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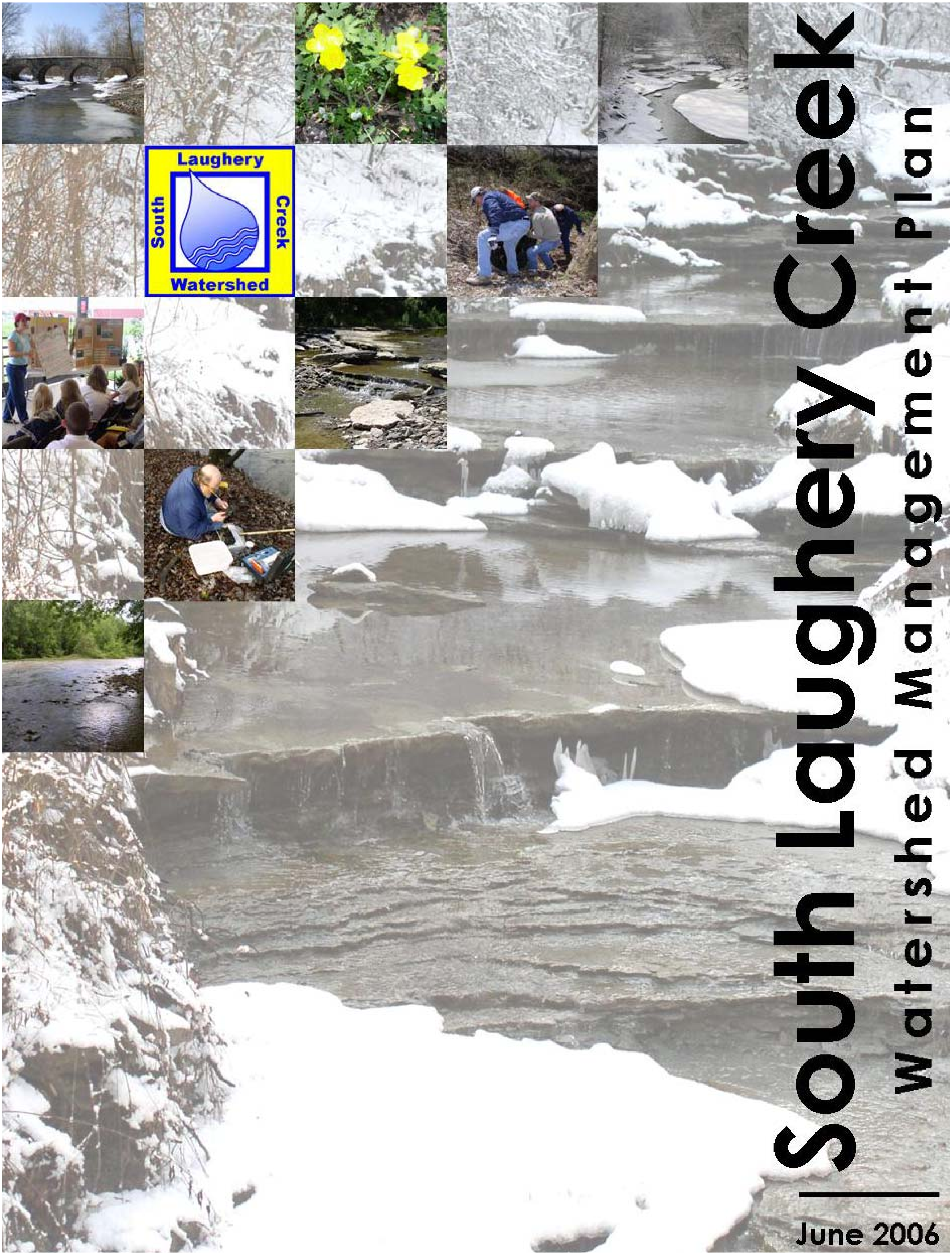

South Laughery Creek

Watershed Management Plan

June 2006

Funding for this project has been obtained from a United States Environmental Protection Agency Clean Water Act #319 Grant

The South Laughery Creek Watershed Management Plan was developed by the South Laughery Creek Watershed Committee, a subcommittee of the Dearborn County Soil and Water Conservation District.

Edited by: South Laughery Creek Watershed Steering Committee; June 2006

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Our Mission:

To educate citizens of the watershed about conservation through community involvement while utilizing leadership, teamwork, and resources effectively.

Our Vision:

To provide a healthy creek and surrounding habitat that promotes productive land use and responsible recreational practices.

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Section One - Project Introduction

Project Inception

In the spring of 1999, the Dearborn and Ohio County Soil and Water Conservation Districts entered into a joint venture perform do water testing on lower Laughery Creek. Test results revealed high E. coli levels during periods of high water flow. Action steps were taken by the Dearborn County Soil and Water Conservation District (DCSWCD) to further investigate and secure funding to study the South Laughery Creek Watershed.[1]

The DCSWCD successfully submitted an application in the fall of 2002 to the Indiana Department of Environmental Management (IDEM) for a Clean Water Act Section 319 grant to engage in a two-year assessment study of the South Laughery Creek Watershed.

In the fall of 2003, the DCSWCD was awarded the 319 grant and began the assessment phase of the program. The first stage of the program was to identify water quality, land use, and natural resource characteristics within the watershed. This project was designed to involve stakeholders while trying to identify threats to local water quality resources, developing strategies to protect these resources, and providing an examination of issues and concerns facing residents within the watershed. This living document may be used as a guide by local decision makers, partners, and educators for implementation purposes, and any type of assistance efforts.

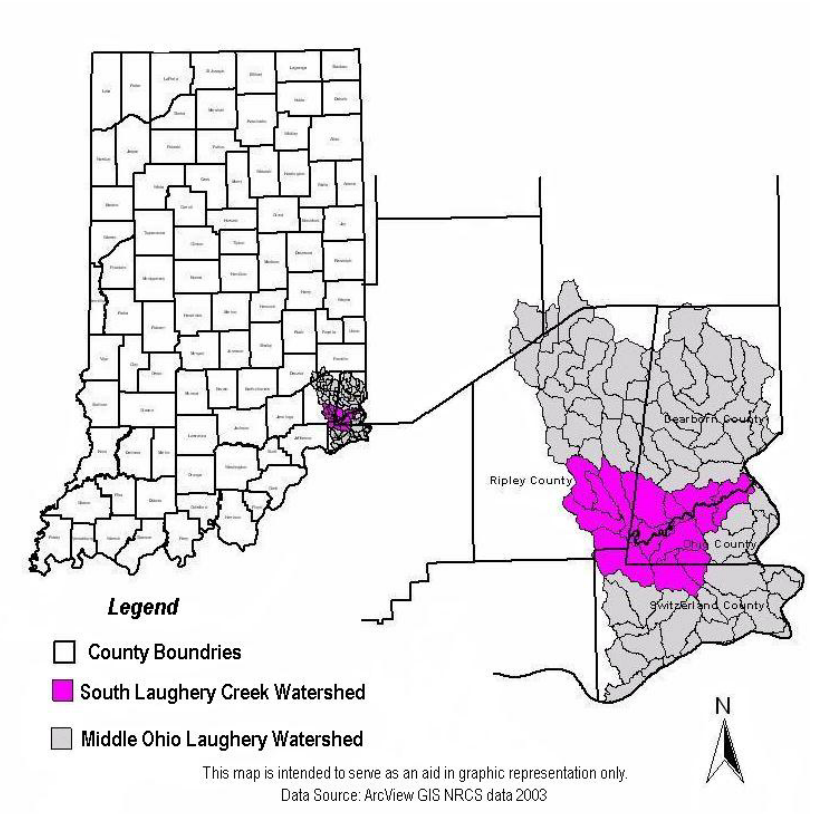


Figure 1 Location in Middle Ohio Laughery Watershed

This project resulted in part from a long range plan developed by the DCSWCD in 1996. During the long range planning process, the DCSWCD identified natural resource assessment of various watersheds within the county as a priority. Southern Laughery Creek was the second watershed to be studied in Dearborn County. It was chosen for study due to increasing urban

[1] Indiana Department of Environmental Management Clean Water Act Section 319 Nonpoint Source Pollution Management Program Grant

development, an opportunity to increase no-till acres, and elevated levels of fecal coliform during high flow periods as reported in a study completed in 1996 by DCSWCD and the Ohio County Soil and Water Conservation District (OCSWCD).[2]

Since the South Laughery Creek Watershed lies partially in four counties (Dearborn, Ohio, Ripley, and Switzerland) all four county Soil and Water Conservation District (SWCD) boards of supervisors were contacted for comments and discussion. Letters of support from each SWCD board were submitted in favor of the comprehensive two-year study. With support and funding established, the SWCDs appointed individuals from each county to hire a Project Coordinator.

The SWCDs, along with the Project Coordinator, led efforts to establish a Steering Committee of local landowners, farmers, businesses, other stakeholders, and various agency personnel to determine the focus of the project and future planning efforts.

Building Partnerships

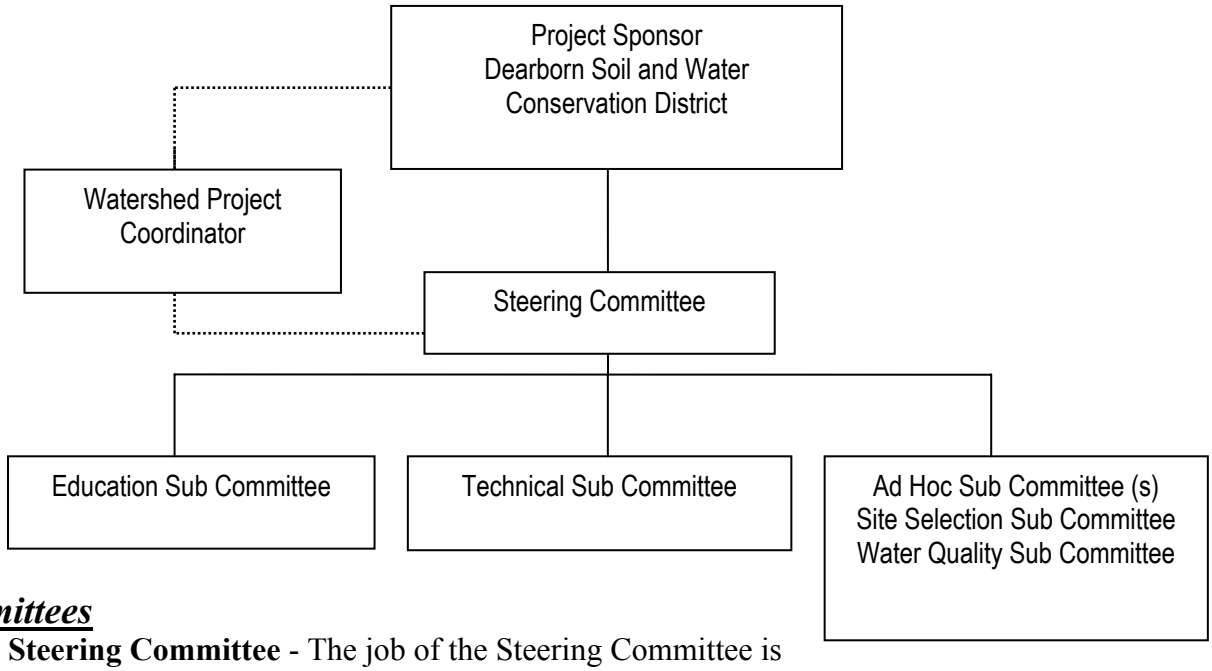
To identify issues of concern among stakeholders in the watershed, two public meetings were held in the spring of 2004 in Ripley and Ohio counties. The meetings were held to introduce the project and allow stakeholders to express their concerns and ask questions in open discussion. Citizens were encouraged to attend meetings through articles and announcements in local papers, flyers, and by word-of-mouth. At the two public meetings in the spring of 2004, individuals were identified from the group who wanted to assist in developing a better understanding of the watershed and represent the broad-based interests of all residents within the South Laughery Creek Watershed.

The South Laughery Creek Steering Committee was responsible for ensuring that local values were taken into consideration during plan development, carrying out planning activities, and coordinating plan implementation.

Over the course of several monthly meetings input was gathered during discussions with individuals in attendance at the meetings expressing concerns pertaining to the health and status of South Laughery Creek. Information was gathered pertaining to agriculture experience, visual observations, and personal reactions to landscape changes. (See Appendix G) After discussing each concern in detail, Steering Committee Members worked in small groups to prioritize a list of concerns. The following concerns arose as the top five concerns: (1) erosion, (2) creek maintenance, (3) water quality, (4) education, and (5) recreation. Refer to Appendix I for a complete list of concerns gathered by the committee.

During the course of the project, the Steering Committee developed subcommittees to research specific concerns and issues. Each committee was responsible for ensuring local values were taken into account during this assessment phase of the project. Each subcommittee had specific tasks to complete and to compile information for the management plan.

[2] Indiana Department of Environmental Management Clean Water Act Section 319 Nonpoint Source Pollution Management Program Grant



Committees

Steering Committee - The job of the Steering Committee is to make decisions, to plan, to broadly represent the interests and citizens in the watershed, and to maintain loose ties with the sponsor, usually through the Watershed Coordinator.

Education Committee - The education subcommittee is made up of community residents and agency personnel. The main responsibilities for this committee are developing field days and marketing ideas so the public becomes aware of the project's mission. They also assist the coordinator in educational activities and school programs.

Technical Committee - The technical sub committee is made up of community residents and agency personnel. The committee is responsible for analyzing data and providing technical assistance when needed.

Site Selection Sub Committee - The site selection sub committee was an Ad Hoc committee formed to select the testing sites for the water monitoring portion of the project. The group was responsible for looking at maps and creating criteria for selecting a good sample site, and ultimately selecting the 13 sample sites used during the testing.

Water Testing Sub Committee - The water testing sub committee was an Ad Hoc committee formed to review all submitted quotes and proposals by various water testing firms and select the company who would perform the actual water testing.

Section Two – Watershed Description

A watershed is an area of land that water flows over or under on its way to a particular body of water. In the United States, watersheds are identified using a hierarchical coding system, Hydrologic Unit Codes or (HUC). HUCs are used as a way of cataloguing portions of the landscape according to drainage. The smaller the HUC code the larger the piece of land corresponding to it. The 11 digit HUC codes for the South Laughery Watershed are 0509203070 and 05090203080. The South Laughery Creek Watershed is part of the much larger Middle Ohio-Laughery watershed (05090203). Refer to Figure 1 on page 2.

The South Laughery Watershed is comprised of 13 subwatersheds, shown in Figure 2. The subwatersheds range in size from seven square miles to over 20 square miles: (1) Kinnet Branch 12.96 square miles, (2) Goodpasture Branch 16.38 square miles, (3) Mud Lick 5.87 square miles, (4) South Fork Laughery Lower 13.56 square miles, (5) Willow Creek 9.56 square miles, (6) South Fork Laughery Headwaters 14.02 square miles, (7) Bear Creek 25.58 square miles, (8) Bell Branch 9.35 square miles, (9) Hayes Branch 20.04 square miles, (10) Caesar Creek 15.47 square miles, (11)Turkey Creek 7.97 square miles, (12) Raccoon Creek 12.21 square miles, and (13) Cave Hill 12.15 square miles.

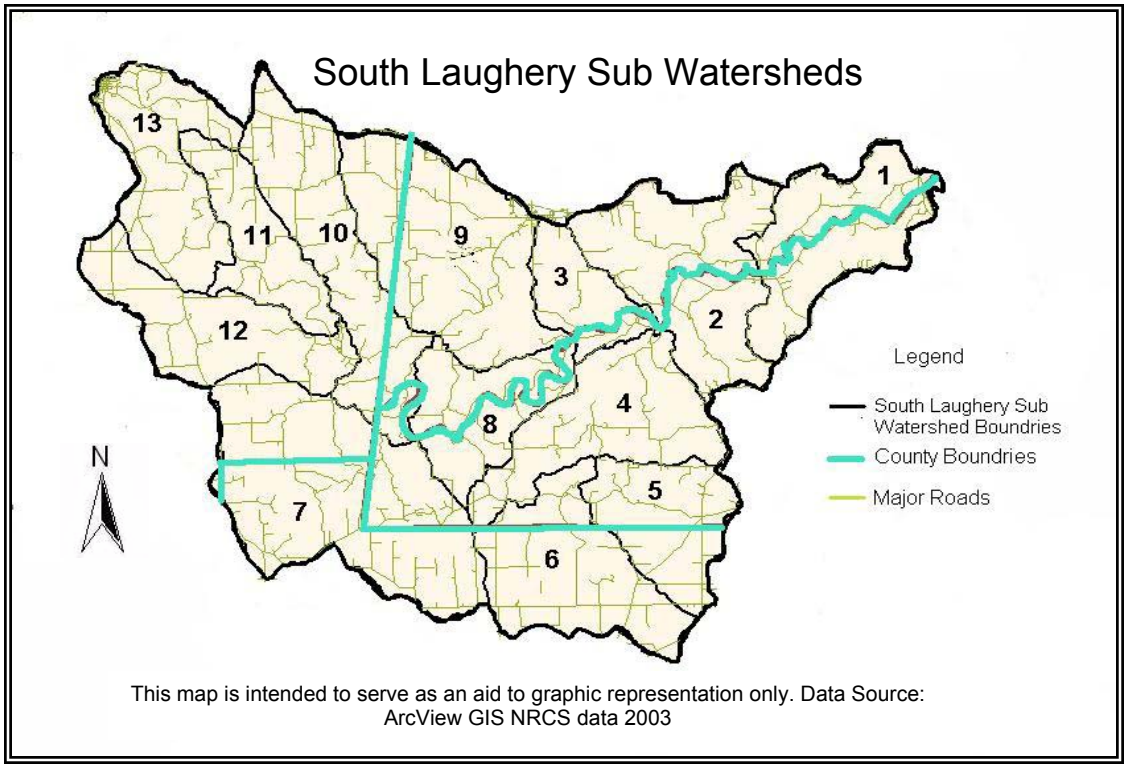


Figure 2 South Laughery Creek Watershed Subwatersheds

Physical Description

Approximately 30 million years ago, the South Laughery Creek Watershed region was a nearly featureless erosion surface.3 The majority of the watershed is underlain with Ordovician-age shale and limestone, which occurs under the entire area of Dearborn, Ohio and Switzerland counties. The eastern half of Ripley County is underlain with limestone of the Devonian-age. Eden, Carmel, Pate and Switzerland soils are common soils within the Ordovician areas, and have dominantly formed in clayey residuum from this bedrock material. These soils are primarily used for pasture and woodland.[4]

Approximately 300,000 years ago, the Illinoian Glacier deposited till over most of the older bedrock. Today the till covers ridge tops; however, most of the till has eroded on steeper slopes, exposing the older Ordovician bedrock. Soils associated with this landform are Pate, Eden, and Switzerland series. On the broader ridge tops the Illinoian till is thicker and is covered with silty material called loess. Examples of these soil types are Cincinnati, Rossmoyne, and Bonnell Series. The soils along the Ohio River include Jules, Stonelick and Chargrin series. These soils are deep and well drained and were formed from local alluvium over Ordovician bedrock. They are located on relativity flat bottom lands and are subject to frequent flooding.[5]

Natural History

In pre-settlement times, the Switzerland Hills Section, (which includes all of South Eastern Indiana) was mainly rugged and forested, but contained several examples of glade, cliff, and barrens communities as well as aquatic habitats. Many of the early settlers first arrived in Indiana from the Kentucky Commonwealth and the Ohio Territory regions.[6]

The Switzerland Hills Section is sharply defined on its western boundary by the Laughery Escarpment. The escarpment approximates the boundary between the Ordovician rocks and the Silurian rocks associated with the Muscatatuck Flats and Canyons. This area is 1,100 feet above sea level in elevation. It is the drainage divide between westerly flowing streams with midlevel gradient such as the East Fork of the White River, and the southerly and easterly flowing Indian Kentucky Creek, Laughery Creek, and the White River.

The area has been deeply dissected by streams where the bottoms of the valleys may be 450 feet below the uplands. Some of the highest elevations in the state are found here. While the topography is hilly, cliffs are not common.[7] Soils are derived both from drift and from residual soils from the Ordovician limestone and soft shale. Soil profiles are very thin with bedrock near the surface.

The most notable natural community of this section is the mesophyte forests associated with ravines. These communities differ from many of the forests of Indiana in that about a dozen species of trees may dominate any one given stand. Typical dominant tree species include

[3] Nickell, Allan K., Soil survey of Dearborn and Ohio Counties, Indiana. Soil Conservation Service, 1981
[4] Indiana Department of Environmental Management, Office of Water, Middle Ohio-Laughery Watershed Restoration Action Strategy, June 2000
[5] Dena Marshall, Soil Survey Subset Leader Hoosier Hills Soil Survey Project Office
[6] Campbell, Ronald K., The Natural Heritage of Indiana; Date Unknown
[7] Campbell, Ronald K., The Natural Heritage of Indiana; Date Unknown

American beech, white ash, blue ash, sugar maple, white chinquapin oak, red oak, shagbark history, tulip tree, Ohio buckeye, and black walnut.[8]

One early account of the area says "you could not shoot an arrow in any direction for more than twenty feet without hitting a tree…The comberness of the forest, which by day was dark and silent, made travel through it rather gloomy."[9]

Land Use

An understanding of the land use of the watershed is best achieved by breaking the watershed down by counties. Dearborn County holds 25% of the entire watershed with 27,655 acres, Ohio County comprises 26% of the watershed with 29,172 acres, Ripley County has 32% with 36,184 and Switzerland County comprises 17% with 19,064 acres (112,000 acres total). (See Figure 3 and Table 1 for specific land uses.)\

Table 1: South Laughery Creek Watershed Land Use

Land Use Entire Watershed	Approximate Percentage of Watershed Encompassed per Land Use
Agriculture: Pasture, Row Crop	46.08%
Forest, Wood/Shrub Land	52.60%
Open Water	.27%
Urban	1.03%

[8] Campbell, Ronald K., The Natural Heritage of Indiana; Date Unknown
[9] Bakeless, John, The Eyes of Discovery; 1950

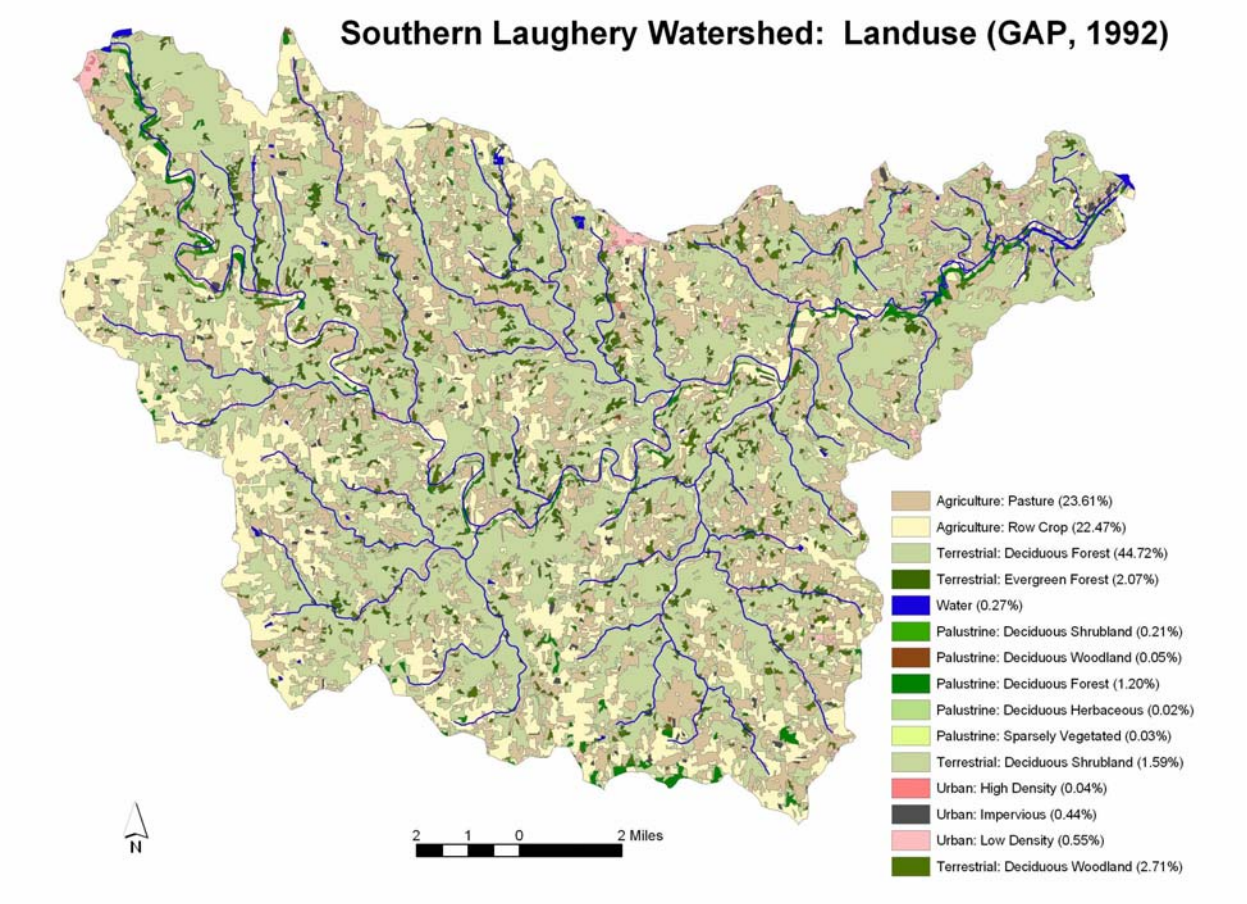


Figure 3 South Laughery Creek Watershed Landuse

Wildlife **(contributed by Ed Guljas[10])**

The South Laughery Watershed is well suited for certain wildlife species and has the potential to benefit others. The rolling topography offers a variety of opportunities to improve both upland and woodland habitat. Much of the water courses themselves are bordered by trees and other woody vegetation, further enhancing their value to wildlife.

Each individual wildlife species has certain habitat needs. Habitat can be defined as anything and everything a species needs to survive in an area, the year-a-round. These needs include nesting sites, resting areas, areas to find refuge, clean water, food, and so on. If any of these requirements are missing, so too will be the wildlife species.

In general, woodland species such as gray and fox squirrels, white-tailed deer and wild turkey are prospering in the watershed. Attempts to re-establish ruffed grouse have not been overly successful due to the loss, and non-replacement of early successional forest types. This game bird is likely rare in the watershed. Woodcock and certain woodland songbirds have been affected by the same lack of habitat type. Resident woodcock populations have decreased; however, migrating woodcock can be expected to occur during fall and spring in suitable areas. In addition to the loss of early woodland habitat, the abundance of brown-headed cowbirds has

[10] Guljas, Ed, Indiana Department of Natural Resources, District Biologist

caused problems for certain neo tropical songbirds because of their parasitic habit of laying eggs in the birds' nests.

Most native mammals, including coyotes, are doing well. Others such as rabbits are either holding their own or decreasing in abundance. Rabbits are being most seriously affected by the preponderance of tall fescue that crowds out the beneficial cover and food plants rabbits need to prosper. Certain ground nesting birds such as bobwhite quail and songbirds are declining, once again due to the invasion of dominance of exotic fescue grass, and also loss and degradation of habitat.

The giant Goose, the largest of the eleven or more subspecies of Canada geese, is becoming a nuisance in the watershed. The large number of private ponds and the birds' innate ability to coexist in the presence of humans has allowed this bird to prosper. While capable of migrating, they will frequent an area the year-a-round if not overly subjected to disturbance.

Because of its nuisance potential, the Indiana Division of Fish and Wildlife issue permits both to discourage nesting and to relocate Canada geese. Another control method is the early goose hunting season held each year from September 1st to the 15th.

