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The Youngs Creek Watershed:

A Plan for the Future

Prepared by

The Youngs Creek
Advisory Group

October 2003

Sponsored by
The Johnson County
Soil and Water
Conservation District

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The Youngs Creek Watershed: A Plan for the Future

Project Mission Statement

Adopted by the

Youngs Creek Advisory Group

To assess the water quality of the Youngs Creek Watershed and promote watershed health for the benefit of its residents.

This project was made possible by a $206,600 Clean Water Act Section 319 grant to the Johnson County Soil and Water Conservation District from the Indiana Department of Environmental Management.

The Youngs Creek Watershed: A Plan for the Future

Executive Summary

The Youngs Creek Watershed is located in central Indiana, approximately 15 miles south of Indianapolis. This watershed is included in the larger watersheds of the Driftwood River and the East Fork of the White River. The Youngs Creek Watershed is an 11-digit watershed that contains eight 14-digit subwatersheds, spans approximately 79,500 acres (24 square miles), and is entirely contained within Johnson County. Of the waterbodies in this watershed, Youngs Creek and Brewer Ditch were listed on Indiana's most recent 303(d) List of Impaired Waterbodies for pathogens.

The Youngs Creek Watershed contains a unique mixture of both urban and agricultural landuses. Close proximity to Indianapolis has prompted the expansion of both population and urban landuses in the northern portion of the watershed. However, agricultural landuses, predominantly corn and soybean production, continue to dominate the watershed area. Notably, this watershed also contains a large portion of Atterbury State Fish and Wildlife Area, which features a rich variety of plant and animal resources.

The Youngs Creek Watershed: A Plan for the Future is the result of 22 months of gathering input, conducting research, and initiating discussions among state and local government representatives, agricultural producers, local businesses and industries, watershed residents, and interested citizens in order to identify and address watershed concerns. The Youngs Creek Advisory Group was formed to lead the process, and that group formed the following mission statement that captures the purpose of this project: *To assess the water quality of the Youngs Creek Watershed and promote watershed health for the benefit of its residents.*

This Plan was created as a result of the group's efforts to reduce pollution from nonpoint sources in the watershed. In order to accomplish this, the Advisory Group focused its attention on three main areas in the watershed: 1) agricultural nonpoint source pollution, including both cropland and livestock farming, 2) urban nonpoint source pollution and increasing impervious surfaces in the watershed, and 3) the lack of a vegetated riparian buffer near many streams in the watershed.

The Advisory Group developed goals, objectives, and action items to address each of the three focus topics:

Agricultural Goals

1. By August 2007, implement no-till on 40% of corn after soybeans and 80% of beans after corn.
2. Increase awareness about how farmland practices may impact water quality. Increase participation in conservation programs by 100% through cost-share, Farm Bill programs, and other efforts by 2007.
3. Encourage and promote the use of watering and manure management systems.

Riparian Goals

4. Assess the status of riparian buffers in the Youngs Creek Watershed.
5. Prioritize riparian buffer restoration areas within the Youngs Creek Watershed.
6. Improve or maintain riparian buffers adjacent to streams (natural, man-made, or altered), ponds, and wetlands throughout the watershed. This consists of an ongoing and incremental goal of increasing buffers where absent or insufficient, maintaining existing buffers, and connecting existing buffers where possible.
7. Promote riparian buffer installation through outreach efforts targeted at three primary audiences within the watershed: agricultural producers, urban residents, and rural or low-density residential landowners.
8. Equip policy makers with information they need to improve and maintain riparian buffers in the watershed.

Urban Goals

9. Promote water-friendly behaviors among residents and officials in urban and urbanizing areas of the watershed.
10. Promote dialogue among engineers, officials, and other professionals in the watershed about the installation and maintenance of structures and/or practices (BMPs) that counterbalance impervious surface run-off.
11. Determine the need to re-design or alter retention ponds in existing subdivisions to meet design standards set forth in the Johnson County Subdivision Control Ordinance, and share this information with the subdivisions' residents.
12. Provide input to Stormwater Phase II entities in Johnson County during the Phase II planning process.

Future actions as a result of this plan include expanded programs and activities focused on nonpoint source pollution education in the watershed, increased opportunities for watershed landowners to implement conservation practices, and attempts to further cooperation and involvement among watershed stakeholders.

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Glossary of Terms

303(d) List – a list identifying waterbodies that are impaired by one or more water quality elements thereby limiting the performance of designated beneficial uses.

Aquifer – any geologic formation containing water, especially one that supplies water for wells, springs, etc.

Best Management Practice (BMP) – practices implemented to control or reduce nonpoint source pollution.

Canopy Cover – the overhanging vegetation over a given area.

Channelization – straightening of a stream; often the result of human activity.

Coliform – intestinal waterborne bacteria that indicates fecal contamination. Exposure may lead to human health risks.

Designated Uses – state-established uses that waters should support (e.g. fishing, swimming, aquatic life).

Detention Pond – a basin designed to slow the rate of stormwater run-off by temporarily storing the run-off and releasing it at a specific rate.

Dissolved Oxygen – oxygen dissolved in water that is available for aquatic organisms.

Downstream – in the direction of a stream's current.

Dredge – to clean, deepen, or widen a waterbody using a scoop, usually done to remove sediment from a streambed.

Easement – a right, such as a right of way, afforded an entity to make limited use of another's real property.

Ecoregion – a geographic area characterized by climate, soils, geology, and vegetation.

Ecosystem – a community of living organisms and their interrelated physical and chemical environment.

Erosion – the removal of soil particles by the action of water, wind, ice, or other agent.

Escherichia coli (*E.coli*) – a type of coliform bacteria found in the intestines of warm-blooded organisms, including humans.

Glide (Run) – a stretch of fast, smooth current, deeper than a riffle, with little or no turbulence on the surface.

Gradient – measure of a degree of incline; the steepness of a slope.

Groundwater – water that flows or seeps downward and saturates soil or rock.

Headwater – the origins of a stream.

Hydrologic Unit Code (HUC) – unique numerical code created by the U.S. Geological Survey to indicate the size and location of a watershed within the United States.

