forest Management /Improving Riparian Health

- Develop relationship with MeadWestvaco – increase partnerships
- Need more information on resources to assist with proper mgmt techniques
- Resources to explore grasslands to forested lands –
 - Governor’s Bicentennial Legacy Program in Ohio
 - Wildlife Federation
 - Global Releaf
 - Heartwood
 - MeadWestvaco cost share program

8:45 – 9: 00 Ranking of problems – Before closing the meeting participants were asked to rank their top five concerns. Each person was given 5 red dots –dots could be distributed according to their top concerns, e.g. – 5 dots on one item, 1 dot per item, etc. The list below was taken from the survey that participants completed at the beginning of the meeting. When the surveys were tallied most issues were checked at least once. For this reason we wanted to give everyone the full list for the ranking exercise. Below is a breakdown of the number of dots per issue in order of importance:

- Stream debris (logjams) – 7
- Toxic contamination of fish and other organisms – 7
- Poor sewage/waste disposal practices – 4
- Acid Mine Drainage (from past coal mining practices) – 4
- Erosion and sedimentation - 3
- Litter, illegal trash dumping –2
- Lack of educational opportunities to learn about the Raccoon Creek -2
- Low abundance of fish and other wildlife - 1
- Pollution from oil and gas wells and other hazardous materials – 1
- Poor drinking water - 1
- Stability of stream banks (loss of trees, wetlands, floodplain development etc). - 1
- Forestry mgmt. concern (soil and vegetation loss, habitat modification) – 1
- Lack of communication between different levels of government and community organizations -1

Meeting Adjourned

Raccoon Creek Management Plan Public Meeting

Wilkesville, Ohio

March 1, 2001

6:30 – 7:00 Open house with displays (Streamulator, Division of Wildlife, Raccoon Creek Improvement Committee, and ILGARD had displays and literature for local citizens). During the open house period ILGARD staff had an opportunity to discuss the watershed approach to planning and discuss any concerns on a one-to-one basis. Two handouts were available, one describing current projects in the watershed and the other detailing information on using a watershed approach. Citizens were given three ways in which to participate in the meeting and share their concerns including: 1) the completion of a survey, 2) one-to-one conversation during open house period, or 3) group discussion after the guest speaker. Overall, approximately 43 people participated in the meeting.

7:00–7:40 The meeting began by welcoming local citizens to participate in the planning process and a brief description of how this plan will help direct future work in the watershed. Mike Greenlee, ODNR Division of Wildlife, gave a presentation on various riparian habitat best management practices. He had an excellent Powerpoint presentation of good and bad riparian conditions and practices that he has seen around the state of Ohio. Some impacts mentioned that our applicable to Raccoon Creek included unreclaimed abandoned mine lands; agricultural practices (uncontrolled livestock in streams); clearing of riparian zones; and removal of stream channel habitat.

7:40 – 8:20 An open discussion took place with local citizens to give them an opportunity to express their concerns. To encourage discussion, surveys were tallied during the guest presentation and presented to the group by major areas of concern. This allowed people to discuss specific concerns, or areas that need to be addressed. Following is a list generated from the meeting (not in any particular order of importance):

Flooding

- Jackson County – SR 327: poor reclamation practices around Little Raccoon Creek’s Dixon/Dickason Run—this has caused a major sediment problem in the creek and the stream rechannelization.
- Wellston area –severe flooding takes place
- Beavers cutting trees on banks— worsening riparian stabilization problems
- Beaver dams – cause of flooding problem?
- Logjams – biggest concerning –logs crossing creek – completely blocking flow
- US 35 through Rio Grande (mainstem of creek flows under US 35 at Bob Evans Farm) –area of sitting water for long period after heavy rains–highway acting as a barrier
- Robert C. Byrd dam on Ohio River – since building of dam, flooding at mouth of Raccoon Creek in Gallia County is more prevalent. Higher pool levels on the Ohio River is leading to higher pool levels on the mainstem of Raccoon Creek at the mouth.

Sedimentation / Erosion

- More development –increased runoff

- Upstream of Wilkesville – reclaimed lands – land not returned to original land use – fewer trees – now in grass
- Bank slips – stream runs on both sides of slip – forms island
- Wilkesville – upstream of covered bridge – potential bank slip

Acid Mine Drainage

- Above St. Route 124 – deep mine seeps
- St. Route 160 – Dundas area- Pierce Run – AMD coming off of old reclaimed sites.
- Near County Road 26 – AMD in creek

Sewage

- Near Co. Rd. 26 draining into creek
- Bidwell – along St. Rt. 554 –sewage plant –plant seems to be releasing at all times even during low to no flow in creek.

8:20 – 8: 30 Ranking of problems – Before closing the meeting participants were asked to rank their top five concerns. Each person was given 5 red dots –dots could be distributed according to their top concerns, e.g. – 5 dots on one item, 1 dot per item, etc. The list below was taken from the survey that participants completed at the beginning of the meeting. When the surveys were tallied all issues were checked at least once. For this reason we wanted to give everyone the full list for the ranking exercise. Below is a breakdown of the number of dots per issue in order of importance:

- Acid Mine Drainage (from past coal mining practices) – **26**
- Flooding - **16**
- Erosion and sedimentation - **12**
- Changing the natural flow of the stream (dredging, dry dams etc). - **12**
- Loss of historical resources – **11**
- Litter, illegal trash dumping -**10**
- Agricultural Pressures (soil loss, grazing, pesticide/fertilizer run-off, habitat loss) - **9**
- Forestry concern (soil and vegetation loss, habitat modification) – **9**
- Fixing areas that were poorly reclaimed in 1960's/70's - **8**
- Lack of recreational opportunities - **6**
- Stream debris (logjams) – **5**
- Poor sewage/waste disposal practices – **4**
- Low abundance of fish and other wildlife - **4**
- Lack of communication between different levels of government and community organizations - **2**
- Pollution from oil and gas wells and other hazardous materials - **2**
- Toxic contamination of fish and other organisms - **2**
- Need for sustainable jobs and industry in the area - **1**
- Lack of educational opportunities to learn about the Raccoon Creek -**0**

- Stability of stream banks (loss of trees, wetlands, floodplain development etc). - 0
- Poor drinking water - 0

Meeting Adjourned

FOCUS GROUP SUMMARIES

Acid Mine Drainage Focus Group Meeting

December 7, 2001

ILGARD, Ohio University

Attendees: Mitch Farley and Mary Ann Borch, ODNR Division of Mineral Resources Management; Dan Imhoff and Keith Orr, Ohio EPA; Brett Laverty, Vinton SWCD; Chip Rice, ILGARD; Rachael Hoy, ILGARD.

The purpose of the meeting was to discuss the issue of Acid Mine Drainage in the Raccoon Creek watershed. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, Acid Mine Drainage ranked number 1. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and the goals and objectives that are developed as a guide to future restoration work in the watershed.

The discussion began with a description of other planning processes that are ongoing in the watershed to identify AMD problems and develop solutions. The Acid Mine Drainage Abatement and Treatment plan, which is funded by ODNR, Division of MRM identifies key AMD producers in the watershed and prioritizes restoration projects according to their ability to reduce the acid load to the stream. The Total Maximum Daily Load planning process, which is conducted by Ohio EPA, looks at all impaired stream miles, the causes and sources for the impairments and recommends solutions for restoration of all streams to their use designation. The TMDL in Raccoon Creek is primarily a study of the AMD problem. It was decided by the focus group that the Raccoon Creek Management plan could develop activities to support these restoration projects in the overall effort to restore the health of stream.

Agreed Goal for the Management plan: Reduce the effects of acid mine drainage in an effort to achieve a healthy stream.

Indicator: All stream segments will meet WWH by reducing the AMD loadings so that this is not the limiting factor in improving the health of the stream.

Role of Mgmt plan for AMD:

- Track # of sources identified and those eliminated through various planning processes
- Look at other studies in similar settings, such as PA. Targets for alkalinity are set for restoration targets.
- Establish a long term sampling plan for water quality (quarterly) and biology (every 5 years) to gauge effectiveness of past treatment projects.
 - Review existing monitoring cycles developed for AMDAT plans to assist in developing long term monitoring plan.
 - Establish sample net--minimum # of sites on mainstem, downstream of main tributaries.
 - Evaluate sampling techniques- QA/QC
 - Group I sampling and flow to be taken at each site
 -
 - Establish location of biologic sampling with assistance from OEPA and Midwest Biodiversity Institute
 - Establish qualitative assessment of habitat sites - QHEI
 - Establish frequency of sampling
 - Create a strategy for long term funding of monitoring plan.
 -
 - Little Raccoon Creek long term monitoring sites for water quality are set--need to set biology
- Identify sediment indicators where past coal mining has contributed to the degradation of the stream.
 - Look at past studies--e.g. West Branch of Shade River; Troutman's (?) Fish in Ohio--looks at pre-settlement, pre-mining; OEPA sediment studies in MD.
 - Nature, source, movement studies are needed for sediment
 - Identify AML sites and map
- More research is needed to look at the AMD affects on the biology in the creek--physical and chemical--develop indicators
- Research Iron/Aluminum floc as a recoverable resource- what are the economic possibilities or market for this. (look at PA study).
- Work to diversify funding--private and public to fund AMD restoration efforts --model Virginia Endowment. Develop a private funding initiative--present to funders the importance of AMD restoration as a community development project.
- Stay connected to the Eastern Coal Region Roundtable
- Explore benefits of reclamation to the local community--evaluate some of our past projects and those in other states
 - Develop case studies of clean streams and their economic impacts on an area (PA, MD), industries, recreational activities that move in.
 - Interview groups of interests--Small mouth Bass Alliance
 - Research community willingness to pay--cost/benefit--\$ they will place on stream restoration.
 - Research demographic information in the watershed to see if there is any correlation with dead streams. (Environmental Justice study)
- Research AMD impacts on biology

- University student research -- presence of macroinvertebrates and different AMD constituents
- Refine our ability to use biology as an indicator in AMD impacted areas
- Educate local population of stream degradation due to AMD through;
- Volunteer sampling efforts, both water quality and biology
- Tours
- Develop RC forum and citizen group's capacity to do sampling with assistance from OU faculty, watershed coordinator and agency staff. Look at Craig Manes model in WV- Downstream Alliances--which has trained citizens to do this type of work.

Flooding Issue Focus Group Meeting

October 9, 2001

Village of Vinton

Attendees: Don Woethe, Mayor of Rio Grande; Chip Rice, ILGARD; Brett Laverty, Vinton SWCD; Randy Breech, Floodplain Administrator Village of Vinton; Donna Dewitt, Mayor Village of Vinton; Vance Rannells, RCIC; Glenn Stout, Vinton Co. Health Department; Gary Radabaugh, Jackson Co. Floodplain Administrator

The purpose of the meeting was to discuss the issue of flooding throughout the Raccoon Creek watershed. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, flooding ranked number 2. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and goals and objectives for that are developed as a guide to future restoration work in the watershed.

The summary that follows includes some group discussion about specific flooding issues and how the Raccoon Creek partners can work toward assisting with this issue.

- Generally most participants felt that the flooding issue should be approached from an education standpoint. There seems to be a lot of misinformation out there about flooding, its causes, etc.
- Who needs to be educated? Builders, contractors, public officials, general public—we rely too much on prosecutors, judges to know the regulations and enforce them properly.
- There are conflicting goals –builders/contractors—promoting growth (This unfortunately can lead to increased run-off, sedimentation in the creek if proper management practices are not used) Versus maintaining an adequate floodplain for the natural process of flooding to occur.
- An education program could target Best Management Practices for supporting proper floodplain management
- Gallia would like to re-write their flood ordinances – there is a problem with people building very close to the river bank—they are elevating the land to

- comply with floodplain regulations, however, a full hydrologic analysis is not begin done to show the effects of this on people living down stream.
- What are a landowners rights? Landowners must comply with floodplain regulations. Different management practices could be introduced to landowners, through fact sheets/workshops related to the importance of riparian buffers.
 - What are some other practices that can exacerbate flooding problems?
 - Poor logging practices,
 - abandoned mine lands,
 - elevating property to build in the floodplain;
 - cleared areas, overgrazed areas, exposed soils-can lead to erosion-infilling of creek
 - sedimentation (changes the depth of a creek –can lead to small floods which is a nuisance for landowners) ,
 - beaver dams
 - road construction
 - farming to close to edge of creek, or other activities that have involved weakening of stream bank stability
 - logjams
 - loss of wetlands
 - undersized bridges and culverts on small roads and driveways
 - Building permits are required in the watershed, but some counties do not have construction codes in place—Gallia does not have a unified building code
 - What are some areas that the Raccoon Creek partners could work on:
 - Mapping key areas in the watershed that flood—large scale mapping
 - Document land use changes in the watershed
 - Identify roads that are often under water during floods
 - Bridges are often built above the 100 year floodplain—put marks on bridges as an educational tool to show that structures should be built above this.
 - Research any studies that have been done on the displacement of water during floods and the use of dry dams.
 - Assist local communities with floodplain mgmt. plans (through the funding available from ODNR’s Floodplain Mgmt program)
 - Tie into Bicentennial activities—look into Legacy funding for stream bank restoration project.
 - Research the use of fly ash for bank stabilization projects (AEP has used this in a few areas in Gallia County
 - Develop a citizen/volunteer/student program to set up rain gauges to collect a weekly average around the watershed. Also build measuring sticks/staffs to track water stages during flood events at areas that have been identified as flooding frequently.

Other people to involve in this process:

- Todd Gibson
- Terry Hemby
- Mike Null
- Dave Bollinger
- Drew Todd

Sewage Focus Group Meeting
October 3, 2001

Attendees: Kurt Simon, OVRC&D; Chip Rice, Raccoon Creek Coordinator; John Meredith, NRCS; Jerry Iles, OSU extension; Glenn Stout, RCIC president; Constance White, Program Administrator ODNR, SWCD, Rachael Hoy, ILGARD

The purpose of the meeting was to discuss the issue of sewage and waste disposal practices throughout the Raccoon Creek watershed. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, sewage ranked number 3. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and the goals and objectives that are developed as a guide to future restoration work in the watershed.