Deer populations contribute to crop damage throughout the watershed. During the 2003 deer hunting season, populations were reduced in Ripley County by 1,602 animals and Ohio County reduced their deer population by 1,095 units. In spite of these high kills, the four counties continue to experience deer related crop damage. The Division of Fish and Wildlife's approach to controlling thriving deer populations has been to issue out of season deer harvesting permits.

The wild turkey was re-established as a native bird in the watershed in 1984. Due to ideal habitat, it prospered and became abundant enough to be included on the list of game species starting in 1987. All four counties have healthy wild turkey populations. Switzerland County ranked top in the state in total kills during the 2004 hunting season and Dearborn County ranked eighth. Wildly perceived by some to have nuisance potential, the wild turkey has largely not shown itself to be so. Rather, they have proven to be highly beneficial, eating large quantities of crop pests including grasshoppers, tobacco worms and Japanese beetles. However, because they have become numerous in the watershed, a fall hunting season is being planned for 2005. All four watershed counties will likely be included in the hunting range.

Several state endangered wildlife species are documented as occurring in the watershed. Animals in this category are any whose prospects for survival or recruitment are in immediate jeopardy and are in danger of disappearing from the state. This includes all species classified as endangered by the Federal Government. Watershed Endangered species are the Bobcat (Lynx Rufus), the Henslow's Sparrow (Ammodramus henslowii), the Northern Harrier (Circus cyaneus), and the Barn Owl (Tyto alb). Between 1995 and 1999, River Otters (Lutra Canadensis) were reestablished in a number of Indiana locations including two in the southeastern portion. The closest location to the South Laughery Creek Watershed was the Big Oaks National Wildlife Refuge, formerly The Jefferson Proving Grounds in Jefferson County. In the last few years, the state endangered river otter has been documented as occurring in the watershed.

The Bobcat's habitat preferences include hilly, forested terrain characterized by rock outcrops, rocky ledges and caves. However, where these are lacking, it frequents rocky or swampy woodlands and brushy areas.

The Henslow's Sparrow's habitat requirements include low-lying and grassy fields, especially those with seasonally damp areas. It also uses hay meadows and similar grassy areas bordering wetlands and other bodies of water.

Such areas are either not as plentiful as they once were or are dominated by wildlife unfriendly fescue. Where acceptable areas do occur, their generally small size makes nest discovery by predators relatively easy.

The Northern Harrier's habitat needs include large weedy or grassy fields, especially native grasslands for nesting and hunting for food. Being a ground nester, its reproductive success is hampered by lack of suitable, fescue free, grassland nesting areas and egg predation by animals such as snakes, skunks, raccoons, and opossums.

The Barn Owl's population has declined for a number of reasons. The countryside is no longer dominated by large tracts of fescue free pastures and hayfields which once supported large number of meadow voles and other rodents, the Barn Owl's major food. Barn Owls rely on natural tree cavities and old style barns and silos for secure nesting sites. They also took advantage of church steeples and bell towers. Most such nesting sites have disappeared in the recent past. Another serious problem is the high number of raccoons whose agile climbing ability allows them to reach nests in cavities or barn rafters where they prey on eggs and nestlings.

The River Otter is on the state Endangered Species list only because it is still relatively rare. However, it enjoys good reproductive success, is expanding its range and is expected to reach sufficient enough numbers in the near future to enable it to be removed from endangered status.

Two species of Special Concern are documented as occurring in the watershed. Animals in this category are those about which some problems of limited abundance or distribution in Indiana are known or suspected and should be closely monitored. The list species are the Broad-winged Hawk (Buteo platypterus) and the Worm-eating Warbler (Helmitheros vermivorus).

Broad-winged Hawks need extensive stands of ungrazed forest for large woodlands, relatively free from human disturbance for their nesting sites and for hunting. Such areas are becoming increasingly scarce.

The Worm-eating Warbler nests on the ground in early succession stages of forest growth, area which, as mentioned earlier are decreasing in number. Being a ground nester, it suffers from predation by egg eating animals such as snakes, skunks, raccoons, and opossums. Free ranging domestic cats also take their toll. In addition, as mentioned above, the parasitic Brown-headed Cowbird negatively impacts nesting success.
There is a chance, the Indiana bat, the only know Federally Endangered Species in the state, may be present in the watershed. The secretive animal is known to roost beneath the loosened bark of dead and dying trees in several areas in the state. Such trees are to be found in the watershed.

Since wildlife responds both positively and negatively to changes in habitat, willing landowners have the opportunity to encourage and promote the presence of targeted species. The United States Department of Agriculture, through its various Farm Bill Programs, including the Conservation Reserve Program (CRP), Wetland Preserve Program (WRP), Wildlife Habitat Incentive Program (WHIP) and others, provides incentives for landowners to create restore and enhance habitat for upland, woodland and wetland wildlife species. In addition, the Indiana Division of Fish and Wildlife has several programs that benefit wildlife through habitat improvement. Professional Wildlife Biologists are available to draw up habitat management plans for private property. These same Biologists administer the Classified Wildlife Habitat Program through which property taxes are reduced on acreage devoted to the management of wildlife. They also administer several financial assistance programs intended to defray the cost of habitat creation, restoration and enhancement.

Conclusion: Certain wildlife species are prospering in the Southern Laughery Watershed while others are in decline. Habitat improvement is the only practical method of stopping and reversing those declines. Help for this purpose is available to interested landowners from both Federal and State agencies. (See Appendix A for Endangered and Threatened Species.)

Fisheries

According to Larry L. Lehman's 1995 Fish Management Report of Laughery Creek[11], Laughery Creek supports a relatively diverse fish community. During the May and June 1995 reporting, a total of 5,206 fish, from 10 families representing 55 species and two hybrids were collected at 8 sample sites along Laughery Creek. The Bluntnose minnow was the most abundant species collected by number (19%), followed by the Longear Sunfish (14%), Gizzard Shad (12%), and the Golden Redhorse (11%). The remaining 53 kinds of fish each comprised (6%) or less of the total by number. Ten species were collected at seven stations, while one station yielded only nine species of fish. A second sampling in the fall of 1995 included the same eight sites; however, instead of picking up all fish only the eight game fish species were collected. See Appendix C for complete list. The Spotted bass appeared to be the most widely distributed game fish in Laughery Creek, appearing at all eight sample stations. Rock bass were also widely distributed. Large mouth bass and channel catfish were collected at seven stations which indicated they are scattered throughout the creek, although they do not appear to be as abundant as Spotted bass or Rock bass. Channel catfish, however, ranked second in importance by weight (18%), in the fall sample. Small mouth bass were collected at only four stations in the spring and in the fall.

These four stations were located in the natural stretch of stream between the Versailles dam and the embayment below Hartford. Judging by electrofishing catch rates, Laughery Creek offers anglers good opportunity to catch rock bass over six inches and channel catfish over ten inches. Although Spotted bass and Smallmouth bass are relatively abundant, smallmouth bass appear to be reaching 12 inches during their fifth year of growth. White bass and Sauger are relatively abundant in the Ohio River and migrate up Laughery Creek in the spring to spawn. No fish species were collected in this survey that are currently listed by the State of Indiana as endangered, threatened, of special concern or extirpated {Anonymous 1993}. Based on the May

[11] Lehman, L., Fisheries Survey of Laughery Creek. Indiana Department of Natural Resources, Indianapolis, 1995

survey results, Smallmouth bass comprised 1.0% of the fish population in Laughery Creek by number and 1.8% by weight. In both the spring and fall samples only four collection sites were used in the natural portion of the stream below Versailles Dam.

Spotted bass are widely distributed throughout Laughery Creek and appear to be about twice as abundant as Smallmouth bass, however most Spotted bass appear to be less than 12 inches long. Laughery Creek presently supports a relatively diverse fish community. To maintain this fish community, it is important that the existing wooded riparian corridor is preserved. Woody vegetation, such as willows, should be used to control bank erosion where control is necessary. (See Appendix B, C and D for a list of species and fish consumption advisory.)

Soils

Dearborn and Ohio portions of the watershed consist of three main soil types (Refer to Figure 4 for a detailed map of Dearborn County and Ohio County soils):

"**Cincinnati-Rossmoyne-Bonnell** soils are best suited to cultivate crops in the more level areas and to pasture and hay in the steeper areas. Currently they are used mainly for cultivated corps, hay and pasture, but some areas remain woodland. Erosion is the major hazard of this soil type. The soils are suitable for residential and urban uses in the more level areas and in areas where public sewer systems can be installed. The soils are only fairly suitable for intensive types of recreation development because of either slow soil permeability or steep slopes.

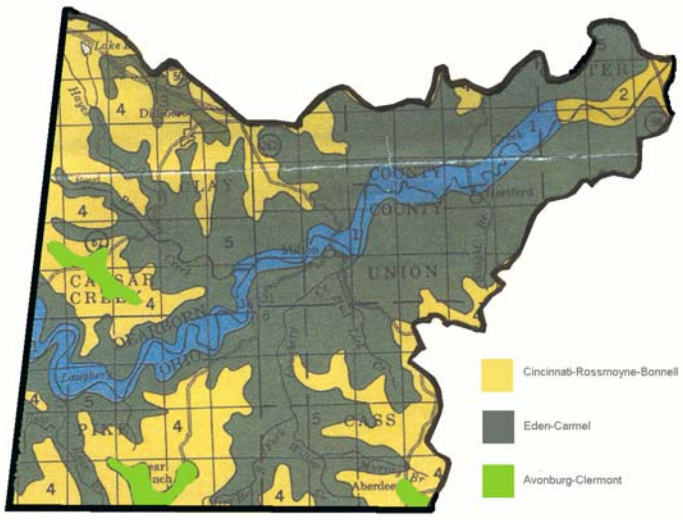


Figure 4 Dearborn and Ohio County Soils

"**Eden-Carmel** soils are well suited for improved pasture and trees. In some areas the soils are also used for hay and cultivated crops. Steep slopes are the major limitation and erosion is a major hazard. Erosion is such a severe hazard on the steeper slopes that cultivated crops, logging roads, and skid trails are impractical. Because of the slope, the suitability of the soils for residential and urban uses and for intensive types of recreation development is poor.

"**Avonburg-Clermont** soils are best suited for cultivated crops. Some areas used for pasture or remain in woodland. In most of the cultivated areas the surface is artificially drained. Wetness is the main limitation to use of the soils for farming. Wetness is such a severe limitation and so difficult to correct that the soils are poorly suited to residential and other urban uses and to the

more intensive types of recreation development. Adequate drainage system must be considered if these soils are to be used for urban development."[12]

The Ripley County portion of the South Laughery Watershed consists of three main soil types (refer to Figure 5 for a detailed map of Ripley County soils):

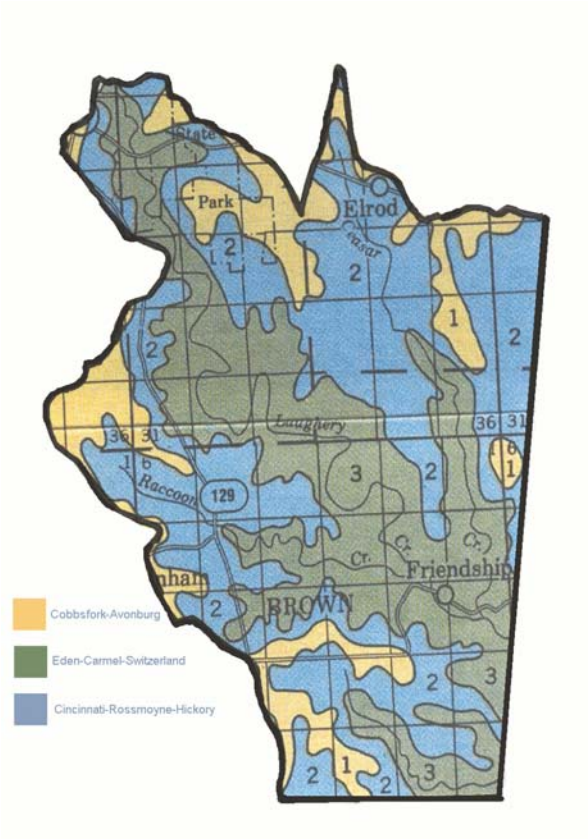


Figure 5 Ripley County Soils

"**Cobbfsork-Avonburg** soils are best suited for crops. Due to wetness and erosion with this soil type residential and other uses are poor with inadequate drainage. Woodlands have good potential for growth.

"**Cincinnati-Rossmoyne-Hickory** soils are best suited for crops, hay and pasture. Erosion and slope are the main limitations with this soil type which makes residential and urban development fair. Farming is the most practical purpose for this soil type.

"**Eden-Carmel-Switzerland** soils are best suited mainly for woodland. The less sloping areas are used for pasture and crops. Slope and erosion are the main limitations which create poor potential for crops and create erosion hazard."[13]

The Switzerland County portion of the South Laughery Watershed consists primarily of three soil types (refer to Figure 6 for a detailed map of Switzerland County soils):

"**Avonbury-Cobbsfork** soils have a seasonal high water table making wetness a severe limitation. Areas with this soil type are best suited for cultivated crops. It is generally unsuited to urban uses because of the wetness. An adequate drainage system should be the first management consideration if the area is to be used for urban development. The suitability for the more intensive recreations uses is poor because of the wetness.

"Cincinnati-Weisburg-Bonnell soils are best suited for cultivated crops in the more level areas and pasture and hay in the steeper areas. Erosion is the main hazard. It is such a severe hazard on the steeper slopes that growing cultivated crops in impractical. The suitability for urban uses is good in the more nearly level areas and in areas where public sewer systems can be installed.

[12] Nickell, Allan K., Soil survey of Dearborn and Ohio Counties, Indiana. Soil Conservation Service, 1981
[13] McWilliams, Kendall M., Soil Survey of Ripley County and part of Jennings County, Indiana. Soil Conservation Service, 1985

The suitability for the more intensive recreation uses is only fair because slow permeability and slope.

"**Eden-Switzerland** soils are suited for pasture or woodlands. Some small areas are used for hay or cultivated crops. Tobacco is the main crop in these small areas. The slope is the main limitation, and erosion is the main hazard. Erosion is such a severe hazard on the steeper slopes that growing cultivated crops is impractical. Slope generally restrict the area making is unsuited to urbanization and recreational uses."[14]

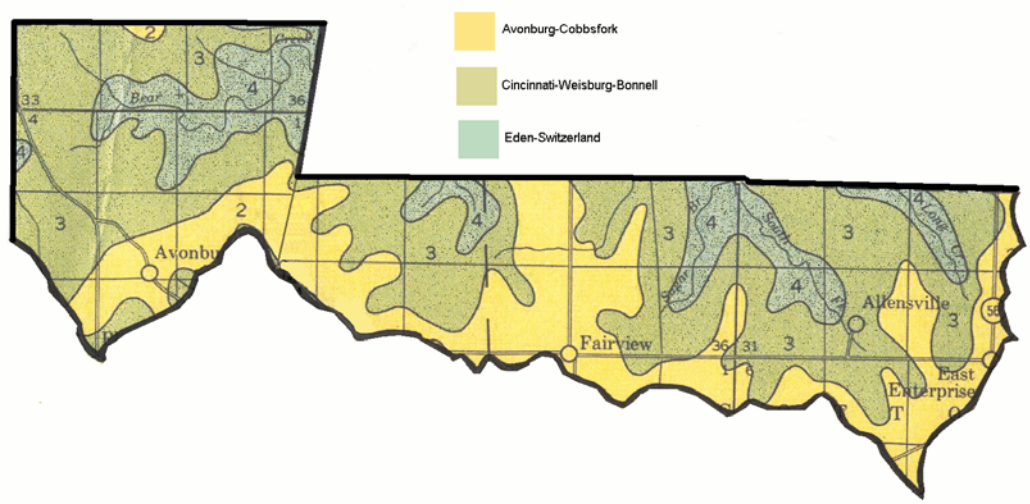


Figure 6 Switzerland County Soils

Topography

The South Laughery Creek Watershed is approximately 112,000 acres of gently rolling hills increasing in height from the Ohio River in the east to the town of Versailles in the west. The lowest average point is near the city of Aurora at approximately 500 feet above sea level. The landscape steadily increases westward reaching the highest elevation point of 980 feet above sea level. (See Figure 7 for the flood plain area within the South Laughery Creek Watershed.)

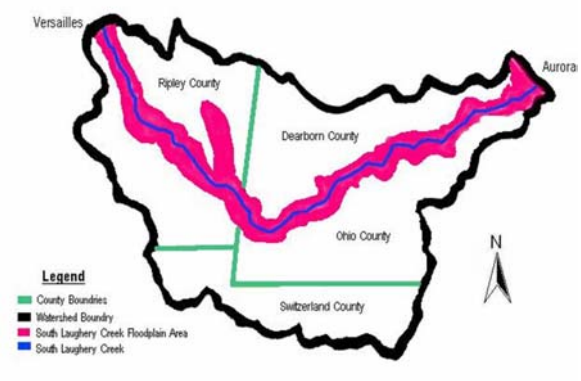


Figure 7 South Laughery Creek Flood Plain

Hydrology

South Laughery Creek is approximately 22 miles in length with headwaters beginning in central Ripley County just below Versailles Lake, and the confluence connecting with the Ohio River just west of the City of Aurora.[15] The watershed contains more than 30 smaller tributaries many

[14] Nickell, Allan K., Soil survey of Switzerland County, Indiana. Soil Conservation Service, 1987
[15] Lehman, Larry, Versailles Lake Fish Management Report, Indiana Department of Natural Resources, 1998

of which are unnamed. Talking with local residents and reviewing maps, twenty five tributaries have been identified.

A small "mill dam" was constructed on Laughery Creek in the mid to late 1800's near the town of Friendship. That dam has broken down and is not normally a barrier to fish movement in the creek. A large dam was constructed in the town of Versailles in 1956 to form a 230 acre lake which supplies drinking water to the towns of Versailles and Holton. Consequently, the dam acts as a barrier to upstream fish migration and no fish ladders are present. Following the completion of the Markland Locks and Dam on the Ohio River in 1964, the fish habitat was altered in Laughery Creek below Hartford. The dam raised the water level in the Ohio River which partially flooded and changed a 6.7 mile portion of Laughery Creek into a slow-flowing embayment. (Figure 8 shows the tributaries within the South Laughery Creek Watershed.)

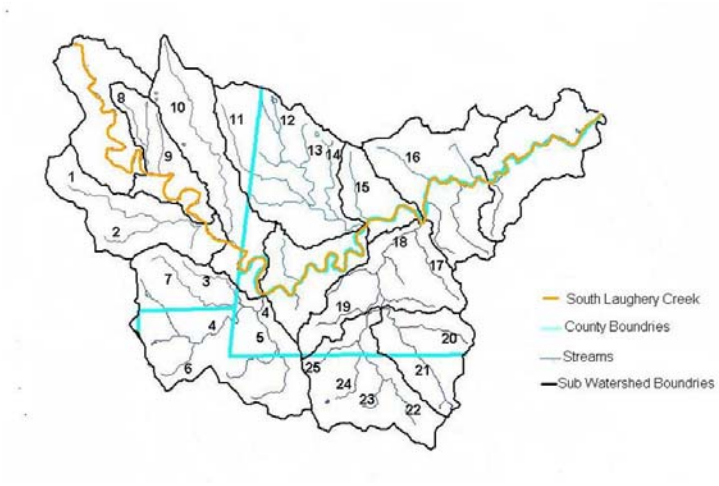


Figure 8 South Laughery Creek Watershed Tributaries

Water Supply

In Dearborn and Ohio Counties, drinking water is supplied from deep wells located in gravelly outwash material along the Ohio River. Public rural water lines from these wells carry the water throughout the area. In areas where water is not available from public water sources, water is obtained from dug wells, drilled wells, springs, cisterns, ponds and aquifers.[16] According to John Grace, Environmental Health Specialist for Dearborn County, most county residents receive water by wells and cisterns. According to Earl Ketenbrink from the Ohio County Health Department Ohio County residents receive water through the Rising Sun Utilities and the Aberdeen Pate Utilities which receive their water by way of an aquifer below and parallel to the Ohio River.

Ripley County residents are supplied water through Versailles Water Works, which receives water mainly from surface water sources such as Laughery Creek, Versailles Lake, and reservoirs. In more rural areas, residents depend on deep wells to obtain water, since groundwater in this upland area is limited. Most of the wells in this area are shallow, 20 to 40 feet deep, and are in glacial material of the Illinoian age.[17]

Public or private utilities provide water to about half of the occupied housing units in Switzerland County. All of this water is pumped from deep wells located in deposits of sand and gravel in the valley of the Ohio River. In areas where water is not provided through public water

[16] Nickell, Allan K., Soil survey of Dearborn and Ohio Counties, Indiana. Soil Conservation Service, 1981
[17] McWilliams, Kendall, Soil Survey of Ripley County and part of Jennings County, Indiana, 1985

lines, water is obtained from dug wells, drilled wells, springs, cisterns, ponds, creeks or the Ohio River.[18] According to Joe Spiller, Switzerland County Health Department, Switzerland County residents receive water from Patriot Water and Vevay Water Municipalities. These municipalities pump water from local wells.

Conditions such as drought, contamination, and terrorism pose potential threats to our water supply, making location and protection of all wells, aquifers, and water supplies important.

Wetlands

There are 2,240 acres of wetlands within the watershed, with three predominant wetland types associated with the watershed.

> "Lacustrine Wetlands are wetlands surrounding lakes and reservoirs. These wetlands are fresh water and are larger than 20 acres or contain water depths greater than 6 feet."[19]
>
> "Palustrine Wetlands include marshes and swamps as well as bogs, fens, tundra and floodplains. Palustrine wetlands are not associated with lakes or reservoirs." [20]
>
> "Riverine Wetlands are wetlands in channels of rivers and streams where water velocity is faster and the dominant bottom surface is rocky. Fast moving riverine wetlands feature animals associated with fast-moving water such as caddisflies. Riverine wetlands also form along slower-moving streams and rivers; their bottom is often muddy, and they support more vegetation and animals accustomed to slow-moving water. Riverine wetlands are part of the riparian, or streamside, habitat."[21]

Historical Land Use

"Prehistoric people, in what is now Dearborn and Ohio County, lived mainly along the Ohio River and its larger tributaries. Archaeologists consider these areas prime hunting grounds for artifacts. In 1781, Indians, supported by the British, attacked Colonel Archibald Lochry and 107 recruits at the mouth of Laughery Creek, this battle was the only Revolutionary War battle fought on Indiana soil.

In the late 1790's after the Revolutionary War, settlers began arriving in the area. Dearborn County was formed in 1803 and included what are now Ohio, Switzerland, and part of Ripley Counties. Lawrenceburg is the county seat of Dearborn County. Lawrenceburg became a town in 1802 and Aurora in 1819. Ohio County was organized in 1845. Rising Sun is the county seat of Ohio County."[22]

[18] Nickell, Allan K., Soil survey of Switzerland County, Indiana. Soil Conservation Service, 1987
[19] Idaho Public Television, "The Five Sub Systems of Wetlands", 2005, http://www.idahoptv.org/dialogue4kids/wetlands/fivetypes.html
[20] Idaho Public Television, "The Five Sub Systems of Wetlands", 2005, http://www.idahoptv.org/dialogue4kids/wetlands/fivetypes.html
[21] Idaho Public Television, "The Five Sub Systems of Wetlands", 2005, http://www.idahoptv.org/dialogue4kids/wetlands/fivetypes.html
[22] Nickell, Allan K., Soil survey of Dearborn and Ohio Counties, Indiana. Soil Conservation Service, 1981

"Ripley County, organized in 1817, was named after General Eleazer Wheelock Ripley, who fought in the War of 1812. Two years later Daniel and Henry Wooley settled in what is now Shelby Township. In May of 1818, the county was divided into three townships. In 1858, Center Township was organized in the last of a series of changes that resulted in the present 11 townships. John de Paul, who owned a great deal of land in Ripley County, gave 100 acres to the county in 1818. This became Versailles, the county seat, which was named after the town in France where de Paul's father was born. On September 21, 1818, the first sale of lots in Versailles was held, and 166 lots were sold. The town of Napoleon was platted on February 09, 1820, and was the second town in the county. Cross Plains was platted in 1826, New Marion in 1832, Milan in 1836, Friendship in 1850, Batesville in 1852, and Sunman and Osgood in 1856."[23]

"The early inhabitants of the area now known as Switzerland County were probably nomadic hunters. Artifacts, such as arrowheads, hint of more recent Indian inhabitants. The first log cabin in the area was built in 1795, along Plum Creek. The area officially became Switzerland County in 1814. The town of Vevay was laid out in 1813 and was incorporated as a town in 1836. It flourished during the steamboat era, when it was a major political, cultural and economic center. It declined in importance with the advent of the railroads, which bypassed the county."[24]

Land Use Trends

With most of the original forests cleared for settlement and farming, the agriculture landscapes have dramatically changed since the early 1800s. Like many Midwestern counties on the fringe of expanding urban areas, farmland has declined as residential and commercial areas have grown. Since 1900, land in farms has declined in Dearborn County by 45%, Ohio County by 57%, Ripley County by 59% and Switzerland County by 50%. However, land in farms still comprises 42% in Dearborn County, 54% in Ohio County, 56% in Ripley County, and 48% in Switzerland County. Much of this farmland has been used for residential and commercial development.

Population

The population within the South Laughery Creek Watershed counties has steadily increased over the last century. Dearborn County has seen the most significant population increase of the four counties of the watershed over the past 20 years due to its close proximity and access to Cincinnati. With US 50 running east and west across Dearborn County, both Kentucky and Ohio are easily accessed via Interstate 275. This easy access to major metropolitan areas is appealing and allows residents to country style living with relatively short commutes to cities. However, this population growth does not come without problems. Due to the large influx of people moving into the watershed area, traffic back ups and congestion are becoming a more frequent occurrence.[25]

[23] McWilliams, Kendall M., Soil Survey of Ripley County and part of Jennings County, Indiana. Soil Conservation Service, 1985
[24] Nickell, Allan K., Soil survey of Switzerland County, Indiana. Soil Conservation Service, 1987
[25] Indiana Population of Counties, http://www.census.gov/population/cencounts/in190090.txt, August 1995

Timber

The watershed area was settled around the 1800s at which time it was 95% covered with hardwoods. The timber consisted of mixed deciduous hardwoods such as maple and beech. The stands were cleared in the early 1830s as land parcels were being sold. Pine and cedars were scarce in the area because they are a successional species that appeared only after the land is cleared for farming.[26]

Public Land

Only three percent of land in Indiana is publicly owned. The South Laughery Creek Watershed has privately owned land with exception to its county, city, and state parks. Table 4 lists county, city and state parks within the South Laughery Creek Watershed.

Table 2. County, City, and State Parks

Name	Location	Description
Versailles State Park	US 50 just east of the town of Versailles	Second largest state park in Indiana. Boat rental, camping, fishing, picnic area, play ground equipment, horse back riding, Olympic sized pool and shelter houses
Dillsboro Community Park	Arlington Road in Clay Township	12 acre park with 2 shelter houses, 3 soft ball fields, soccer field, football field, play equipment, picnic tables and restrooms
Falling Timber Nature Preserve (state owned)	US 50 just East of the town of Versailles	Predominant natural community. Consisting of mesic and dry mesic upland forests, and riparian forests, very scenic and filled with fossil laden rock.