Impervious Surface – any material covering the ground that does not allow water to pass through or infiltrate (e.g. roads, driveways, roofs).

Infiltration – downward movement of water through the uppermost layer of soil.

Macroinvertebrates – animals lacking a backbone that are large enough to see without a microscope.

Maximum Contaminant Level (MCL) – the highest level of a contaminant that is allowed in drinking water.

National Pollutant Discharge Elimination System (NPDES) – national program in which pollutant dischargers such as factories and treatment plants are given permits with set limits of discharge allowable.

Nonpoint Source Pollution (NPS) – pollution generated from large areas with no identifiable source (e.g., stormwater run-off from streets, development, commercial and residential areas).

Permeable – capable of conveying water (e.g., soil, porous materials).

Point Source Pollution – pollution originating from a "point," such as a pipe, vent, or culvert.

Pollutant – as defined by the Clean Water Act (Section 502(6)): "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water."

Pool – an area of relatively deep, slow-moving water in a stream.

Retention Pond – A basin designed to retain stormwater run-off so that a permanent pool is established.

Riffle – an area of shallow, swift moving water in a stream.

Riparian Zone – an area, adjacent to a waterbody, which is often vegetated and constitutes a buffer zone between the nearby land and water.

Run – see Glide.

Run-off – water from precipitation, snowmelt, or irrigation that flows over the ground to a waterbody. Run-off can pick up pollutants from the air or land and carry them into streams, lakes, and rivers.

Sediment – soil, sand, and minerals washed from the land into a waterbody.

Sedimentation – the process by which soil particles (sediment) enter, accumulate, and settle to the bottom of a waterbody.

Soil Association – a landscape that has a distinctive pattern of soils in defined proportions. Typically named for the major soils.

Storm Drain – constructed opening in a road system through which run-off from the road surface flows on its way to a waterbody.

Stormwater – the surface water run-off resulting from precipitation falling within a watershed.

Substrate – the material that makes up the bottom layer of a stream.

Topographic Map – map that marks variations in elevation across a landscape.

Total Maximum Daily Load (TMDL) – calculation of the maximum amount of a pollutant that a waterbody can receive before becoming unsafe and a plan to lower pollution to that identified safe level.

Tributary – a stream that contributes its water to another stream or waterbody.

Turbidity – presence of sediment or other particles in water, making it unclear, murky, or opaque.

Upstream – against the current.

Water quality – the condition of water with regard to the presence or absence of pollution.

Water quality standard – recommended or enforceable maximum contaminant levels of chemicals or materials in water.

Watershed – the area of land that water flows over or under on its way to a common waterbody.

Wetlands – lands where water saturation is the dominant factor in determining the nature of soil development and the types of plant and animal communities.

Zoning – to designate, by ordinance, areas of land reserved and regulated for specific uses, such as residential, industrial, or open space.

Acronyms

BMP	Best Management Practice
BOD	Biological (or Biochemical) Oxygen Demand
CRP	Conservation Reserve Program
CTIC	Conservation Technology Information Center
CWA	Clean Water Act
CWP	Center for Watershed Protection
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
GAP	Gap Analysis Program
GIS	Geographic Information System
GPS	Global Positioning System
HUC	Hydrologic Unit Code
IAC	Indiana Administrative Code
ICM	Impervious Cover Model
IBRC	Indiana Business Research Center
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
ISU	Indiana State University
MRCC	Midwestern Regional Climate Center
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint source
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
PCB	Polychlorinated Biphenyls
QHEI	Qualitative Habitat Evaluation Index
SWCD	Soil and Water Conservation District
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UWA	Unified Watershed Assessment
WHIP	Wildlife Habitat Incentives Program
WWTP	Wastewater Treatment Plant
YCAG	Youngs Creek Advisory Group

Section I: Project Introduction

The Johnson County Soil and Water Conservation District (SWCD) successfully submitted an application in 2000 for a Clean Water Act Section 319 grant for the Youngs Creek Watershed Assessment Program. The Assessment Program, which began in September of 2001, enabled the SWCD to identify water quality, landuse, and natural resource characteristics within the Youngs Creek Watershed. In addition, the Assessment Program was designed to involve local stakeholders in identifying threats to local water quality resources and developing strategies to protect them. The Assessment Program culminated in October 2003 with the completion of this management Plan.

The design of the Assessment Program was based strongly on the watershed approach for environmental management. The watershed approach is a coordinating framework that focuses public and private sector efforts to address water quality concerns within a watershed. This type of management approach integrates four major features: 1) targeting priority problems, 2) involving stakeholders, 3) developing integrated solutions, and 4) measuring success (USEPA 1995). Since watersheds often include large areas with varied landuses, a watershed management approach integrates planning for both hydrological and ecological functions. This approach also ensures that diverse interests are represented in the planning process, and it helps to form lasting partnerships to achieve success.

The Assessment Program provided the first thorough examination of concerns and issues facing residents of this watershed. This resulting plan is a living document and is intended as a guide to be used by local decision makers for outreach, education, implementation, and assistance efforts. Further, it is to be used by landowners and citizens of the watershed to increase their understanding of water quality issues. The suggestions made under this management plan do not establish legal requirements, but instead provide a framework to coordinate voluntary efforts to improve and maintain water quality.

Designating the Study Area

A watershed is an area of land that water flows over or under on the way to a particular waterbody. In the United States, watersheds are identified using a hierarchical coding system, Hydrologic Unit Codes (HUC), developed in the mid-1970s by the U.S. Geological Survey (USGS). Based on topographical surface features, this system divided the country into regions, sub-regions, accounting units, and cataloging units. A unique number was assigned to identify each level. The resulting system provides a watershed coding system organized in a nested hierarchy by size – the more digits contained in the code, the smaller the watershed. The Youngs Creek Watershed

Assessment Program chose to focus planning efforts in the Youngs Creek Watershed (HUC 05120204090). This hydrological unit contains the area of land drained by Youngs Creek as well as a section of land drained by Sugar Creek. However, for the purposes of this Plan, the entire area will be referred to as the Youngs Creek Watershed. This watershed is part of the larger Driftwood River Watershed (HUC 05120204), and is located entirely within Johnson County in the central portion of Indiana, south of Indianapolis. In total, the 124 square-mile Youngs Creek Watershed spans approximately 40% of the county's land area (Figure 1).