- OVRCD Board approved staff to move ahead in their ten county area to help counties develop county household sewage plans (in Raccoon Creek this would include Gallia, Jackson, Vinton)
- EPA guidelines have been provided outlining the plan structure
- Completing this plan makes counties eligible for the following funds: Section 319 funds are available on a watershed scale and Department of Environmental Financial Assistance (DEFA) offers low interest loans which is state money—it is also matchable with 319 \$--this funding can be applied for on a county basis. Money for DEFA has been building for years from loan repayments from municipalities for treatment facilities. --
- Steps in the planning process:
 - write plan—advantage—eligible for \$ from 319 program
 - connect with participating member (by signing a agreement with EPA)-banks—potential bank in area Oak Hill
 - Health dept determines need for replace septic—certificate issued by Health department
 - bank --holder of the loan—gets certificate from homeowner—application filled out for loan—pass financial test of bank—bank contacts DEFA –DEFA purchases a CD to by down the loan
- plan approved eligible for funding from EPA
- implementation through health department
- Vinton county rural hardship program –through DEFA—also on a loan basis. —Ken Reed Community Deve. Director in Vinton –in charge of distribution of \$.

Kurt:

- Jackson County has had their first meeting to start the planning process. Anticipated completion of the plan is July 2002.
- Buckeye Hills not moving forward with assisting counties with plans—Kurt talked to Bob First—10-10-01---will contact Athens and Hocking to hold meetings

Glenn:

- 10% of County sewer in McArthur
- 90% of county is household sewage systems—45-50% not functioning properly (approx. 50% of aerator systems and 30 % of septic systems not functioning properly) –main problem –lack of maintenance
- Vinton County needs an inspection program in order to increase staffing to monitoring systems.-Right now monitoring is done on a complaint basis.
- Vinton county currently receiving DEFA funding –no county wide plan as of yet—but Kurt will work on a timeline with Glenn to get started.
- there is an interest in group or cluster systems –Dundas is working on such a system for 65 households. This project will establish a permanent responsible body for the maintenance of the system—probably the township trustees. Monitoring responsibilities will be maintained by the Health department
- The village of Hamden will be connecting to Wellston treatment facility in 2003.
 - Hamden’s lack of a centralized sewage system has had a large human impact on the health of Raccoon Creek.
 - Hooking up to Wellston is the realistic solution with Hamden water supply hooked up to Wellston.
- Wilkesville – Dynergy powerplant site –possibility in opportunity with this industry to set up a sewage system (?)
- Vinton county could use some help with:
 - documenting failing systems
 - assistance with water quality testing
 - assistance with plan development
 - the county needs to be able to employ people for quick inspections

Other comments collected from County Health Department officials in the watershed to be incorporated into goals and objectives:

Gallia:

Zane stated that people must understand that activities conducted by the health department concerning their wastewater treatment systems are for their own benefit. It is difficult to get this idea across to people.

People simply cannot afford to install expensive, high-tech wastewater treatment systems and Zane finds it difficult to justify spending, for example, \$8000 on an on-lot system for a \$1500 trailer. Zane said that the most he could justify spending is about \$3500 to \$4000. He also said that it is nearly impossible to solve this problem without forcing the

residents to go bankrupt. Essentially, they just need to find a system that is economically feasible.

Meigs:

Mindy said that a lot of education is needed concerning the proper treatment of sewage/wastewater. She suggested that the local newspapers write articles about the topic. Local newspapers usually get a pretty big audience, so perhaps some informative articles would really get people to thinking and maybe even acting to make sure that their on-lot system is working properly.

Hocking:

Gene said that if proponents and drafters of this bill want to mandate regular inspections of on-lot systems, then they will have to figure out another way to fund those inspections (e.g. the cost of manpower) because most people won't support the idea of having to pay to have their system regularly inspected.

Glen also mentioned that "sewage treatment system" makes people feel a lot more comfortable than "sewage disposal system". Also it helps reinforce the idea that everything is connected and that water is reused and thus must be well treated.

Athens:

Are new incoming residents given any information concerning their responsibilities to make sure that their sewage/wastewater is effectively treated and disposed of?

No, and Jeff said that this is a major problem. He said that *education* is needed to inform people of their responsibilities. People need to know what their options are and how to maintain an effective on-site treatment system. They need to have a simple list of "do's and don'ts" for their septic system.

Are there any opportunities for residents to receive financial assistance to make sure that their on-site system is safe and effective?

Jeff mentioned a Rural Hardship Program that offered funding a few years ago, but other than that, assistance is hard to identify and it also very sporadic.

Trash/Illegal Dumping Focus Group Meeting

November 14, 2001
Vinton County SWCD

Attendees: Glenn Stout, Vinton County Health Department; Melissa Pennington, Extension; Jim Beckner; Solid Waste District; Chip Rice, ILGARD; Rachael Hoy, ILGARD.

The purpose of the meeting was to discuss the issue of trash and illegal dumping in the Raccoon Creek watershed. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, trash and illegal dumping ranked number 4. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and the goals and objectives that are developed as a guide to future restoration work in the watershed. Raccoon Creek Improvement Committee; Brett Laverty, Vinton SWCD; Jerry Iles, OSU

The following discussion ensued to brainstorm specific issues in the watershed, begin to identify a key goal (s), objectives and activities to work on:

- Small debris floats away and larger debris stays behind.
- Some people living along the creek dump their trash and it inevitably floats downstream
- Education is needed to help change some attitudes
 - Create fact sheets as needed—use existing information developed through Project Green Sweep.
 - Solid waste district has mapped all illegal dump sites in 4 county area—use this information as part of a media campaign to increase local awareness
- Identify hot spots along the stream and look into the possibility of dumpsters in these locations
- Identify sites on abandoned stripmined lands; commercial lands; public lands
- Increasing fines may be another way to curb “bad habits”
- Educate local officials with photos and presentations of the situation in their county
 - Other candidates for presentations: Construction companys, home improvement contractors; landowners who provide fill dirt; hunters
- Place information/flyers with homeowners who are having work done
- Create workshops for offenders specifically focusing on water quality issues
- Have prepared slide shows of dumpsites
- Plan Clean up events
 - school kids and 4h a few times annually
 - identify key sights to clean up along the creek with the Solid Waste District
 - get information out and get people involved in Adopt a Stream program

- groups to involve: Kiwanis, environmental groups, Lions; canoe groups, fishing clubs,
 - Consider planning a “Raccoon Creek Sweep” that would take place annual in targeted areas.
 - Target areas where recreational opportunities are high
 - As incentives for being involved in the clean ups—raffle off items for ex. A canoe
- Collaborate with Solid waste district in their educational program with schools to landfills, tours of sites, etc.
- Educating people of different alternatives to littering through:
 - Comprehensive lists of local haulers and recycling alternatives
 - Distribute to landowners on the creek, school kids, township trustees, commissioners
 - Trash pick-ups – pick certain areas annually-for example, Vinton Township plans clean ups on a regular basis.
 - Dumpsters at key locations
 - Advertise locations that offer special drop-off days
 - Develop incentive programs to people
 - Presentations that show good vs. bad--photos
 - Have locations for people to dump things that haulers and recycling centers might not take
 - Some townships have levies to support trash dumpsters/clean up efforts—research these examples.

Potential goal idea: Reduce amount of trash/illegal dumping throughout the watershed—mitigate the problem (keeping it from getting worse)

Objective ideas: Educate local citizens of the illegal trashing dumping problem in an effort increase awareness and begin to mitigate.

Identify and plan clean up activities to further reduce illegal dumping.

- Educate people on recycling efforts in local communities:
 - Gallia, Vinton and Meigs have drop off locations
 - Jackson –curbside and drop off

Who should be involved in these initiatives? ReUse Industries, Solid waste districts; ODNR Recycling program; County officials charged with these duties; Health departments

Stream Debris Focus Group Meeting

October 3, 2001

Vinton County SWCD

Attendees: Glenn Stout, Vinton County Health Department; John Meredith, NRCS; Brett Laverty, Vinton SWCD; Kevin Yost, Vinton SWCD; Chip Rice, ILGARD; Rachael Hoy, ILGARD.

The purpose of the meeting was to discuss the issue of stream debris in Raccoon Creek. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, stream debris ranked number 5. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and the goals and objectives that are developed as a guide to future restoration work in the watershed.

- Senator Carnes secured funding for a logjam removal program—35 five counties have participated at \$142,000/county. Each SWCD is 1 ½ years into the 3 year project.
 - This project was the first of its kind—a similar program, but still a little different—the Emergency Watershed Protection program under USDA—was a federal program, which aided in stream bank stabilization projects after major disasters.
 - 50 applications were received in Vinton County—25 in the Raccoon Creek watershed—projects have been reviewed on a first come first serve basis.
 - 12 projects have been completed—\$20,000 remaining—this may cover 10-15 small applications
 - SWCD supervisors are pleased with the program—it brings in new clients to the SWCD
 - Problems with this funding:
 - Citizens perceive this as reducing flooding
 - There is little chance that funding will be made available again in the future for this effort
 - Budgets are tight—hard to envision finding the funding elsewhere
- What is needed?
 - Riparian education program for citizens: look at land use practices, BMPs, discuss the natural function of a stream, logjams, failing banks
 - Workshops and tours are two ways to relay information
 - Look at other SWCD logjam removal programs –Jackson, Gallia—how successful have they been?
- Benefits of the logjam program--the money allowed for cosmetic changes –it would have been nice to use some \$ for some stream bank BMPs.
- It would be nice to prioritize logjams across SWCD districts to assist with those that are causing most severe property damage.
- Some ideas for ways the Raccoon Creek Partners can work on this:

- Create inventory of major problem areas and map, for example, St Rt. 278 at US 50 there is a clogged culvert; and Zaleski wetland –formed by railroad and beaver dams. Low head dams with built up debris against them—e.g. Vinton Co. and Gallia, below Bob Evans Farm
- Map current project sites and do follow up –develop a tracking system. Also look at impacts downstream.
- Encourage student research on log jams and the subsequent trapping of sediment and other debris moving downstream.
- Focus on new clients to SWCDs for education programs
- Look at State property and identify stream debris problems
- Research other county programs and their success
- Acquire local feedback on how logjams are perceived.
- Educate population on the natural function of the creek so that they can make informed decisions. This can be done through stream workshops, brochures, commercials, videos.
- Educate the population on beaver dams—understanding habitat advantages vs. how they cause problems (e.g. disrupt drainage, flood properties, road in floodplain). Discuss how to take care of beavers—e.g. winter trapping and benefits of them in wetlands.

Erosion and Sedimentation Focus Group Meeting

November 27, 2001

Vinton Furnace Experimental Forest

Attendees: Wayne Lashbrook, MeadWestvaco; Brett Laverty, Vinton SWCD; Chris Smid, MeadWestvaco; Paul Whyte, Division of Forestry, Athens District; Chip Rice and Rachael Hoy, ILGARD.

The purpose of the meeting was to discuss the issue of Erosion and Sedimentation in the Raccoon Creek watershed. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, this issue ranked number 6. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and the goals and objectives that are developed as a guide to future restoration work in the watershed.

The meeting begin with the development of a list of the main sources of erosion and sedimentation into the creek:

- Abandoned Mine Lands
- Poor logging practices - both loggers and landowners not being responsible by requiring loggers to follow BMPS.
- Stream bank stabilization practices
- Illegal dumping into the stream
- Trail use on state, federal and private land with little to no maintenance, such as off road vehicles, horses, bikes, and walkers
- Development of subdivisions
- Home construction
- Developing access to home sites
- Lack of township, county road maintenance- e.g. road cuts
- Oil/gas operations on banks of creek
- Farming activities up to creeks edge-e.g. row cropping
- Grazing/watering of livestock, i.e. unlimited access
- With a decrease in floodplain inevitably we see a loss of the stream's ability to function naturally

The discussion preceded to what needs to be done:

- Construction of stable road crossings
- Research:
 - What kind of loading should the stream carry?
 - Current sources, residual --pace it runs through the system
 - Soil types in Ohio-need for hard data
 - Look at other agency/company research--e.g. MeadWestvaco
- Educate people on the sediment problem and the various sources

- Different target audiences for education: Kids-water quality problems; Adults-laws, policies, enforcement
- Repackaging of educational material from different sources is needed to simplify and condense the information out there - simple one page/one stop fact sheet development.
- Target audiences--loggers, landowners, local officials
- Increase raccoon creek partners through educational process, such as adding the farm bureau
- Plan more recreational activities, e.g. canoe trips--to point out stream problems
- Coordinate workshops with responsible agencies/experts in the following topic areas:
 - Riparian reparation/buffer zone establishment - SWCDs, NRCS
 - Floodplain mgmt workshops - ODNR Floodplain mgmt program
 - Zoning options--pros and cons --Local planning officials
 - Look at other states that are implementing rural zoning.
 - Restoring streamside wetlands/marshes
- An inventory of all possible causes has been collected--an analysis of the load they are each contributing to the stream is needed. Example: how much sediment load is coming from AML.
- Identify all pockets of AML.
- Look at Cochocton Research Station how they collect/analyze data --how they are funded
- Visit other watersheds that have implemented successful streamside mgmt.--e.g - Indiana
- Work with agency that provide training on timber practices--establish a landowner workshop--work with regulating agencies--OFA, SWCD
- Create an identity for Raccoon creek--identify key areas of interest and their contribution to the watershed--e.g. farming--stress many positives, but also how erosion /sedimentation problems can be caused by some bad practices
 - Develop a sign campaign for the watershed - "entering Raccoon Creek Watershed"
- Work with OSU extension and other agencies to increase # of farm tours to highlight bmps
- Organize tree plantings
- Work with ODNR Div. Of Forestry to get a Watershed Forester to work with local landowners.
 - Division of Forestry could offer office space, clerical support, vehicle. How to fund salary--work with other project partners to leverage funds.

Goal idea: Identify key problem areas and educate people of solutions to improve the health of the stream

Who needs to be involved in these initiatives? OFA, NRCS, MeadWestvaco, ODNR, Div. Of Forestry, SWCDs, OSU extension, ODOT

Funding Options - \$ and In-kind: USDA, US Fish and Wildlife, ODNR Division MRM, ODOT , OEPA 319

Streambank Stabilization Focus Group Meeting

February 1, 2002

ILGARD, Ohio University

Attendees: Constance White, ODNR; Chip Rice, ILGARD; Larry Williams, RCIC; Paul Whyte, ODNR-Forestry; Rachael Hoy, ILGARD.

The purpose of the meeting was to discuss the issue of Streambank Stabilization in the Raccoon Creek watershed. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, this issue ranked number 8. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and the goals and objectives that are developed as a guide to future restoration work in the watershed.

The focus group brainstormed information related to the problems and causes of stream bank stabilization issues, in addition to discussing who should be involved in activities and potential funding sources.