[26] Breedlove, Darrell, Indiana Department of Natural Resources, District Forester

Section Three – Establishing Baseline Data

Soil and Water Conservation District Historical Data

In 1996, the Dearborn and Ohio County Soil and Water Conservation Districts along with the counties' water boards embarked in a joint venture to determine the water quality of Lower Laughery Creek. A 12 month study was undertaken while testing for over 150 pesticides along with nitrogen, phosphates, fecal coliform, and the most widely used agriculture chemicals. The project was discontinued after six months since no significant amounts of agricultural chemicals were found. During the six month period when positive results for certain pesticides were obtained, drinking water standards were met. The only significant positive results obtained were for fecal coliform. High counts were obtained during periods of high flow. During one particular month of study, the fecal coliform levels reached six times the safe level for swimming. The partnering groups decided to suspend tests and they were not continued until the South Laughery Creek Watershed Project began in 2004. The 1996 informal water samples were collected by Dearborn and Ohio County resident volunteers.

IDEM 303d Water Quality Results

In 2004, the Indiana Department of Environmental Management Environmental Toxicology and Chemistry Section found high levels of E. coli within the South Laughery Creek Watershed that exceeded water quality standards. As a result of this testing, the South Fork Laughery Creek in Ohio County was listed as an impaired water body for E. coli.

Every two years, under the 303d section of the Federal Clean Water Act, individual states are required to identify water bodies that do not meet water quality standards for designated uses. Impairments to local water quality can come from both point and non point sources of pollution. Non Point source pollution is the primary contributing factor to the impairments found within the South Laughery Creek Watershed as there are very few commercial and industrial areas. From the 303d list, states must establish rankings to prioritize and develop a TMDL. A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards.[27]

"Waterborne pathogens can cause diseases, such as ear, skin, and eye infections as well as diarrhea and hepatitis. The detection of these pathogens is critical in evaluating water quality. Coliform bacteria are present in the digestive tracts and feces of all warm-blooded animals, including humans, and can be detected wherever waterborne pathogens are found. However, the coliform group of bacteria includes a variety of organisms, some of non-fecal origin.

[27] Johnson County Soil and Water Conservation District, Young's Creek Advisory Group, *The Young's Creek Watershed: A Plan for the Future*, October 2003

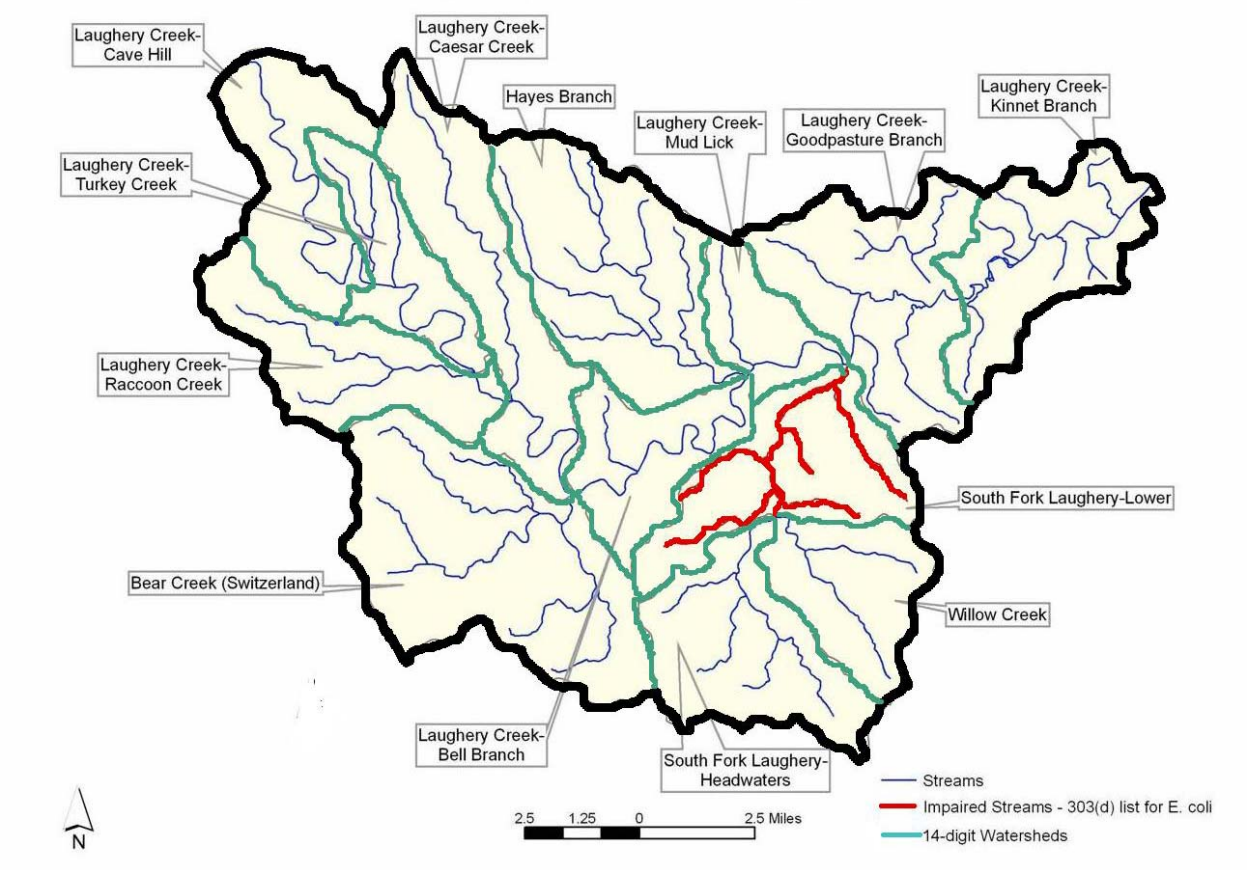


Figure 9 Impaired Waterbodies

Therefore, coliform are not reliable as a sole indicator of waterborne pathogens. E. coli, a member of the coliform group, is a reliable indicator organism because it is found solely in the intestinal tracts of warm-blooded animals. The presence of E. coli indicates the presence of waterborne pathogens and the potential for waterborne diseases."[28] (See Figure 9 for impaired streams within the South Laughery Creek Watershed. No TMDL is currently scheduled for the South Laughery Creek Watershed.)

Visual Assessment Results

Windshield surveys were conducted in the fall of 2004 to obtain visual assessments of the watershed land and stream health. Members from the Steering Committee reported findings after driving portions of the watershed and recording the data they observed.

Dearborn County (Northeast Portion of watershed) had 73 documented sites with the following observations:
Debris at many sites in this portion of the watershed
Erosion occurring along streambanks
Pastured areas (some overgrazed) along the streams

[28] Johnson County Soil and Water Conservation District, Young's Creek Advisory Group, *The Young's Creek Watershed: A Plan for the Future*, October 2003

Campsites with outhouses along streams
Access points and tire tracks in the creek from recreational vehicles
New construction of roads and houses
Areas of Cropland occurring mainly in the bottomlands

Ohio County (Southeast Portion of watershed) had 160 documented sites with the following observations:
Erosion from overgrazed pastures
Crop fields on sloping fields with minimal coverage
Extensive sloped woodlands within watershed (closer observation needed to determine condition)
Housing developments noted in many areas of the watershed
Campsites noted along Laughery Creek Main Branch
Evidence of construction equipment in floodway

Ripley County (Northwest Portion of watershed) had several documented sites with the following observations:
Erosion occurring from overgrazing and livestock access to waterbodies
Majority of watershed covered by woodland
Wildlife habitat areas noted throughout the watershed
Few areas of rolling cropland with marginal cover

Switzerland County (Southern part of watershed) had several documented sites with the following observations:
Surface applied manure (potential for nutrient contamination)
Overgrazing of pastures may contribute to sedimentation
Livestock access to waterbodies
Large percentage of row crop with a high percentage in no-till
Some areas have low residue amounts on cropland which increases erosion
Numerous outhouses noted due to lifestyle preferences

Project Water Monitoring Results

Earth Tech of Bloomington, Indiana was contracted to conduct 12 months worth of sampling for specific parameters listed in the final contract from the Indiana Department of Environmental Management (IDEM). Sampling at 13 locations was done within the watershed over the required 12 month period for the following parameters: phosphorus, nitrogen, suspended solids, pH, temperature, dissolved oxygen, turbidity, salinity, conductivity, E. coli, and macroinvertebrates. The water testing data was analyzed in part using the Hoosier Riverwatch Volunteer Stream Monitoring Training Manual. Figure 10 shows a detailed representation of testing sites throughout this project.

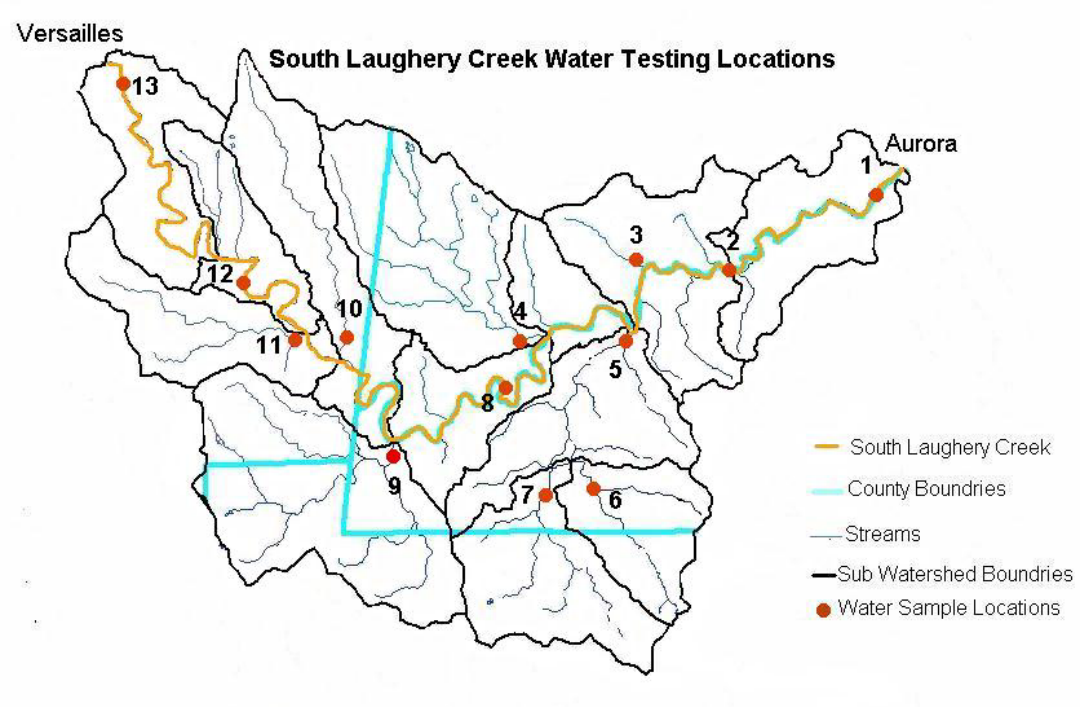


Figure 10 South Laughery Creek Watershed Testing Locations

The sampling parameters listed in the original contract issued by IDEM did not require sampling for BOD, Biological Oxygen Demand, which is a requirement to complete the Water Quality Index through the Hoosier Riverwatch Manual. The BOD testing was added late in 2005 and no significant demand was found. The Water Quality Index ratings were calculated without BOD data using an appropriately modified formula. In addition, there were months when technical problems and low flow yielded incomplete data.

To formulate the Water Quality Index through the Hoosier Riverwatch Manual, at least six parameters are required to rate the water quality. The Technical Committee used E. coli, turbidity, dissolved oxygen, total phosphorus, pH, temperature, and nitrate/nitrite.

The committee examined all the water quality data, while taking into consideration all other information gathered during the project. After all of the data was analyzed, the steering committee agreed there were priority areas within the watershed that needed attention.

The following data illustrates some of the factors taken into consideration while examining the water quality within the South Laughery Creek Watershed. The following descriptions were extracted from the Hoosier Riverwatch Volunteer Stream Monitoring Training Manual.[29] They are included so that the reader can better understand the parameters being monitored.

[29] Lyn Hartman and Mandy Burk (November 2000). Hoosier Riverwatch Volunteer Stream Monitoring Training Manual. Indiana Department of Natural Resources, Purdue University

Turbidity

Turbidity is the measurement of the relative clarity or 'cloudiness' of the water. Turbid water is caused by suspended and colloidal matter, including clay, silt, organic and inorganic matter, along microscopic organisms. Turbidity should not be confused with color, since darkly colored water can still be clear and not turbid. If a stream is extremely turbid, sunlight reaching the plants within a water body will be reduced, therefore, altering the process of photosynthesis.

When water is turbid, the floating particles absorb heat from the sun, raising water temperature and thus lowering dissolved oxygen levels. The particles can kill fish and aquatic invertebrates by clogging their gills and smothering their habitat. Most living organisms survive better in waters with lower turbidity.

Turbid water may result from soil erosion, urban runoff, algal blooms, and bottom sediment disturbances caused by boat traffic or abundant bottom feeding fish. Turbidity is an important measurement, because light affects both the biological and chemical reactions in a stream. Typical range is 0 to 173 NTU while the average for Indiana is 36 NTU. (Figures 11-15 show the turbidity levels over the course of one year.*)

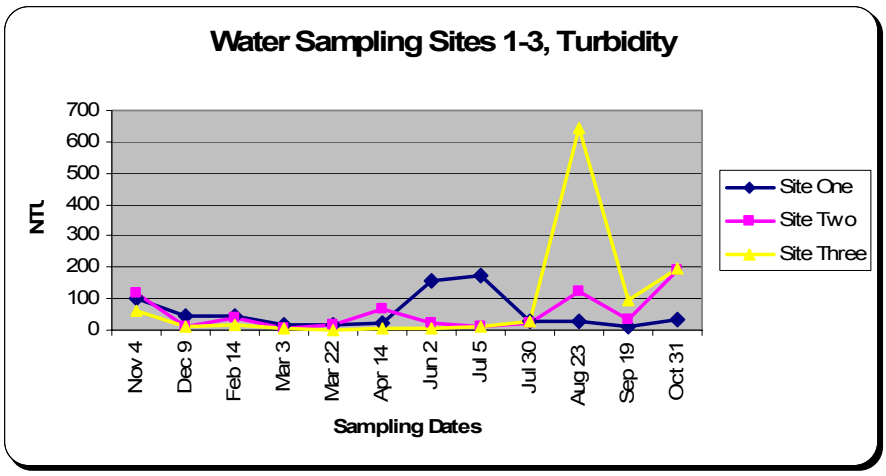


Figure 11 Turbidity Data - Sites 1-3

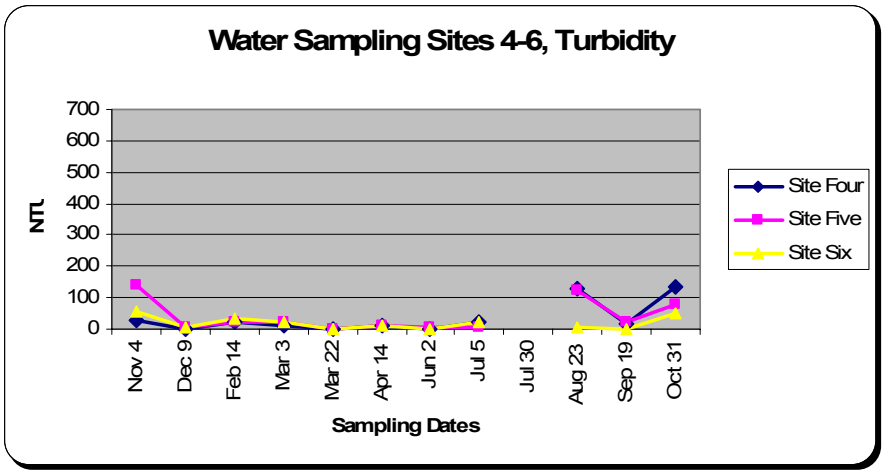


Figure 12 Turbidity Data - Sites 4-6

* Gaps in the graphs indicate unavailable data.

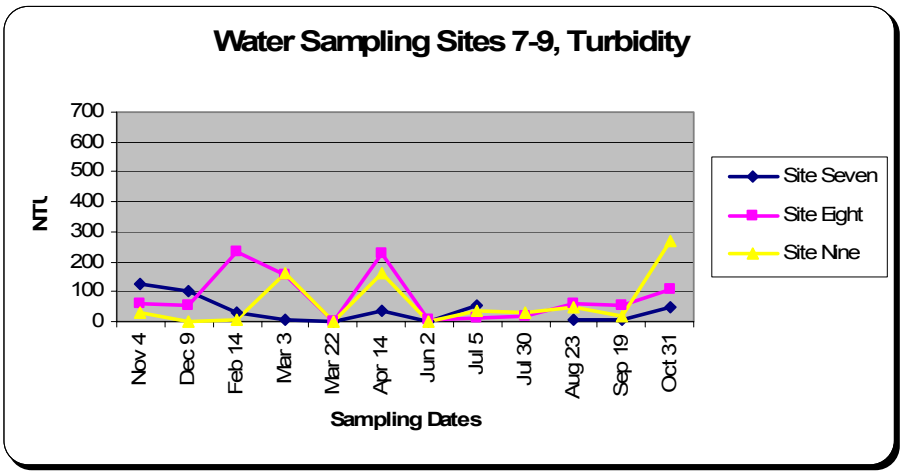


Figure 13 Turbidity Data - Sites 7-9

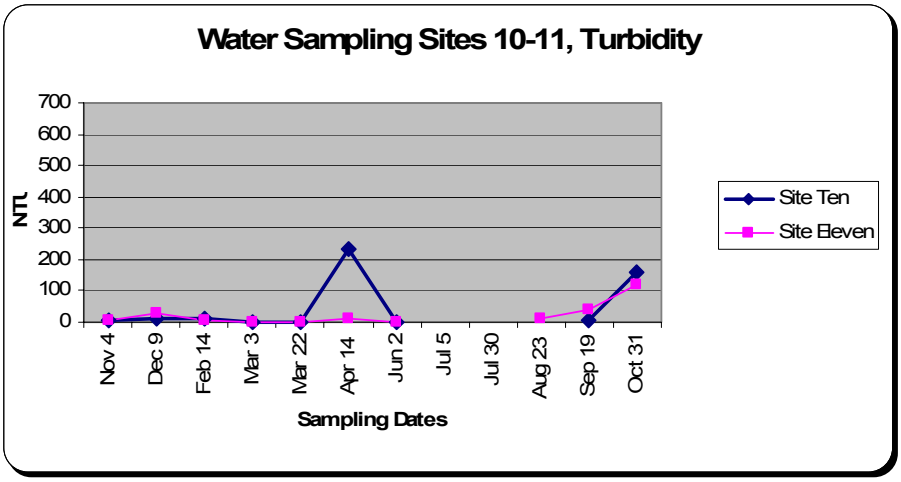


Figure 14 Turbidity Data - Sites 10-11

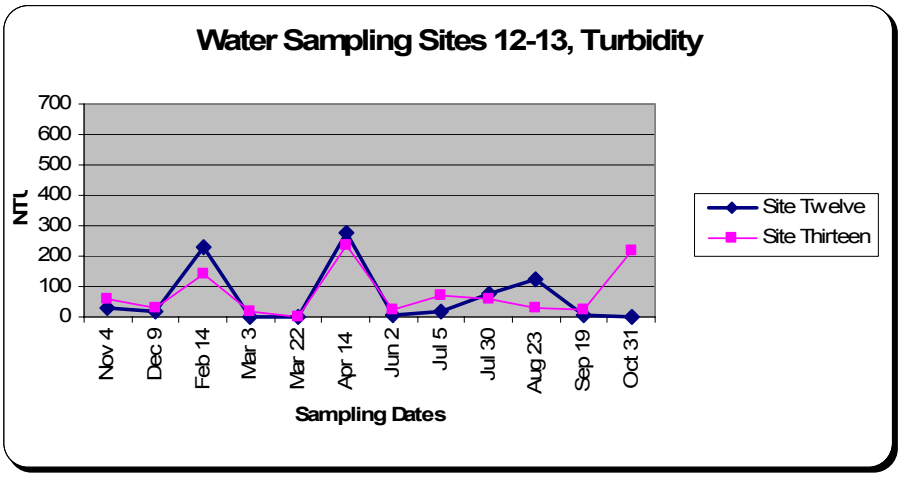


Figure 15 Turbidity Data - Sites 12-13

Turbidity Testing Results - Turbidity predictably increased during storm events, but there was no evidence of significant sources of sediment inputs at either main stream or tributary stations. Silty water was observed at Station 11 in December 2004. This was traced upstream to some earth work that was being done at a residential lot about one quarter mile upstream. This did not prove to be a continuing source of sediment loadings, however. Water at station 13, while not obviously sediment laden, tended to be dark and murky, and even at a depth of a foot, it was often difficult to see the bottom at times. This could be a result of operations at the State Park and wastewater treatment plant.[30] The turbidity levels were noted to exceed the State's average of 36 NTU at many of the testing sites.

E. coli

Fecal coliform bacteria are found in the feces of warm-blooded animals, including humans, livestock, and waterfowl. These bacteria are naturally present in the digestive tracts of animals, but are rare or absent in unpolluted waters. Fecal coliform bacteria can enter a water body via combined sewer overflows (CSO's), poor septic systems, and runoff from agricultural feedlots. The bacteria can enter the body through mouth, nose, eyes, ears, and cuts in the skin.

E. coli is a specific species of fecal coliform bacteria used in Indiana's state water quality standards. Some strains of E. coli can lead to illness. While not all strains of E. coli are pathogenic, the bacteria occurs with other intestinal tract pathogens that may be dangerous to human health. So, the presence of E. coli is an indicator of fecal contamination.[31] The state single sampling standard for Indiana's E. coli contamination in a waterbody is 235/CFU's/100mL for full body contact throughout the recreational months of April thru October.[32] (Figures 16-20 show the E. coli levels over the course of one year.*)

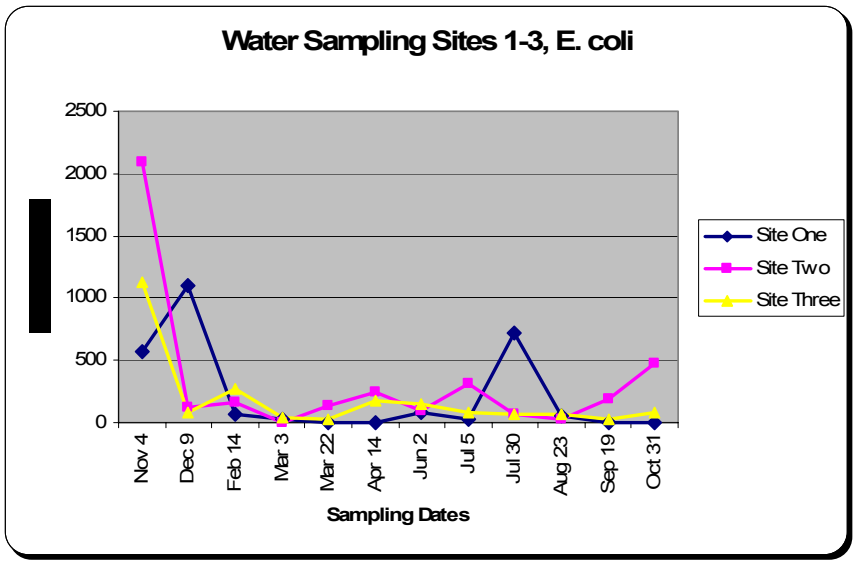


Figure 16 E. Coli Data - Sites 1-3

[30] James Keith (January 2006). South Laughery Creek Watershed Testing Results, Earth Tech.
[31] Lyn Hartman and Mandy Burk (November 2000). Hoosier Riverwatch Volunteer Stream Monitoring Training Manual. Indiana Department of Natural Resources, Purdue University
[32] Indiana Department of Environmental Management, Office of Water Quality, http://www.in.gov/idem/owm/planbr/wqs/review/archive/ecoli.html, December 2005
* Gaps in the graphs indicate unavailable data.

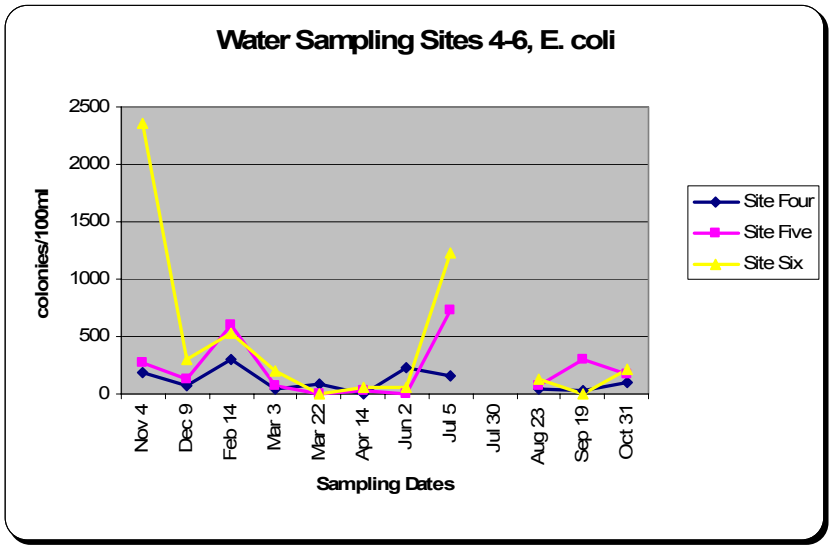


Figure 17 E. Coli Data - Sites 4-6

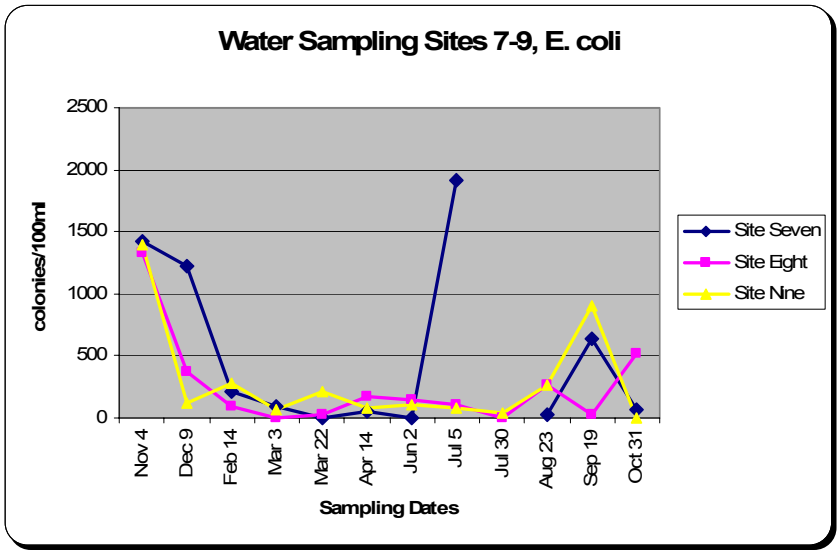


Figure 18 E. Coli Data - Sites 7-9

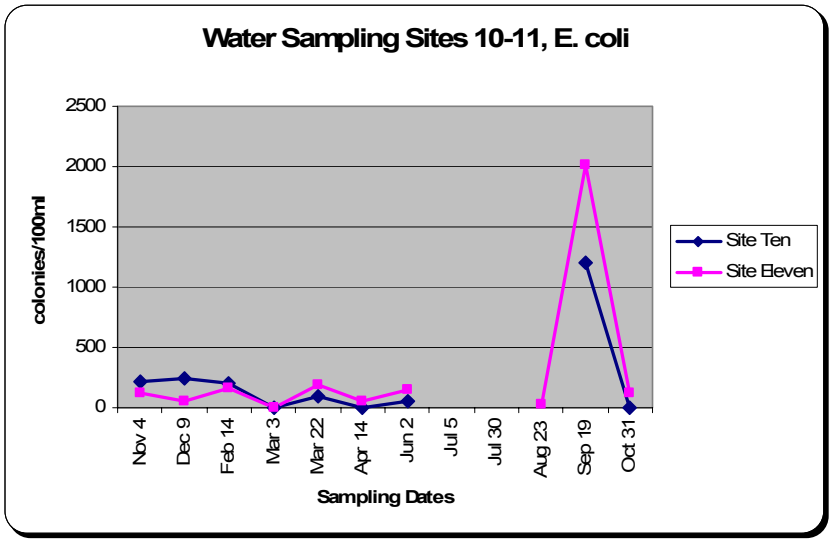
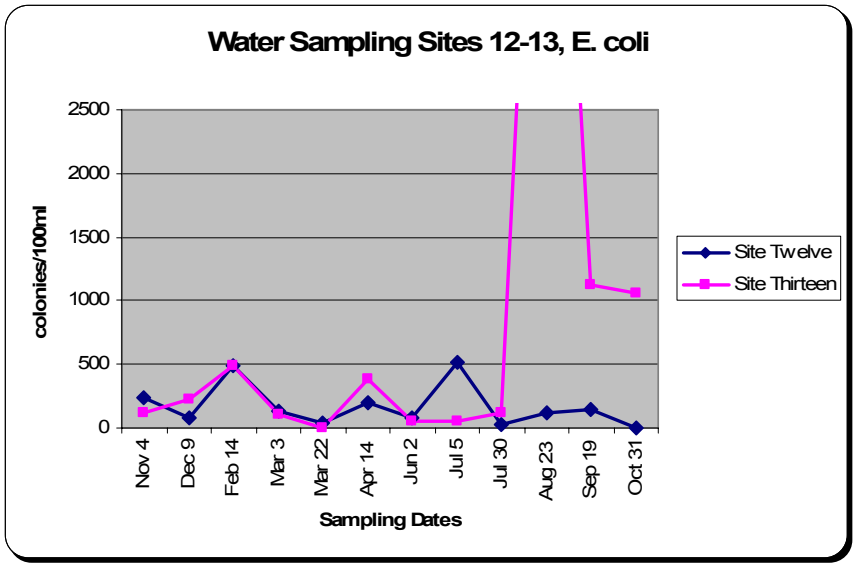


Figure 19 E. Coli Data - Sites 10-11

Figure 20 E. Coli Data - Sites 12-13



E. Coli Testing Results - There is a peak of Total Coliforms and E. coli at Station 2, which may come from nearby residences at Hartford. Total coliforms and E. coli are high at tributary Stations 6 and 7, and may reflect bacteria carried downstream by runoff from upland pastures and feedlots. Station 11 has a peak of E. coli, which may reflect septic effluent from a number of residences located upstream along SR 62 and Rost Run. There is also a peak of both bacteria at Station 13, which is downstream from Versailles State Park and from the wastewater treatment plant.