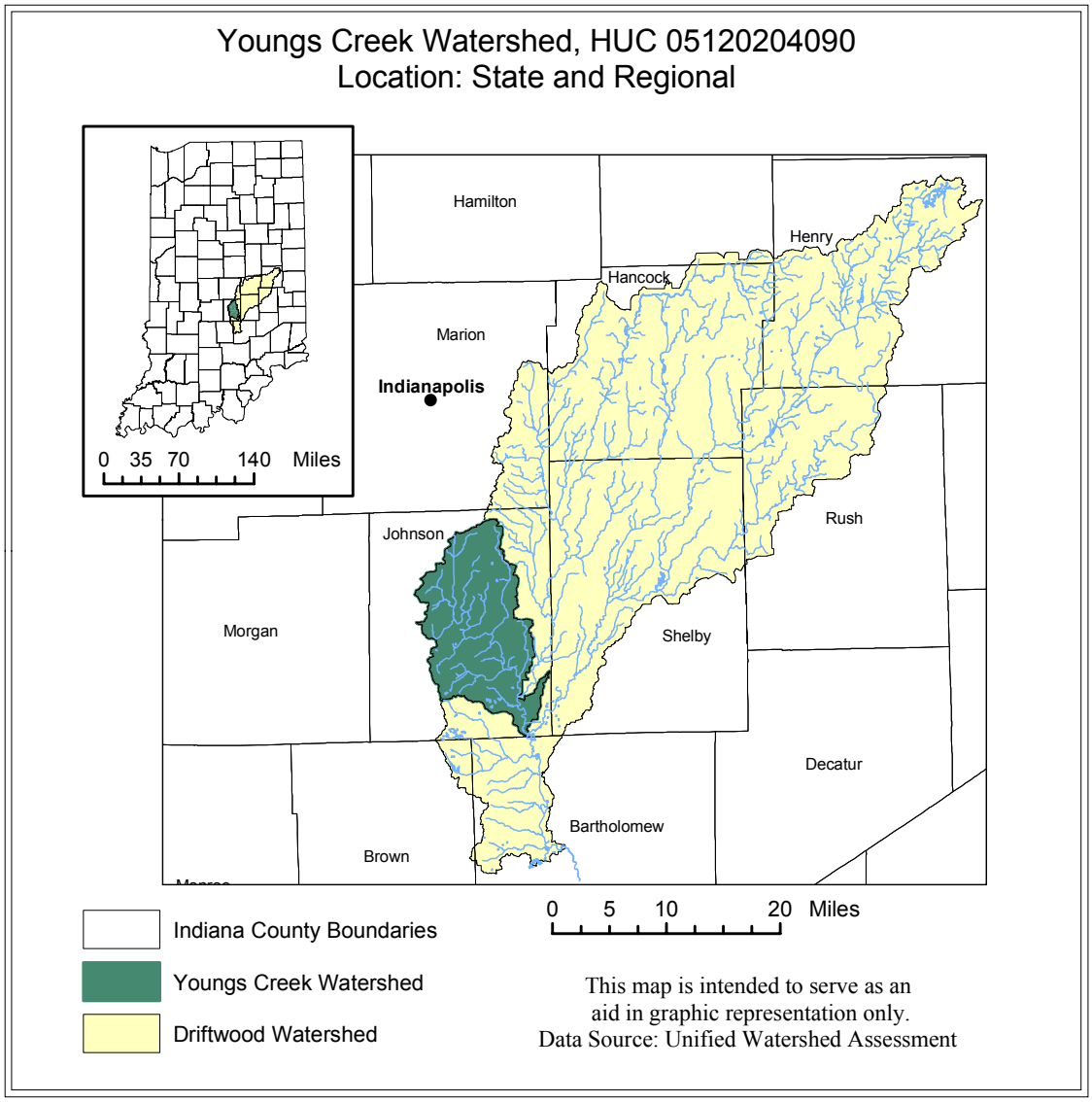

Figure 1. Youngs Creek Watershed: state and regional location

This watershed includes the county seat of Franklin, the cities of Whiteland and New Whiteland, and portions of Trafalgar, Bargersville, Greenwood, and the Atterbury State Fish and Wildlife Area. The major roadways of US 31 and I-65 also pass through portions of the watershed

(Figure 2). This watershed is unique for its size because it is entirely contained within Johnson County's boundaries. Management efforts for watersheds that span several counties or states involve coordinating efforts of many different stakeholders. The Youngs Creek Project was fortunate to be able to focus efforts on building strong partnerships among stakeholders within Johnson County.