Problems/causes:

- Lack of adequate streamside cover, especially further south in the watershed.
- Clear cutting for strip mining –small to no buffer near stream
- Lack of adequate buffer—what is adequate?
- Stability issue—grass buffer vs. trees
- Logging-not following BMPS—stay away 100ft. to streams edge, limit stream crossings
- Streambanks in grass—can lead to poor canopy for the stream, which has an effect on aquatics.
- Uncontrolled access of livestock/horses into the stream
- Off-road vehicle use close to the stream can damage/destroy stream bank buffer (Example: on MeadWestvaco property in the Elk Fork Subwatershed off road vehicles have been seen in the public hunting area-impacts to creek have been noted)
- Upgrades to township roads after '97 flooding-e.g. fresh ditches cut
- Question was raised as to whether there is a funding source that can be accessed by private property owners to address streambank problems? Is there direct assistance or is the main source through ODNR's technical assistance programs
- Concern was raised about the logjam program and the criteria for what is cut along stream banks

Solutions:

- Need for education to landowners adjacent to the stream in the following areas:
 - Upstream impacts to folks living downstream

- People need to recognize value to them to do this—incentive programs--taxbreaks, CAUV, CRP
- NRCS guidelines for buffer widths—size stream = size buffer
- Rosgen
- Contract development with loggers-land owners need to understand implications logger work, their responsibility under H.B. 88.—this type of training could be done in small groups by township
- Need for controlled access of livestock –H.B. 88 and OEPA 319 funds can be used for a cost share to develop alternative watering systems
- Need to identify key resource people and landowners to help with the education process.
- Need to make landowners and loggers aware of Master Logger Program
- Workshops:
 - BMP workshops for loggers should also be offered to private landowners
- Tours:
 - Identify model farms with good buffer management
 - Riparian planting at Gifford on Possum Creek on St.Rt. 377
 - Visit farms where rural water systems are being developed to provide another source of water for livestock. Bill/Stacy Dix in Margaret’s Creek-seasonal dairy, rotational grazing, stable access program is being used to control erosion
 - Look at Northwest Ohio NRCS program as a model of stream side tree plantings.
- Planned events:
 - Tree plantings—possible resources for tree plantings—ODNR MRM, Forestry. Assistance: CCC.
- Work with organizations like Tread Lightly, a national movement that encourages low impact outdoor recreational activities. They have produced educational materials for off road vehicle use and hunters.
- Encourage low impact usage, such as mountain bikes, hiking on MeadWestvaco property—get off road clubs involved in education and care of these areas.
- Work with NRCS media campaign—expand this buffer initiative to improve water quality into Raccoon creek –RCIC interested in taking this on.
- Compile existing information/tool box of information from various organizations—NRCS, SWCDs, OSU extension, “Tread Lightly” –distribute information to school libraries, local village libraries.
- Explore the development of a trust for Raccoon Creek for conservation easements—look at Hocking River Commission as a model.
- Research the development of other incentive programs for private landowners, such as local tax breaks for the development of local water quality plans on their property. Look at what other states are doing.
- Research what is a “good buffer” with various types of land use—look at NRCS and Rosgen literature.

Draft goal: Increase technical assistance to landowners to educate them on and assist with streambank stabilization techniques.

Draft Goal indicators:

Percentage of increased cover or dedicated buffer along the stream

Increased aquatic diversity of the stream

Funding Options: Hardwood Forest Fund, Global Relief Fund, OEPA 319, SWCDs (H.B. 88); NRCS-CRP-Conservation Reserve Program and EQIP, OEEF

Focus Group notes: Loss of Historical Resources October 23, 2001

Attendees: Members of the Vinton County Historical Society, David Boothe, Vinton County Economic Development Director, Bob Davis, President of the Vinton County Convention and Visitor's Bureau, Jane Ann Burns, Janet Davis.

The focus group meeting to discuss the issue of the loss of historical resources in the Raccoon Creek watershed was held with two different groups in Vinton County. Raccoon Creek project staff from ILGARD met with the Vinton County Historical Society and the Vinton County Convention and Visitor's Bureau and two separate occasions to discuss initiatives across the watershed. This issue was identified as a key area of concern during the public meetings held throughout the watershed. Of the eight issues that ranked the highest among local citizens, this issue ranked number 7. For this reason we will proceed to develop goals, objectives, and action strategies to support a plan to address this issue. The Raccoon Creek partners will use the management plan and the goals and objectives that are developed as a guide to future restoration work in the watershed.

The topics of discussion at both meetings involved the upcoming Bicentennial for the most part and how the Raccoon Creek partners could become involved to assist with projects related to heritage tourism.

Ideas for involvement in upcoming historical restoration/ preservation events:

- Identify points of interest in Raccoon Creek to help create an identity for the watershed for a driving tour and a bike tour.
 - Sites could include both historical and natural
 - Work with Ohio Historical Society to make sure all sites on registry are noted and well documented.
- Map sites of interest and assist with written and audio information about sites.
- Work with visitor's Bureau and other interested partners on the Rails to Trails initiative from Mineral to Zaleski.
- Work with local historical societies to help prepare for upcoming bicentennial events including:
 - Wallpaper project: Residents throughout the six county area of the watershed are being interviewed to collect oral histories.

- Mailbox project: this will involve getting the word out to people to decorate they're mailboxes for the Bicentennial.
- Offer tours of historical sites throughout the watershed and provide watershed maps so that people begin to connect historical sites with natural features.
- Work with the Ohio Arts Council and County historical societies to assist with the implementation of the Ohio's Hill Country Heritage Area Strategic Plan:
 - Help fill gaps in identifying community historic and other significant resources. Identify these resources through public gatherings.

Invite representatives from the Ohio Historic Preservation Office to attend watershed meetings to discuss economic incentives for historic preservation and to discuss the development of local historic preservation programs.

**Final Public Meeting:
Raccoon Creek Open House
Wilkesville Community Building
November 26, 2002 3:00 pm – 7:00 pm**

Two draft management plans were put on display for public review and comment. Raccoon Creek partners were available to answer questions. Raccoon Creek maps, brochures and newsletters were available for people to take with them. Three people attended the open house. There were several questions about next steps after the plan is approved to which partners responded. The only comment on the plan itself was the reference to the Raccoon Creek Improvement Committee and if this group was still functioning and accepting new members.

Funding Resources

The following public and private resources are potential funding sources for the remediation work outlined in the Raccoon Creek management plan.

Acid Mine Drainage

Acorn Foundation

Overview: Established in 1978, the Acorn Foundation supports projects dedicated to building a sustainable future for the planet and to restoring a healthy global environment. The Acorn Foundation is particularly interested in small and innovative community-based projects that: preserve and restore habitats supporting biological diversity and wildlife; advocate for environmental justice, particularly in low-income and indigenous communities; and prevent or remedy toxic pollution.

Deadline: January 15th and June 15th for Spring and Fall grant making meetings respectively. Decisions usually take at least 6 months from date of submittal.

Eligibility: Non-profit organizations. Most Acorn Foundation grants are made in North America, though occasional grants are made in Latin America.

Assistance Provided: Grants range from \$5,000 to \$10,000.

Contact:

Common Council Foundation
1221 Preservation Park Way
Oakland, California 94612- 1206
Phone: (510) 834-2995
Fax: (510) 834-2998
e-mail: ccounsel@jgc.org
<http://www.commoncounsel.org/index.html>

Ben and Jerry's Foundation

Overview: The Ben & Jerry's Foundation offers competitive grants to not-for-profit, grassroots organizations throughout the United States that facilitate progressive social change by addressing the underlying conditions of societal and environmental problems. All of the Foundation's funding decisions are made by a team of Ben & Jerry's employees that meets three times a year to review proposals. Although the Ben & Jerry's Foundation doesn't prioritize any particular issue area for funding, Ben and Jerry's does focus on the types of activities and strategies an organization uses for creating social change in any number of areas.

Eligibility: The Foundation will only consider proposals from grassroots, constituent-led organizations that are organizing for systemic social change. Ben and Jerry's support programs and projects that demonstrate creative problem solving. Generally Ben and Jerry's funds organizations with budgets under \$250,000, and only distributes funds to organizations with 501(c) 3 status, or those who have a sponsoring agency with this status.

Assistance Provided: Full grants - Awards are granted ranging from \$1,001 - \$15,000.

Small grants - Each cycle the Ben & Jerry's Foundation may fund a small number of material grants for \$1,000 or less for innovative programs that fit into the general guidelines and are infused with a spirit of hopefulness.

Deadlines: Letters of Interest may be submitted at any time and are reviewed on an ongoing basis. However, they may take up to eight (8) weeks to be reviewed, and therefore must be submitted at least ten (10) weeks prior to the funding cycle deadline for which you wish to be considered. Deadlines to submit a full proposal (for invited applicants only) are: March 1st, July 1st, and November 1st

Contact:

Ben & Jerry's Foundation
30 Community Drive
South Burlington, VT 05403
Phone: 802-846-1500

Internet: <http://www.benjerry.com/foundation/>

Challenge Grants for Conservation - The National Fish and Wildlife Foundation

Overview: The Foundation awards challenge grants to projects that: Address priority actions promoting fish and wildlife conservation and the habitats on which they depend; work proactively to involve other conservation and community interests; leverage Foundation provided funding; and evaluate project outcomes. The Foundation makes strategic investments in conservation projects, especially those that address one or more of the following priorities: Habitat protection and restoration on private lands; sustainable communities through conservation; and conservation education.

Assistance Provided: The Foundation awards challenge grants: each dollar awarded by the Foundation must be matched with one non-federal dollar or goods and services of equal value. However, the Foundation strives to increase resources directed to conservation and encourages applicants to achieve at least a 2:1 ratio of \$2 raised in non-federal funds, goods, or services for every dollar awarded by the Foundation.

The funds awarded by the Foundation are matching funds. The Foundation's matching funds are federal funds provided to the Foundation by annual Congressional appropriations and agreements with federal agencies. Grants typically range from \$10,000 to \$150,000 based upon need.

Deadlines: June 1st and October 1st for grant requests over \$5,000. Small grant requests are perpetual.

Eligibility: Federal, tribal, state, and local governments, educational institutions, and non-profit organizations.

Contact:

National Fish and Wildlife Foundation
1 Federal Drive
Ft. Snelling, MN 55111
(612) 713-5173

Director: [Donn Waage](#)

National Office

National Fish and Wildlife Foundation
1120 Connecticut Avenue, NW, Suite 900

Washington, DC 20036
Phone: (202) 857-0166
Fax: (202) 857-0162

Clean Ohio Fund

Overview: The Clean Ohio Fund is landmark legislation to fund preserving open space and farmland, brownfield cleanup, recreational trails and improve public health. The fund, known as Issue One, was passed in November of 2000. Abandoned mine lands have been classified as brownfields in the past and may qualify for these funds.

Contact:

<http://www.dnr.state.oh.us/cleanohiofund/default.htm>

Community Assistance Program

Overview: Loans for water systems. Must demonstrate that project is needed to comply with Safe Drinking Act/Clean Water Act, or to alleviate public health/pollution problem.

Contact:

Community Assistance Program
Ohio EPA
Division of Environmental and Financial Assistance
P.O. Box 1049
Columbus OH 43216-1049
(614) 644-2832
www.epa.state.oh.us/defa/defamain.html

Conservation Technology Support Program

Overview: The Conservation Technology Support Program (CTSP) makes annual grants to conservation groups using GIS technology to actively protect and restore natural resources. Funds are granted to support the purchase of computers, software and training.

Deadline: CTSP is not making grants during 2001-2002. Please check website to verify due dates at a later time.

Eligibility: U.S. based, non-governmental, non-profit organization, except Native American Tribes and International Groups.

Awards: Approximately 50 grants of computers, software and technical support are made each April, out of a total of 150 applications.

Contact: <http://www.ctsp.org/>

Drinking Water Assistance Fund

Overview: Loans for water systems. Projects are funded based on readiness to proceed. Plans must be approved before loans are made.

Contact:

Drinking Water Assistance Fund
Ohio EPA
Division of Drinking and Ground Water
P.O. Box 1049
Columbus OH 43216-1049
(614) 644-2752

www.epa.state.oh.us/ddagw/ddagwmain.html

EPA Environmental Justice Grants

Overview: The purpose of the program is to provide financial assistance to eligible community groups and federally recognized tribal governments that are working on or plan to carry out projects to address environmental justice issues. Funds can be used to develop a new activity or substantially improve the quality of existing programs that have a direct impact on affected communities.

EPA's Office of Environmental Justice has outlined the purpose, goals, and general procedures for fiscal year 2001 Environmental Justice grant awards. EPA will make available \$1.5 million for grants to eligible groups (i.e., community-based/grassroots organizations) and federally recognized tribal governments that are working on projects to address environmental justice issues. Preference will be given to community-based/grassroots organizations.

EPA Office of Water Environmental Education Grants

Overview: The purpose of the Environmental Education Grants (EEG) is to provide financial support for projects that design, demonstrate, or disseminate environmental education practices, methods, or techniques. Projects must focus on one of the following: (1) improving environmental education teaching skills; (2) educating teachers, students, or the public about human health problems; (3) building state, local, or tribal government capacity to develop environmental education programs; (4) educating communities through community-based organization; or (5) educating the public through print, broadcast, or other media.

Deadline: Deadline has passed for FY 2002. Please call or check website to verify upcoming due dates.

Eligibility: Local, tribal, or state education agencies, colleges and universities, nonprofit organizations, state environmental agencies, and noncommercial education broadcasting agencies.

Assistance Provided: Project grants (up to \$25,000 regionally; \$25,000 to \$150,000 nationally). Non-federal government match of 25 percent is required.

Contact:

U.S. Environmental Protection Agency
Office of Environmental Education
Ariel Rios Bldg., 1200 Pennsylvania Ave., NW
Washington, D.C. 20460
Phone: (202) 260-8619

Internet:

<http://www.epa.gov/enviroed/grants.html>

Environmental Statistics Center – EPA

Overview: Environmental research is important for understanding and responding to threats to human and ecosystem health posed by various types of pollution. While we have a good understanding of many of the components that make up the environment, we have much less knowledge about the interactions between components. Such an understanding is imperative for finding acceptable responses to threats to the

environment. Research to aid in recognizing and responding to these threats requires the use of statistics, from sampling and data collection to analysis and modeling. The Center invites proposals for statistical research that improves the methodology or theory of statistics relevant to environmental research.

Assistance Provided: Approximately \$1.25 million per year, including direct and indirect costs, will be awarded for a single Center, depending on the availability of funds.

Eligibility: Academic and not-for-profit institutions located in the U.S., and state or local governments, are eligible under all existing authorizations.