There is a peak of both bacteria at the initial sampling episode, and then values decline in winter. There is another peak in Total Coliforms in April 2005 which may reflect renewed biological activity associated with warmer weather, but there is no accompanying increase in E. coli at this time. There is another peak of Total Coliforms in July 2005, then a decline through the remaining sampling episodes. E. coli values remain low throughout the winter through June 2005, then rise through September and decline in October.

IDEM regulations under 327 IAC 2-1-6 (d) establish bacteriological quality for recreational water uses through the recreational season (April through October). E. coli must not exceed 235 per 100 ml in any one sample. There is no Total Coliform standard for recreational waters, and the Total Coliform standard for drinking water supply was not addressed in this sampling scheme. A total of eighteen exceedences occurred at ten stations (5 main stream and 6 tributaries) throughout the course of this investigation.

All of the stations have the potential to occasionally receive E. coli inputs from livestock, recreational facilities and septic systems, but there appears to be no consistent source for E. coli, either at main stream stations or tributary stations, with the exception of Station 13, which is downstream from Versailles State Park and from the wastewater treatment plant.[33]

[33] James Keith (January 2006). South Laughery Creek Watershed Testing Results, Earth Tech.

Dissolved Oxygen

Oxygen is as important to aquatic life as it is to life on land. Most aquatic plants and animals require oxygen for survival, and the availability of oxygen affects their growth and development. The amount of oxygen found in water is called dissolved oxygen (DO) concentration. Oxygen from the atmosphere dissolves readily in the water until the water becomes saturated. Aquatic plants, algae, and other small organisms such as phytoplankton also produce oxygen as a by-product of photosynthesis.

DO is an important measure of stream health. The presence of oxygen in water is a positive sign, while absence of oxygen from water is often a sign that the water is polluted. Aquatic organisms require different levels of DO. However, dissolved oxygen levels below 3 parts per million (ppm=mg/L) are stressful to most aquatic organisms, and levels below 2ppm will not support fish life. Levels of 5 to 6ppm are usually required for growth and activity of aquatic life. Extremely high levels of DO can be harmful to aquatic organisms, including fish, by causing gas bubble disease.[34] (Figures 21-25 show the DO levels over the course of one year.)*

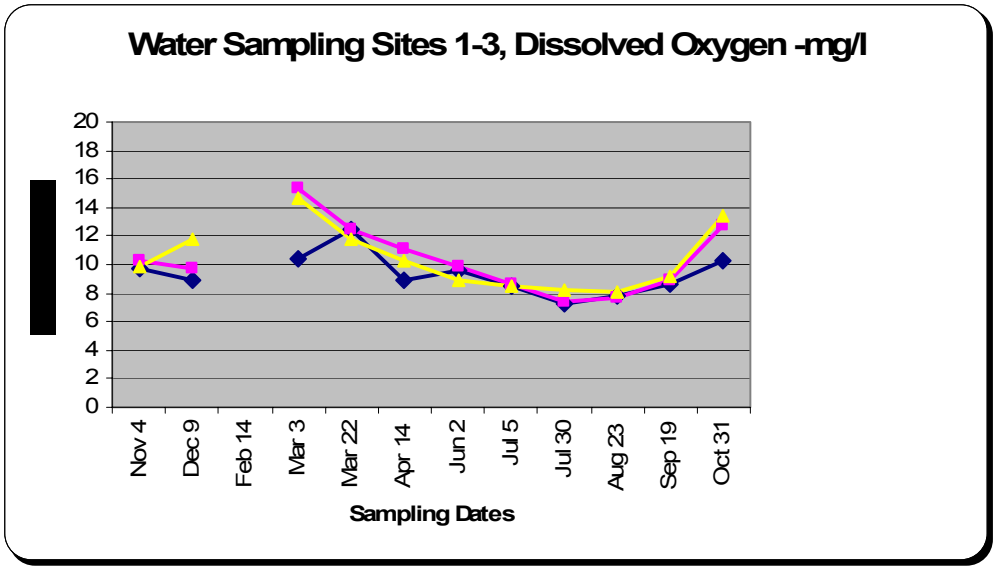


Figure 21 Dissolved Oxygen Data – Sites 1-3

[34] Lyn Hartman and Mandy Burk (November 2000). Hoosier Riverwatch Volunteer Stream Monitoring Training Manual. Indiana Department of Natural Resources, Purdue University

* Gaps in the graphs indicate unavailable data.

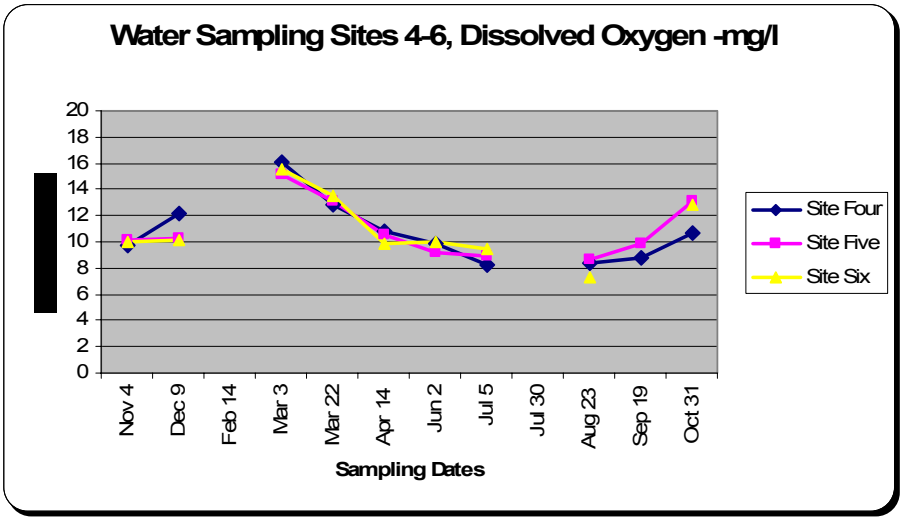


Figure 22 Dissolved Oxygen Data – Sites 4-6

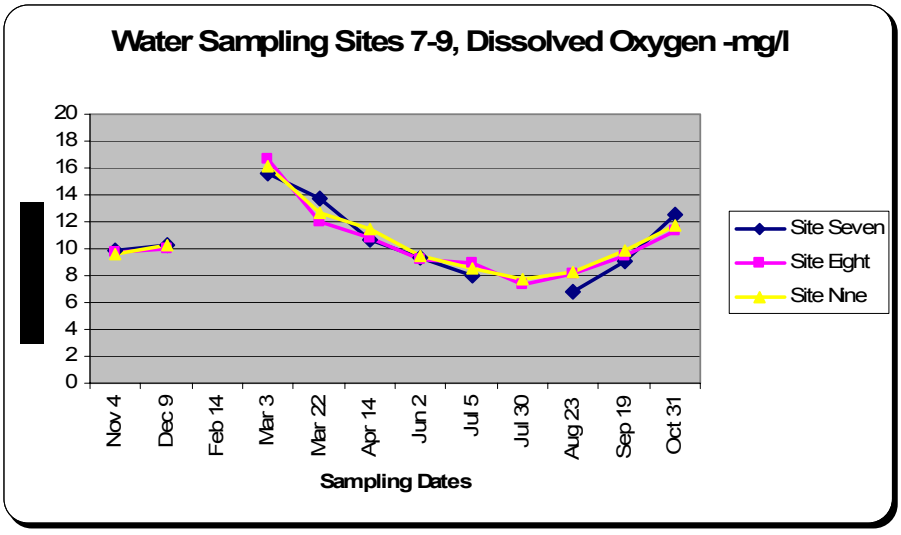


Figure 23 Dissolved Oxygen Data – Sites 7-9

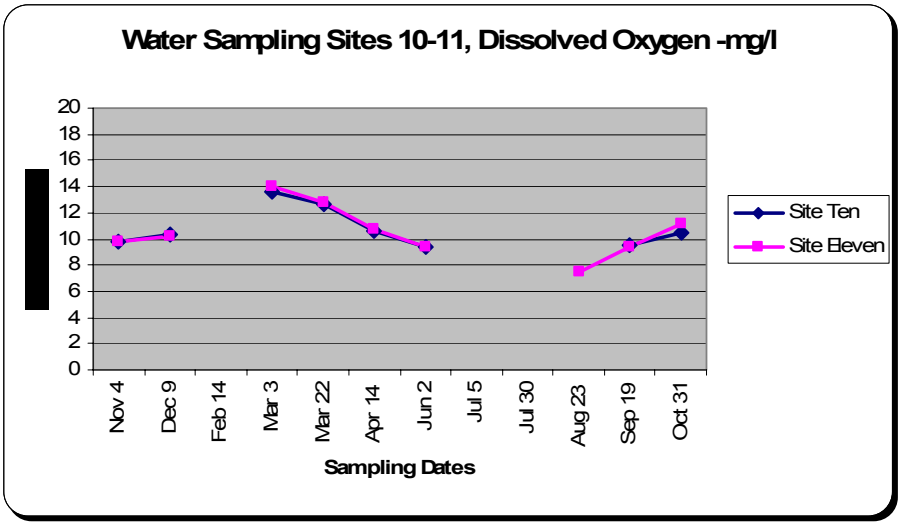
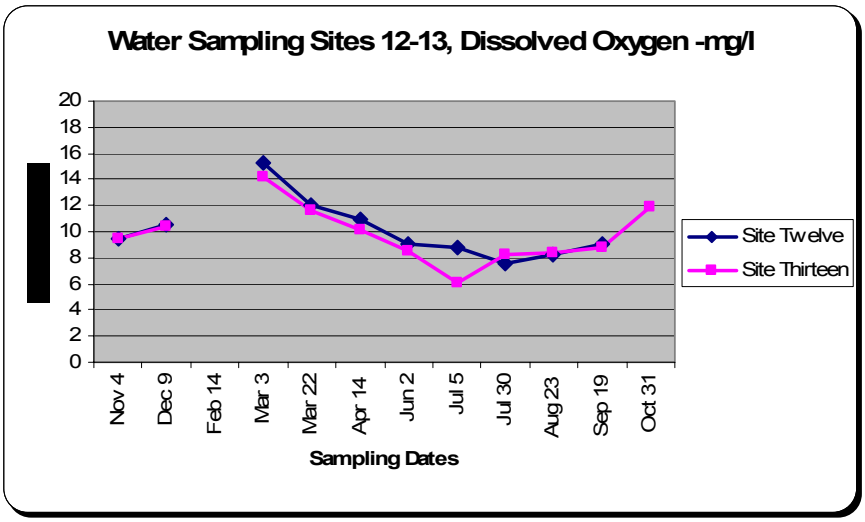


Figure 24 Dissolved Oxygen Data – Sites 10-11

Figure 25 Dissolved Oxygen Data - Sites 12-13



Dissolved Oxygen Testing Results - Main stream, temperatures are highest at Station 1, but the remaining main stream temperatures are fairly uniform. Tributary stations 10 and 11 have the lowest overall temperatures, possibly a result of comparatively heavy shading of these mainly wooded stream valleys. Overall, the water appears to be well oxygenated. Dissolved oxygen generally varies little from station to station, but there are noticeable low values at Station 12 and 13, which also exhibited black staining on the bottoms of rocks, a sign of at least occasional anoxic conditions. pH varies little from station to station.

There is a noteworthy negative relationship between Dissolved Oxygen and Temperature over time. The water at most stations is well aerated by flow over rocks, riffles and falls. Oxygen loss may occur as a result of warming water, lower summer water levels and respiration by aquatic plants and animals.

Water flow in tributaries diminished to the point where samples could not be taken several times in the summer of 2005, although there was still water in sheltered pools, gravel pockets and beneath rocky riffles. This helps to preserve the resident macroinvertebrates. The drying occurred even though most of the tributaries have sizeable drainage areas. This points to a possible lack of ground water storage in soils and bedrock of the watershed. The lack of springs in the study area was notable even though the stream is situated in a carbonate terrain. This lack of storage will mean the stream biota as a whole may be vulnerable to losses during extended dry periods. BOD5 was not detected at any station.[35]

Total Phosphorus

Phosphorus is essential to plant and animal life, and its presence in the environment is natural. Problems with phosphorus as a water pollutant result not from its presence, but from the addition of excessive amounts. Aquatic ecosystems develop with very low levels of phosphorus. The addition of seemingly small amounts of phosphorus that would have little-to-no affect on terrestrial system can lead to problematic algal blooms when added to aquatic systems.

[35] James Keith (January 2006). South Laughery Creek Watershed Testing Results, Earth Tech.

Phosphorus enters surface waters in organic matter (dead plants and animals, animal waste), attached or absorbed to soil particles, or in a number of man-made products (detergents, fertilizers, industry wastes). Phosphorus is important in fertilizer because it increases vegetation.

When transported into aquatic systems, phosphorous increases aquatic plant growth such as algae and weeds. When phosphorus levels are too high, excess plant and algal growth creates water quality problems. Plants begin to die and decompose, depleting the dissolved oxygen supply in the water. This can ultimately lead to fish kills in some circumstances. Phosphorus is also released from decomposing plants back into the water continuing the cycle. The reaction of the aquatic system to an overloading of nutrients is known as eutrophication. (Figures 26-30 illustrate Total Phosphorus numbers for the one year sampling period.*)

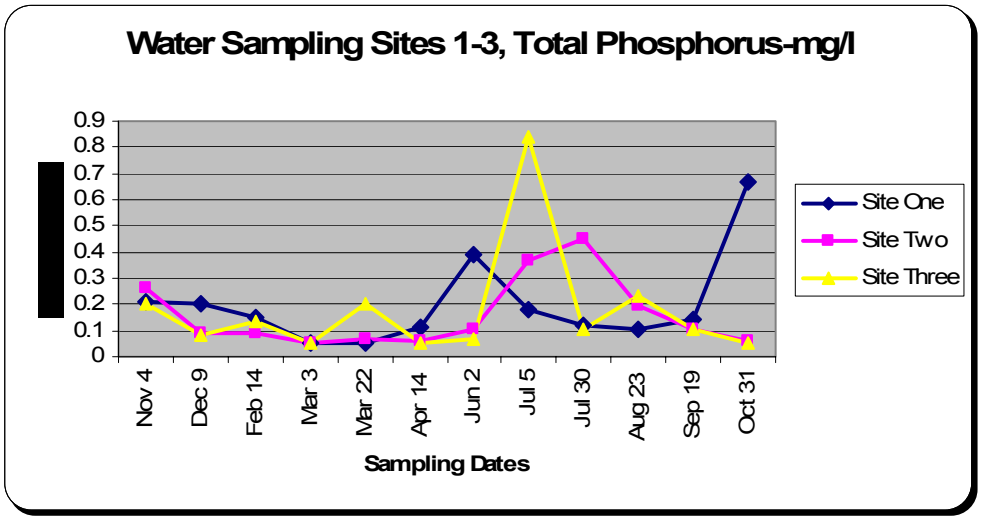


Figure 26 Total Phosphorus Data - Sites 1-3

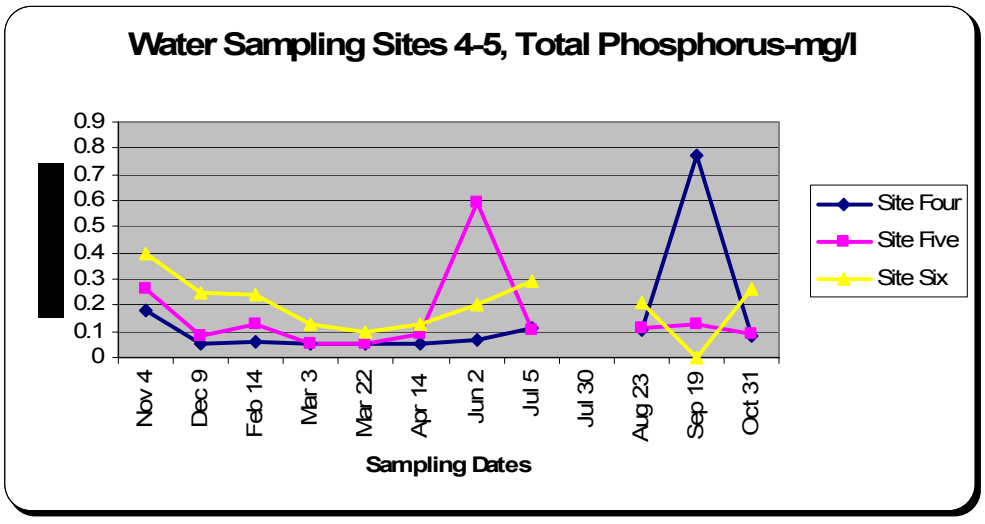


Figure 27 Total Phosphorus Data - Sites 4-6

* Gaps in the graphs indicate unavailable data.

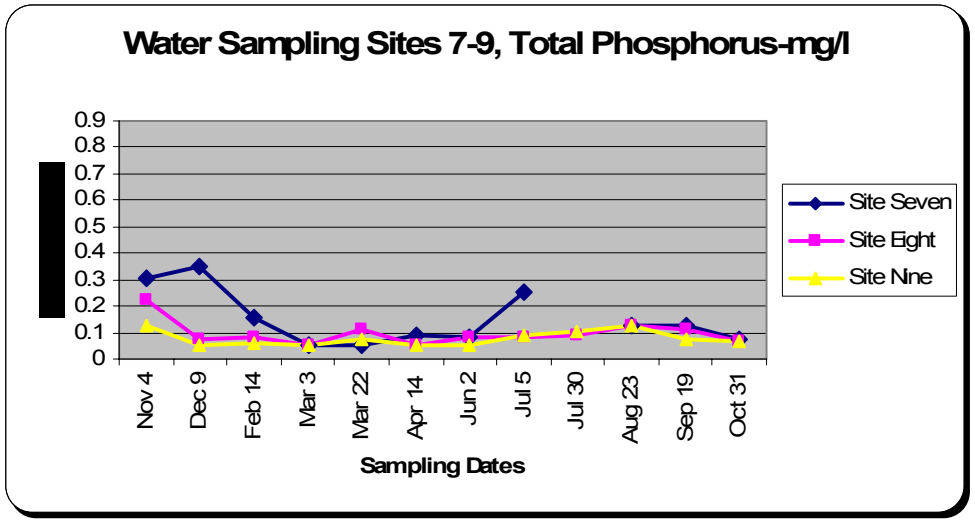


Figure 28: Total Phosphorus Data - Sites 7-9

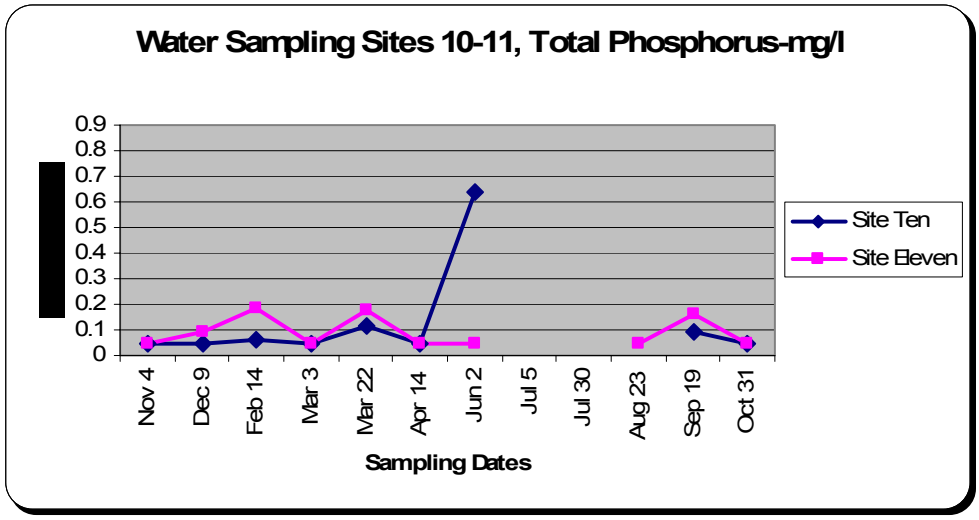


Figure 29: Total Phosphorus Data - Sites 10-11

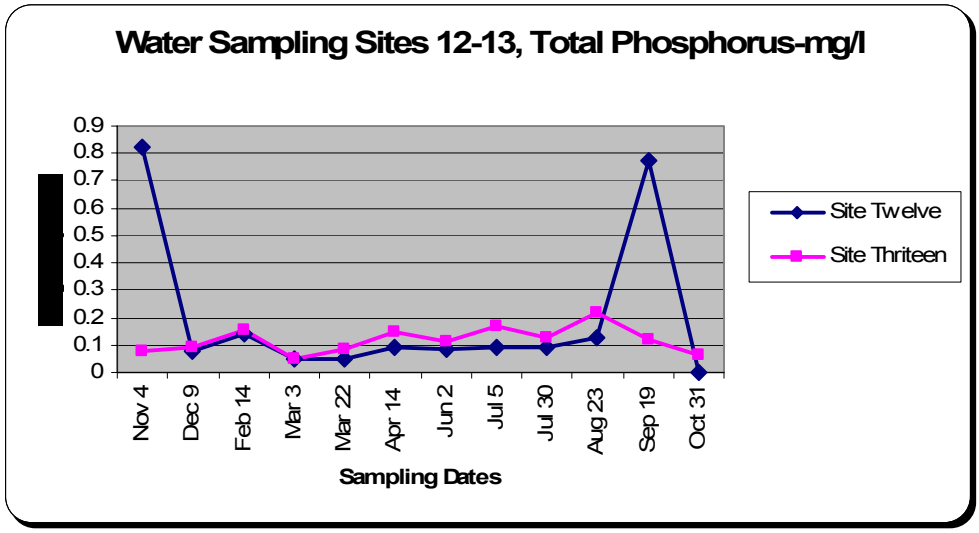


Figure 30: Total Phosphorus Data - Sites 12-13

Phosphorus Testing Results – Several spikes were observed above the 0.3mg/L targeted level for phosphorus. These spiking events may correspond with nutrient application on agricultural land or septic system inputs.

Water Quality Index

Using the Advanced Chemical Monitoring Data Sheet from the Hoosier Riverwatch Manual, See Appendix F, test results were entered on the sheets to obtain the Water Quality Index (WQI). The WQI is the overall health of each test site when examining all required parameter results cumulatively. The scale for determining the WQI according to the Hoosier Riverwatch Manual is listed in Table 3. The average water quality rating for each site is located on Figure 31. For all water monitoring data please contact the Dearborn County Soil and Water Conservation Office for the final reports.

Table 3. Hoosier River Watch water quality index ranges

Excellent	90-100%
Good	70-90%
Medium	50-70%
Bad	25-50%
Very Bad	0-25%

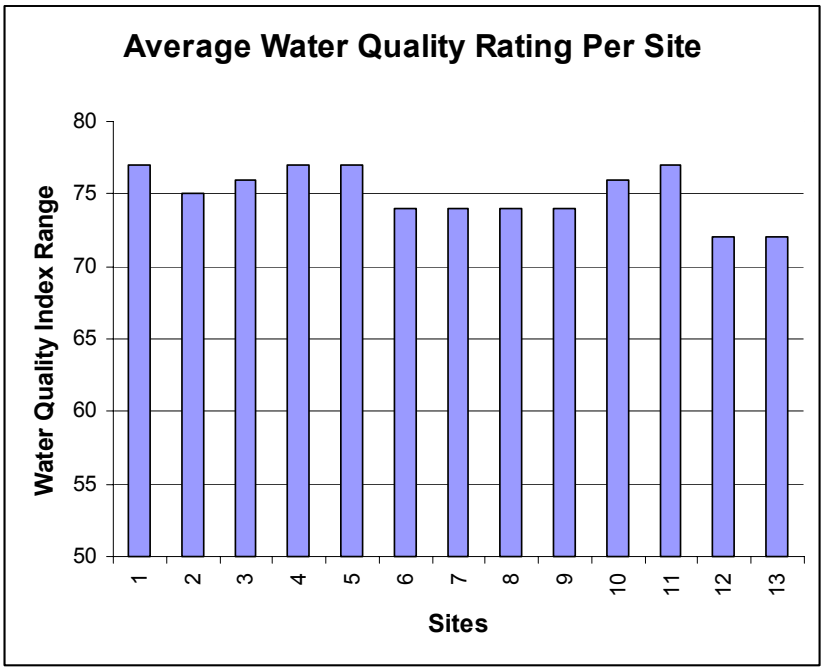


Figure 31 Average Water Quality Rating Per Site

After examining all parameters needed to calculate the Water Quality Index through the Hoosier Riverwatch Manual, some sites warranted concern. The Technical Committee pinpointed these areas within the watershed.

There was unanimous agreement by the Steering Committee that test Site Five (0803 South Laughery Lower sub watershed), Site Six (0802 Willow Creek sub watershed) and Site Seven (0801 South Fork Headwaters sub watershed) indicated a high priority of concern. Site Five is the area listed on the 303d impaired waterbodies list for E. coli. Site Six and Site Seven are upstream from Site Five and there is some concern that Site Six and Site Seven are contributing to lower water quality at Site Five. These three sites often exceeded the standard level for E. coli of 235/CFU's/100mL for total body contact. (Figure 32 shows the areas of concern.)