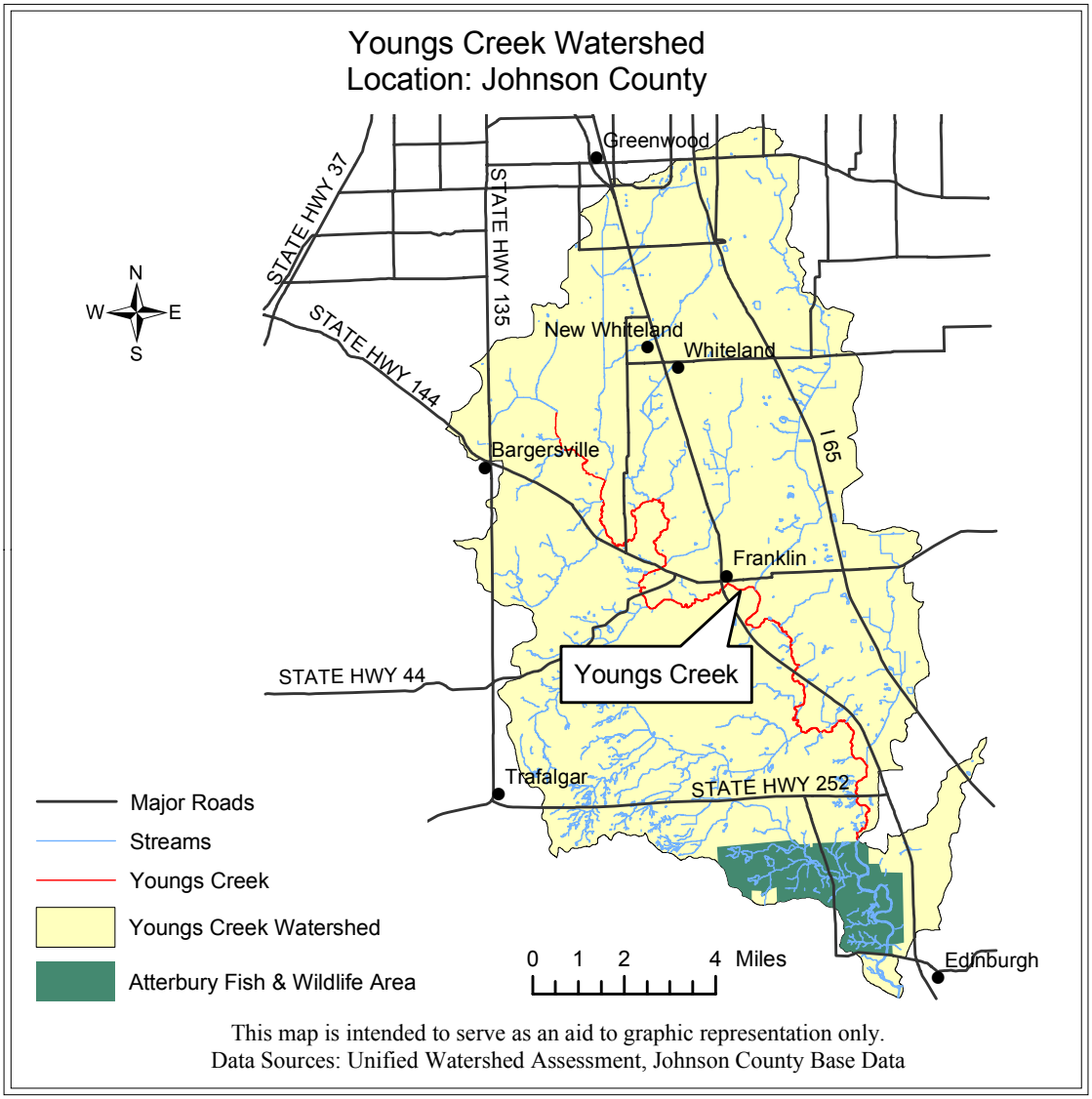

Figure 2. Youngs Creek Watershed: county location

Building Partnerships

The Assessment's organizational structure is shown in Figure 3. Assessment efforts were sponsored by the SWCD Board of Supervisors and two watershed planning staff members, the Watershed Coordinator and Watershed Educator. The SWCD and watershed planning staff led efforts to develop the Advisory Group. Once established, the Advisory Group determined the

direction of planning efforts. During the project, the Advisory Group divided into three sub-groups to research specific issues. These sub-groups were referred to as Research Teams. The SWCD, along with watershed planning staff, assisted the Advisory Group and subsequent Research Teams in analyzing concerns and developing the management plan.

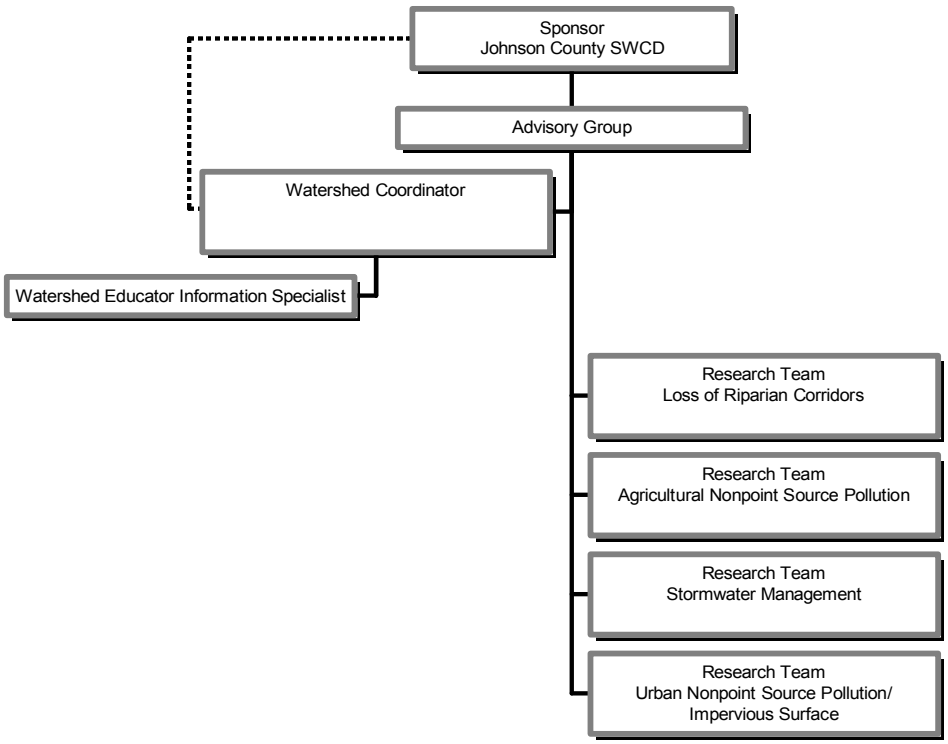

Figure 3. Organizational structure of the Youngs Creek Watershed Assessment Program

The SWCD's planning efforts began with the formation of a watershed Advisory Group (Figure 4). In November of 2001, an initial meeting was held to introduce the Youngs Creek Watershed Assessment Program to the public and to form the Youngs Creek Advisory Group (YCAG). Citizens were encouraged to attend this meeting through press releases in the *Daily Journal* and the *Ag Report*, and individual invitations were mailed to a list of stakeholders composed by the Johnson County SWCD Board of Supervisors. The members of the YCAG represent diverse interests and backgrounds within the watershed, and include government officials, educators, farmers, planners, scientists, and concerned citizens. Appendix A lists the members who participated in developing the management plan. This group was responsible for ensuring local values were taken into account during plan development, carrying out planning activities, and coordinating plan implementation. The mission statement adopted by the Youngs Creek Advisory Group is as follows:

To assess the water quality of the Youngs Creek Watershed and promote watershed health for the benefit of its residents.