Deadline: March 21

Contact:

<http://es.epa.gov/ncercq/rfa/envistat01.html>

The ESRI Community Development Grant Program

Overview: The ERSI Community Development Grant Program has been established to assist community development agencies in the establishment of GIS projects, which make the agencies more efficient, and facilitates the migration of GIS data to other departments.

Deadline:

Eligibility: The grant is open to local government agencies responsible for the creation and/or management of data used in the community development process.

Priority given to: Agencies demonstrating collaborative efforts with multiple departments/agencies; projects that communicate innovative government through the use of GIS; organizations not currently using ESRI software.

Awards: The grant program consists of a \$2,218,000 GIS investment program. ESRI will provide software and training to a total of 100 governmental community development agencies meeting the requirements of an eligible government organization.

Contact:

<http://www.esri.com/industries/localgov/grants-new.html>

The ESRI Environmental Protection Grant Program

Overview: The goal of this program is to foster and support the integration of geographic information system (GIS) technology in community environmental protection organizations and to foster the dissemination of the resultant GIS information over the Internet.

Eligibility: Local (city, town, etc.) environmental departments, Planning Organizations, EPA Initiative Programs participants (e.g. Brownfields, EMPACT, One-Stop)

Priority given to: Organizations demonstrating collaborative efforts with multiple departments, Projects that promote public access to GIS databases, Projects that communicate innovative data sharing through the use of GIS.

Awards: Software and training grants totaling \$684,000 will be awarded to community environmental protection organizations throughout the United States.

Contact:

<http://www.esri.com/industries/localgov/grants-new.html>

Ford Motor Company

Overview: As a corporate citizen of the world, Ford Motor Company believes that concern for the environment is vital to developing products for the marketplace. Ford Motor Company continues its strategy of keeping environment as its second priority after education. Ford supports a number of organizations that advance environmental education, research and conservation.

Deadlines: Requests for support are accepted and reviewed throughout the year. There are no application deadlines.

Contact:

Ford Motor Company Fund
One American Road
P.O. Box 1899
Dearborn, MI 48126-1899
Phone: 888-313-0102

IBM

Overview: IBM's support of the environment promotes the optimal use of leading-edge technology to conduct environmental research to offer new knowledge and enhanced understanding of these important issues. IBM grants funds to universities that are promoting the optimal use of leading-edge technology to conduct research and recommend solutions to major environmental problems.

Eligibility: IBM only considers requests submitted by organizations that have a tax-exempt classification under Sections 170(c) or 501(c)(3) of the U.S. Internal Revenue Code.

Contact:

IBM Corporation Corporate
Community Relations and Public Affairs
18000 West Nine Mile Road
Southfield, MI 48086
<http://www.ibm.com/ibm/ibmgives>

The J.C. Downing Foundation

Overview: The foundation supports innovative efforts and original projects that offer far-reaching gains and widespread results in the area of, but not limited to environmental research and preservation.

Deadline: Perpetual

Eligibility: The Foundation awards grants to qualified nonprofit organizations with explicit, identifiable needs. There are no restrictions based on geography. The Foundation supports local, national, and international programs. Applications from the Southern California area may be given preferential consideration, but applications from other geographical areas will not be excluded.

Assistance Provided: There are no restrictions on grant amounts. Typical awards are between \$5,000 and \$50,000. The J.C. Downing Foundation issues project grants, not general support grants.

Contact:

<http://www.jcdowning.org/>

Nathan Cummings Foundation

Overview: The Environmental Program's goal is to facilitate environmental justice and sustainable communities by supporting the accountability of corporations, governments, and other institutions for their environmental practices. One way the foundation seeks to accomplish this by ensuring communities, especially those vulnerable due to low-to-moderate socioeconomic status, race, or ethnicity are protected from environmental degradation.

Eligibility: The foundation seeks to work with partners in the public, private, and nonprofit sectors.

Assistance Provided: Grants have ranged in size up to \$780,000.

Contact:

The Nathan Cummings Foundation
475 Tenth Avenue, 14th Floor
New York, NY 10018
<http://www.ncf.org/>

National Fish and Wildlife Foundation: Five Star Restoration Challenge Grants

Overview: The Five-Star Restoration Program provides modest financial assistance on a competitive basis to support community-based wetland, riparian, and coastal habitat restoration projects that build diverse partnerships and foster local natural source stewardship through education, outreach, and training activities.

Deadline: postmarked by 02-Mar-02

Assistance: Average grant is \$10,000. Awards are between \$5,000 and \$20,000.

Eligibility: Open to any public or private entity

Contact:

Tom Kelsch
National Fish and Wildlife Foundation
1120 Connecticut Avenue NW Suite 900
Washington, D.C. 20036
Phone: (202) 857-0166
Fax: (202) 857-0162
Internet: <http://nfwf.org/programs/5star-rfp.htm>

ODNR, Division of Mineral Resources Management

Federally Funded Abandoned Mine Land Program

Overview: Federal excise taxes on coal are returned to the State of Ohio for reclamation of abandoned mine land sites that adversely affect the public's health and safety.

Acid Mine Drainage Set-Aside Program

Overview: Up to ten percent of Ohio's federal excise tax monies are set aside for acid mine drainage abatement. Priority is given to leveraging these funds with watershed restoration groups and other government agencies.

State Abandoned Mine Land Program

Overview: State excise taxes on coal and industrial minerals are dedicated to reclamation projects that improve water quality in impacted streams. Priority is given to leveraging these funds with other partners.

ODNR Nonpoint Source Watershed Projects

Overview: Funds provided to help implement programs and projects, which protect or improve natural functions of water resources. Projects generally provide cost sharing to landowners or managers to apply nonpoint source pollution control policies.

Assistance Provided: Grants are usually funded in the \$30,000-50,000 range.

Eligibility: SWCDs or other local agencies in cooperation with SWCDs.

Deadline: March 1 each year

Contact:

Jill Evans, 614-265-6637

Office of Surface Mining (OSM), Reclamation and Enforcement

Appalachian Clean Streams Initiative

Overview: The mission of the ACSI is to facilitate and coordinate citizens groups, university researchers, the coal industry, corporations, the environmental community, and local, state, and federal government agencies that are involved in cleaning up streams polluted by acid mine drainage. OSM provides funds for ACSI projects on an annual basis.

Direct Grants to Watershed Groups

Overview: A grant process for directly funding citizen watershed groups efforts to restore acid mine drainage impacted streams on a project basis.

Ohio Division of Wildlife: Wildlife Diversity Grant Program

Overview: The priorities for Wildlife Diversity grant program include research, surveys (biological or sociological), management, preservation, law enforcement, education, and land acquisition. Funding is a maximum of \$5,000 for one year. Two public presentations focusing on the project highlights are required of grant recipients.

Eligibility: Both individuals and organizations.

Deadline: December of each year

Contact:

Kendra Wecker

614-265-7043

1840 Belcher Drive, Building G

Columbus, OH 43224-1329

Phone: 614-265-6300

Fax: 614-262-1143

Ohio Environmental Education Fund (OEEF)

Sponsored by Ohio EPA

Overview: The OEEF supports a variety of environmental education projects through the issuance of grants, and encourages submission of pollution prevention proposals. The OEEF offers grants for environmental education projects annually. OEEF's mission is to

promote public understanding of environmental issues, primarily through grants for environmental education projects targeting one of three audiences: K-12 (which we define to include pre-school, university, and teacher training); general public; and regulated community. OEEF also will fund equipment needs related to education projects.

Assistance Provided: Grants are awarded in amounts up to \$50,000. Mini-grants \$500 to \$5000. Please contact the Office of Environmental Education for further information.

Eligibility: Organizations located in Ohio with a federal tax ID number.

Deadlines: January 15 and July 15

Contact:

Carolyn Watkins

Office of Environmental Education

Lazarus Government Center

PO Box 1049

Columbus OH 43216-1049

Phone: (614) 644 – 2873

Fax: (614) 728- 1275

e-mail: carolyn.watkins@epa.state.oh.us

Internet: www.epa.state.oh.us/other/oeeef/oemain.html

Ohio EPA 319 Program

Overview: Under the Clean Water Act (CWA) the EPA was directed to control water pollution from point and nonpoint source pollution. As a result, funding was appropriated to support the Ohio Nonpoint Source Management Program that protects and/or corrects problems associated with nonpoint source pollution and water resources. Ohio EPA Ohio NPS Programs emphasize education, technical assistance, financial incentives and voluntary actions rather than regulatory mandates or permits. The Ohio NPS Program is based upon innovation and voluntary compliance and involves a multitude of local, state, and federal agencies working toward a common water quality goal.

Contact:

Julio Perez, (614)-644-2874

Partners for Fish and Wildlife Program

Overview: This program assists private landowners by providing technical and financial assistance to establish self-sustaining native habitats.

Contact:

United States Fish and Wildlife Service

Rural Abandoned Mine Program (RAMP)

Overview: This program provides technical and financial assistance to landowners who voluntarily enter into five- to 10-year contracts for reclamation of up to 320 acres of eligible abandoned coal-mined lands and waters.

Application Deadline(s): Eligible project sponsors may submit formal requests for assistance to the NRCS state conservationist in each state at any time.

Eligibility: Local or state agency, county, municipality, town or township, soil and water conservation district, flood prevention/flood control district, Indian tribe or tribal

organization, or other subunit of state government with the authority and capacity to carry out, operate, and maintain installed works of improvement.

Assistance Provided: Technical assistance and cost sharing (amount varies) for implementation of NRCS-authorized plans. Technical assistance on watershed surveys and planning.

Contact:

State NRCS office

Headquarters: Department of Agriculture

Natural Resources Conservation Service

P.O. Box 2890

Washington, DC 20013-9770

Phone: (202) 720-3534

E-mail: rcollett@usda.gov

Internet: <http://www.ftw.nrcs.usda.gov/programs.html>

Sustainable Agriculture Research and Education

Overview: The purpose of the Sustainable Agriculture Research and Education (SARE) Program is to facilitate and increase scientific investigation and education to reduce the use of chemical pesticides; to mitigate run-off, fertilizers, and toxic materials in agricultural production; to improve management of on-farm resources used to enhance productivity and competitiveness; to promote crop, livestock, and enterprise diversification; to facilitate the research of agricultural production systems located in areas that possess various soil, climatic, and physical characteristics; to study farms that have been to be managed using farm practices that optimize the use of on-farm resources and conservation practices; and to promote partnerships among farmers, nonprofit organizations, agribusiness, and public and private research and extension institutions.

Application Deadline: Pre-proposal – Mid-July, Proposal- Mid-September. See Internet site for regional deadlines <http://www.sare.org/htdocs/docs/other.html>

Eligibility: Land-grant colleges or universities, other universities, state agricultural experiment stations, State cooperative extension services, nonprofit organizations, individuals with demonstrable expertise, and federal or state governmental entities. Producers are eligible for a separate small grants program.

Assistance Provided: Project grants (cooperative agreements). Funding is available through Chapter 1 (research and education) and Chapter 3 (field personnel training) of the Farm Bill.

Contact:

vberton@wam.umd.edu

<http://www.sare.org/>

USDA Natural Resource Conservation Service Watershed Protection Programs

Flood Prevention

Overview: Also known as the "Small Watershed Program" or the "PL 566 Program," this program provides technical and financial assistance to address resource and related economic problems on a watershed basis. Projects related to watershed protection, flood prevention, water supply, water quality, erosion and sediment control, wetland creation and restoration, fish and wildlife habitat enhancement, and public recreation are eligible

for assistance. Technical and financial assistance is also available for planning and installation of works of improvement to protect, develop, and use land and water resources in small watersheds.

Application Deadline(s): Eligible project sponsors may submit formal requests for assistance to the Natural Resource Conservation Service state conservationist in each state at any time.

Eligibility: Local or state agency, county, municipality, town or township, soil and water conservation district, flood prevention/flood control district, Indian tribe or tribal organization, or other subunit of state government with the authority and capacity to carry out, operate, and maintain installed works of improvement. Projects are limited to watersheds containing < 250,000 acres.

Assistance Provided: Technical assistance and cost sharing (amount varies) for implementation of NRCS-authorized watershed plans. Technical assistance on watershed surveys and planning. Although projects vary significantly in scope and complexity, typical projects entail \$3.5 million to \$5 million in federal financial assistance.

Contact:

State NRCS office

Headquarters: Department of Agriculture

Natural Resources Conservation Service

P.O. Box 2890

Washington, DC 20013-9770

Phone: (202) 720-3534

E-mail: rcollett@usda.gov

Internet: <http://www.ftw.nrcs.usda.gov/programs.html>

**USDA Natural Resource Conservation Service Watershed Protection Programs
Wetland Reserve Program**

Overview: This program is a voluntary program to restore wetlands. Participating landowners can establish conservation easements of either permanent or 30-year duration, or can enter into restoration cost-share agreements where no easement is involved. In exchange for establishing a permanent easement, the landowner receives payment up to the agricultural value of the land and 100 percent of the restoration costs for restoring the wetlands. The 30-year easement payment is 75 percent of what would be provided for a permanent easement on the same site and 75 percent of the restoration cost. The voluntary agreements are for a minimum 10-year duration and provide for 75 percent of the cost of restoring the involved wetlands.

Contact:

State NRCS office

Headquarters: Department of Agriculture

Natural Resources Conservation Service

P.O. Box 2890

Washington, DC 20013-9770

Phone: (202) 720-3534

E-mail: rcollett@usda.gov

Internet: <http://www.ftw.nrcs.usda.gov/programs.html>

W. Alton Jones Foundation

Overview: The foundation supports programs that strive to reduce risks to pesticides, pollutants, and related compounds that interfere with the development of healthy individuals.

Deadline: Perpetual

Contact:

W. Alton Jones Foundation
232 East High Street
Charlottesville, Virginia 22902-5718
Fax: 1.804.295.1648
<http://www.wajones.org/grants/Guidelines.htm>

Watershed Cooperative Agreement Program

Overview: The Office of Surface Mining (OSM) of the U.S. Department of the Interior solicits applications from eligible, not-for-profit candidates for cooperative agreement funding under the Watershed Cooperative Agreement Program to undertake local acid mine drainage reclamation projects. The funds are part of the Appalachian Clean Streams Initiative.

Deadline: Will accept applications until funds have been exhausted.