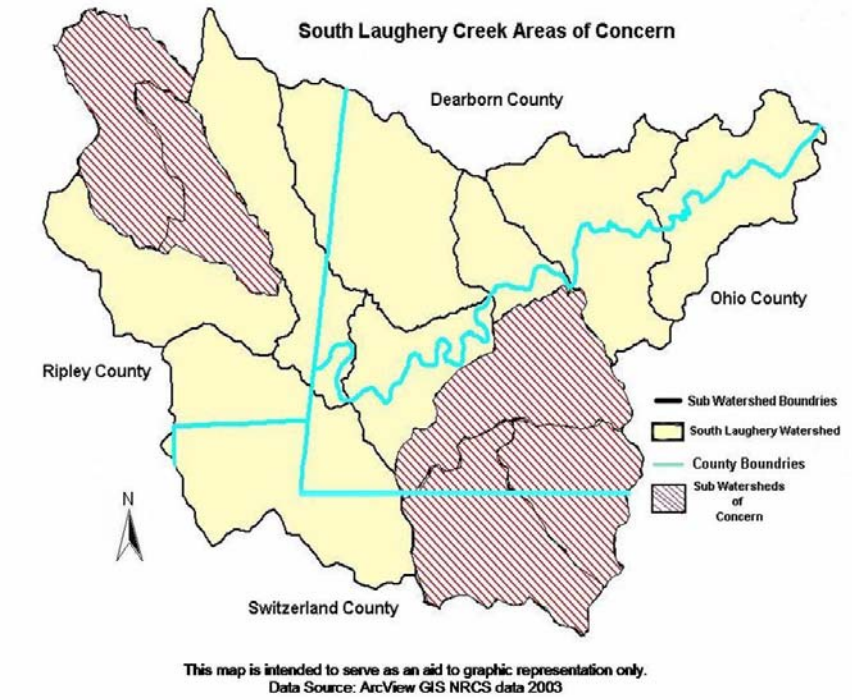


Figure 32 South Laughery Creek Watershed Areas of Concern

Site Five exceeded E. coli standards four out of the 12 tests, Site Six exceeded four out of 12 tests, and Site Seven exceeded four out of 11 tests. Satellite imagery shows a large portion of these tributaries with stream buffers of less than 90 feet and some portions of less than 30 feet. (See Figure 37 on page 47 to learn more about riparian buffers within the watershed.) Drive-by observations along with agricultural data documents a relatively large number of cattle and at least three dairy operations within this area of the watershed.

High E. coli counts generally followed weekly Cincinnati rainfall (http://www.wunderground.com/US/OH/Cincinnati.html) of 0.5 inches or higher. See Figure 33 for rainfall information. In addition, a question arose concerning sewage treatment overflow from a small town located within the affected area, Upon investigation these concerns were determined to be unfounded. The Steering Committee agreed that these three sub-watersheds and three sites merit further study and action.

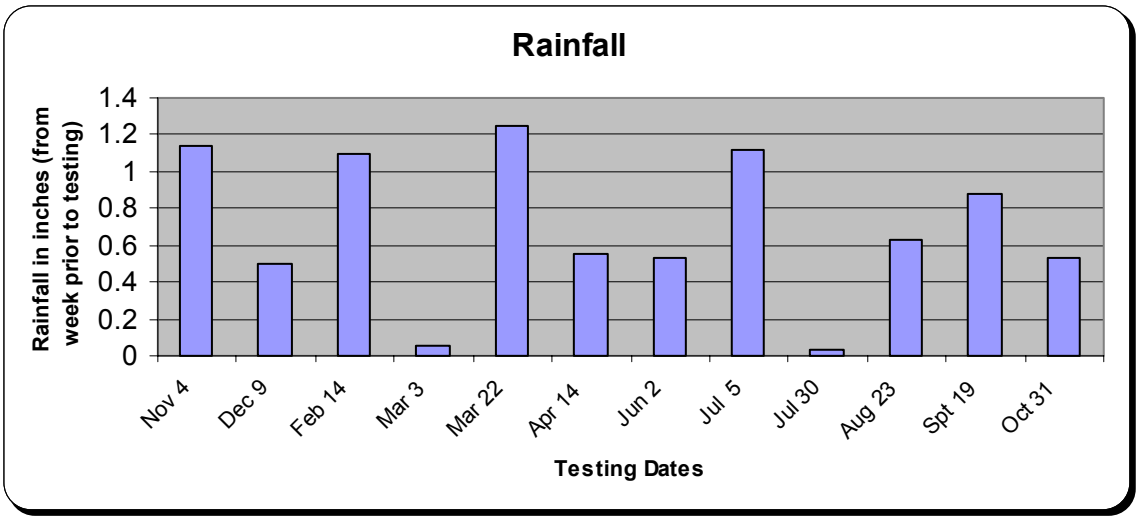


Figure 33 Rainfall within South Laughery Creek Watershed

Two additional sites reported elevated E. coli levels during the course of the tests. Site Thirteen, located in Versailles State Park, is the headwaters for the main stream of South Laughery Creek. This site is located in the (0701) Cave Hill sub watershed and showed E. coli counts exceeding the 235/CFU's/100mL standard five out of the 12 tests. The August test yielded an extreme 7220/colonies/100mL. Upon further investigation, it was determined that in August 2005 the State Park connected a new wastewater treatment plant across the stream, perhaps creating a spill during hookup. The effluent from the new plant drains west of South Laughery Creek into Grants Creek.

Other test sites exceeding standards were scattered throughout different seasons and show some correlations to precipitation events. Site 12 is further downstream from Site Thirteen and exceeded the E. coli standard three out of 12 times. In addition to high E. coli counts, Site Twelve had turbidity values of 230 NTU in February and 276 NTU in April.

There were two dates showing high Total Phosphorous levels at Site Twelve. (See Figure 30.) November readings were 0.820 mg/L and September readings were 0.770 mg/L. Both of these high numbers followed high weekly rainfall. Site Twelve falls within the (0703) Turkey Creek sub-watershed and is difficult to study with drive-by observation. Satellite imagery shows bank areas near the testing site with stream buffers of less than 90 feet and in some areas less than 30 feet. Discussion within the Steering Committee determined that this area has been heavily used for pasture and agriculture in past years, but is now undergoing more residential development.

Site Eight within the (0706) Bell Branch sub-watershed had low Water Quality Index ratings because of extremely high turbidity on the February, March, and April testing dates, following high weekly rainfall. Satellite imagery shows a large area of the creek above site eight that has stream riparian buffers of less than 90 feet and less than 30 feet in some areas. One of the Steering Committee members lives near site Eight and reports a great deal of stream bank erosion caused by the main channel of Laughery Creek cutting across fields during flooding. Erosion has been a high priority of the Steering Committee and the area near Site Eight is important to investigate for further action concerning erosion.

Site Two near the old Hartford Ford in the (0804) Goodpasture Branch sub-watershed exceeded the E. coli standard in four out of 11 tests. The high numbers follow high weekly rainfall. This site is in the main stream channel but farther downstream from the tributary outflow of Site Five, Site Six, and Site Seven (Site Five is on the 303(d) list). Satellite imagery shows stream buffers of less than 30 feet within the immediate area of the Hartford Ford. This area has a non-power boat launch and draws many fishermen.

Litter and dumping is a big problem in this area; and a community clean-up was held in the spring of 2005. There is significant development occurring in the higher elevations of the sub watershed and buffers along the drainage areas are minimal. This area will also merit more study to determine the effect of further development on turbidity and general changes to the sub-watershed habitat.

Although site one in the (0805) Kinnet Branch sub watershed showed water quality data that was of concern, the Steering Committee felt that this site is heavily impacted by the backwater of the Ohio River and may not highly benefit from action that would be within the scope of this project.

The macro-invertebrate data collected by Earth Tech was extremely sparse averaging only two or three organisms per site. Members of the Technical Committee did macro-invertebrate sampling according to the methods described in the Hoosier Riverwatch Manual and discovered high numbers and good diversity at Site Nine in the (0705) Bear Creek sub watershed. Most of the organisms discovered by the contracting firm and the samples taken by the Technical Committee showed organisms in the categories of Group 3 (Good: tolerate moderate pollution) and 4 (Excellent: tolerate zero pollution), according to Hoosier Riverwatch ratings.

The oxygen saturation percent was consistently in the excellent range for all sites and all dates with the exception of Site thirteen in early July, which had DO reading of 6.12 mg/L and 77% saturation. This site has already been described above as an area of concern because high E. coli counts.

The Technical Committee and Steering Committee agree on the need for action to improve the water quality in and around the areas of Sites Five, Site Six, Site Seven, Site Twelve, and Site Thirteen. Additional benefits could be gained by implementing erosion controls around Sites Two and Site Eight. The creek shows the potential for being a healthy and clear water body with safe recreation and beneficial habitat for wildlife. All persons concerned with this endeavor hope that future actions will be supported by the stakeholders within the watershed and that significant progress towards a healthy watershed will be seen within the next few years.

NPDES Discharge Data

Water pollution degrades surface water making it unsafe for drinking, fishing, swimming and other activities. The National Pollution Discharge Elimination System (NPDES) permit program, which is authorized by the Clean Water Act, controls water pollution by regulating point source pollution that discharges into water bodies within the United States. Sources of point source pollution can be straight pipes from factories, industry, and businesses or man made ditches as well as individual homes that are connected to a municipal system.

In most cases, the NPDES permit programs are administered by individual authorized states. Since the permit introduction in 1972, the NPDES permit program is responsible for significant improvements to our Nations water quality.

The Aberdeen facility violated the MCL (Maximum Contaminant Level) for coliform in July 1996. Versailles Water Works violated the MCL for Atrazine during January - December 2005 and April – October 2000.

Table 4: NPDES Permits for South Laughery Creek Watershed

County	Permit Location Site	Permit Issued	Permit Expiration	Violations
Dearborn	All Rite Ready Mix of Indiana 10513 Morgan Branch Road Aurora, IN	Jan. 13, 2003	Jan. 31, 2008	No Violations Listed
	Dillsboro Municipal Waste Water Treatment Plant SR 62 & Spangler Road Dillsboro, IN	Feb. 12, 2004	Feb. 28, 2007	No Significant Violations Reported
Ohio	Aberdeen Pate Water Company Inc. Aurora, IN 47001	None Listed	None Listed	Violations include: Maximum Contaminant Level, Treatment Technique, and Monitoring and Reporting
Ripley	DAIRYLAND BAKE-MART 219 EAST HIGHWAY 50 VERSAILLES IN 47042	Jan. 15, 2005	Jan. 31, 2009	No Violations Listed
	Friendship Regional Sewer District Friendship, IN 47021	Apr. 12, 2005	Apr. 30, 2010	No Violations Listed
	Tobacco Road 13 110 East US Highway 50 Versailles, IN 47042	Oct. 15, 2003	Oct. 31, 2008	No Violations Listed
	Versailles Lagoon 1700 S 50 W Versailles, IN 47042	Sept. 01, 2004	Sept. 30, 2009	No Violations Listed

	Versailles State Park US 50 E & US 421 Versailles, IN 47042	Feb 26, 2004	Mar 31, 2009	No Violations Listed
	Versailles Water Works 822 E Water Works Road Versailles, IN 47042	Nov 10, 2003	Nov 30, 2008	Violations include: Maximum Contaminant Level, Treatment Technique, and Monitoring and Reporting
	Browning's Recreational Camp 3622 E CR 200 S Dillsboro, IN	Nov. 13, 2000	Oct. 31, 2005	No Violations Listed
Switzerland	None	None	None	None

Lake and River Enhancement

Currently there are no Lake and River Enhancement (LARE) projects being conducted in the South Laughery Creek Watershed. Project Clear, which covered water ways above the town of Versailles and Versailles Lake, received $900,000 in state and federal funding in the mid-1990s to use for cost-share conservation practices in the Upper Laughery Creek Watershed. The LARE grant gave incentives for the installation and use of best management practices on 20,000 acres of no-till land, 85 acres of filter strips, and the reduction of 150,000 tons of soil from entering their watercourses.[36]

[36] Project Clear News Letter, Winter Issue 1998

Section Four – Identifying Problems, Causes and Stressors

As mentioned in Section One, during the course of several meetings the Steering Committee members developed their five major concerns through group discussion, visual observations and life experience. The five major concerns reached by the group were Erosion, Water Quality, Creek Maintenance, Recreation and Education. These concerns have been validated by the baseline data gathered. Tables 5-9 illustrate the group's concerns and possible causes of the concerns.

Taking into consideration the amount of time that was allotted for this project, the Steering Committee agreed to focus on the top three problems in each area of concern for further research. The Steering Committee began gathering background data to validate the selected problem statements and compile evidence to support its decisions.

Table 5. Erosion Problem Causes and Stressors

Stressor	Source	Change	Supporting Data	Location of Impairment
Sedimentation and nutrient loading	Streambank erosion caused by obstructions in the creek	Simplified Permitting Process for debris removal	Visual Observation	Throughout watershed
	Trampling of banks due to livestock access	Fencing of livestock from intermittent and perennial streams	Visual Observation	Near streams, Throughout watershed
	Recreational vehicles in stream and boat wakes	Provide education erosion associated with recreational activities	Visual Observation and Landowner Consultation	In main channel and tributaries
	Cropland and pastureland erosion	Increase conservation tillage and pasture management	Tillage Transects, Water Testing Data	Throughout watershed
	Lack of filter strips and riparian buffers	Increase filter strips and riparian buffers	Visual observations, Stream Buffer analysis	Throughout watershed

Erosion Problem Statements

- Livestock and wildlife contribute to erosion through the compaction of soil and the breaking down of the stream bank.

Evidence to Support:
Visual observations and landowner discussion were the major sources of evidence to support this problems statement. Livestock with free range access to a stream contributes to the compaction and the breakdown of the streambanks. Trampled streambanks were noted as a potential source of erosion. In addition, these trampled areas contained very little vegetation, therefore reducing riparian areas which could assist in trapping sediment before it entered the stream. The water quality data noted turbidity, the relative clarity of a liquid, as a point of interest with increased levels.

- Lack of use of “best management practices" for tillage contributes to soil erosion.

Evidence to Support:
With the use of the tillage information demonstrating tillage trends the group was able to illustrate that no till corn and soybeans are continuing to grow in Dearborn, Ohio, Ripley, and Switzerland Counties. As mentioned earlier in this document, conventional tillage exposes bare soil and makes it extremely susceptible to erosion during a heavy precipitation event. Also, the lack of riparian areas contributes to erosion when farming and livestock are allowed access within 30 feet of a waterbody. (See Figure 37)

- Obstructions in Laughery Creek and tributaries cause flooding during heavy rains. The flooding erodes stream banks and farmlands.

Evidence to Support:
Obstructions were an extremely important topic with the Steering Committee. During a heavy precipitation event, debris that is carried to an area can clog and narrow the stream channel forcing the stream to find an alternative route. This new route contributes to stream bank erosion as the brisk flowing water moves downstream cutting its new channel. This has occurred in several areas throughout the watershed and noted through visual observations and discussions with landowners, who individually have lost up to 25 acres of farm land due to obstructions within the creek.

Table 6. Water Quality Problem Causes and Stressors

Stressor	Source	Change	Supporting Data	Location of Impairment
High E. Coli levels	Lack of or improper operating septic systems	Reduce E Coli levels, reduce amounts of waste directly entering water bodies	Water Testing Data	Throughout watershed
	Livestock access to creek	Increase livestock fencing along water bodies	Visual Observation, Water Testing Data	Sub Watershed Unit 0802 and 0803

Water Quality Problem Statements

- Septic system and outhouses not maintained in accordance with public health standards may contribute to high E. coli counts. Direct dumping of raw sewage into the waterways might be occurring.

Evidence to Support:
During visual surveys, permanent camps and outhouses were noted on Laughery Creek and its tributaries with direct discharge into the waterbody. These camps were located in such close proximity to waterbodies that septic systems would not be feasible. Other evidence included individual accounts where fisherman witnessed pipes dumping raw sewage directly into the creek. The water quality data showed high levels of E. coli at all 13 sample locations over the course of the one year sample period. In addition, the South Fork Laughery Lower sub watershed which consists of 13.56 square miles is documented on the 303d list for E. coli. (See Figure 9 for South Laughery Creek Watershed – Impaired Streams.)

- Livestock with uncontrolled access to waterbodies may lead to an increase in pathogens from animal waste which can result in digestive and other health problems for humans.

Evidence to Support:
According to the Watershed Inventory Tool for Indiana, the estimated manure deposition into South Laughery Creek or one of its tributaries is 53,088 lbs/day in Dearborn County, 84,888 lbs/day in Ohio County, 182,201 lbs/day in Ripley County and 46,707 lbs/day in Switzerland County. Likewise, livestock access to waterbodies was noted during windshield surveys throughout the watershed (Please refer to Appendix E).

Table 7. Creek Maintenance Problem Causes and Stressors

Problem	Source	Change	Supporting Data	Location of Impairment
Debris obstruction in channel causes streambank erosion	Debris deposited due to flooding	Simplify regulation to allow debris removal	Visual Observation	Main Channel and tributaries
Complex permitting process for streambank and channel maintenance	Current regulations restricting access to water bodies	Create a streamline, user-friendly permitting process	Landowner consultation	Main Channel and tributaries

Creek Maintenance Problem Statements

- Laws and restrictions concerning the repair of stream banks hinder the maintenance of the stream channel.

Evidence to Support:
The evidence to support this problem statement stemmed from individual circumstances, that landowners encountered, when dealing with various agencies regarding the laws and restrictions that allow a landowner to remove obstructions in a floodway when his/her property is being destroyed by the changing water course.

- Laws and restrictions concerning removal of obstructions in the creek hinder maintaining optimal flow in flood conditions.

Evidence to Support:
The evidence to support this problem statement stemmed from individual circumstances, that landowners encountered, when dealing with various agencies regarding the laws and restrictions that allow a landowner to remove obstructions in a floodway when his/her property is being destroyed by the changing water course.

Table 8. Recreation Problem Causes and Stressors

Problem	Source	Change	Supporting Data	Location of Impairment
Deterioration of Hartford Ford	Lack of maintenance	Improve access	Visual Observation	Hartford on Main Channel
Creek bed damage and disturbance of natural habitat	Recreational vehicles	Reduce recreational vehicle use on stream banks and channels	Visual Observations	Main Channel and tributaries
Hazards associated with swimming and/or wadding in streams	Elevated E. Coli levels	Reduce E. Coli levels to 235 colonies/100mL	Water Testing Data	Main Channel and tributaries
Trash	Not securing objects before flooding event	Landowner responsibility to reduce waterbody pollution	Visual Observations	Main Channel and tributaries

Recreation Problem Statements

- The use of recreational vehicles in the creek bed damages the water course and disturbs the natural beauty, wildlife, and creek habitat.

Evidence to Support:
Visual observations verified this problem statement. Tire marks were evident in several locations of the stream especially the popular shallow recreational areas.

- E. Coli levels are a concern for fisherman, waders, and swimmers in the creek.

Evidence to Support:
Primary evidence for this problem statement came from a portion of the watershed that is currently listed on the 303d list for E. coli. Individual fisherman and swimmers will reduce contact with water known to carry potentially harmful pathogens. Some individuals expressed interest of fish health in these high risk areas.

- Some property owners do not retrieve and dispose of man-made objects and trash washed into the creek or onto their land after flooding episodes.

Evidence to Support:
Property owners came forward and expressed concern that over the years, visual observations revealed people who live next to a stream do not take appropriate measures of securing man-made objects. Therefore, during a flooding event, someone else's property moves down stream affecting another landowner.

Table 9. Education Problem Causes and Stressors

Problem	Source	Change	Supporting Data	Location of Impairment
Landowner difficulty in understanding Laws and Restrictions	Complexity of permitting process	Increase educational opportunities between agencies and landowners	Landowner consultation	Throughout Watershed
Lacking in education about the importance of Best Management Practices	Lack of promotion of current conservation programs	Increased promotion and implementation of current conservation programs	Landowner consultation	Throughout Watershed
	Complexity of existing conservation programs			
Failing septic systems	Inadequate education on maintenance of septic systems	Increased educational opportunities	Water Quality testing	Throughout Watershed

Education Problem Statements

- There is a lack of education about septic system maintenance, health regulations, dumping, and disposal of wastes which might contribute to poor water quality in the creek.

Evidence to Support:
Evidence for this problem statement was gathered primarily through discussion in group meetings and visual observations. Many members expressed concern that neighbors with older homes in the area did not have septic areas clearly defined. Because the area is mainly rural agriculture, many of the homes were built before current health departments required such strict guidelines for septic system installation. Many homes along South Laughery Creek today would not be eligible for septic system permits because of the soil types and the location of the property in a floodplain.

- There is a lack of education about best management practices for riparian buffers, pasturing, and tillage which may contribute to erosion in the watershed.

Evidence to Support:
Evidence for this problem statement arose through interactions with landowners and agency personnel along with visual observations. Agency personnel noticed that some counties have higher best management practices on the ground than others, perhaps indicating that some counties do a better job of promoting and educating landowners about the benefits of adopting

these practices. Many committee members were unaware that there are federal dollars earmarked for certain practices that they may be eligible to receive. Also, landowners who had lost significant portions of their land had little to no riparian buffer which could have helped reduce the erosion rate of their land.

Section Five – Identifying Sources

Sedimentation and Nutrient Loading

2004 Cropland Transect Survey

In the spring of 2004, Indiana Department of Natural Resources (IDNR) conducted cropland transects surveys in order to provide records on the adoption of conservation tillage methods throughout all counties in Indiana. In 2004, all counties within the South Laughery Creek watershed participated in this survey.

According to the 2004 Cropland Tillage Data, posted at http://www.in.gov, agriculture fields were classified into the following tillage method categories:

No-Till- is any direct seeding system, including strip preparation, with minimal soil disturbance.

Mulch-Till- is any tillage system leaving greater than 30% crop residue cover after planting, excluding no-till.

Conventional tillage- is any tillage system leaving less than 30% crop residue cover after planting.

The appropriate conservation tillage practice can help alleviate the impact of soil erosion and eventually reduce soil run-off. Erosion causes the loss of productive land and reduces penetration rates. Productive soil is essential because it covers seedlings and provides support for growth. Soil particles also hold on to nutrients and gradually deliver them to the plant.

As soil particles wash into waterways, water quality is reduced. Aquatic communities are impacted as increased sediment levels smother spawning beds, decrease sunlight available for photosynthesis, and increase water temperatures. Excessive sedimentation may increase flooding potential due to barriers in water flow and increase cost for maintenance such as dredging.[37]

According to the 2004 tillage transects, Ripley County leads the watershed with both no-till acres per county with 14,221 acres of corn and 21,068 acres of soybeans followed by Switzerland County with 3,010 acres of no-till corn and 3,010 acres of no-till soybeans. Dearborn County came in third with 769 acres in no-till corn and 3,844 acres in soybeans, Ohio County produced 474 acres of no-till corn and 1,539 acres of no-till soybeans.[38]

There seems to be a significant gap within the amount of corn and soybeans produced with no-till practices. Several factors may contribute to these gaps. No-till corn is a concern for some farmers because planting is typically later than conventional tillage. Machinery many be another reason for the decrease conservation tillage practices. Many of the Soil and Water Districts have

[37] Johnson County Soil and Water Conservation District, Young's Creek Advisory Group, *The Young's Creek Watershed: A Plan for the Future*, October 2003

[38] Access Indiana Website, www.in.gov, Tillage transects report 2004. Figures 13-15

no-till drills for soybeans but not for corn. Many farmers do not have the financial means for equipment upgrades. It is thought that no-till beans are higher in no-till acres since beans do not have to be planted as early and no-till beans seem to have better resistance to weather related stress, unlike no-till corn. (Figures 34-36 illustrate tillage practices by county for 2004.)

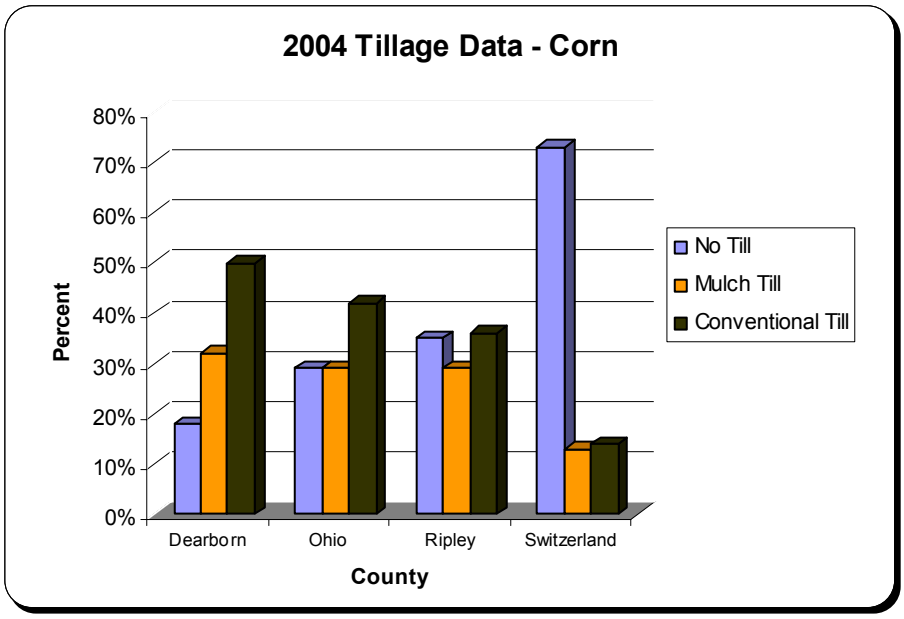


Figure 34 2004 Tillage Data - Corn

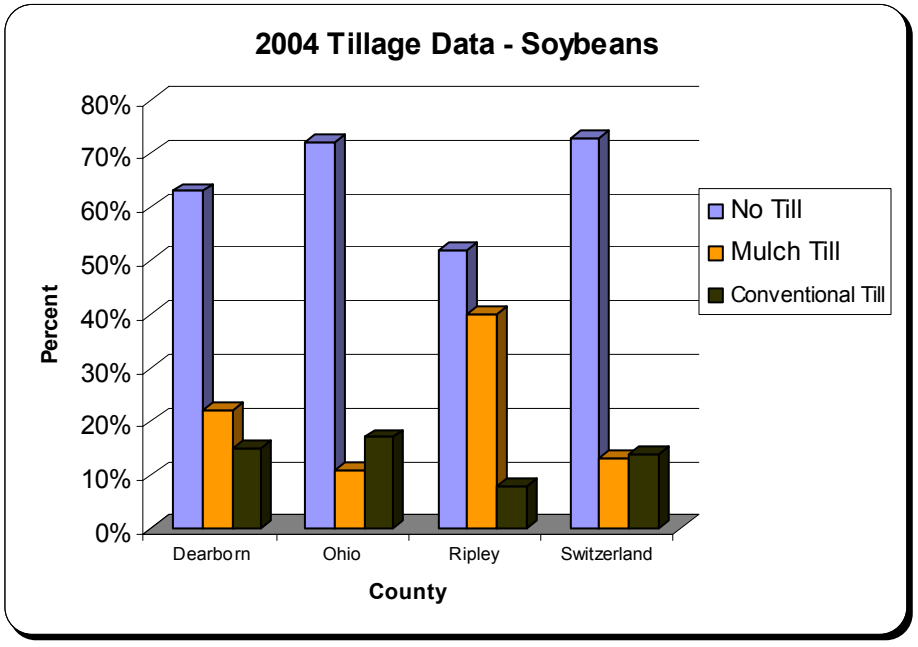


Figure 35 2004 Tillage Data - Soybeans

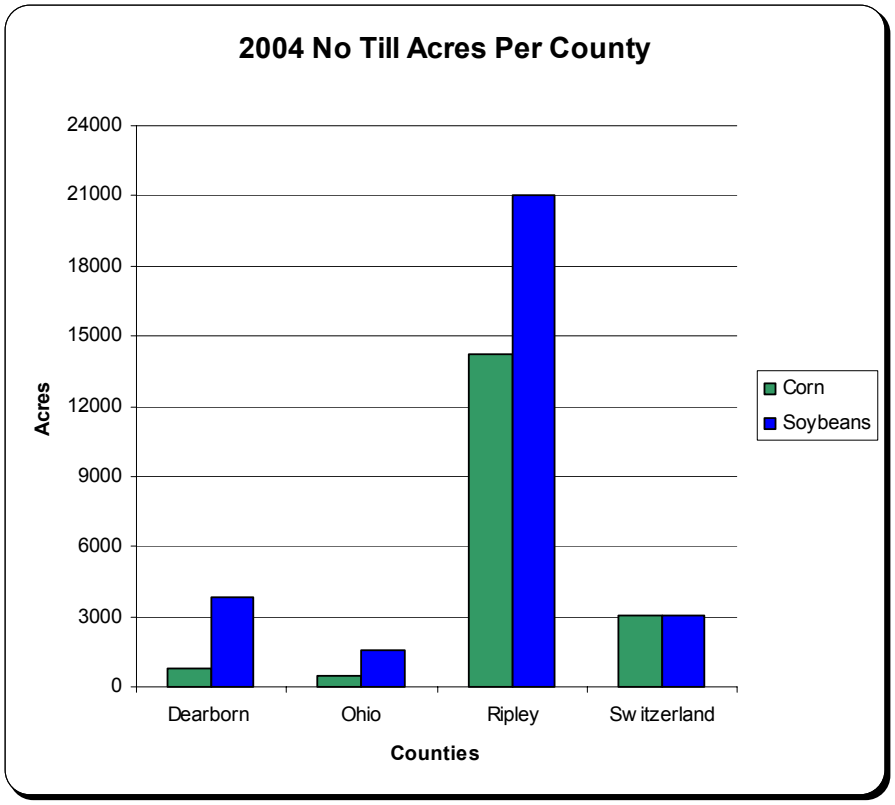


Figure 36 2004 No-Till Acreages Per County

Riparian Buffer Width

Riparian buffer refers to the area of land directly adjacent to stream channels. If riparian areas are left undisturbed, these buffer zones help maintain the quality and health of aquatic life in a water body. Tall grasses and woody vegetation along riparian zones provide important water quality benefits. Stream-side vegetation acts as a natural filter by trapping and removing sediment, nutrients, and other pollutants during precipitation events, reducing the amount of pollutants from entering a particular body of water. Riparian buffers also reduce the potential for erosion by stabilizing stream banks with deep root structures that help anchor soil to the stream bank. Riparian buffers also provide habitat for wildlife, while providing shade and reducing water temperatures. Riparian areas also assist in slowing and storing floodwaters.