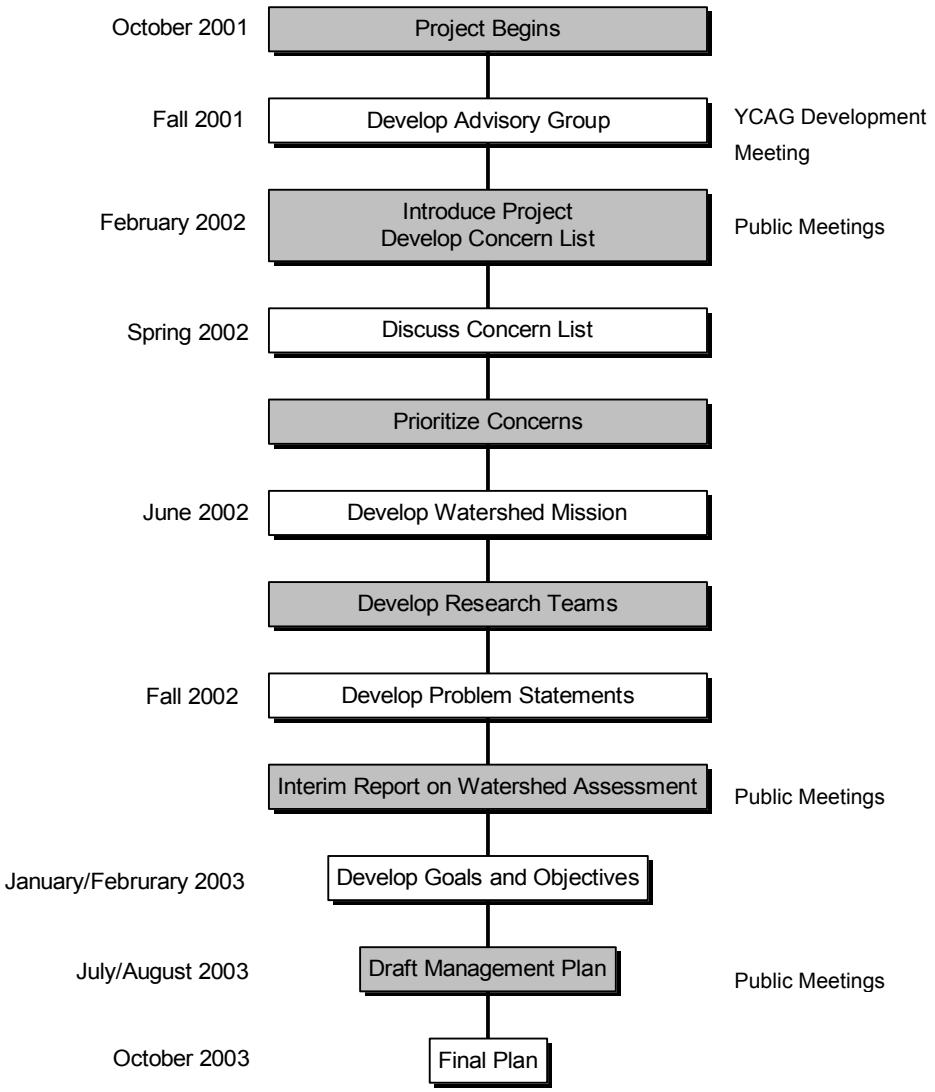

Figure 4. Youngs Creek Watershed planning process

In order to identify issues of concern among residents in the watershed, a series of public meetings were held in February of 2002 at public libraries in White River Township, Franklin, and Edinburgh. These meetings introduced the watershed project and provided residents with a forum to express their concerns. In addition, a questionnaire was published on the SWCD website and mailed to creekside residents in the watershed to gather additional input. The concerns from these activities were compiled and distributed to the YCAG (Appendix B). The YCAG participants spent several months discussing this list to establish a foundation of common knowledge, to determine the scope of each concern, to combine similar concerns, and to decide if additional information was needed.

After discussing each concern in detail, Advisory Group members prioritized the list based upon the following criteria (1) feasibility of accomplishing tasks given the resources available; (2) time-effectiveness; and (3) advancement of the group's mission.

A weighted ranking system was used to calculate results for prioritized concerns. Each member ranked his/her top three concerns and categorized them as high, medium, or low. Concerns ranked as high were given three points, concerns ranked as medium were given two points, and concerns ranked as low were given one point. Both the total of the ranking and the total number of voters were recorded. For example, "Need for education" scored 22/10. Twenty-two represents the total number of points this concern received, and ten represents the number of voters ranking this concern. The higher the percent of voters ranking the issue, the higher the degree of consensus among group members. Table 1 shows the results of the prioritization activity. The top five concerns, listed in order by the ranking sum, were "Need for Education," "Agricultural Nonpoint Source Pollution," "Increased Impervious Surface," "Urban Nonpoint Source Pollution," and "Loss of Riparian Corridors."

Table 1. Concern Prioritization

Concern	Total Votes	% of Voters (n=16)	Sum of Rank
Need for Education	10	62.5%	22
Ag Nonpoint Source Pollution	9	56.3%	17
Increased Impervious Surface	4	25.0%	12
Urban Nonpoint Source Pollution	6	37.5%	12
Loss of Riparian Corridors	4	25.0%	8
Stormwater Management	4	25.0%	7
Effects of Septic Systems	2	12.5%	5
Loss of Forest/Farmland	4	25.0%	5
Legal Drain	2	12.5%	4
Point Source Pollution	2	12.5%	3
Flooding	1	6.3%	1

During this phase of the planning process, the YCAG chose to focus time and energy planning strategies to address the top five concerns on the concern list. The top ranked concern, the need for education, was deemed as a fundamental part of the other four concerns, so educational strategies were integrated into the plan to address each concern.