Total Funds Available: \$275,000,000

Maximum Grant Amount: \$100,000

Eligibility: Eligible applicants are not-for-profit, established organizations with IRS 501(c)(3) status. Applicants must have other partners, contributing either the funding or in-kind services needed to complete the project. Projects in the following States are eligible: Alabama, Illinois, Indiana, Iowa, Kentucky, Maryland, Missouri, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia and West Virginia. Projects must meet eligibility criteria for coal projects outlined in Section 404 of the Surface Mining Control and Reclamation Act of 1977.

Contact:

Max Luehrs
Appalachian Clean Streams Coordinator
Office of Surface Mining
Columbus Area Office
4480 Refugee Road Suite 201
Columbus, OH 43232
Phone: (614) 866-0578 ext. 110
Email: mluehrs@osmre.gov

Water Resource Development Act, Section 905b (86)

Recent additions to the U.S. Army Corps of Engineers conventional mission include a habitat restoration grant program for the completion of feasibility studies and project construction where a Federal interest can be verified. A principal non-federal sponsor must be identified for this cost-share program.

Contact:

U.S. Army Corps of Engineers

Flooding

Flood Hazard Mitigation and Ecosystem Restoration Program

Overview: Informally known as Challenge 21, this watershed-based program strives to identify sustainable solutions to flooding problems by examining nonstructural solutions in flood-prone areas, while retaining traditional measures where appropriate. The program creates a framework for more effective federal coordination of flood programs and creates partnerships with communities to develop solutions to flooding problems. Eligible projects will meet the dual purpose of flood hazard mitigation and riparian ecosystem restoration. Projects might include the relocation of threatened structures, conservation or restoration of wetlands and natural floodwater storage areas and planning for responses to potential future floods.

Eligibility: Local governments. Study area must be in a floodplain

Assistance Provided: Cost-share between federal and local governments. Federal share is 50 percent for studies and 65 percent for project implementation, up to a maximum federal allocation of \$30 million.

Contact:

U.S. Army Corps of Engineers, Planning Division
20 Massachusetts Avenue, NW
Washington, DC 20314-1000
(202) 761-0115

harry.e.kitch@usace.army.mil

<http://www.usace.army.mil>

Flood Mitigation Assistance Program

Overview: The Flood Mitigation Assistance (FMA) program helps states and communities identify and implement measures to reduce or eliminate the long-term risk of flood damage to homes and other structures insurable under the National Flood Insurance Program (NFIP). Projects may include (1) elevation, relocation, or demolition of insured structures; (2) acquisition of insured structures and property; (3) dry flood proofing of insured structures; (4) minor, localized structural projects that are not fundable by state or other federal programs (erosion-control and drainage improvements); and (5) beach nourishment activities such as planting of dune grass.

Eligibility: State agencies, participating NFIP communities, or qualified local organizations. Communities that have been suspended from the NFIP are not eligible.

Assistance Provided: Two types of grants are available:

Planning grants assist communities with the development of Flood Mitigation plans (assessment of flood risk and identification of actions needed to reduce risk).

Communities must have Flood Mitigation Plans to be eligible for FMA project grants.

Project grants provide funds for the implementation of measures to reduce flood losses.

Contact:

Contact regional office

Headquarters:

Federal Emergency Management Agency

Mitigation Directorate

500 C Street, SW, Washington, DC 20472

(202) 646-4621

<http://www.fema.gov/home/MIT/fmasst.htm>

<http://www.state.oh.us/odps/division/ema/index.htm>

Hazard Mitigation Grant Program

Overview: This program helps states and communities implement long-term hazard mitigation measures following a major disaster declaration. The program's objectives are to prevent or reduce the loss of life and property from natural hazards; to implement state or local hazard mitigation plans; to enable mitigation measures to be implemented during immediate recovery from a disaster; and to provide funding for previously identified mitigation measures that benefit the disaster area. Eligible projects include the elevation, acquisition, or demolition of structures that will reduce future losses.

Application Deadline: 18 months after disaster declaration

Eligibility: State and local governments, certain private nonprofit organizations or institutions, and Indian tribes or authorized tribal organizations and Alaska native villages or organizations. Project must be in a previously declared (by the President) disaster area.

Assistance Provided: Project grants (match of funds or in-kind services required). FEMA can fund up to 75 percent of total eligible costs.

Funding Level: The following funding levels represent the money available for FEMA's Disaster Assistance (DA) Program. Hazard Mitigation, a program within DA, receives a portion of the money for grants. A community in a disaster area receives an additional 15 percent of its total disaster funds to spend on hazard mitigation.

Contact:

Contact regional office

Headquarters: Federal Emergency Management Agency

Mitigation Directorate

500 C Street, SW, Washington, DC 20472

(202) 646-4621

<http://www.fema.gov>

Project Impact Grant Program

Overview: Project Impact helps communities that have a history of losses from natural disasters or have a significant disaster risk, such as those located in watershed floodplains. Through Project Impact, the Federal Emergency Management Agency (FEMA) helps communities engage a wide cross-section of its members in a collaborative process to prevent damage due to natural disasters. Funds are provided to help assess risks, build public-private partnerships, identify and implement projects, and communicate and mentor success. The key is to incorporate and sustain self-reliant disaster resistance into the basic fabric of a community.

Application Deadline: Contact state emergency management office for schedule.

Eligibility: Communities/local governments (selection process takes place at the state level).

Assistance Provided: Grants

Contact:

Contact state emergency management office or

FEMA regional office
Headquarters: Federal Emergency Management Agency
500 C Street, SW Washington, DC 20472
(202) 646-4600
eipa@fema.gov
<http://www.fema.gov/impact>

Wastewater Treatment

Appalachian Regional Commission

Overview: The Appalachian Regional Commission (ARC) awards grants to qualified individuals and organizations for research and projects that enhance the quality of life for communities of the Appalachian Region. ARC undertakes projects that address their five goals: developing a knowledgeable and skilled population, strengthening the region's physical infrastructure, building local and regional capacity, creating a dynamic economic base and fostering healthy people.

Eligibility: Program grants are awarded to state or local agencies and governmental entities, local governing boards, and nonprofit organizations. Organizations must first apply to the program manager in their respective states.

Contact:

Jennifer Simon, Assistant Director
Governor's Office of Appalachia
77 South High Street, 28th Floor
P.O. Box 1001
Columbus, OH 43216-1001
(614) 644-9228
email: jsimon@odod.state.oh.us
<http://www.arc.gov/>

Ben and Jerry's Foundation

(See "Acid Mine Drainage" section.)

Community Assistance Program

(See under "Acid Mine Drainage" section.)

Great Lakes Rural Community Assistance Program

Overview: Great Lakes RCAP provides technical assistance to help small communities solve their drinking water, wastewater and solid wastes issues. Current programs include the Small Communities Wastewater Project grant fund and the Safe Drinking Water Assistance Training and Technical Assistance Project. The Great Lakes RCAP is a good technical assistance resource for small communities working on infrastructure projects.

Contact:

Kristin Woodall
Great Lakes RCAP
PO Box 590
Freemont, OH 43420

(800) 775-9767

<http://www.glrca.org>

Ohio Water and Sewer Rotary Commission

Overview: To provide interest-free loans to pay that portion of the cost of a sewer or drinking water line extension project, which otherwise would have been paid by assessments on agricultural land.

Contact:

Ohio Water and Sewer Rotary Commission
Department of Development
P.O. Box 1001
Columbus OH 43266-1001
(614) 466-2285

Rural Hardship Grant Program

Overview: Hardship grants are designed to assist communities that cannot afford the full costs of the loans offered by the Clean Water State Revolving Fund. Under this program, the USEPA awards grants to states, which in turn provide assistance to disadvantaged communities smaller than 3,000 people. These grants were intended to complement the funds offered by the CWSRF so that, by using a combination of funding sources, any community, despite its economic status, can meet its wastewater disposal needs. In addition to assisting with the development of infrastructure, these funds can also be used to provide training, education and technical assistance on the operation and maintenance of onsite systems.

Small Communities Environmental Infrastructure Group (SCEIG)

Overview: While not a funding source, SCEIG provides technical assistance to communities. SCEIG is an association of federal and state agencies, local governments and groups, service organizations, and educational institutions designed to help small communities in meeting their environmental infrastructure needs.

Contact:

Steve Grossman
Ohio Water Development Authority
88 East Broad St., Suite 1300
Columbus OH 43215-3516
(614) 466-5822
www.cpmra.muohio.edu/sceig

Village Capital Improvement Fund (VCIF)

Overview: Jointly administered by the Ohio Environmental Protection Agency and Ohio Water Development, the purpose of VCIF is to aid Ohio villages with financing preliminary engineering plans, detailed engineering plans, feasibility studies, and legal costs incurred for planning phases of wastewater and/or public drinking water facilities. VCIF is a partially interest-free loan program.

Contact:

VCIF Coordinator, Sharon Williamson

Division of Environmental and Financial Assistance
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus OH 43216-1049
(614) 644-3637
www.epa.state.oh.us/defa/vcif.html

W. Alton Jones Foundation

(See “Acid Mine Drainage” section.)

The Water Environment Research Foundation Endowment for Innovation in

Applied Water

Overview: Quality Research recognizes superior achievement and creative vision through the Paul L. Busch Award. The award, administered by WERF, seeks to distinguish an outstanding and innovative individual or team for research in the fields of water quality and the water environment. Also, the award aims to further the body of applied research of an individual or team whose work demonstrates innovation and the practical potential for improving the water environment.

Deadline: June 1st

Eligibility: Individuals or teams who show promise and make significant contributions to research and its practical application are eligible to submit applications or be nominated for this award. There are no restrictions based on race, gender, citizenship, or nationality. Individuals or teams are eligible to receive the Paul L. Busch Award. Applicants may self-nominate or be nominated by a third party. The means of application will make no difference for selection. Awardee shall perform work in conjunction with a U.S.-based firm, university, or organization.

Assistance Provided: The winners are recognized and rewarded with a grant of \$100,000 to continue their work.

Contact:

Water Environment Research Foundation
Attn: The Paul L. Busch Award
601 Wythe Street
Alexandria, VA 22314 –1994
<http://www.werf.org/>

Water Pollution Control Loan Fund

Overview: Loans made for wastewater systems. Projects are funded based upon readiness to proceed and priority.

Contact:

Water Pollution Control Loan Fund
Ohio EPA
Division of Environmental and Financial Assistance
P.O. Box 1049
Columbus OH 43216-1049
(614) 644-2832
www.epa.state.oh.us/defa/defamain.html

Water Quality Special Research Grants Program

Overview: This program teams the Cooperative State Research Education Extension Service (CSREES) with multiple federal agencies. The program is targeted directly to the identification and resolution of agriculture-related degradation of water quality. Eligible proposals will provide watershed-based information that can be used to assess sources of water quality impairment in targeted watersheds; develop and/or recommend options for continued improvement of water quality in targeted watersheds; and evaluate the relative costs and benefits associated with cleanup to all responsible sectors (e.g., farming, processing, urban runoff, municipal waste treatments). The program favors proposals that have a clear problem statement and are place-based. In addition, preference is given to projects that coordinate targeted research, education, and cooperative extension activities to minimize any adverse impacts that agricultural, forest, and range management practices, food and agricultural product processing, and/or livestock production systems might have on the nation's water quality.

Application Deadline: Perpetual

Eligibility: State/local governments and academic/nonprofit institutions located in the United States are eligible for EPA, National Science Foundation, and USDA funding. Profit-making firms and federal agencies are eligible for USDA funding.

Contact:

U.S. Department of Agriculture
Cooperative State Research, Education and
Extension Service
Ag Box 2201, Washington, DC 20250-2201
(202) 401-5971

mhorton@reeusda.gov
<http://www.reeusda.gov>

Water and Sanitary Sewer Program

Overview: Provides grants to small, needy communities in rural areas to help them comply with Environmental Protection Agency mandates.

Contact:

Office of Housing and Community Partnerships (OHCP)
Ohio Department of Development
(614) 466-2285
Or (800)-848-130

Water and Waste Disposal Systems for Rural Communities

Overview: This program provides monies to provide basic human amenities, alleviate health hazards and promote the orderly growth of the rural areas of the nation by meeting the need for new and improved rural water and waste disposal facilities. Funds may be used for the installation, repair, improvement, or expansion of a rural water facility including costs of distribution lines and well pumping facilities. Funds also support the installation, repair, improvement, or expansion of a rural waste disposal facility, including the collection and treatment of sanitary waste stream, storm water, and solid wastes.

Application Deadline: Perpetual

Eligibility: Municipalities, counties, and other political subdivisions of a state (such as districts), and authorities, associations, cooperatives, non-profit corporations, and federally recognized Indian tribes

Assistance Provided: Project grants (617 grants awarded in FY98, ranging from \$3,000 to \$4.1 million) Direct loans (774 loans awarded in FY98, ranging from \$5,000 to 7.3 million) Guaranteed/insured loans (9 guaranteed/insured loans awarded in FY98)

Contact:

U.S. Department of Agriculture
Rural Utilities Service,
Water and Environmental Programs
1400 Independence Avenue, SW, Washington, DC
(202) 690-2670

<http://www.usda.gov/rus/water/programs.htm>

Water and Waste Disposal Loans and Grants

Overview: The U.S.D.A. Rural Utilities Service offers loans and grants to assist rural communities with their waste management needs. Funds are designed to aid local residents by reducing the costs of waste and wastewater disposal to a more affordable level. Public bodies and not for profit corporations are eligible. Projects must be serving unincorporated areas or incorporated communities with populations of less than 10,000. Applicants must be unable to finance project through conventional sources.

Contact:

Water and Waste Disposal Loans and Grants
Rural Development
US Department of Agriculture
200 N High St, Room 507
Columbus OH 43215
(614) 255-2500

The W. K. Kellogg Foundation

Overview: The Foundation considers requests that fall within its established or developing programming areas: Health, food systems and rural development; youth and education; and philanthropy and volunteerism. Within these areas attention is given to the crosscutting themes of leadership; information systems/technology; capitalizing on diversity; and social and economic community development.

Eligibility: 501(c)(3) status

Deadline: Perpetual

Contact:

W.K. Kellogg Foundation
One Michigan Avenue East
Battle Creek, Michigan 49017 USA
Phone: (616) 968-1611
Fax: (616) 968-0413

<http://www.wkkf.org/>

Litter and Illegal Dumping

Canon U. S. A., Inc.