By analyzing aerial data, it is noted that the South Laughery Creek Watershed has approximately 84.05 square miles of waterbody frontage that has a 90 foot or greater riparian buffer, 77.53 square miles of the watershed holds a riparian buffer width of 30-90 feet, and only 12.37 miles of the watershed has a degraded riparian area with less than 30 feet. (Figure 37 illustrates riparian areas in the South Laughery Creek Watershed.)

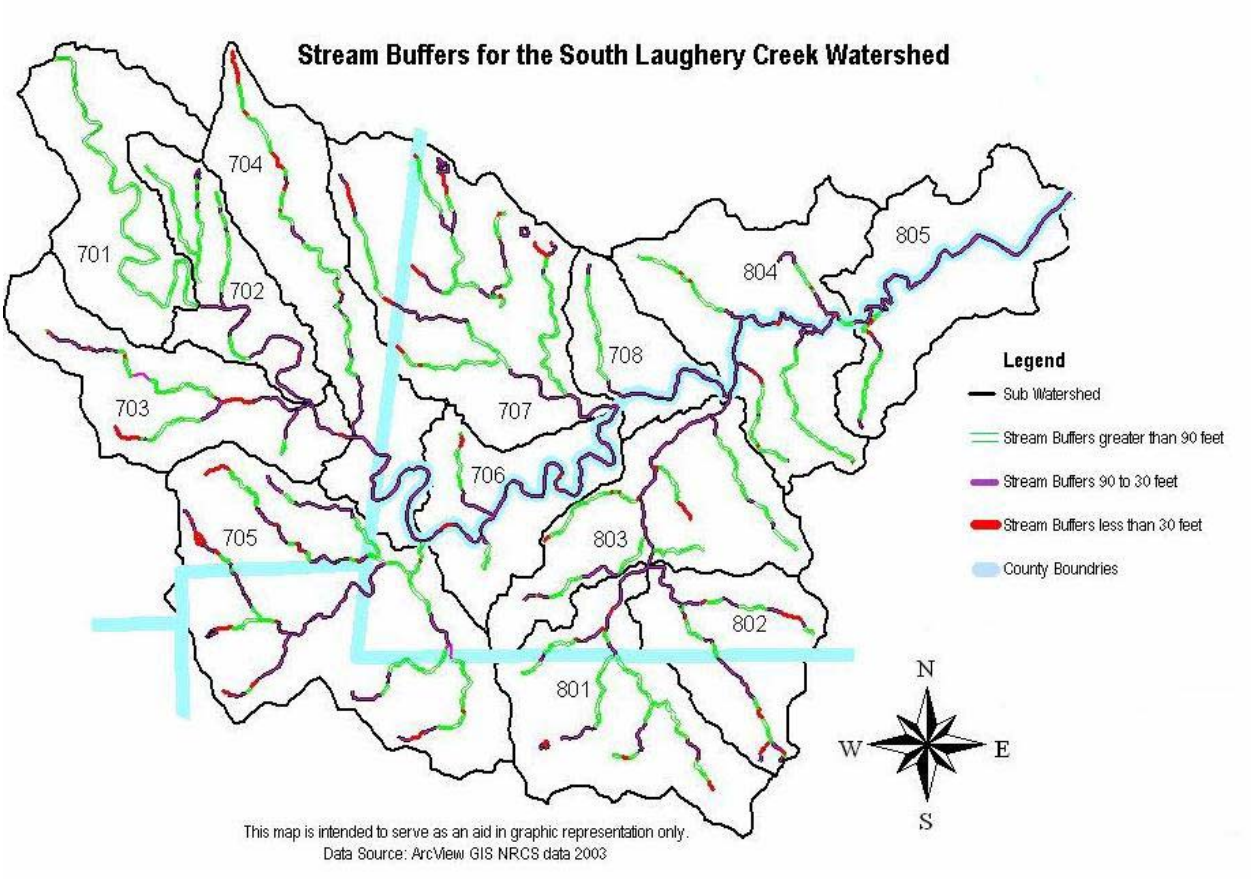


Figure 37 Riparian Buffers in the Watershed

Stream Bank Erosion

"Streambank erosion occurs when flowing water directly removes a stream's banks and beds. This problem is often initiated by excess run-off during heavy rain events. Fast-flowing streams scour the bank, often contributing high sediment loads to the stream. As the stream slows, this sediment is deposited downstream. Although streambank erosion is a natural process that typically occurs during high flow periods, it can be enhanced by the lack of vegetated riparian buffers and direct livestock access to streams."

"Excessive streambank erosion can lead to a number of water quality problems. As streambanks erode, vegetation and habitat for aquatic organisms are also lost. High sediment loads can reduce water clarity causing breathing and feeding problems for aquatic organisms, and the penetration of light needed for photosynthesis. Sediment can also carry chemicals, nutrients, and other pollutants that adversely affect water quality. In addition, erosion can affect the local economy. Repair to damaged roads, bridges and public utilities as well as costs associated with stabilizing or controlling erosion sites can impact both local governments and private citizens."

"Several factors contribute to streambank erosion. Increases in impervious surfaces, poor vegetative cover, and steep slopes often contribute to large amounts of run-off that result in fast moving streams. In addition, practices of stream straightening and dredging lead to a long term

increase in stream power and velocity. More powerful streams result in energy applied to streambanks and greater potential for erosion."[39]

Streambank erosion is a concern throughout the entire watershed at different levels of intensity with its greatest located along the main channel, as documented during watershed windshield surveys. Likewise, although not typical within the watershed, several sites have been assessed by the Natural Resources Conservation Service which have erosion rates higher than 1,000 tons per year.

Estimated Pesticide Application per County

Pesticides are used to stop or limit any undesirable organism (insect, animal or weed) from damaging crops and products. Unfortunately, pesticides are often transported into water supplies before they have enough time to breakdown into harmless compounds after pest control is accomplished. Because these pesticides may be reaching our water supplies, it is important to have an approximate idea of the amount of pesticides being applied to land within the watershed. Using the Extension Guide for Water Partnerships application and data from the 1998 Agricultural Statistic Book, figures were entered into Tables 10-13 to estimate the pesticides being applied within the watershed.[40]

Table 10. Dearborn County Estimated Pesticide Application[41]

Crop Type	Acres Per County		Pesticide Type	Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre) 1998 Figures		Estimated Amount of Pesticide Applied (lbs)
Corn	725		Atrazine	0.89		1.36		877.5
			Metolachlor	0.42		2.04		621.2
			Acetochlor	0.32		1.97		457.0
			Primisulfuron	0.14		0.03		3.05
		X	Cyanazine	0.13	X	1.43	=	134.8
Soybeans	977		Glyphosate	0.55		0.85		456.7
			Chlorimuronethyl	0.27		0.02		5.3
			2,4-D	0.26		0.39		99.1
			Imazethapyr	0.25		0.04		9.8
			Paraquat	0.19		0.89		165.2

[39] Johnson County Soil and Water Conservation District, Young's Creek Advisory Group, *The Young's Creek Watershed: A Plan for the Future*, October 2003

[40] Dearborn County Soil and Water Conservation District, Tanners Creek Watershed Steering Committee, *The Tanners Creek Watershed Management Plan; May 2003*

[41] Alyson Faulkenburg and Jane Frankenberger. Watershed Inventory Tool for Indiana: A guide for watershed partnership. Department of Agriculture and Biological Engineering, Purdue University. Tables Formats 4,5,6,7

Table 11. Ohio County Estimated Pesticide Application

Crop Type	Acres Per County		Pesticide Type	Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre) 1998 Figures		Estimated Amount of Pesticide Applied (lbs)
Corn	897		Atrazine	0.89		1.36		1085.7
			Metolachlor	0.42		2.04		768.5
			Acetochlor	0.32		1.97		565.5
			Primisulfuron	0.14		0.03		3.77
		X	Cyanazine	0.13	X	1.43	=	166.8
Soybeans	1029		Glyphosate	0.55		0.85		481.1
			Chlorimuronethyl	0.27		0.02		5.6
			2,4-D	0.26		0.39		104.3
			Imazethapyr	0.25		0.04		10.3
			Paraquat	0.19		0.89		174.0

Table 12. Ripley County Estimated Pesticide Application

Crop Type	Acres Per County		Pesticide Type	Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre) 1998 Figures		Estimated Amount of Pesticide Applied (lbs)
Corn	4464		Atrazine	0.89		1.36		5403.2
			Metolachlor	0.42		2.04		3824.8
			Acetochlor	0.32		1.97		2814.1
			Primisulfuron	0.14		0.03		18.7
		X	Cyanazine	0.13	X	1.43	=	830
Soybeans	6504		Glyphosate	0.55		0.85		3040.6
			Chlorimuronethyl	0.27		0.02		35.12
			2,4-D	0.26		0.39		659.5
			Imazethapyr	0.25		0.04		65.0
			Paraquat	0.19		0.89		1100.0

Table 13. Switzerland County Estimated Pesticide Application

Crop Type	Acres Per County		Pesticide Type	Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre) 1998 Figures		Estimated Amount of Pesticide Applied (lbs)
Corn	891		Atrazine	0.89		1.36		763.4
			Metolachlor	0.42		2.04		1078.4
			Acetochlor	0.32		1.97		561.7
			Primisulfuron	0.14		0.03		3.7
		X	Cyanazine	0.13	X	1.43	=	165.6
Soybeans	1059		Glyphosate	0.55		0.85		495.0
			Chlorimuronethyl	0.27		0.02		5.7
			2,4-D	0.26		0.39		107.3
			Imazethapyr	0.25		0.04		11
			Paraquat	0.19		0.89		179.0

Estimated Fertilizer Application per County

Fertilizer, like pesticides, can make our lives easier by providing the necessary nutrient for productive crop growth. Like pesticides, fertilizer can cause water quality problems when they are applied in excessive amounts. The nutrients of greatest concern in the watershed are nitrogen (N) and phosphorous (P). Nitrogen decomposes into nitrate, which can cause serious health concerns with groundwater contamination. Tiled fields and ditches carry nitrate runoff to waterbodies. Phosphorus makes its way to a waterbody by attaching itself to soil particles. Excessive phosphorus can cause algal blooms. Once algal blooms occur, dissolved oxygen is depleted and aquatic life has a difficult time surviving.

To estimate the amount of fertilizer applied in the South Laughery Creek Watershed the average amount of fertilizer applied from the 1998 Agricultural Statistics Publication was used. (See Tables 14-17 for fertilizer application per county.)

Table 14. Dearborn County Estimated Fertilizer Application [42]

Crop Type	Fertilizer Type	Crop Acres Per County		Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre)		Estimated Amount of Fertilizer Applied (lbs)
Corn	Nitrogen	725	X	1.00	X	145	=	105,125
	Phosphorus			0.97		59		41,491.8
Soybeans	Nitrogen	977		0.15		29		4,250
	Phosphorus			0.26		46		11,685

Table 15. Ohio County Estimated Fertilizer Application

Crop Type	Fertilizer Type	Crop Acres Per County		Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre)		Estimated Amount of Fertilizer Applied (lbs)
Corn	Nitrogen	897	X	1.00	X	145	=	130,065
	Phosphorus			0.97		59		51,335.3
Soybeans	Nitrogen	1029		0.15		29		4,476.2
	Phosphorus			0.26		46		12,306.8

[42] Alyson Faulkenburg and Jane Frankenberger. Watershed Inventory Tool for Indiana: A guide for watershed partnership. Department of Agriculture and Biological Engineering, Purdue University. Tables Formats 8,9,10,11

Table 16. Ripley County Estimated Fertilizer Application

Crop Type	Fertilizer Type	Crop Acres Per County		Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre)		Estimated Amount of Fertilizer Applied (lbs)
Corn	Nitrogen	4464	X	1.00	X	145	=	647,280
	Phosphorus			0.97		59		255,474
Soybeans	Nitrogen	6505		0.15		29		28,296.8
	Phosphorus			0.26		46		77,799.8

Table 17. Switzerland County Estimated Fertilizer Application

Crop Type	Fertilizer Type	Crop Acres Per County		Fraction of Acres Treated in the State 1998 Figures		Average Rate of Application (lbs/acre)		Estimated Amount of Fertilizer Applied (lbs)
Corn	Nitrogen	891	X	1.00	X	145	=	129,195
	Phosphorus			0.97		59		50,991.9
Soybeans	Nitrogen	1059		0.15		29		4606.7
	Phosphorus			0.26		46		12,665.6

Livestock

Manure from animals is a significant source of nitrogen, phosphorus, and more importantly, E. coli. E. coli is a specific species of fecal coliform bacteria commonly found in polluted waters. Some strains of E. coli are pathogenic, causing disease. E. coli is found in the intestinal tract of warm blooded animals and may pose potential dangers to human health. E. coli bacterium is able to enter the body through the mouth, nose, eyes, ears, or cuts in the skin.

Livestock with creek and tributary access emerged as a concern for the Committee. Visual assessments supported this concern as several documented sites were located in subwatersheds 0801, 0802, and 0803. Likewise, estimates from the Indiana Watershed Inventory Tool for

Indiana indicated high levels of manure produced per day within the watershed. See Tables 18-21 for a detailed account of manure production within the watershed counties.

To estimate the amount of manure potentially entering South Laughery Creek and its tributaries we obtained the number of livestock from the 2003-2004 Agriculture Statistics. If information was not available for a specific animal, the Steering Committee Members and Farm Service Agency Staff helped estimate the amount of animals in the watershed.[43]

Table 18. Dearborn County Manure Production[44]

Livestock	Number of Animals in County		Average Amount of Manure Produced Per Day		Amount of Manure Produced Per Day lbs/day		Fraction of Nutrient in a Pound of Manure		=	Pounds of N in the Manure	Pounds of P in the Manure
							Nitrogen	Phosphorus			
Swine	112.6	X	11.7 lbs/day	=	1,317.4	X	0.0045	0.004		5.9	5.3
Dairy Cattle	42		115 lbs/day		4,830		0.0045	0.002		21.7	9.7
Beef Cattle	560		75 lbs/day		42,000		0.008	0.0065		336	27.3
Poultry	70.8		0.18 lbs/day		12.74		0.026	0.026		.33	.33
Houses	112		44 lbs/day		4928		.006	.0023		29.6	11.3
Total Amount of Manure Produced Per Day					53,088.14		Total Amount of Nutrients Produced Per Day			393.53	53.93

Table 19. Ohio County Manure Production

Livestock	# of Animals in County		Manure Produced Per Day		Manure Produced Per Day lbs/day		Fraction of Nutrient in a Pound of Manure		=	Pounds of N in the Manure	Pounds of P in the Manure
							Nitrogen	Phosphorus			
Swine	0	X	11.7 lbs/day	=	0	X	0.0045	0.004	=	0	0
Dairy Cattle	104		115 lbs/day		11,960		0.0045	0.002		53.8	23.9
Beef Cattle	728		75 lbs/day		54,600		0.008	0.0065		436.8	354.9
Poultry	132.1		0.18 lbs/day		23.8		0.026	0.026		.618	.618
Horses	416		44 lbs/day		18,304		.006	.0023		109.8	42.1
Total Amount of Manure Produced Per Day					84,888		Nutrients Produced/Day			601	422

[43] Dearborn County Soil and Water Conservation District, Tanners Creek Watershed Steering Committee, *The Tanners Creek Watershed Management Plan; May 2003*

[44] Alyson Faulkenburg and Jane Frankenberger. Watershed Inventory Tool for Indiana: A guide for watershed partnership. Department of Agriculture and Biological Engineering, Purdue University. Tables Formats 12,13,14,15

Table 20. Ripley County Manure Production

Livestock	Number of Animals in County		Average Amount of Manure Produced Per Day		Amount of Manure Produced Per Day lbs/day		Fraction of Nutrient in a Pound of Manure		=	Pounds of N in the Manure	Pounds of P in the Manure
							Nitrogen	Phosphorus			
Swine	4532	X	11.7 lbs/day	=	53,024.4	X	0.0045	0.004		283.6	212.1
Dairy Cattle	600		115 lbs/day		69,000		0.0045	0.002		310.5	138
Beef Cattle	612		75 lbs/day		45,900		0.008	0.0065		367.2	298.4
Poultry	116.3		0.18 lbs/day		20.93		0.026	0.026		.54	.04
Horses	324		44 lbs/day		14,256		.006	.0023		85.5	32.8
Total Amount of Manure Produced Per Day					182,201.33		Total Amount of Nutrients Produced Per Day			1,047.34	681.34

Table 21. Switzerland Manure Production

Livestock	Number of Animals in County		Average Amount of Manure Produced Per Day		Amount of Manure Produced Per Day lbs/day		Fraction of Nutrient in a Pound of Manure		=	Pounds of N in the Manure	Pounds of P in the Manure
							Nitrogen	Phosphorus			
Swine	0	X	11.7 lbs/day	=	0	X	0.0045	0.004		0	0
Dairy Cattle	80.6		115 lbs/day		9,269		0.0045	0.002		41.7	18.5
Beef Cattle	377		75 lbs/day		28,275		0.008	0.0065		226.2	183.8
Poultry	65.26		0.18 lbs/day		11.7		0.026	0.026		.30	.30
Horses	208		44 lbs/day		9,152		.006	.0023		54.9	21.0
Total Amount of Manure Produced Per Day					46,707.7		Total Amount of Nutrients Produced Per Day			323.1	232.6

Trash

During several drive-by activities conducted throughout the inventory process the presence or absence of trash was noted. Whether the trash was near a waterbody or just within the watershed boundary, eventually, all trash leads to a body of water. Trash can be introduced into watersheds by passing motorists, travelers, landowners and flooding events. Trash seems to be the greatest problem in Dearborn County. Cole Lane, which was the site of a clean-up effort, is heavily used as an easy access route to reach neighboring counties. Once trash reaches a waterbody it may float along the surface or sink to the bottom. Trash interferes with habitats, decreases navigations, and takes decades to decompose, therefore impacting wildlife for many years. Certain pollutants can cause irreparable harm to the landscape. In addition to trash impacting water quality, trash can also affect the stream's aesthetic properties. (See Figures 38 and 39.)

Figure 38 No dumping sign at trash site

Figure 39 Abandoned car lot

Section Six – Identifying Critical Areas, Setting Goals, and Selecting Indicators

The group needed to target individual areas within the watershed where stressors and their sources were causing the greatest damage. The steering committee referred to the benchmark data gathered while examining each individual goal to decide where applying each treatment would yield the greatest effect on the overall watershed health. (See Tables 22-33 for goals, objectives, and critical or target areas of concern.)

Erosion Goals and Objectives

Table 22: Goal 1 - Reduce soil erosion by 5000 tons within the watershed by 2010.

Objective 1	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Increase conservation tillage by 500 acres within the watershed	Educate landowners on the benefits of conservation tillage	Landowners Producer/Lessee	Steering Committee Education Committee Technical Committee Project Sponsor Conservation Partnerships	Jan 2006 – Jan 2010	Number of increased acres with conservation tillage	Entire watershed Including perennial and intermittent streams Areas of target interest would be areas that are less than one mile from a perennial and intermittent stream
	Multi Media sources for education Newspapers, SLI, radio				Number of tons of soil saved	
	Hold annual conservation tillage meeting				Number of landowners attending meetings and receiving information	
	Establish 319 implementation grant funding				Reduction of Nutrient and Sediment Load in Stream	
	Promote practice with displays and promotion at community events					

Table 23: Goal 1 - Reduce soil erosion by 5000 tons within the watershed by 2010.

Objective 2	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Exclude 250 head of livestock from access to water bodies, perennial and intermittent streams, within the watershed	Promote and educate landowners about restricting livestock access to waterbodies through fencing and stream crossing	Landowners Producers/Lessee	Steering Committee Education Committee Technical Committee Project Sponsor Conservation Partnership	On-going	Number of head of livestock with restricted access	Entire watershed Areas within the watershed where livestock has been visualized
	Distribute fencing practices through various media sources including targeted mailing, newspapers and radio				Number of landowners receiving information	
	Establish federal and state cost share funding for rotational grazing programs including alternative watering supply				Number of landowners participating in programs	
	Encourage and assist landowners to do conservation plans and apply for cost share programs				Lower levels of E-Coli within the stream	

Note: 319 Educational Funding will be used during the 2006-2008 year schedule

Table 24: Goal 1 - Reduce soil erosion by 5000 tons within the watershed by 2010.

Objective 3	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Reduce the amount of run off and erosion from entering water bodies, perennial and intermittent streams by installing 500 acres of Best Management Practices within the watershed	Educate the public about the importance and benefits of conservation practices through various media sources	Landowners Producers/Lessee	Steering Committee Education Committee Technical Committee Project Sponsor Conservation Partnership	On-going	Number of acres installed with Best Management Practices	Areas of targeted interest would be areas that are less than one mile from a perennial and intermittent stream focusing on increasing pasture and hay land
	Establish cost share funding pertaining to riparian buffers, filter strips, conservation tillage, wetland restoration and cover crop				Amount (tons) of soil saved	
	Educate and inform landowners with cropping history near water bodies about the Conservation Reserve Program practices available				Number of landowners participating and informed	
					Reduced Nutrient and Sediment Load in Stream	

Water Quality Goals and Objectives

Table 25: Goal 2 - By 2010 South Laughery Creek is removed from the 303d impaired bodies list, and full body contact E Coli counts are lower than 235/CFU's/100mL at all 13 test sites throughout the recreational months April thru October.

Objective 1	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Educate public and landowners about the properties of septic systems, water quality and livestock exclusion from water bodies	Hold two public meetings involving soil scientists and health departments to educate on septic systems	Land and Home Owners	Steering Committee Education Committee Technical Committee Project Sponsor Conservation Partnership	Annually	Number of people participating in programs	Entire watershed
	Educate 2000 individuals about septic system general maintenance, locations and requirements for installation through various media sources, target mailing, new papers, SLI				An Increase in the number of people requesting sanitarian assistance	
					Reduced e-Coli, Nutrient and Sediment levels within the stream	

Table 26: Goal 2 - By 2010 South Laughery Creek is removed from the 303d impaired bodies list, and full body contact E Coli counts are lower than 235/CFU's/100mL at all 13 test sites throughout the recreational months April thru October.

Objective 2	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Exclude 250 head of livestock out of water bodies, perennial and intermittent streams Note: Same livestock as listed under Goal 1 objective 2	Through public appearance and media provide public awareness about federal, state, and local cost share programs available Establish and offer cost share opportunities for fencing and alternative watering sources	Landowners Producers/Lessee	Steering Committee Technical Committee Education Committee Project Sponsor Conservation Partnership	Jan 2006 – Jan 2010	Number of head of livestock with restricted access	Entire watershed where livestock have access to perennial and intermittent streams

Creek Maintenance Goals and Objectives

Table 27: Goal 3 - By 2008 decrease unwanted debris and abandoned items along any water bodies, perennial streams and intermittent steams created by misplaced items and illegal dumping within the South Laughery Creek Watershed. Example of items are but not limited to: tires, vehicles, bottles, refrigerators, papers, and toxic chemicals.

Objective 1	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Inform a minimum of 1000 citizens of the effects of illegal dumping and proper resource disposal	Publish two articles in local newspapers bringing awareness to the effects of illegal dumping	All watershed citizens and visitors	Education Committee	Annually	Mailing distribution numbers	Dearborn and Ohio Counties
	Display and promote proper waste disposal techniques at two public events				Visual observations during drive by surveys	

Table 28: Goal 3 - By 2008 decrease unwanted debris and abandoned items along any water bodies, perennial streams and intermittent steams created by misplaced items and illegal dumping within the South Laughery Creek Watershed. Example of items are but not limited to: tires, vehicles, bottles, refrigerators, papers, and toxic chemicals.

Objective 2	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Remove abandoned items within the watershed	Identify partners Solid Waste Management District	All watershed citizens and visitors	Steering Committee Technical Committee Education Committee Project Sponsor Conservation Partnership	Annually	Number of volunteer participants and tons of trash collected	Dearborn and Ohio Counties
	Hold at least one watershed clean-up within the watershed				Visual observations during drive by surveys	

Permitting Procedures Goals and Objectives

Table 29: Goal 4 - Make the 'Construction in a Floodway' permitting procedure (for floodway maintenance and stream bank erosion control) more understandable and accessible to citizens, including the permit-required / no-permit-required decision point.

Objective 1	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Exhibit a typical current permitting procedure	Hold workshop on the paperwork and documentation needed for constructing in a floodway	Landowners Producer/Lessee	Steering Committee Technical Committee Education Committee Conservation Partnership	Annually	Number of people participating in programs	Residents who live on South Laughery main channel
	Demonstrate typical correspondence during permitting process and show relation to a project not requiring permits				Number of local citizens requesting permitting procedure information	
	Document this current permitting procedure and have available to local citizens					

Table 30: Goal 4 - Make the 'Construction in a Floodway' permitting procedure (for floodway maintenance and stream bank erosion control) more understandable and accessible to citizens, including the permit-required / no-permit-required decision point.