In June of 2002, members of the Advisory Group split into three Research Teams: (1) agricultural nonpoint source (NPS) pollution, (2) urban NPS pollution/increased impervious surfaces, and (3) loss of riparian corridors. Each Research Team was charged with researching information about that team's specific concern and developing goals, objectives, and actions to address each

concern. The similar concerns of urban NPS pollution and increased impervious surfaces were combined for one Research Team to address. The three research teams met regularly from August of 2002 through the end of the project.

Two public meetings were held in November 2002 to highlight the data collected at that point in the assessment, preliminary analysis of the data, and planning progress. Additionally, it provided an opportunity for local citizens to expand upon the information needed to develop goals and strategies to address the concerns.

Upon draft completion, plans were made available via the Johnson County SWCD website (www.swcd.org), the county fair, at community fairs, and public meetings. A review and comment period was held to gather feedback regarding the strategies and recommendations.

Throughout the project, a bi-monthly newsletter, *Youngs Creek Connections*, provided community leaders, local agencies, government personnel, interested citizens, and local library patrons with updates on activities, programs, and progress of the assessment project. At the end of the project, the newsletter mailing list had grown to include over 200 recipients.

Section II: Physical Description of the Watershed

This section provides an understanding of the physical setting of the watershed. This background information includes descriptions of the area's geologic history, physiography, water supply, soils, hydrologic features, Johnson County's legal drain system, local climatic information, existing wetlands, and the natural history of the watershed.

Geologic History

Johnson County lies in the region of gray-brown podzolic soils of the east-central portion of the United States. These soils developed under a heavy forest cover of deciduous trees, with sufficient rainfall to maintain a moist condition throughout the soil, except for short periods of time.

Johnson County's southern border marks the approximate southern edge of the Wisconsin glacial deposits, which advanced through Indiana 20,000 years ago. These glaciers deposited glacial till, scattered sand and gravel deposits, silt, lake clays, and alluvial materials on the land surface. These deposits helped to create soil that is rich in minerals and nutrients.

Beneath these glacial deposits, the Youngs Creek Watershed is comprised of three different bedrock geology groups: the Muscatatuck Group, New Albany Shale, and the Borden Group (Figure 5).

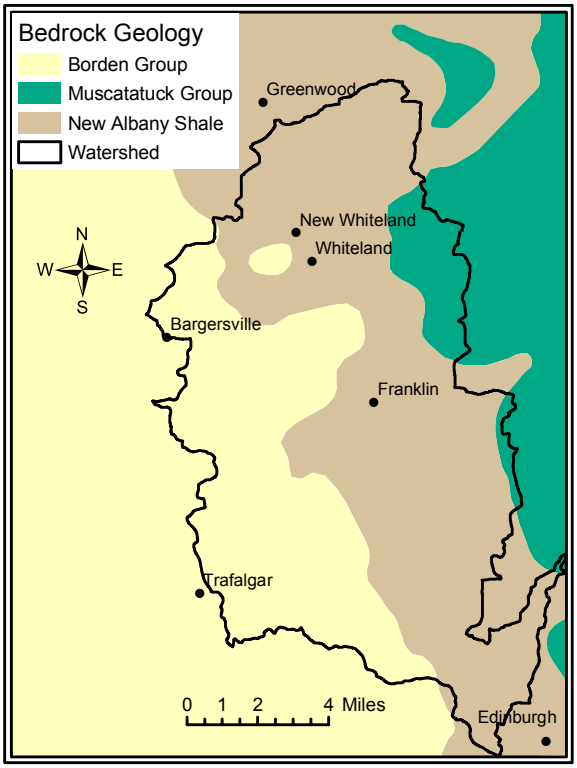

Figure 5. Youngs Creek Watershed: bedrock geology

The Muscatatuck Group in the eastern edge of the county consists mostly of dolomite. The New Albany Shales are brown to black shales that are rich in organic materials. Borden shales are comprised of shale, siltstone, some sandstone, and limestone. Borden shales are exposed by streambanks and road cuts.

Physiographic Features

Two distinct physiographic regions are contained in the Youngs Creek Watershed: the Scottsburg Lowland and the New Castle Till Plains and Drainageways (Figure 6) (Gray, 2000). The Scottsburg Lowland covers the extreme southeastern part of the county and the watershed. This region includes broad glaciofluvial outwash plains and terraces in addition to wide bottomlands that lie adjacent to the Blue and Driftwood Rivers, Sugar Creek, and its tributaries.

Most of the Youngs Creek Watershed is classified as New Castle Till Plains and Drainageways, part of the larger Central Till Plain. The till plains were formed from glacial deposits. They are characterized by fairly low relief with occasional terminal moraines and knolls that rise above the level ground.

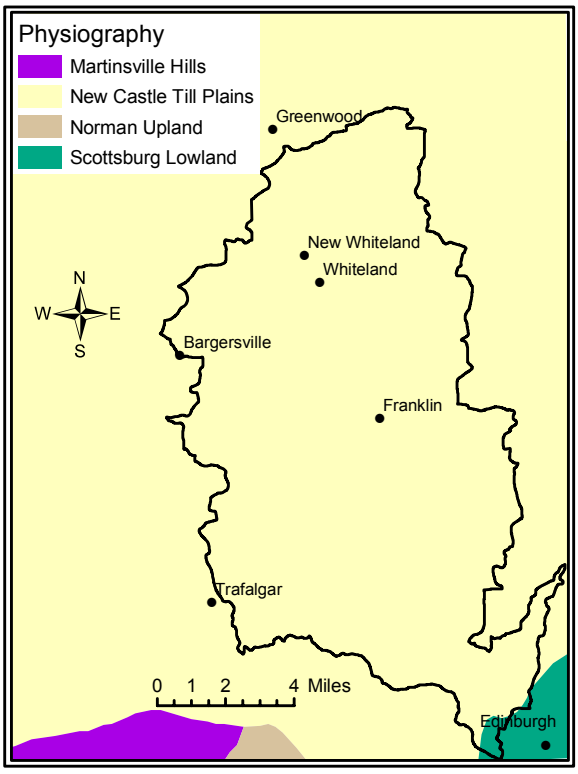

Figure 6. Youngs Creek Watershed: physiography

Water Supply

Drinking water is provided through both private wells and municipal water systems for residents of the Youngs Creek Watershed. The Indiana-American Water Company provides water service to an area encompassing the cities of Greenwood and Franklin, as well as portions of Clark, Needham, Pleasant, and White River townships in the northern portion of the watershed. Indiana-American also wholesales water to municipally owned systems in New Whiteland and Whiteland. To provide water to this system, Indiana-American has combination well/water treatment facilities throughout the county. Private wells are utilized primarily in unincorporated areas of the county.