Overview: Since 1990, Canon U.S.A. Inc. has been supporting environmental efforts through its Clean Earth Campaign, based in Lake Success, NY. The program supports programs in four areas: Recycling is primarily addressed through the Canon Cartridge Recycling Program, which keeps empty ink cartridges from being placed in landfills or similar facilities. Exhibition into the Parks teaches conservation to old and young through research methods using donated Canon products -- cameras, camcorders, binoculars, etc. The Science category is for science-based conservation programs. Finally, the Outdoor Appreciation heading encompasses three educational awards: the Canon National Parks Science Scholars is a three-year scholarship for doctoral students doing environmental research on National Park ecosystems, the Envirothon is a year-long environmental curriculum culminating in a competition for high school students, and the program sponsors the PBS "Nature" series.

Assistance Provided: Scholarships, donations and grants

Contact:

<http://www.usa.canon.com/cleanearth/index.html>

FishAmerica Foundation

Overview: In the last 18 years, the Foundation has provided 620 grants totaling more than \$4.9 million to improve the fisheries resource in all 50 states and Canada. To apply for a grant, send a completed application, a letter of support from a state resource agency, and evidence of your organization's nonprofit status to: Grant Applications, FishAmerica Foundation, 225 Reinekers Lane, Suite 420, Alexandria, Virginia 22314.

Projects: The conservation projects committee funds hands-on, action-orientated projects that have clear and identifiable benefits to sport fish populations and the sport of fishing. The conservation committee only funds projects that directly enhance water quality, habitat and/or sport fish populations. The average conservation grant is \$7,500. FishAmerica prefers projects with overall budgets of less than \$100,000. Funds for non-labor costs are provided for the following: habitat improvement; stream bank stabilization; aeration systems; fishing reefs; silt removal; planting of trees and vegetation; fish passage improvements (i.e. fish ladders, small dam removal, culvert removal/replacement); hatchery construction/renovation; litter clean-ups; education related to enhancement activities; heavy equipment rental and operation (i.e. placement of large woody debris, dam removal, silt removal).

Deadlines: conservation project proposals are accepted anytime.

Contact:

Johanna DeGroff, Grants administrator, jdegroff@asafishing.org (703) 548-6388

Ford Motor Company

(See "Acid Mine Drainage" section.)

The George Gund Foundation

Overview: Primary grant making emphasis in the Cleveland bioregion is on the protection of ecosystems and natural features of the area. Efforts to develop a broader

ecological perspective for the region and encourage citizen awareness and advocacy are encouraged. Grant making in Ohio is focused on statewide issues and statewide organizations promoting improved public policy or providing coordination and support for local environmental groups. The Foundation has a special interest in programs that develop leadership and management capacity in nonprofit environmental organizations. Priority in this area is given to programs that train and link networks of organizations. Currently, the Foundation's grant making interests include the arts, civic affairs, economic development, education, the environment and human services.

Deadlines: December 30, March 30, June 30 and September 30.

Assistance Provided: Past awards have ranged from 5,000 to 150,000

Contact:

The George Gund Foundation
1845 Guildhall Building
45 Prospect Avenue, West
Cleveland, Ohio 44115
e-mail: info@gundfdn.org
fax: (216) 241-6560
telephone: (216) 241-3114
<http://www.gundfdn.org/>

Ohio Division of Wildlife: Wildlife Diversity Grant Program

(See "Acid Mine Drainage" section.)

Ohio Environmental Education Fund (OEEF)

(See "Acid Mine Drainage" section.)

EPA Office of Water Environmental Education Grants

(See "Acid Mine Drainage" section.)

The Public Welfare Foundation

Overview: The Public Welfare Foundation seeks to provide effective technical assistance to grassroots organizations; provide national and local advocacy and training and technical support to regional and local groups in a range of disciplines, including public health, environmental law, media, leadership development, and organizational development; pursue innovative strategies to achieve pollution prevention and reduce pollution at its source.

Deadlines: Perpetual

Eligibility: 501(c)(3) status

Assistance Provided: average grant is \$42,298. Most grants fall between \$25,000 and \$50,000

Contact:

Public Welfare Foundation
1200 U Street, NW
Washington, DC 20009-4443
Phone: (202) 965-1800
Fax: (202) 265-8851

e-mail: general@publicwelfare.org.

Internet: <http://www.publicwelfare.org/funding/index.html>

Recycle Ohio!

Overview: The Division of Recycling and Litter Prevention (division), through the Ohio Department of Natural Resources, offers the Recycle, Ohio! Grant to counties, solid waste districts (SWDs) and cities with a population of greater than 50,000 to implement statewide solid waste reduction, recycling, recycling market development and litter prevention programs

Contact:

<http://www.dnr.state.oh.us/recycling/pages/rogrant.htm>

Take Pride in Ohio Schools!

Overview: Provides funds for litter prevention, recycling and waste reduction activities in schools. Available for 7-12 grade.

Contact:

Heidi Hetzel-Evans

ODNR Division of Recycling & Litter Prevention

(614) 265-6373

In kind resources available from the Athens, ...Solid Waste District

Erosion, Sedimentation, Stream Debris and Stream Bank Stabilization

Acorn Foundation

(See "Acid Mine Drainage" section.)

Challenge Grants

Sponsored by National Fish and Wildlife Foundation (NFWF)

Overview: Each dollar awarded by the foundation must be matched with one non-federal dollar or goods and services of equal value. Eligibility: The foundation funds projects throughout the United States and its territories as well as Canada, Mexico, and other international areas that host migratory wildlife and other U.S. trust resources such as marine mammals, threatened and endangered species, and anadromous and marine fish.

Deadline for Pre-proposals: June 01, 2001 and October 15, 2001.

Amount: \$25,000-\$150,000

Contact Information:

National Fish and Wildlife Foundation

kania@nfwf.org

www.nfwf.org/guidelines.htm

(202) 857 - 0166

Challenge Grants for Conservation - The National Fish and Wildlife Foundation

(See "Acid Mine Drainage" section.)

Clean Ohio Fund

(See “Acid Mine Drainage” section.)

Clean Water Action Plan Fund

Overview: The purpose of this fund is to restore streams, riparian areas and wetlands resulting in direct and measurable water quality improvements.

Contact: U.S. Fish and Wildlife Service

Conservation Works of Improvement

Overview: Soil and Water Conservation Districts and county commissioners are eligible for grants up to 50% of the project cost for natural resource protection projects involving multiple landowners. Projects include wetlands development, storm water management, mitigation for agricultural drainage.

Contact:

Kevin Elder

Ohio Department of Natural Resources

Division of Soil and Water Conservation

(614) 265-6617

Environmental Statistics Center – EPA

(See “Acid Mine Drainage” section.)

EPA Office of Water Environmental Education Grants

(See “Acid Mine Drainage” section.)

FishAmerica Foundation

(See “Litter and Illegal Dumping” section.)

Five Star Challenge Restoration Grants

Overview: The purpose of this program is to provide modest financial assistance to support community-based wetland and riparian restoration projects that build diverse partnerships and foster local natural source stewardship.

Contact: U.S. Fish and Wildlife Service

Ford Motor Company

(See “Acid Mine Drainage” section.)

Great Lakes Basin Program for Soil Erosion & Sediment Control

Overview: The goal of the Great Lakes Basin Program is to protect and improve Great Lakes water quality by controlling erosion and sedimentation; limiting the input of associated nutrients and toxic contaminants to the waters of the Great Lakes Basin; and minimizing off-site sources of sediment that cause damage to harbors, streams, fish and wildlife habitat, recreational facilities, and the basin's public works systems. Funds primarily projects in the Great Lakes region but is willing to fund other projects that would be applicable to the region or would have a regional effect.

Contact:

<http://www.glc.org/basin/RFPP.html>

Hardwood Forestry Fund

Overview: The purpose of the Hardwood Forestry Fund is to promote hardwood timber growth, management, education, and environmentally sound uses of our forest resources. The Hardwood Forestry Fund supports sustainable hardwood forest management by funding tree planting, hardwood management, and hardwood research requests as funding becomes available. Member forest products companies provide funding for Hardwood Forestry Fund projects. Average project funding is \$1/seedling. Project criteria include location, professional management, a multiple-use management plan and the hardwood species involved.

Contact:

Hardwood Forestry Fund
P.O. Box 2789
Reston, VA 20195-0789
(304) 487-8729 or hffund@hpva.org.

IBM

(See “Acid Mine Drainage” section.)

The J.C. Downing Foundation

(See “Acid Mine Drainage” section.)

Keep the Wild Alive's Species Recovery Fund

Overview: This program provides financial support for innovative efforts that improve on-the-ground conditions specified species. The fund was created to spur the implementation of habitat restoration efforts, species reintroduction efforts, private landowner habitat production activities, and other creative endeavors that directly improve conditions of specified species.

Assistance Provided: Grants range from \$3,000 to \$7,000.

Eligibility: Organization, agency, tribe, university, or individual working to improve the on-the-ground conditions for eligible species. Priority will be given to grassroots organizations. Please check website to verify eligible species.

Deadline: The deadline for applications for 2002 has already passed. Please check website to verify future deadlines.

Contact:

<http://www.nwf.org/wildalive/>

The National Science Foundation – Geoscience Education

Overview: A major motivation of the program is to foster collaborations that integrate research and education. Proposals may target any educational level: 1) graduate and postdoctoral education and training (outside the framework of normal NSF research grants), 2) undergraduate education, 3) elementary and secondary education, and 4) education outside the classroom. Awards are intended to facilitate the initiation or piloting of highly innovative educational activities that involve leading geoscience researchers where support may not otherwise be available.

Deadline: April 17

Assistance Provided: \$1.5 million for 18 to 22 awards.

Eligibility: Scientists, engineers and educators usually initiate proposals that are officially submitted by their employing organization.

Contact:

Jewel Prendeville, Directorate for Geosciences, 703-292-8521,
email jprendev@nsf.gov.

Michael Mayhew, Division of Earth Sciences, 703-292-8557,
email mmayhew@nsf.gov.

Roddy Rogers, Division of Atmospheric Sciences, 703-292-8524,
email rrogers@nsf.gov.

Lisa Rom, Division of Ocean Sciences, 703-292-8582,
email erom@nsf.gov.

<http://www.nsf.gov/cgi-bin/getpub?nsf0142>.

<http://www.nsf.gov/home/geo/>

Non-Point Source Education Grants

Overview: Two types of grants are available. Personnel grants through which SWCDs can hire or retain NPS education specialists to develop education programs targeting schools and general public audiences. Watershed Awareness to Watershed Action (WAWA) mini-grants for projects such as educator workshops, student field days, water festivals, storm drain stenciling, landowner and developer seminars, and other watershed awareness initiatives.

Contact:

ODNR, Division of Soil and Water Conservation
Jeanne Russell
614-265-6682

Ohio Department of Natural Resources, "Nature Works"

Eligibility: Local governments, including cities, villages, townships, joint recreations districts, park districts, counties, and conservancy districts can apply for up to 75 percent reimbursement grants for acquisition, development, or rehabilitation of public park and recreation areas. The applicant must have the ability to maintain the funded project as a place of public recreation. Applicants must own the land for which they hope to receive funds.

Deadline: July 1

Contact:

Mike Cook or Steve Kloss
Ohio Department of Natural Resources
Division of Real Estate and Land Management
614-265-6408

Ohio Environmental Education Fund (OEEF)

(See "Acid Mine Drainage" section.)

Partners for Fish and Wildlife Program

(See “Acid Mine Drainage” section.)

The Public Welfare Foundation

(See under “Litter and Illegal Dumping” section.)

Sustainable Agriculture Research and Education

(See “Acid Mine Drainage” section.)

**USDA Natural Resource Conservation Service Watershed Protection Programs
Conservation Reserve Program (CRP)**

Overview: CRP is a voluntary land retirement program designed to reduce erosion and protect environmentally sensitive lands with grass, trees, and other long-term cover. Landowners bid for annual rental payments during a sign-up period. If selected, landowners contract their land for a 10-year period. Cost-sharing of 50 percent is available.

Contact:

State NRCS office.

Headquarters: Department of Agriculture

Natural Resources Conservation Service

P.O. Box 2890

Washington, DC 20013-9770

Phone: (202) 720-3534

E-mail: rcollett@usda.gov

Internet: <http://www.ftw.nrcs.usda.gov/programs.html>

**USDA Natural Resource Conservation Service Watershed Protection Programs
Environmental Quality Incentive Program**

Overview: This program assists in the conservation of structural, vegetative, and land management practices on eligible land. Five- to ten-year contracts are made with eligible producers. Cost-share payments may be made to implement one or more eligible structural or vegetative practices, filter strips, tree planting, and permanent wildlife habitat. Incentive payments can be made to implement one or more land management practices.

Contact:

State NRCS office.

Headquarters: Department of Agriculture

Natural Resources Conservation Service

P.O. Box 2890

Washington, DC 20013-9770

Phone: (202) 720-3534

E-mail: rcollett@usda.gov

Internet: <http://www.ftw.nrcs.usda.gov/programs.html>

**USDA Natural Resource Conservation Service Watershed Protection Programs
Flood Prevention**

(See “Acid Mine Drainage” section.)

**USDA Natural Resource Conservation Service Watershed Protection Programs
Forestry Incentives Program (FIP)**

Overview: Aides in tree planting, timber stand improvement, site preparation for natural regeneration, and other related activities.

**USDA Natural Resource Conservation Service Watershed Protection Programs
Wetland Reserve Program**

Overview: This program is a voluntary program to restore wetlands. Participating landowners can establish conservation easements of either permanent or 30-year duration, or can enter into restoration cost-share agreements where no easement is involved. In exchange for establishing a permanent easement, the landowner receives payment up to the agricultural value of the land and 100 percent of the restoration costs for restoring the wetlands. The 30-year easement payment is 75 percent of what would be provided for a permanent easement on the same site and 75 percent of the restoration cost. The voluntary agreements are for a minimum ten year duration and provide for 75 percent of the cost of restoring the involved wetlands.

Water Quality Special Research Grants Program

(See “Wastewater Treatment” section.)

Watershed Protection and Flood Prevention/PL566 Program

(See “Flooding” section.)

Watershed Resource Restoration Sponsor Program

Sponsored by Ohio EPA's Division of Environmental and Financial Assistance (DEFA). **Overview:** Ohio EPA has introduced the Water Resource Restoration Sponsor Program (WRRSP) allowing communities to add projects protective of water resources to approved Water Pollution Control Loan Funds (WPCLF). In this program, loan interest from any municipal/county DEFA loan project for a wastewater treatment or collection system improvement may be diverted to fund stream restoration projects. Stream restoration projects eligible for funds include: Land conservancy easements, Stream bank re-stabilization, Riparian restoration, Dam modification, Sediment remediation projects, Source Water Protection Plans, Watershed Implementation Plans, Watershed Action Plans. The restoration project may be performed by the loan applicant, or the funding may be directed to a third party sponsor (watershed environmental group). The OEPA invites watershed groups to work with Ohio EPA staff to provide a list of needed stream projects to loan applicants within the next 12 months.