Objective 2	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Demonstrate floodway maintenance and stream bank erosion control methods for permit and no-permit situations	Hold field day that addresses stream bank erosion issues at a suitable location which demonstrates problems that need permits and those that do not	Landowners Producers/Lessee	Steering Committee Technical Committee Education Committee Conservation Partnership	Annually	Field Day Attendance	South Laughery main channel and South Laughery Creek main channel floodplain areas
	Document field day presentation on videotape/DVD and make this publication available to the public			2006	Video Distribution Requests	
	Document field day in brochure and make available to citizens			2006 or as needed	Brochure Distribution Numbers	

Table 31: Goal 4 - Make the 'Construction in a Floodway' permitting procedure (for floodway maintenance and stream bank erosion control) more understandable and accessible to citizens, including the permit-required / no-permit-required decision point.

Objective 3	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Create a 'streamlined model' of the 'construction in a floodway' permitting procedure	Explore and document the steps needed for a floodway construction permit Partner with appropriate permitting agencies to implement the created 'streamlined model'	Agencies Legislators Landowners	Technical Committee Conservation Partnership	Jan 2006 – Jan 2007	Completed Documentation	South Laughery main channel and South Laughery Creek main channel floodplain areas

Education Goals and Objectives

Table 32: Goal 5 - To attain a strong public understanding of the natural dynamics of a watershed to provide a healthy creek and surrounding habitat that promotes productive land use and responsible recreational practices.

Objective 1	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Public understanding of watershed issues and BMPs	Refer to Erosion and Water Quality Goals and Objectives	General Public	Education Committee	On-going	Newsletters mailed, landowners sign-up for cost-share, attendance at workshops	Whole watershed

Table 33: Goal 5 - To attain a strong public understanding of the natural dynamics of a watershed to provide a healthy creek and surrounding habitat that promotes productive land use and responsible recreational practices.

Objective 2	Action Items	Target Audience	Responsible Party(s)	Schedule	Indicators	Target Areas Comments and Restrictions
Enhance watershed importance in school curricula	Educational visit to area school to demonstrate watershed processes	Educators Students	Education Committee Watershed Coordinator	2 presentations annually	Number of students per session	Entire watershed
	Workshop to train on the available instructional materials for watersheds			Annually	Number of participants	
	Host language art contest for area schools regarding watersheds			Annually	Number of participants	

Section Seven - Choosing Measures to Apply

The following section will discuss management practices and how they contribute to the overall wellbeing of South Laughery Creek and its tributaries. Goals 3-5 are not addressed in the section below because they are educational.

Goal 1 – Reduce sediment by 5000 tons.

Conservation tillage – By increasing conservation tillage throughout the watershed, residue amounts will increase to a significant level to reduce sediment load into nearby waterbodies.

Fencing of livestock (exclusion and rotational grazing) and prescribed grazing– Fencing out livestock will have an impact on streambank erosion by reducing trampling of banks. In addition, interior fencing will allow better management of pastures preventing overgrazing which, in turn, will lead to a reduction in sediment loading.

Filter strips and riparian buffers – Nutrients and sediments will be filtered by establishing or widening stream buffers.

Establishment/Renovation of hay/pasture– Conversion of cropland to hayland and the renovation of existing grasslands will aid in infiltration and decrease sedimentation.

Waterways and WASCOBS – Waterways and basins can be effective in reducing sedimentation of nearby waters, especially in areas where residue management or other practices are impractical.

Cover crops – Cover crops can improve soil tilth, control erosion and weeds, provide supplemental forage, and maintain or improve organic matter. They can reduce soil compaction and increase water infiltration. Cover crops have a filtering effect on movement of sediment, pathogens, and dissolved and sediment-attached pollutants.

Critical area planting – Shaping and reseeding to permanent vegetative cover will prevent these eroded sites from contributing sediment loads to waterbodies.

Tree planting – Tree and shrub establishment can help stabilize soil and provide long-term erosion control, provide cover and other benefits for wildlife, and reduce air pollution. In addition, this practice can be designed for the uptake of specific nutrients, and it can improve landscape aesthetics.

Goal 2 – Reduce E. Coli loading in South Laughery Creek

Roof Run-Off Structures – These systems prevent roof runoff water from flowing across concentrated waste areas and barnyards to reduce pollution from livestock, improve water quality, and protect the waterbodies.

Livestock exclusion – The fencing of livestock at least 30 feet from waterbodies will reduce loafing areas in and around streambeds. This reduction in access may lead to lower levels of nutrients and E. Coli.

Alternative Watering Systems – Water will be conveyed from a source of supply to points of use other than waterbodies.

Waste Management - Storage and application of animal waste according to an approved NRCS Nutrient Management Plan.

Section Eight – Calculating Load Reductions

Projects developing watershed management plans with Section 319 funds are required to include estimates for existing pollutant loads within the watershed, as well as estimated pollutant load reductions that may result from the implementation of best management practices outlined in the watershed plan.

Estimates of existing nutrient, sediment, and E. coli loading within the watershed were calculated using the water quality data collected during the course of the project. Since stream flow was not collected and there is no USGS gage station in the vicinity, flow was estimated using the Long-Term Hydrologic Impact Assessment (L-THIA) model. L-THIA is an analysis tool that allows the user to calculate the average annual runoff for an area based on its land use, soil, and climate characteristics. For the South Laughery watershed, the average annual runoff at the outlet of the watershed was calculated to be 54.16 cubic feet per second (cfs).

When calculating pollutant loads for a watershed as a whole, it is preferable to use water quality data collected at the site nearest to the watershed outlet. However, in the case of South Laughery Creek, this site (Site #1) is influenced by the Ohio River and may not be an accurate representation of conditions in the watershed. Therefore, water quality data from the closest upstream site (Site #2) were used to calculate existing pollutant loads for the watershed.

The current loads listed below were calculated using the estimated flow rate of 54.16 cfs and the average sediment, nutrient, and E. coli concentrations at Site #2.

Parameter	Average Concentration	Current Load
Total Suspended Solids (TSS)	21.708 mg/L	1,156 tons/year
Nitrate-Nitrite (N)	0.7408 mg/L	78,942 lbs/year
Total Phosphorus (TP)	0.212 mg/L	22,590 lbs/year
E. coli	328 cfu/ml	1.59 x 1014 cfu/year

In order to put the current load estimates in the context of water quality, target loads were calculated using State water quality standards, or recommended guidelines from literature if a State standard did not exist. The target loads listed below represent the amount of pollutants that the stream can assimilate (at the estimated average flow) and still meet the State standards or recommended guidelines.

Parameter	Target Concentration	Target Load
Total Suspended Solids (TSS)*	80 mg/L	4262 tons/year
Nitrate-Nitrite (N)**	10 mg/L	1,065,611 lbs/year
Total Phosphorus (TP)*	0.3 mg/L	31,968 lbs/year
E. coli***	235 cfu/ml	1.14 x 1014 cfu/year

*Recommended guidelines
**State standard for nitrate in drinking water
***State standard for E. coli (single sample)

By comparing the current loads with the target loads, an estimate of the necessary load reductions can be calculated.

Parameter	Current Load	Target Load	Reduction Needed
Total Suspended Solids (TSS)	1,156 tons/year	4,262 tons/year	--
Nitrate-Nitrite (N)	78,942 lbs/year	1,065,611 lbs/year	--
Total Phosphorus (TP)	22,590 lbs/year	31,968 lbs/year	--
E. coli	1.59 x 1014 cfu/year	1.14 x 1014 cfu/year	4.53 x 1014 cfu/year (28.4%)

Based on the estimated current and target E. coli loads, a 28% reduction would be necessary to meet water quality standards. While this value is only an estimate, it gives an idea of the magnitude of the E. coli reductions necessary to achieve water quality standards.

Although the current load estimates are below the target loads for the sediment and nutrient parameters, it does not mean that reductions for these pollutants are not necessary. Current and target loads were estimated for the watershed as a whole using data specific to Site #2. While this method gives a general idea of overall watershed conditions, it doesn't account for local variation. Water quality data and visual observations demonstrate that sediment and phosphorus are a valid concern in various locations throughout the watershed.

Section Ten – Implementing Measures

Action Item	Cost Estimate	Potential Funding Sources
Educate landowners on the benefits of conservation tillage	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Multi Media sources for education news papers, SLI, and radio	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Hold Annual Conservation Tillage Meeting	Small	319 Grant, Historic Hoosier Hills, SWCD
Establish 319 implementation grant funding	Large	319 Grant
Promote practice with displays and promotion at community events	Small-Moderate	319 Grant
Promote and educate landowners to do waterbody fencing and crossing	Small-Moderate	319 Grant
Distribute fencing practices through various media sources including targeted mailing, new papers and radio	Small-Moderate	319 Grant
Establish federal and state cost share funding for rotational grazing programs including alternative water supply	Large	319 Grant, Federal Programs
Encourage and assist landowners to do conservation plans and apply for cost share programs	Small–Moderate	319 Grant, Historic Hoosier Hills, SWCD
Educate the public about the importance and benefits of conservation practices through various media sources	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Establish cost share funding pertaining to riparian buffers, filter strips, conservation tillage, wetland restoration and cover crop	Large	319 Grant
Educate and inform landowners with cropping history near water bodies about the Conservation Reserve Program practices available	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD

Hold two public meetings involving soil scientists and health departments to educate on septic systems	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Educate 2000 individuals about septic system general maintenance, locations and requirements for installation through various media sources, target mailing, new papers, SLI	Moderate	319 Grant, Historic Hoosier Hills, SWCD
Through public appearance and media provide public awareness about federal, state, and local cost share programs available	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Publish two articles in local newspapers bringing awareness to the effects of illegal dumping	Small	319 Grant
Display and promote proper waste disposal techniques at two public events	Small	319 Grant, Historic Hoosier Hills, SWCD
Identify partners Solid Waste Management District	Small	--
Hold at least one watershed clean-up within the watershed	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Hold workshop on the paperwork and documentation needed for constructing in a floodway	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Demonstrate typical correspondence during permitting process and show relation to a project not requiring a permit	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Document field day presentation on video tape/DVD and make this publication available to public	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Document field day in brochure and make available to citizens	Small-Moderate	319 Grant, Historic Hoosier Hills, SWCD
Explore and document the steps needed for a floodway construction permit	Moderate	319 Grant, Historic Hoosier Hills, SWCD
Partner with appropriate permitting agencies to implement the created ‘streamlined model’	Small-Moderate	Additional Funding

Educational visit to area schools to demonstrate watershed process	Small	319 Grant , SWCD
Workshop to train on the available instructional materials for watersheds	Small	319 Grant, SWCD
Host language art contest for area schools regarding watersheds	Small-Moderate	319 Grant, SWCD

Small = $0.00 - $1,500.00
Small – Moderate = $1,500.00 - $3,000.00
Moderate = $3,000.00 - $7,000.00
Moderate – Large = $7,000.00 - $12,000.00
Large - $12,000.00

Section Eleven – Monitoring Indicators

Throughout the implementation process, the committee will use several indicators to determine if improved water quality has been achieved.

Administrative Indicators

Monitoring attendance at watershed functions, distribution of literature throughout the watershed, and tracking of conservation practices will help the committee monitor landowner participation.

The coordinator will:
Develop a database of watershed activity attendees to track attendance and involvement at various watershed events
Monitor tons of waste removed from watershed
Track distribution of educational literature
Monitor number of news articles submitted to local newspapers and organizations
Track the measure of conservation practices planned and installed.

Administrative indicators will be used for Goal One, Goal Two, Goal Three, Goal Four, and Goal Five.

Environmental Indicators

Environmental indicators track water quality improvement through load reductions. The coordinator will be responsible for completing the IDEM Estimated Load Reduction worksheet after each cost-share practice is implemented in the watershed. Additionally, the committee will seek future funding to continue water quality testing on South Laughery and its tributaries to show an improvement in water quality data from installation of best management practices.

Tons of sediment saved per best management practice
Reduction in E. Coli per best management practice
Reduction of nutrients per best management practice
Increase in future water quality data.

Environmental indicators will be used for Goals 1 and 2.

Section Twelve – Evaluating and Adapting the Plan

During the development of this Plan, the Dearborn Soil and Water Conservation District decided to pursue funding for the Implementation Phase of this project. The Dearborn County Soil and Water Conservation District Board asked Historic Hoosier Hills Resource Conservation and Development (HHH RC&D) Council to sponsor the 319 implementation grant. HHH RC&D Council accepted and in the spring of 2005 a 319 grant proposal was submitted to IDEM.

This current grant will provide funding to establish the need for assistance to residents of the watershed. The Implementation Grant will support cost-share programs to implement specific BMPs. These efforts will be directed by the strategies set forth within this Plan. The Implementation Grant (if received) will be supervised by a Steering Committee, Soil and Water Conservation Districts, and the HHH RC&D.

The Steering Committee will meet throughout the implementation phase to revisit the Plan and review progress toward the group's goals. The responsible parties for this project will make necessary changes, updates, and track progress of Plan achievements by measuring indicators associated with goals and objectives. Any questions about this Plan or the South Laughery Creek Watershed project can be directed to the following:

Dearborn County Soil and Water Conservation District
10729 Randall Avenue Suite 2
Aurora, Indiana 47001
(812) 926 2406 ext 3

Historic Hoosier Hills RC&D
1981 South Industrial Park Road
PO Box 407
Versailles, Indiana 47042
(812) 689 6410 ext 5

Appendix A: Endangered and Threatened Species

State and federal endangered, threatened, or rare species in the Laughery Creek Watershed (Source Endangered, Threatened and Rare Species, High Quality Natural Communities and Significant Natural Areas documented from the Laughery Creek Watershed, Indiana)

Species Name	Common Name	State Rank	Federal
Vascular Plant			
Penstemon Canescens	Gray Beardtongue	ST	**
Juglans Cinerea	Butternut	WL	**
Viburnum Molle	Soft leaf Arrow-Wood	SR	**
Lilium Canadense	Canada Lily	SR	**
Phlox Amplifolia	Large-Leaved Phlox	ST	**
Birds			
Ammodramus Henslowii	Henslow's Sparrow	SE	**
Aimophila Aestivalis	Bachman's Sparrow	SE	**
Fish			
Crystallaria Asprella	Crystal Darter	SSC	**
Amphibian			
Ambystoma Barbouri	Streamside Salamander	**	**
Mammals			
Lynx Rufus	Bobcat	SG	**
Forest			
Forest-Floodplain Wet-Mesic	Mesic Upland Forest	SG	**
Forest-Flatwoods Bluegrass Till Plain	Bluegrass Till Plain Flatwoods	SG	**
Forest – Upland Dry-Mesic	Dry-Mesic Upland Forest	SG	**
Forest – Upland Mesic	Mesic Upland Forest	SG	**
Fed = ** Not Listed, State: SE= State Endangered; ST = State Threatened; SR= State Rare; SSC = Species of Special Concern; SG = State Significant; WL = Watch List; ** = Not Listed			

Appendix B: 1996 Fish Survey Index

Common name	Scientific Name	Number	%	Size Range Inches	Total Weight Ponds	%	Occurrence Index
Bluntnose minnow	Pimephales notatus	991	19.0	1.5-3.5	3.83	0.4	8
Longear sunfish	Lepomis megalotis	741	14.2	1.3-6.1	28.82	3.2	8
Gizzard shad	Dorosoma cepedianum	633	12.2	3.6-12.8	98.25	11.1	8
Golden redhorse	Moxostoma erythrurum	572	11.0	2.3-14.8	145.96	16.5	8
Steelcolor shiner	Cyprinella whipplei	319	6.1	1.7-4.4	3.88	0.4	8
Green sunfish	Lepomis cyanellus	267	5.1	1.5-6.9	15.44	1.7	8
Rock bass	Ambloplites rupestris	167	3.2	2.1-9.3	30.99	3.5	6
Silver redhorse	Moxostoma anisurum	162	3.1	2.5-15.0	70.71	8.0	8
Black redhorse	Moxostoma duguesnei	147	2.8	2.2-13.7	28.22	3.2	7
Northern hog sucker	Hypentelium nigricans	135	2.6	2.9-14.5	16.02	1.8	7
Bluegill	Lepomis macrochirus	130	2.5	1.3-7.9	10.06	1.1	8
Spotted bass	Micropterus punctulatus	102	2.0	2.7-12.3	27.03	3.0	8
Greenside darter	Etheostoma blennioides	86	1.7	2.2-3.5	0.51	0.1	5
Striped shiner	Luxilus chrysocephalus	76	1.5	1.9-5.7	1.35	0.2	6
Central stoneroller	Campostoma anomalum	71	1.4	2.4-5.1	1.73	0.2	5
Common carp	Cyprinus carpio	60	1.2	14.9-26.5	215.90	24.3	8
Smallmouth bass	Micropterus dolomieu	53	1.0	2.8-13.0	16.27	1.8	4
Logperch	Percina caprodes	53	1.0	2.9-5.9	0.98	0.1	7
Channel catfish	Ictalurus punctatus	47	0.9	6.3-24.0	54.99	6.2	5
Largemouth bass	Micropterus salmoides	32	0.6	1.6-15.8	11.10	1.3	7
Quillback	Carpiodes cyprinus	28	0.5	4.5-17.3	20.51	2.3	6
Spotted sucker	Minytrema melanops	26	0.5	2.9-13.2	5.40	0.6	4
Fantail darter	Etheostoma flabellare	25	0.4	1.3-2.5	0.07	*	5
Silver shiner	Notropis photogenis	23	0.4	2.8-4.5	0.22	*	6

White crappie	Pomoxis annularis	21	0.3	3.0-10.8	4.20	0.5	6
White bass	Monroe chrysops	15	0.3	4.2-15.8	8.14	0.9	1
White sucker	Catostomus commersoni	15	0.3	3.8-11.3	4.08	0.5	3
Shorthead redhorse	Moxostoma macrolepidotum	14	0.3	5.0-13.7	5.83	0.7	2
Yellow bullhead	Ameiurus natalis	14	0.3	3.5-10.0	3.20	0.4	4
Silverjaw minnow	Notropis buccatus	14	0.3	2.0-2.7	0.08	*	2
Rosefin shiner	Lythrurus ardens	14	0.3	1.4-2.9	0.06	*	4
Spotfin shiner	Cyprinella spiloptera	13	0.2	2.7-4.2	0.17	*	6
Freshwater drum	Aplodinotus grunniens	12	0.2	4.6-16.8	9.29	1.0	4
Slenderhead darter	Percina phoxocephala	12	0.2	2.3-3.2	0.08	*	4
Rainbow darter	Etheostoma caeruleum	12	0.2	1.6-2.3	0.03	*	3
Highfin carpsucker	Carpiodes velifer	10	0.2	3.2-14.5	4.88	0.6	2
Brook silverside	Labidesthes sicculus	10	0.2	2.3-2.9	0.03	*	7
Longnose gar	Lepisosteus osseus	9	0.2	14.5-36.0	10.07	1.1	4
Banded darter	Etheostoma zonale	9	0.2	1.6-2.1	0.02	*	3
Flathead catfish	Pylodictis olivaris	8	0.2	7.3-18.0	7.97	0.9	5
Smallmouth buffalo	Ictiobus bubalus	7	0.1	12.0-18.0	12.92	1.5	2
River carpsucker	Carpiodes carpio	7	0.1	4.0-15.0	4.50	0.5	1
Sauger	Stizostedion canadense	7	0.1	5.6-9.8	0.77	0.1	3
Creek chub	Semotilus atromaculatus	7	0.1	1.7-2.9	0.04	*	2
Hybrid sunfish	-	5	0.1	4.6-6.6	0.56	0.1	2
Stonecat	Noturus flavus	4	0.1	3.5-7.4	0.26	*	2
Blackside darter	Percina maculata	4	0.1	2.7-3.4	0.03	*	2
Emerald shiner	Notropis atherinoides	3	0.1	2.5-3.1	0.01	*	1
Bullhead minnow	Pimephales vigilax	3	0.1	1.3-2.1	**	*	1
Orange spotted sunfish	Lepomis humilis	2	*	2.8-3.5	0.05	*	2
Golden shiner	Notemigonus crysoleucas	2	*	2.7-3.5	0.01	*	2
Johnny darter	Etheostoma nigrum	2	*	1.9-2.0	**	*	2
Black crappie	Pomoxis nigromaculatus	1	*	12.0	1.27	0.1	1
Warmouth	Lepomis gulosus	1	*	6.0	0.16		1
Brindled madtom	Noturus minurus	1	*	3.1	0.02	*	1
Stonecat x madtom	-	1	*	3.1	0.01	*	1

hybrid							
Rosyface shiner	Notropis rubellus	1	*	2.7	**	*	1
Totals		5,206			886.98		

*Less than 0.1%

** Less than 0.01 Lb.

Source: Fisheries Survey of Laughery Creek, 1996. Larry L. Lehman

Appendix C: Fish Index for fall 1995 collection

Common name	Number	%	Size Range Inches	Total Weight Ponds	%	Occurrence Index
Spotted bass	211	36.7	1.9-13.5	22.62	16.2	8
Rock bass	170	29.6	1.5-9.1	25.31	18.1	7
Smallmouth bass	120	20.9	2.5-15.5	15.93	11.4	4
Largemouth bass	34	5.9	3.1-16.5	14.98	10.7	7
Channel catfish	22	3.8	1.5-21.0	25.40	18.2	7
White bass	7	1.2	5.0-12.0	2.22	1.6	3
Flathead catfish	6	1.0	9.1-34.2	32.44	23.2	4
Sauger	5	0.9	9.4-9.7	0.84	0.6	1
Totals	575	-	-	139.74	-	-

Appendix D: Fish Consumption Advisories

According to the 2003 Indiana Fish Consumption Advisory Laughery Creek has the following advisories. Placing a fish in advisory groups provides the public with information about the safety of eating the many types of fish found within Indiana waterways. The following groups determine the amount of fish a person can eat by the amount and type of contaminants in the specific waterways. Note: The heavier and larger the fish, the longer time that fish has had to absorb the possible contaminants in the waterways. {Indiana Fish Consumption Advisory 2003}

Location	Species	Fish Size (Inches)	Contaminant	Group
Laughery Creek	Carp	21+	■ ●	2
Ripley County	Channel Catfish	17+	●	2
Ripley County	Freshwater Drum	16-17 17+	● ●	2 3
Ripley County	Rock Bass	7-9 9+	● ●	2 3
Ripley County	White Sucker	9+	●	2
Dearborn County	Carp	21+	■ ●	2
Dearborn County	Channel Catfish	17+	●	2
Dearborn County	Freshwater Drum	16-17 17+	● ●	2 3
Dearborn County	Rock Bass	7-9 9+	● ●	2 3
Dearborn County	White Sucker	9+	●	2

2003 Indiana Fish Consumption Advisory Streams and Rivers

● = Mercury Group 2=1 meal/week Group 4=1 meal/2 months

■ = PCB's Group 3=1 meal/month Group 5=Do Not Eat

Each group has advisories the following chart will help describe each group's restriction

Group 1	Unrestricted consumption. One meal* per week for women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15
Group 2	One meal*per week (52 meals per year) for adult males and females. One meal*per month for women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15.
Group 3	One meal*per month (12 meals per year) for adult males and females. Women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15 do not eat
Group 4	One meal* every 2 months (6 meals per year) for adult males and females. Women who are pregnant or breastfeeding, women who plan to have children, and children under the age of 15 do not eat
Group 5	No Consumption (DO NOT EAT)

* A meal is defined as 8 ounces of uncooked fish for a 150-pound person or 2 ounces of uncooked fish for a 40-pound child.

Appendix E: Drive by Surveys

The following information was taken from a windshield Survey of Dearborn County in the northern portion of the watershed. Observations were made to establish the overall health and produce a baseline for this portion of the watershed. Note: The week prior Cincinnati had flooding at 52 feet due to hurricane activity which ultimately affects backflow into the Ohio River.

Observed By: Rita Cutter, Marilyn Fowler, and Martha Jones
September 30, 2004

Cole Lane and Hartford Road
Boat ramp washed out. Hole in the middle of the ford. Debris: Refrigerators, and flooding trash. Farm fields covered with sediment from flooding. Invasion of Johnson grass

East Laughery Creek Road Headed West of Cole Lane
Abandoned farm equipment
#8020 Logging activity
The first bridge we came to has really deep cutting erosion. Debris carried into fields from flooding
Abandoned Barn with trash

Hueseman Road
2nd bridge abandoned trucks by drive, recliner and trash present
Ditching work noted along road near power line crossing
#8501 new construction
3rd bridge noted flat and rocky near #8259 poor fish habitat
4th bridge shallow
New culverts and pipes noted
No dumping signs present surrounded by trash on north side of creek
Dry Creek noted near power lines on wood poles
Obvious tire tracks in creek packed gravel from four wheelers
Rope swing with swimming debris on both sides of road
4 wheeler access near 5th bridge along with paths from RV's
Access areas covered with debris
Curve in road extremely eroded which leads to natural gravel ford which crosses creek

Hwy 262
Ohio and Dearborn County Borders
Water clear with flat rock bottom

Hartford Road and Hwy 262
Near testing site pools and exposed rocks
Abandoned vehicles

West Laughery Creek Road

Old bridge crossing noted
Debris along side creek
Various camps
#10678 deep cutting on tributary from water coming from steep hillside
Campsites noted with no sign of septic
Washout trying to repair with gravel
A frame house with camps noted
#11742 for sale with trailer on edge of bank
Dump site, trailers, grills, exercise bikes and out house

Arlington and West Laughery
Deep water whirlpool
Out houses
#12014 Tree Farm
#12184 Livestock

Roberts Road
Ford over Mud Lick branch

W. Laughery
Slip repaired- steep bank undercut by creek
Camps with out houses next to creek
Permanent residence with out house
Access ford across creek entering Ohio County
Tributary cows close and have access
#12837 erosion cuts, more gravel needed
Abandoned farm equipment
Camp with outhouse right on creek with sink that runs into creek
Tributary bridge stabilized rock bottom
Tree farm- walnuts
#14083 new construction with septic
Bad slip with new culvert very steep cut
#14085 campsites leaning with outhouse
#14197 tributary

Baum Hollow Road and West Laughery
New guard rail
Camp with no evidence of septic flat rock area
Camp and outhouse

West Laughery Dead ends into Bells Branch
Camp with motorcycles and tent
Farm on east before Clay-Miller Road pasture erosion and deep cuts

Bells Branch and Baum Hollow Intersection

Steep sides to creek bottom
Roads passing on the way out of this adventure
Prosperity Ridge and Bells Branch
Nolte Road to Bells Branch
Cutter Road and Bells Branch
Bells Branch to 62

Cole Lane and Laughery Creek Road
Small dumpy houses near Hartford Bridge on steep bank
Narrow riparian areas
Refrigerators and trash
Low land on Dearborn County Side
All area round Hartford in floodplain area

East Laughery Creek Road
Near #7154
New development on Laughery Creek side
Pasture with horses
Tributary next to pasture
Steep gully from hill slope runoff South Side near Creek
New Road work and guard rail protecting extremely steep bank
Seasonal camping with mercury vapor light in flood area
*Non creek side of forested slopes and grassy areas
Woodland and hay ground lots of round bales past Alta Vista
Creek tributary clogged past Tangle wood
#6283
Worn pasture
Cedar Hill Sides
South Side Bean Field Sloping to creek
New Housing Construction
#5561
New expanded drive
Tributary really cut from above steep slopes
Left/Right side abandoned pasture and Cedar Scrub Land
#5112
House auto body area
Cars in floodplain
On left side of road many trailers
#4872
Camps in floodplain
#4825
Property for sale in floodplain near new Pole Barn
Vic's Lane a lot of lots; land gets steep by the creek
Large pond with sides
#4497
New horse barn on creek side on left with good pasture

#4399
New home
Fencing and pasture toward creek side
#4317
Construction on right hand side
Left side of road grass hillside
Rough pasture with horses

Morgan's Branch Road
Asphalt piles
Large trucks
Abandoned machinery in standing pools of water
End

Note: numbers only used as reference points

Noted sites for future reference:
Erosion: 11
Camps/outhouse access: 14
Debris: 16
Development/Construction: 15
Poor riparian zone/habitat: 3
Creek Maint (guard rails, road slips): 3
Forest: 3
Livestock: 4
Degraded Pasture 3

The following information was taken during a windshield survey of Ohio County portion of the watershed. Observations were made to establish the overall health and produce a baseline for this portion of the watershed.