Soils

An extensive survey of soils in Johnson County was completed in 1948 and updated in 1979. Due to the large number of individual soil types within the Youngs Creek Watershed, this report discusses soil associations. A soil association is a landscape that is comprised of a distinctive pattern of individual soils in defined proportions. The soil association is named for the most prevalent soil types within the association.

There are eight major soil associations in the Youngs Creek Watershed: (1) Crosby – Brookston, (2) Crosby – Miami, (3) Genesee – Shoals – Ross, (4) Rensselear – Whitaker, (5) Ockley – Fox, (6) Genesee – Eel, (7) Fox – Ockley – Nineveh, and (8) Miami – Hennepin. Table 2 lists the soil associations, the amount of watershed area classified in each, and a brief description (USDA - SCS, 1979). The Crosby, Brookston, Genesee, Shoals, Ross, Rensselear, Whitaker, Eel, and Hennepin soil types have severe limitations for septic tank absorption fields.

Table 2. Soil associations and watershed area

Soil Association	% of watershed	Description
Crosby – Brookston	40%	Very poorly drained and somewhat poorly drained, nearly level and gently sloping soils on terraces and uplands
Crosby – Miami	34%	Well drained and somewhat poorly drained, nearly level to moderately steep soils on uplands
Genesee – Shoals – Ross	8%	Well drained to somewhat poorly drained, nearly level soils on bottom lands, subject to flooding
Rensselear – Whitaker	8%	Very poorly drained and somewhat poorly drained, nearly level and gently sloping soils on terraces and uplands
Ockley – Fox	4%	Well drained, nearly level to moderately sloping soils on terraces
Genesee – Eel	2%	Well drained to somewhat poorly drained, nearly level soils on bottom lands, subject to flooding
Fox – Ockley – Nineveh	2%	Well drained, nearly level to moderately sloping soils on terraces
Miami – Hennepin	1%	Well drained, gently sloping to very steep soils on uplands

Slope and Elevation

Land within the Youngs Creek Watershed ranges in elevation from 610 feet above sea level to 930 feet above sea level, providing approximately 320 feet of relief (Figure 7). Digital maps of elevation and slope for Johnson County were developed using a digital topographic map of 2-ft contour lines obtained from the Johnson County Geographic Information System (GIS) department. The highest elevations in the county are found near the town of Trafalgar, southwest of the Youngs Creek Watershed boundary. The lowest elevations in the county are located in the northwestern corner where the White River flows into Morgan County and the southeastern corner of the county near Edinburgh where Sugar Creek meets with the Big Blue and Driftwood Rivers. Slope is a measurement of elevation change, and slope variations in Johnson County range from 0 to 34 percent (Figure 7). Higher percentages indicate steeper slopes. The map of Johnson County slopes indicates the steepest slopes in the southern and western edges of the county. Much of the northern and central portion of the Youngs Creek Watershed is nearly flat with a gentle slope.

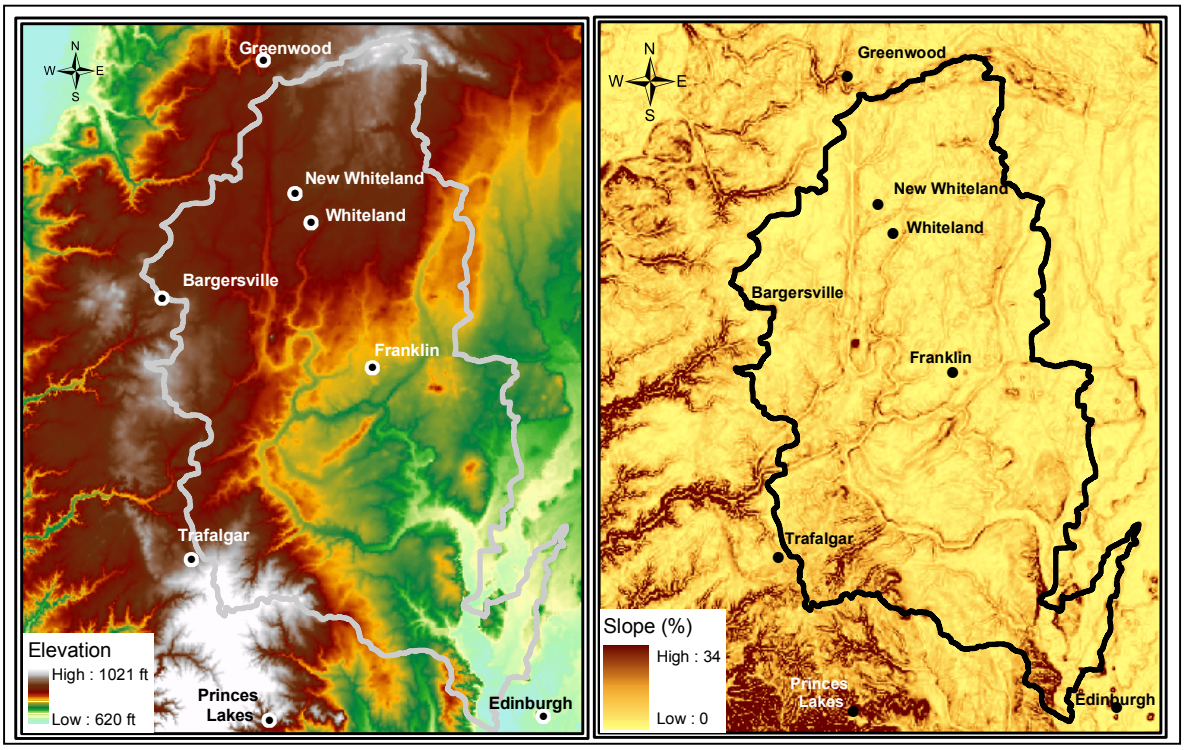

Figure 7. Youngs Creek Watershed: elevation (ft above sea level) and slope (%)