Contact Information:

Pejmann Fallah

pejmann.fallah@epa.state.oh.us

(614) 644 – 2798

Bob Monsarrat

Division of Environmental and Financial Assistance
OEPA
P.O. Box 1049
Columbus, OH 43216-1049
(614) 644-3655

Historical Resources

Alcoa Foundation

Overview: The Alcoa Foundation supports work in Chillicothe, OH and other specific communities around the globe. Primary areas of giving are education, health and human services, the environment and ecology, civic and community improvements, and cultural endeavors. While interested national and international organizations should contact the Foundation in Pittsburgh, local nonprofits should contact their local Alcoa facility in order to be recommended for a grant.

Deadlines: Perpetual

Eligibility: Although Alcoa's scope is national, Alcoa prefers to focus on specific communities. In southeastern Ohio, the community of focus is Chillicothe.

Contact: http://www.alcoa.com/community/community_foundation.asp

Ford Foundation

Overview: Ford's program provides many grants in the areas of asset building and community development, peace and social justice education, media, arts and culture. Its asset building and community development program supports a wide range of rural development projects.

Eligibility: The foundation provides grants to non-profits in the United States as well as to individuals, however; grants given to individuals are usually given in the form of scholarships and through a directing agency.

Deadline: Perpetual

Contact:

Ford Foundation (Headquarters)

320 East 43rd Street

New York, NY 10017 USA

Phone: (212) 573-5000

Fax: (212) 351-3677

internet: <http://www.fordfound.org/>

The George Gund Foundation

(See "Litter and Illegal Dumping" section.)

The National Main Street Center

Overview: The National Main Street Center is part of the National Trust for Historic Preservation. It created the Main Street Approach to downtown revitalization, and promotes the use of the approach to communities to revitalize their traditional commercial areas. It serves as the nation's clearinghouse for information, technical

assistance, research and advocacy on preservation-based commercial district revitalization.

Contact:

Kevin Kuchenbecker
Downtown Ohio, Inc
Ohio Main Street Program
61 Jefferson Ave., Suite 203
Columbus, OH 43215
(614) 224-5410

Ohio Division of Travel and Tourism

Overview: The Ohio Division of Travel and Tourism is committed to providing communities and groups with resources that will support conservation and marketing efforts in heritage tourism development. Information includes funding support, training support and technical assistance. The Division provides a link to a variety of foundations (private, community and corporate) that regularly support community development projects and historical and cultural projects. The division also links to state funding programs in a variety of departments and divisions that provide support in the way of funding, training or technical assistance.

Contact:

Risa Varasso
Heritage Tourism Development Manager
Ohio Division of Travel and Tourism
77 S. High St.
Columbus, OH 43215
(614) 466-8844
www.ohiotourism.com/industry/heritage

Ohio Heritage Area Program

Overview: The Ohio Heritage Area Program is a state designation program designed to reward county collaboration. Those communities/counties that link together under a single unifying theme to preserve, develop and market their historic, natural and cultural resources to visitors will receive state designations. Designations include minor funding and technical assistance for planning, developing and marketing their area to visitors. Heritage areas in Appalachian Ohio include the Ohio Hill Country, Heritage Area and the Ohio and Erie Canal Heritage Area

Contact:

Division of Travel and Tourism
Ohio Department of Development
(614) 466-8844 or 1-800-BUCKEYE
www.ohiotourism.com/industry/heritage/outreach/areas.html

Surdna Foundation

(See “Litter and Illegal Dumping” section.)

Environmental Education

Clean Ohio Fund

(See “Erosion, Sedimentation, Stream Debris and Stream Bank Sedimentation.”)

Keep the Wild Alive's Species Recovery Fund

(See “Erosion, Sedimentation, Stream Debris and Stream Bank Stabilization” section.)

Pew Charitable Trusts

Overview: The Environment program aims to promote policies and practices that protect the global atmosphere and preserve healthy forest and marine ecosystems. Educating and mobilizing the general public, select constituencies and policymakers. The mission of the Public Policy program is to strengthen democratic life in America, primarily by supporting projects to restore public trust in elections, increase the civic engagement of young Americans, and improve public understanding of and confidence in government.

Contact:

e-mail: info@pewtrusts.com

internet: <http://www.pewtrusts.com/>

The William Bingham Foundation

Overview: The William Bingham Foundation provides funding for innovative initiatives in the fields of education, health and human services, science and the arts. The foundation seeks to strengthen civil society and its institutions; works for a world that is environmentally self-sustaining; and educates family members and others in the values and practices of philanthropy, community service and stewardship. Letters of application may be submitted to the director anytime. Trustees evaluate the applications in the spring and fall. Although the foundation focuses much of its grant making efforts in the Cleveland area, it also provides funds for projects throughout the country.

Contact information:

20325 Center Ridge Road

Suite 629

Rocky River, OH 44116

(440) 331-6350

Group Development

Charles Stewart Mott Foundation

Overview: Charles Stewart Mott's central belief in the partnership of humanity was the basis upon which the Foundation bearing his name was established. While this has remained a guiding principle, the Foundation has refined and broadened its grantmaking over time to reflect changing national and world conditions. Through its four programs, and their more specific program areas, the Foundation seeks to fulfill its mission of supporting efforts that promote a just, equitable and sustainable society. Inherent in all grantmaking is the desire to enhance the capacity of individuals, families or institutions at the local level and beyond. The Foundation hopes that its collective work in any program area could lead toward systematic change. The grantmaking programs supported by the foundation include: Civil Society, the Environment, the Flint, MI area, and Pathways out

of Poverty. The Foundation has two focus areas in their environmental grantmaking program: Reform of International Finance and trade and the Conservation of Freshwater Ecosystems. In the Conservation of Freshwater Ecosystems program, the Foundation focuses on the Great Lakes region and on Freshwater Ecosystems in the Southeast region of the U.S. Support is provided for three important elements of the Conservation of Freshwater Ecosystems: strengthening the environmental community, public policy work, and site-based conservation.

Contact information:

Charles Stewart Mott Foundation Home Office
Mott Foundation Building
503 S. Saginaw Street, Suite 1200
Flint, Michigan 48502-1851
Phone: (810) 238-5651
Fax: (810) 766-1753
E-mail: infocenter@mott.org

Coalition Building

Overview: ESC's coalition building subsidies support events that strengthen and build existing coalitions, helping member organizations work together more effectively and develop collaborative strategies on environmental issues. These efforts should have clearly articulated goals, focus on building the capacity of the coalition, and include networking and/or training activities.

Deadline: 1st of each month, at midnight eastern time, even if it falls on a weekend or holiday.

Eligibility: To be eligible for this category of assistance, a coalition must have a governing body, a history of environmental activities, and at least four members that are eligible to participate in ESC programs. The higher the number of ESC-eligible groups in the coalition, the more competitive the application will be. Coalition building events are defined by ESC as those which help to strengthen the functioning of the coalition as a whole, not the individual member groups, and one that helps these member groups to work together more effectively.

Assistance Provided: \$4,000 per calendar year. A 20% match is required (in-kind matches are considered on a case by case basis).

Contact:

Program Manager, Patty Larson
Program Assistant, Ana Arriaza
Environmental Support Center
1500 Massachusetts Ave., NW #25
Washington, DC 20005
Phone: 202-331-9700
Fax: 202/331-8592
Email: esctoa@envsc.org
Internet: <http://www.envsc.org/es03000.htm>

Environmental Support Center Leadership and Enhanced Assistance Program

Overview: The Leadership and Enhanced Assistance Program (LEAP) helps grassroots

environmental groups improve their operations, management, and administration. LEAP is designed to provide an organization with the skills, knowledge, and ability to resolve and strengthen a range of internal organizational opportunities, challenges, problems, or weaknesses.

Assistance Provided: LEAP subsidies average \$10,000 for assistance that occurs over a twelve-month period. The assistance is in the form of a consultant, trainer, workshop, classroom, or other educational format that offers an organization the opportunity to build or improve its capacity in areas such as: Strategic Planning, Fundraising, Board Development, Diversity, Financial Management, Communications, Membership, Evaluation, Leadership Development, Human Resources, Technology, and Marketing.

Eligibility: ESC gives special preference to groups that advocate, organize, litigate or empower citizens to work on environmental issues; serve low-income people and/or people of color; and have limited resources. ESC needs to be reasonably sure that organizations it selects can make the investment for successful organizational change.

Contact: (202) 331-9700

Internet: <http://www.envsc.org>

email: escleap@envsc.org.

Group Training Subsidy

Overview: ESC's group training subsidies are designed to help multiple organizations with similar needs to develop a specialized training session that will build the capacity of each individual organization.

Deadline: 1st of each month, at midnight, Eastern time, even if it falls on a weekend or holiday.

Eligibility: To be eligible for a group-training subsidy, the coordinating organization need not meet ESC eligibility requirements by itself. However, at least four participant groups must be ESC-eligible. The higher the number of ESC-eligible groups, the more competitive the application will be. Any gathering of groups in which training on an organizational development need(s) is a significant part of the agenda is eligible for this assistance.

Assistance Provided: The subsidy amount will depend on the number of ESC-eligible organizations that participate in the training. On average, ESC provides between \$200 and \$250 per group. Organizations that are not eligible for ESC assistance may also participate in the training, but ESC does not subsidize their participation. The application will be stronger if non-ESC funding sources are also used to support the training. A 20% match is required, and in-kind matches are considered on a case-by-case basis.

Individual Organizational Assistance

Overview: This program is designed to deliver assistance to a single organization that wishes to hire a consultant to work with them on organizational development needs or to attend a training session on a particular topic.

Deadline: The 15th of each month, at midnight eastern time, even if it falls on a weekend or holiday.

Assistance Provided: \$3,500 per organization per calendar year. A 20% match is required (in-kind matches are considered on a case by case basis). Groups may receive more than one subsidy in the same year, until the \$3,500 limit is reached.

Environmental Support Center – Training and Organizational Assistance

Overview: The Environmental Support Center (ESC) works to strengthen the organizational effectiveness of local, state and regional organizations working on environmental issues. Its goal is to help organizations improve their internal operations, administration, and management so that they are stronger for the long term. Through the Training and Organizational Assistance Program, ESC helps board, staff, and volunteer leaders develop new skills by providing money to hire consultants and to attend trainings in areas such as planning, organizing, board development, fundraising, communications, financial management, diversity issues, computer skills, technology issues, volunteer management, media relations, and leadership development.

Eligibility: To be eligible for assistance, an organization must be a local, state, or regional nonprofit organization with a portion of its resources devoted to environmental issues preventing pollution, conserving natural resources, and/or promoting a sustainable environment, etc. ESC does not assist individuals, government entities (including tribal governments), for-profit businesses, national/international organizations or their local chapters, or short-term, ad hoc organizations. Organizations that coordinate group training or coalition building events need not meet these eligibility criteria to apply for ESC assistance on behalf of the ESC-eligible groups that participate in them. ESC gives preference to those that: advocate, organize, litigate, or empower citizens to work on environmental issues; serve low-income people and/or people of color; have limited resources.

Contact:

Jim Abernathy, ESC's Executive Director.

Environmental Support Center

1500 Massachusetts Ave., NW #25

Washington, DC 20005

Phone: 202-331-9700

Fax: 202-331-8592

Internet: <http://www.envsc.org/es05000.htm>

EPA – National Environmental Achievement Track

Overview: This program recognizes top public and private facilities that go beyond compliance with regulatory requirements and encourages high levels of environmental performance and management that benefit people, communities, and the environment.

Eligibility: Facility needs to have adopted and implemented an environmental management system that includes policy, planning, checking, and corrective action, and management review; is able to demonstrate specific environmental achievements and continued improvement; commits to public outreach and performance reporting; and has a record of sustained compliance with environmental requirements.

Deadline: 04-Apr-01

Contact:

<http://www.epa.gov/>

Performance Track Information Center – 1-888-339-7875

Innovative Community Partnership

Overview: Grants are intended to initiate community-based projects that promote environmentally and economically sustainable development. The program encourages partnering among community, business, and government entities to work cooperatively to develop flexible, locally oriented approaches that link environmental management and quality of life activities with sustainable development and revitalization. This program challenges communities to invest in a sustainable future that will link environmental protection, economic prosperity, and community well being. These grants are intended to (1) catalyze community-based projects; (2) build partnerships that increase a community's capacity to take steps to ensure long-term ecosystem and human health, economic vitality, and community well-being; and (3) leverage public and private investments to enhance environmental quality by enabling community efforts to continue beyond the funding period.

Application Deadline: Fall

Eligibility: Nonprofit organizations and community groups and Federally recognized Indian tribes, state and local governments

Assistance Provided: Project grants (45 grants awarded in FY98, ranging from \$28,000 to \$200,000) 20 percent match required.

Contact:

U.S. Environmental Protection Agency,
SDCG, Office of the Administrator
Ariel Rios Bldg., 1200 Pennsylvania Ave., NW
Washington, D.C. 20460
Phone: (202) 260-6812
Email: desautels.lynn@epa.gov
Internet: <http://www.epa.gov/ecocommunity/sdcb/>

The Ittleson Foundation

Overview: The Ittleson Foundation supports innovative pilot, model and demonstration projects that will help move individuals, communities, and organizations from environmental awareness to environmental activism by changing attitudes and behaviors. The foundation seeks to encourage and nurture environmental action through: supporting the present generation of environmental activists, whether professionals or volunteers through education, training and other activities; educating and engaging the next generation of environmentalists with a special interest in supporting the training of those who are teaching that generation.

Deadline: April 1st and September 1st

Assistance Provided: Grants in the past have ranged from \$10,000 to \$40,000 with the average being \$20,000

Contact:

Anthony C. Wood
Executive Director
Ittleson Foundation, Inc.
15 East 67th Street
New York, NY 10021
Phone: (212) 794-2008

Internet: <http://www.ittlesonfoundation.org/guides.html>

Jessie Smith Noyes Foundation

Overview: By focusing on sustainable communities, the Jessie Smith Noyes Foundation provides funding in an attempt to promote communities that are environmentally sound, economically vital and socially just; to support individuals and organizations in implementing local initiatives, technologies or systems that respect the inter-connectedness of human and natural communities; and to strengthen local economics built upon inclusive and demographic decision making.