Holmes Hill Road out of French
Steep Forested Slope
Grass Pasture
Cattle noted with good grass coverage
Forest and houses near road

Salem Ridge and Thuremer
Houses near road forest beyond

New Road (Dead End) off Salem Ridge Road
Pasture on Left
Road Widening
Ridge Being Prepared for more houses
One mile long housing development
Individual lots at the end of the road

New power lines installed
No major erosion problems noted

Salem Ridge at New Road
Worn house pasture noted
Forest
Houses near road

Dittmer Road (single land drive)
Cattle protected pond

Salem Ridge Road
Pasture and Forest
Heavy pasture worn from horses
Pasture, houses, and forest noted

Nelson Road
Crossing nelson
Pasture, forest, and scattered houses noted

Chappel Road
Houses and barns
Pasture

Salem Ridge Road
Farm, scattered houses, fields and forests
Aberdeen Pate Water Plant

IN 262
Pastures worn by horses
Corn and Soybean Fields
Mt. Pleasant Cemetery

Woods Ridge Road
No till Soybeans
Corn field on left
County Highway Garage
Hay field and houses
Five to nine acre lot development
Fallow fields
Forested slopes

Akeshill from West Laughery back to Woods Ridge
Creek Valley Houses
Forested Slopes
Cass Union Road

Pasture Hay Field
No till Beans

Downey Ridge Road
Old fields and woods
Bush hogging slopes
Bridge over creek
Corn fields
Houses with pasture and cows
Soybean fields
Hay fields
Forested young slopes
Creek Valley horses noted

262 East from Downey
Forested young slopes
Grassy areas
Cattle noted
Pasture noted
Houses
Alpfalia Field Noted

New Hope Road
Hay fields and pasture
New Hope Cemetery

South Fork and Downey Ridge
Rolling Fields
Pasture
Hay fields
Horses Noted
Pasture with cattle noted (good shape)
Wooded Steep Slopes

Kirkpatrick and South Fork Creek
Steep slopes wooded toward Laughery Creek
Wooded hillsides with young trees
Old pasture being bush hogged

Kirkpatrick South from South Fork Road
House noted with lots of junk
Bull Dozer noted by creek
Evidence of creek maintenance
Young woods noted

South Kirkpatrick

ATV trail up hill
Dead end road scenic farm

South Fork at Kirkpatrick
Wooded Slopes
Pasture that has been Bush Hogged- no animals recently
Hay fields noted
Group of homes

Speir Road
Soy field no till
Pasture

Kindler Road
Road ends at houses
Many vehicles

Downey Ridge at Speir Road
Houses
Hay fields
Corn field
Soy field
South Fork ends at Bear Branch and Milton

Pate Road (dead end)
Soy fields
Hay fields
Woods away from flattened land
Abounded pasture
Valley along Laughery large bottom farm noted
Rolling field recently tilled
Johnson grass between road and Laughery Creek

Milton Bear Branch Road (South crossing Aberdeen Road)
Corn fields
Baptist Church
Soy fields
Houses
Pasture
Pasture

Milton Bear Branch Road (North)
Soy fields
Corn fields
Young woods noted
Houses

Hay field
Pasture and Wood noted
Old field in valley
End at 262

Hartford Pike at Old 56 (traveling up the creek)
Out building and houses
Warm season grasses
Young woods noted
Camps noted by creek
Summer camp noted on Ohio County Side
Cattle on Creek Bank Dearborn County Side
Holiday Hills resort lots of boats
Auto repair shop

Smiley Road
Dead end into small stream
7 homes noted
Creek has been bulldozed
Field in bottom lands
Campsites noted along Laughery

Hartford Pike following Laughery Creek
Bottom land fields
Camp sites along Laughery Creek
Filling of bottom lands along Laughery Creek
Horse pasture noted on hillside
Ag field on bottom lands
Wooded slopes

Crossing Nelson onto Hartford
Building at Hartford
Fields and woods noted
Ag in bottom lands
Evidence of fresh maintenance in Laughery Creek with bull dozer to channel zed creek

Hartford Pike past Akeshill Road
Wooded slopes noted along side of Laughery Creek
Roosting Turkey Vultures noted
End at 262

Laughery Creek Road from Milton Bear Branch Road
Wooded slopes noted
Ag fields
New housing construction
Cedar slopes

Fallow Ag field noted
Young woods noted
Soy fields
Ag fields in bottoms
Cattle on Dearborn County side fenced from creek
Laughery Creek cutting noted through bend in creek
County bank stabilization work being performed
Extensive creek work going upstream
Road climbing out of valley mature trees noted

Milton Bear Branch Road and Iceberg Road
Ag fields

Aberdeen Road West from Works Road
Ag fields
Wooded Valley

Goodner Road South
Ag fields
Hay fields

Aberdeen Road (east or west)
Ag fields
Pasture
Transmission lines
Cattle ponds noted with damage

Aberdeen Road from IN 56 (west)
State garage
Houses
Bare Ag land washing away

Willow Creek Road
Rocky creek bottom
Pasture across Willow Creek
Fenced cattle noted
Extensive creek work to maintain road

Aberdeen from Willow Creek (west)
Wooded slopes noted
Ag fields

Bear Creek North from Aberdeen Road
Hay field
Corn field
Wooded valley

Extensive road maintenance

Aberdeen West (Passing Bell Branch)
Ag land noted
Houses noted in Bear Creek Valley

Bear Creek Road
Pileated Wood pecker noted
Houses noted

Aberdeen
Ag fields
Flat land forests
Recent tree cuttings noted
End Aaron Road

Mexico Ridge Road from Laughery Creek
Ag fields
Logging operation noted
Small fields noted
Homes noted
Corn fields
Pasture noted

Bell Branch Road from Aberdeen
Hay field
Ag field
Wooded valley

Note: Any names or addresses used in this translation are for reference points only

Noted sites for future reference were:
Good Pasture: 32
Degraded Pasture: 3
Development: 31
Forest: 31
Crops/Ag Land: 30
Livestock: 12
Debris/Creek Maint. 11
Camps Outhouses: 6
Protected water bodies: 2

The following information was taken during a windshield survey of Ripley County the western portion of the watershed.
Observations were made to establish the overall health and produce a baseline for this portion of the watershed.

Cave Hill Road to 62 to 575 to 900 ending in Dewberry
The route traveled was the closest point to Laughery Creek in this section of the watershed.

Our observation yielded the following:

No illegal dumping sites were noted.
Approximately 5 percent of livestock present on land.
Approximately 10 percent of this area was agricultural.
Approximately 85 percent of the area was wood and shrub land to support wildlife.

Noted items for future reference were:
Cave Hill Road #2666 livestock erosion on pond. NE Laughery near 300 South
Cave Hill Road and Olean Road erosion on land by cattle and overgrazing. West of Laughery
Cave Hill Road #5508 livestock erosion on pond. East of Laughery. Buffered area before creek.

Note: numbers only used as reference points

The following information was taken during a windshield survey of Switzerland County the southern portion of the watershed. Observations were made to establish the overall health and produce a baseline for this portion of the watershed.

Aberdean Road and East Enterprise
Unremarkable

Allensville Road
Surface applied manure. Cattle have access to tributary. NW side of road

Works Road
Hay fields. Unremarkable

Allensville to Hwy 250 West
Unremarkable

Shillo Road SW
Grazing cattle and crops

Hwy 250 West
Unremarkable

Bear Branch Road North
Unremarkable
Altoff Road East

Unremarkable

East Schudder Road
Rough Pasture

Hwy 250 West
Unremarkable

Aaron Road North
Several Amish Homes

Knigga Road
Loggers on north east side of road #28

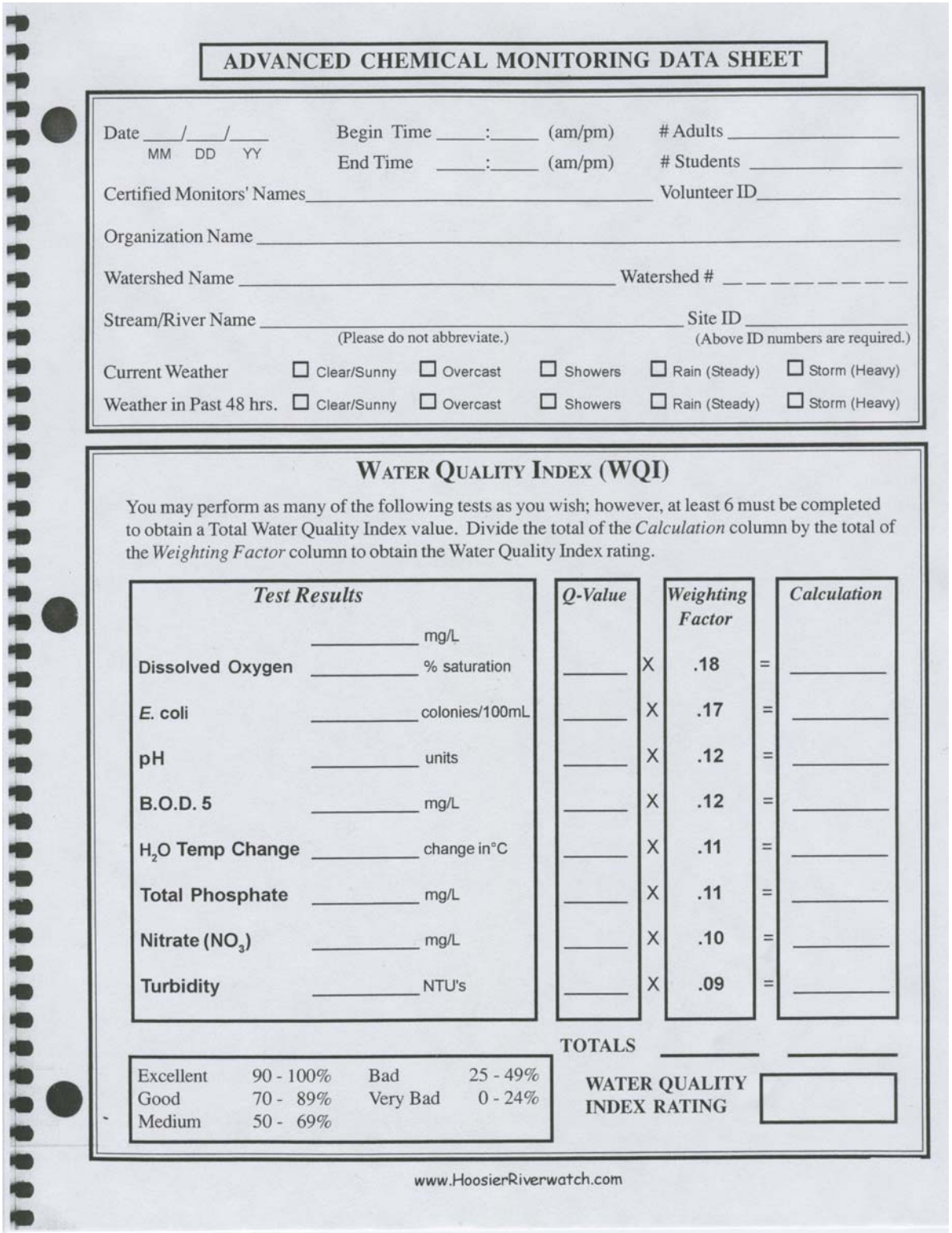
Bear Creek
Unremarkable

Our observation yielded the following

No illegal dumping sites were noted.
Approximately 15% of livestock present on land
Approximately 80% of this area was agricultural
Approximately 5% of this area was forest and woodland

Note: numbers only used as reference points

Appendix F. Water Quality Index Data Sheet



ADVANCED CHEMICAL MONITORING DATA SHEET

Date ____/____/____ (MM DD YY) Begin Time _____:_____ (am/pm) End Time _____:_____ (am/pm) # Adults _____ # Students _____

Certified Monitors' Names _____ Volunteer ID _____

Organization Name _____

Watershed Name _____ Watershed # _ _ _ _ _ _ _ _

Stream/River Name _____ (Please do not abbreviate.) Site ID _____ (Above ID numbers are required.)

Current Weather ☐ Clear/Sunny ☐ Overcast ☐ Showers ☐ Rain (Steady) ☐ Storm (Heavy)

Weather in Past 48 hrs. ☐ Clear/Sunny ☐ Overcast ☐ Showers ☐ Rain (Steady) ☐ Storm (Heavy)

WATER QUALITY INDEX (WQI)

You may perform as many of the following tests as you wish; however, at least 6 must be completed to obtain a Total Water Quality Index value. Divide the total of the *Calculation* column by the total of the *Weighting Factor* column to obtain the Water Quality Index rating.

Test Results			*Q-Value*		*Weighting Factor*		*Calculation*
	_____	mg/L					
Dissolved Oxygen	_____	% saturation	_____	X	.18	=	_____
E. coli	_____	colonies/100mL	_____	X	.17	=	_____
pH	_____	units	_____	X	.12	=	_____
B.O.D. 5	_____	mg/L	_____	X	.12	=	_____
H_2O Temp Change	_____	change in°C	_____	X	.11	=	_____
Total Phosphate	_____	mg/L	_____	X	.11	=	_____
Nitrate (NO_3)	_____	mg/L	_____	X	.10	=	_____
Turbidity	_____	NTU's	_____	X	.09	=	_____
			TOTALS				_____

Excellent	90 - 100%	Bad	25 - 49%
Good	70 - 89%	Very Bad	0 - 24%
Medium	50 - 69%		

WATER QUALITY INDEX RATING ☐

www.HoosierRiverwatch.com

Appendix G: Record of Meetings and Activities

January 2004
6-7 IASWCD Annual Conference Indianapolis, IN
14 Dearborn County SWCD Board Meeting
22 Ohio County SWCD Annual Meeting

February 2004
2 Ohio County SWCD Board Meeting
3 Switzerland County SWCD Board Meeting
11 Dearborn County SWCD Board Meeting
18 SLCWP Public Meeting Versailles, IN

March 2004
8 Ripley County SWCD Board Meeting
10 Dearborn County SWCD Board Meeting
11 Dearborn County SWCD Annual Meeting
30 OKI-RCC Annual Meeting Presentation

April 2004
5 Ohio County SWCD Board Meeting
6 SLCWP Steering Committee Meeting
15 Indiana Regional Envirothon Contest
28-29 Dearborn County Ag Days for 3rd Graders

May 2004
4 Switzerland County SWCD Board Meeting
5 Contractor Selection Sub Committee Meeting
11 Contractor Selection Sub Committee Meeting
SLCWP Steering Committee Meeting
Dearborn County SWCD Board Meeting
19 Contractor Selection Sub Committee Meeting
26 Site Selection Sub Committee Meeting

June 2004
1 Switzerland County SWCD Board Meeting
7 Ohio County SWCD Board Meeting
8 SLCWP Steering Committee Meeting
9 Dearborn County SWCD Board Meeting
14 Ripley County SWCD Board Meeting
21-25 Dearborn County Fair

July 2004
8 Switzerland County Fair
13 SLCWP Steering Committee Meeting
14 Dearborn County SWCD Board Meeting

15 Ohio County Fair
22 Technical Committee Meeting
24 Laughery Valley Fish and Game Field Day
26 Ripley County Fair

August 2004
10 SLCWP Steering Committee Meeting
11 Dearborn County SWCD Board Meeting
24 SLCWP Education Committee Meeting

September 2004
7 Switzerland County SWCD Board Meeting
8 Dearborn County SWCD Board Meeting
9 Technical Committee Meeting
18 Switzerland County Pond Clinic
21 Ripley County Windshield Surveys
25 Pumpkin Show Parade Versailles, IN
30 Dearborn County Windshield Surveys

October 2004
4-6 Tanners Creek Water Festival
12 SLCWP Steering Committee Meeting
13 Dearborn County SWCD Board Meeting
14 Switzerland County Windshield Surveys
17, 24 Ohio County Windshield Surveys

November 2004
1 Ohio County SWCD Board Meeting
9 SLCWP Steering Committee Meeting
10 Dearborn County SWCD Board Meeting
23 Quarterly Review with IDEM
23 SLCWP Steering Committee Meeting

December 2004
1 Dearborn County Windshield Surveys
3 Project Wet Workshop
8 Dearborn County SWCD Board Meeting
14 SLCWP Steering Committee Meeting

January 2005
12 Dearborn County SWCD Board Meeting
18 SLCWP Steering Committee Meeting
25 Education Committee Meeting
27 Ripley County SWCD Annual Meeting

February 2005
1 Switzerland County SWCD Board Meeting
7 Ohio County SWCD Board Meeting
8 SLCWP Steering Committee Meeting
9 Dearborn County SWCD Board Meeting
18 Project Wild Workshop

March 2005
1 SLCWP Education Committee Meeting
3 Ripley County SWCD No-till breakfast
8 SLCWP Steering Committee Meeting
9 Dearborn County SWCD Board Meeting
10 Dearborn County SWCD Annual Meeting
11 Switzerland County SWCD Annual Meeting
22 319 Grant proposal meeting
31 Dearborn County Conservation Tillage Workshop

April 2005
4 Education Committee Meeting
9 SLCWP Clean Up
12 SLCWP Steering Committee Meeting
13 Dearborn County SWCD Board Meeting
19-20 Indiana Regional Envirothon

May 2005
2 Ohio County SWCD Board Meeting
6 Presentation Ohio County 4th grade
10 SLCWP Steering Committee Meeting
11 SLCWP Education Committee Meeting & Dearborn County SWCD Board Meeting
12 ORSANCO Education Field Day
19 Display at Lions Club Aurora
24 Partnership meeting with Versailles State Park

June 2005
1 SLCWP Education Committee Meeting
6 Ohio County SWCD Board Meeting
7 319 Grant Meeting
8 Dearborn County SWCD Board Meeting
14 SLCWP Steering Committee Meeting
19-25 Dearborn County Fair
22 Crosley Fish & Wildlife Area-Geese Banding
23 Mapping of Brant Farm, Versailles State Park
28 Ohio Horse Management Workshop

July 2005
3-9 Switzerland County Fair

12 SLCWP Steering Committee Meeting
13 Dearborn County SWCD Board Meeting
22 Ohio County Community Foundation Check Acceptance for CSP Workshop
26 Ohio County Horse Management Workshop

August 2005
9 SLCWP Steering Committee Meeting
10 Dearborn County SWCD Board Meeting
20 Hogan Creek Conservation Field Day

September 2005
8 Partnership Meeting with Versailles State Park
10 Ohio County Storm Drain Marking
13 SLCWP Steering Committee Meeting
15 Conservation Security Program Workshop
14 Dearborn County SWCD Board Meeting
26-28 Tanners Creek Water Festival

October 2005
6 Ohio County Field Day
11 SLCWP Steering Committee Meeting
12 Dearborn County SWCD Board Meeting

November 2005
1 Switzerland County SWCD Board Meeting and EQIP Ranking
3 Best Management Practice Conference
8 SLCWP Steering Committee Meeting
9 Dearborn County SWCD Board Meeting

December 2005
14 Dearborn County SWCD Board Meeting

Appendix H: Pictures of Water Testing Sites

Site One

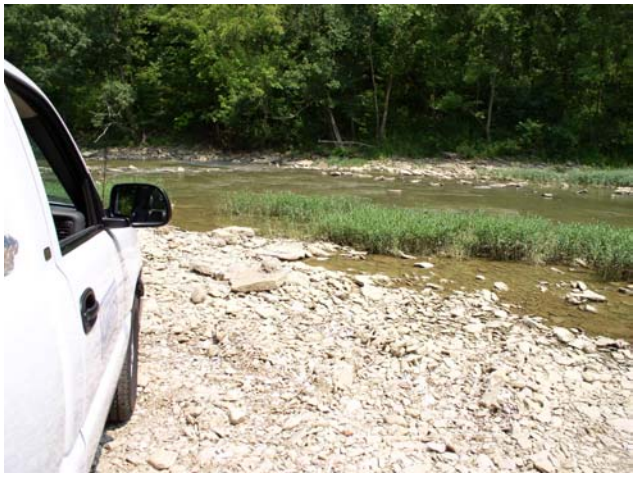
Kinnet Subwatershed – The testing was performed on the creek directly near the Old Iron Bridge on 56 by French before discharging into the Ohio River in Randolph Township.

Site Two

Goodpasture Subwatershed – The testing was performed on the creek directly at the Hartford Ford on Cole Lane in Washington Township.

Site Three

Mud Lick Subwatershed – Testing was performed directly on Laughery Creek via Laughery Creek Road in Clay Township



Site Four

Hayes Branch Subwatershed – Testing was performed down from where all tributaries (Boyd Branch, Hayes Branch, Peter Creek, and Bob Branch) meet before entering Laughery Creek. Access is from Roberts Road in Clay Township.

Site Five

South Fork Lower Subwatershed – Testing was performed down from where all tributaries (South Fork, Dry Branch, and Mud Lick Creek) converge before entering Laughery Creek in Union Township.

Site Six

Willow Creek Subwatershed – Testing was performed down from where all tributaries (Willow Creek and Murray Branch) converge before entering Laughery Creek in Cass Township.

Site Seven

South Fork Headwaters Subwatershed – Testing was performed down from where all tributaries (Sugar Branch, Elk Creek, and South Fork) converge before entering Laughery Creek in Pike Township.

Site Eight

Bell Branch Subwatershed – Testing was performed directly on the main stream on Laughery Creek in Caesar Creek Township.

Site Nine

Bear Creek Subwatershed – Testing was performed down from where all tributaries (Uhlmann Branch, Bear Branch, and Bear Creek) converge before entering Laughery Creek in Pike Township.

Site Ten

Caesar Creek Subwatershed – Testing was performed on Caesar Creek directly before it enters Laughery Creek near the Flea Market in Friendship off from State Road 62 in Brown Township.

Site Eleven

Raccoon Creek Subwatershed – Testing was performed down from where all tributaries (Little Raccoon Creek and Raccoon Creek) converge before it discharges into South Laughery on the Old Stone Four Humped Bridge in Brown Township.

Site Twelve

Turkey Creek Subwatershed – Testing was performed directly on Laughery Creek after the Goose Creek tributary discharge point in Johnson Township.

Site Thirteen

Cave Hill Subwatershed – Testing was performed on US 50 on the bridge near the entrance of Versailles State Park in Johnson Township.

Appendix I: List of Concerns within the Watershed

The following list of concerns were discussed during the April 6, 2004 Steering Committee meeting held in Friendship. These concerns were later prioritized and can be found in Section One: Building Partnerships.

Grandkids swimming
Poor Fishing
Sedimentation
Lack of Filter/Buffer strips
Soil erosion
Obstructions in the stream
Garbage and litter
Larger riparian buffers
Erosion problems
Recreation with limited access
Lack of landowner incentives
High E. Coli levels
Urban pressures
Too many restrictions on landowners from government
Lack of maintenance along stream corridor
Maintain-removal of obstruction in the water way
Effects of backwater from Ohio River
Junk cars
Lack of BMPs within the watershed
Recreational vehicles
Flooding
Streambank erosion

Appendix J: List of Stakeholders, Agencies, and Advisory Committee Contributors

Dearborn County

Dearborn SWCD
10729 Randall Ave, 2
Aurora, IN 47001

Dearborn County Highway Garage
215 W High Street B
Lawrenceburg, IN 47025

Dearborn County Plan Commission
215 B West High Street
Lawrenceburg, IN 47025

Dearborn County Health Department
215 B West High Street
Lawrenceburg, IN 47025

DC Purdue Cooperative Extension
233 Main Street
Aurora, IN 47001

Dearborn County Solid Waste
10700 Prospect Lane
Aurora, IN 47001

Ohio County

OC Purdue Cooperative Extension
412 Main Street
Rising Sun, IN 47040

Ohio County SWCD
P.O. Box 14
Rising Sun, IN 47040

Ohio County Community Foundation
215 Main Street
Rising Sun, IN 47040

Ohio County Health Department
117 Sixth Street
Rising Sun, IN 47040

City of Rising Sun
401 Shiner Blvd
Rising Sun, IN 47040

Ripley County

Ripley County SWCD
1981 S Industrial Park Road Suite 2
Versailles, IN 47042

Ripley County Health Department
102 W 1st North Street
Versailles, IN 47042

Switzerland County

Switzerland County SWCD
105 East Pike Street
Vevay, IN 47043

Switzerland County Health Department
Highway 56
Vevay, IN 47043

State and Federal

IDNR District Wildlife Biologist
Crosley Fish and Wildlife Area
2010 South St. Hwy 3
North Vernon, IN 47265

USDA Farm Service Agency
10729 Randall Ave, Suite 1
Aurora, IN 47001

USDA Farm Service Agency
1981 S Industrial Park Rd Suite 1
Versailles, IN 47042

USDA Farm Service Agency
105 E. Pike Street
Vevay, IN 47043

USDA NRCS
10729 Randall Ave, Suite 2
Aurora, IN 47001
USDA NRCS
1981 S Industrial Park Road Suite 2
Versailles, IN 47042

USDA NRCS
105 E. Pike Street
Vevay, IN 47043

IDNR - Division of Soil
10729 Randall Ave Suite 2
Aurora, IN 47001

IDNR - Division of Soil
1981 S Industrial Park Drive Suite 2
Versailles, In 47042

IDNR - District Forester
Route 3
North Vernon, IN 47265

Versailles State Park
1387 E. US 50
Versailles, IN 47042

IDNR - Division of Fish and Wildlife
4931 South County Road 250 West
Vallonia, IN 47281

Historic Hoosier Soils
Survey Project Office
2600 North State Hwy 7
North Vernon, IN 47265

Other

Historic Hoosier Hills RC&D
PO Box 407
Versailles, IN 47042

Appendix K: Steering Committee Members/Contributors

Marshal Alford
B.J Ault
Casie Auxier
Don Arnold
Sue Arnold *
Lisa Barker
Kim Brinson
Bob Brewington
Steve Brown
Katie Collier
Bob Cunningham
Ivan Cutter
Rita Cutter
Ron Cutter
Nick Domaschko
Dennis Feichtner
Howard Fletcher
Marilyn Fowler
Ted Fowler *
Tim Greive
Keli Hall
Jennifer Hughes
Ed Jones
Ken Lane
Howard Luke
John Miller *
Aimee Morrison
D.L. Ransom
Corey Rieman
George Schewe
Tim Schwipps
Vickie Smith
Terry Stephenson
Gary Thomas
Mark Thomas
Nancy Whisman

* Officers

Appendix L: Acronyms

DCSWCD	Dearborn County Soil and Water Conservation District
BOD	Biological Oxygen Demand
CRP	Conservation Reserve Program
CSO	Combined Sewer Overflows
DO	Dissolved Oxygen
HUC	Hydrologic Unit Code
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
LARE	Lake and River Enhancement
L-THIA	Long Term Hydrologic Impact Assessment
MCL	Maximum Contaminant Level
N	Nitrogen
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
OCSWCD	Ohio County Soil and Water Conservation District
P	Phosphorus
SWCD	Soil and Water Conservation Districts
TMDL	Total Maximum Daily Load
WHIP	Wildlife Habitat Incentive Program
WQI	Water Quality Index
WRP	Wetland Reserve Program