Deadline: Perpetual

Eligibility: 501 (c) (3) status

Contact:

6 East 39th Street, 12th Floor

New York, NY 10016-0112

Phone: (212) 684-6577

FAX: (212) 689-6549

E-Mail: noyes@noyes.org

Internet: <http://www.noyes.org/>

Nationwide Foundation

Overview: Since 1959, the primary goal of Nationwide Foundation has been to provide financial support to qualified, tax-exempt organizations whose programs address basic human needs. The Foundation supplies grants to organizations and programs within these categories: Health and welfare, education, culture and arts, civic and community.

Eligibility: Nonprofit organizations in locations with large Nationwide employee and agent populations such as state offices, service centers, or corporate headquarter sites.

Deadline: Perpetual

Contact:

The Nationwide Foundation

One Nationwide Plaza, 1-22-05

Columbus, Ohio 43215-2220

Phone: (614) 249-0039 and (614) 249-4310

Internet: http://www.nationwide.com/about_us/involve/fndatn.htm

Patagonia Foundation

Overview: Patagonia only funds environmental work. Patagonia is most interested in grants to organizations that identify and work on the root causes of problems and that approach issues with a commitment to long-term change. Patagonia looks for programs with a clear agenda for change and a strategic plan for achieving the organization's goals. Because Patagonia believes that true change will only occur through a strong grassroots movement, the funding focuses on organizations that build a strong base of citizen support. Patagonia funds work that: is action-oriented; builds public involvement and support; is strategic; focuses on root causes; and accomplishes specific goals and objectives.

Eligibility: Patagonia does not fund: general environmental education efforts; research, unless it is in direct support of a developed plan for specific action to alleviate an

environmental problem; acquisition; endowment funds; political campaigns; or organizations without 501(c)3 status.

Deadlines: Proposals must be postmarked no later than April 30 or August 31. Please note that Patagonia does not accept proposals sent by resource-intensive express mail.

Contact:

Jill Zilligen or John Sterling:

Patagonia, Inc.

PO Box 150

Ventura CA, 93002

Internet: http://www.patagonia.com/enviro/enviro_grants.shtml

The Public Welfare Foundation

(See "Litter and Illegal Dumping" section.)

RiverNetwork: Watershed Assistance Grants

Overview: River Network makes grants available to local watershed partnerships to support their organizational development and long-term effectiveness. The purpose of the Watershed Assistance Grants (WAG) program is to support the growth and sustainability of local watershed partnerships in the United States. For the purpose of this grant program, a "watershed partnership" includes interested and affected parties in the identified watershed. This coalition of targeted stakeholders will serve to promote watershed protection and/or restoration by resolving identified watershed problems and issues.

Deadline: Please call or check website to verify funding levels and due dates.

Eligibility: Local watershed partnership in United States

Contact:

WAG Program

520 SW 6th Avenue #1130

Portland, OR 97204

Phone: 503-241-3506 or 1-800-423-6747

Fax: 503-241-9256

E-mail: wag@rivernetwork.org

Internet: <http://www.rivernetwork.org/>

Surdna Foundation

Overview: The Surdna Foundation was established in 1917 and supports six program areas: Environment, community revitalization, effective citizenry, arts, non-profit sector support initiative and organizational capacity building grants.

In the environmental grant program, the Foundation has four focus areas. The two that are detailed below could apply to watershed restoration efforts. In addition, the Foundation also supports initiatives focused on transportation and urban/suburban land use and energy. The Foundation's goals are to prevent irreversible damage to the environment and to promote more efficient, economically sound, environmentally beneficial and equitable use of land and natural resources.

Biological Diversity And The Human Communities That Depend On It:

With primary focus on forest, marine, and freshwater eco-systems and habitat, and secondary focus on innovative approaches to freshwater ecosystems. Examples include translating scientific concerns and findings into public policy; conservation-based development; promoting public policies that insure species preservation; promoting market-based approaches that ensure species preservation; and creating programs that raise broad public awareness of these issues.

Human Systems

With primary focus on informing and connecting people to better understand environmental problems and opportunities and urging them to participate in solutions at the individual level, at the community level, in business, and in government. Examples include forging new links (for example, between religion, environment and science); linking market behavior to environmental change; creating leadership programs that stimulate environmental awareness; encouraging government, the private sector and the individual to adopt cost-effective, environmentally efficient practices.

Contact:

Surdna Foundation
330 Madison Avenue, 30th Floor
New York, NY 10017

Grant requests should be addressed to:

Edward Skloot
Executive Director
Telephone: (212) 557-0010
Fax: (212) 557-0003
E-mail: request@surdna.org

Watershed Coordination Grants

Overview: Grants are available for non-profit and government organizations to receive funding to employ a watershed coordinator to help the watershed community come together and create a water resource protection plan. Watersheds with plans are generally more successful when it comes to obtaining grants for funding implementation work.

Eligibility: Non-profit organizations, local and regional units of Governments

Award: Organizations can request a six-year declining contract to employ a watershed coordinator to work on watershed planning and implementation to control nonpoint source pollution. Grant covers salary and fringe benefits for the coordinator, 100 percent (up to \$40,000) in year one and declining to 50 percent in year six.

Deadline: June 15 each year.

Contact:

Rosida Porter
Ohio Department of Natural Resources
Division of Soil and Water Conservation
Phone: (614) 265-6647
E-mail: rosida.porter@dnr.state.oh.us
Internet: www.dnr.state.oh.us

The W. K. Kellogg Foundation

(See “Wastewater Treatment” section.)

General Environmental Funds

Environmental Loan Fund

Overview: The Environmental Support Center's Environmental Loan Fund was established to stabilize, increase, and diversify the long-term funding base of regional, state and local environmental organizations. The Loan Fund is the only one of its kind dedicated to providing loans and organizational technical assistance to strengthen the voice of environmental advocacy organizations and increase their impact on their chosen environmental issues.

Deadlines: January 15, March 15, June 15, and September 15.

Eligibility: Organizations focusing on membership development, mission-related enterprises, special events, workplace solicitation, donor development, direct mail campaigns, bridge loans, and capital campaign work

Assistance Provided: Loans in the range of \$5,000 to \$50,000; usual length of repayment is two-years.

Contact:

Pamela Skelding

ESC's Loan Fund Manager

Phone: 202-331-9700

e-mail: loanfund@envsc.org

internet: <http://www.envsc.org/es06000.htm>

Lindbergh Foundation

Overview: Each year, The Charles A. and Anne Morrow Lindbergh Foundation provides grants to men and women whose individual initiative and work in a wide spectrum of disciplines furthers the Lindberghs' vision of a balance between the advance of technology and the preservation of the natural/human environment. Lindbergh Grants are made in the following categories: agriculture; aviation/aerospace; conservation of natural resources—including animals, plants, water, and general conservation (land, air, energy, etc.)

Deadline: Second Tuesday of June in the year preceding the awarding of funds.

Eligibility: The Charles A. and Anne Morrow Lindbergh Foundation solicits applications for Lindbergh Grants from the U.S. and abroad through a wide mailing of its application form to all degree-granting institutions in the U.S., as well as the Lindbergh Foundation's mailing list of those in the U.S. and other countries who maintain a current interest in the Foundation's programs. This list includes publications, government agencies, media, universities, and other non-profit organizations. Approximately 200 formal grant applications are received each year.

Assistance Provided: up to \$10,580 (a symbolic amount representing the cost of the "Spirit of St. Louis")

Contact:

<http://www.lindberghfoundation.org>

National Telecommunications and Information Administration: Technology Opportunities Program

Overview: The Department of Commerce's Technology Opportunities Program (TOP) provides underserved communities with the opportunities that emerging digital network technologies offer to solve critical challenges in such areas as lifelong learning, community and economic development, government and public services, safety, health, culture, and the arts. The TOP program promotes widespread availability and use of advanced telecommunications technologies in the public and non-profit sectors. As part of the Department's National Telecommunications and Information Administration (NTIA), TOP gives grants for model projects demonstrating innovative uses of network technology.

Deadline: March 22, 2002

Eligibility: All non-profit entities (including, but not limited to, faith-based organizations, national organizations and associations, non-profit community-based organizations, non-profit health care providers, schools, libraries, museums, colleges, universities, public safety providers) and state, local, and tribal governments are eligible to apply. Although individuals and for-profit organizations are not eligible to apply, they are encouraged to participate as project partners

Assistance Provided: An applicant may request up to a total of \$750,000 in funds from NTIA. TOP expects the federal amounts awarded to range from \$200,000 to \$750,000, with an average of approximately \$500,000. Grant recipients are required to provide matching funds toward the total project cost. Matching funds can be in cash or in-kind contributions.

Contact:

Stephen J. Downs

Director of the Technology Opportunities Program.

Phone: 202/482-2048

fax: 202/501-5136

email: top@ntia.doc.gov.

internet: <http://www.ntia.doc.gov/otiahome/top/>

Sustainable Development Challenge Grants

These grants "provide an opportunity to develop place-based approaches to problem solving that can be replicated in other communities.

<http://www.epa.gov/ecocommunity/>

W. Alton Jones Foundation

(See "Acid Mine Drainage" section.)

Additional Resources

Catalog of Federal Domestic Assistance (CFDA) is a government-wide catalog of federal programs, projects, services, and activities that provide assistance or benefits to the American public. It contains financial and non-financial assistance programs administered by departments and establishments of the federal government.

<http://www.cfda.gov/>

Environmental Grantmaking Foundations

<http://www.environmentalgrants.com>

EPA Catalogue of Federal Funding Sources for Watershed Protection

<http://www.epa.gov/owow/watershed/wacademy/fund/keyword.html>

Includes an excellent online directory of funding sources, by topic.

Foundation Center An online tutorial for beginners about grants searching. The site has a search engine for private and public funding sources and also includes some loan information and links. <http://fdncenter.org/sitemap.html>

Federal Money Retriever Database of government grants. <http://www.fedmoney.com>
Quick guide to six funding databases

Federal Register Search by quarter for funding opportunities offered by the U.S. Departments of Agriculture, Commerce, Education, Energy, Health, and Environment. http://www.access.gpo.gov/su_docs/aces/aces140.html

FEDIX is an outreach tool that provides grant information to educational and research organizations from participating federal agencies. <http://content.sciencewise.com/fedix/index.htm?>

The Nonprofit Gateway

<http://www.nonprofit.gov>

APPENDIX P: PHOTOS OF THE WATERSHED

Raccoon Creek and Its Setting

The creek meanders through six counties in rural southeast Ohio, a region known for its recreation and culture. The Raccoon Creek watershed has a history of resource extraction, including coal, limestone, salt and clay. The watershed is part of the Hanging Rock Iron Region of Ohio, which was a significant national contributor of iron ore in the 19th and 20th centuries. Other culturally important features include covered bridges, old schoolhouses and historic homes.

Hope Riffle



Snow and Redbuds on Little Raccoon Creek



Farm at Keystone Furnace



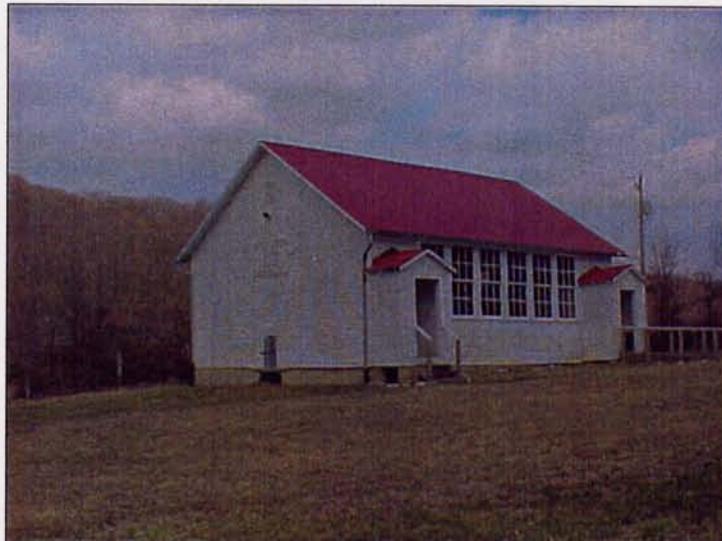
Buckeye Furnace



Buckeye Furnace Covered Bridge, March 2001



Hope School



Raccoon Creek and Its Challenges

Early coal mining has left the watershed with a significant number of abandoned mine lands that continue to seep acid mine drainage into the creek today. In addition, flooding, erosion, untreated wastewater, stream debris, illegal trash dumping and other environmental issues degrade Raccoon Creek.

Mine Entrance Above Big Four Hollow



Acid Mine Drainage at Broken Aro's Lake Milton



Orland Gob Pile



Exposed Tree Roots Caused By Erosion



Flooding in Vinton, Ohio



Effluent Pipe



Plug Town Logjam



Sediment and Trash in the Creek



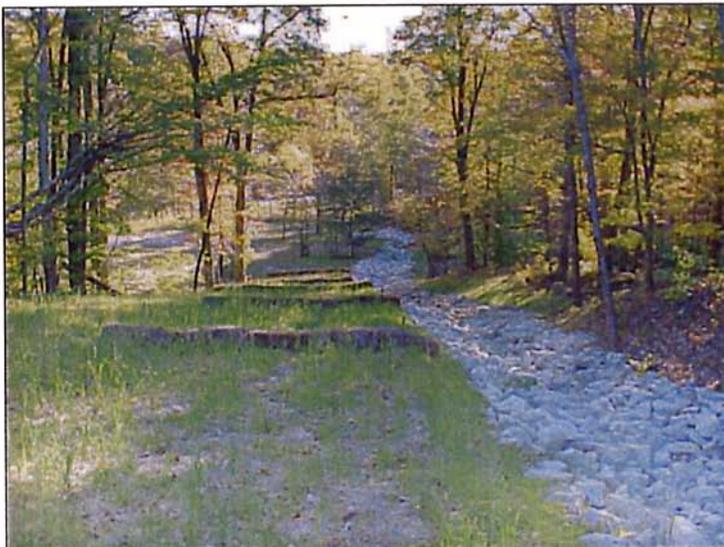
Raccoon Creek and Its Future

Thanks to public involvement, reclamation projects have improved many sites already in the watershed. In addition to projects that reduce acid mine drainage, the community has participated in trash pick-ups, educational canoe floats and local festivals. With increased communication and education, Raccoon Creek will continue on its path to being a healthy ecosystem from which we can all benefit.

McArthur Public Meeting



State Route 124 Seep, October 2001



Buckeye Furnace Reclamation,
Successive Alkaline-Producing System (SAPS)



Recyclabration 2001



Canoe Trip