Hydrologic Features

Youngs Creek is approximately 22 miles in length and flows from the northwest portion of the watershed to the southeast, where it meets Sugar Creek and eventually drains into the Driftwood River. Youngs Creek receives waters from the following tributaries (Figure 8): (1) Alexander Ditch, (2) Roberts Ditch, (3) Gilmore Creek, (4) Grassy Creek, (5) Moores Creek, (6) Brewer Ditch, (7) Powell Ditch, (8) Canary Ditch, (9) Ray Creek, (10) Hurricane Creek, (11) Hazelett Ditch, (12) Herod Ditch, (13) Buckhart Creek, and (14) Amity Ditch. After Youngs Creek empties into Sugar Creek near Edinburgh, Indiana, (15) Herriotts Creek enters Sugar Creek near the base of the watershed. Of note, Sugar Creek within Johnson County was listed in 1993 as an Outstanding River on the Indiana Department of Natural Resources list of Outstanding Rivers (Natural Resources Commission, 1993).

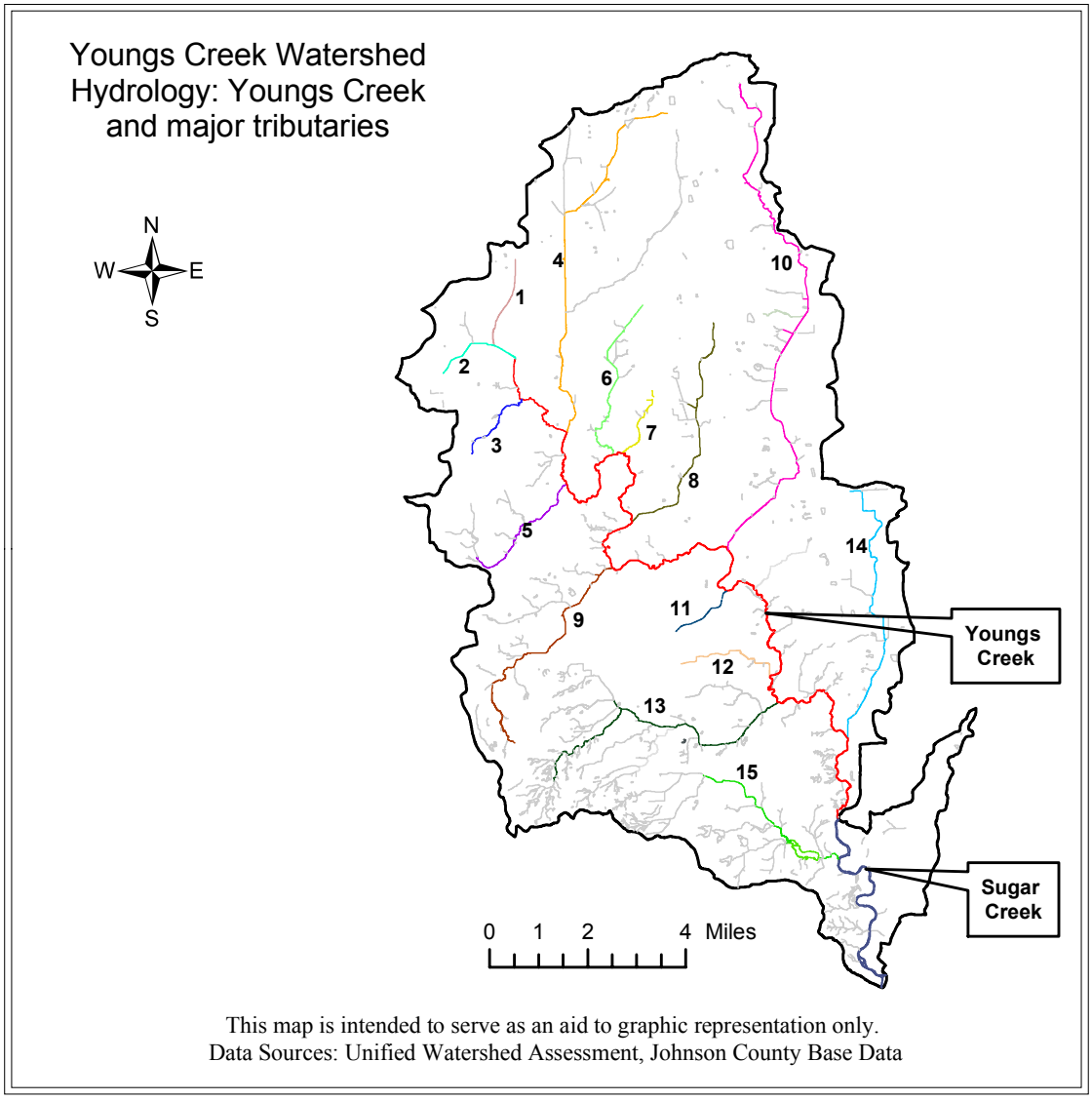

Figure 8. Youngs Creek Watershed hydrology: Youngs Creek and major tributaries

The Watershed is comprised of eight (8) major subwatersheds (14-digit HUC), shown in Figure 9, ranging in size from 12 square miles to 21 square miles. Each subwatershed is named for the major waterbody(s) that drains the land area into Youngs Creek. Examining the watershed on a subwatershed level helps to more accurately isolate and address water quality issues. These subwatershed units formed the basis for analyzing landuse and water quality in the Youngs Creek watershed.

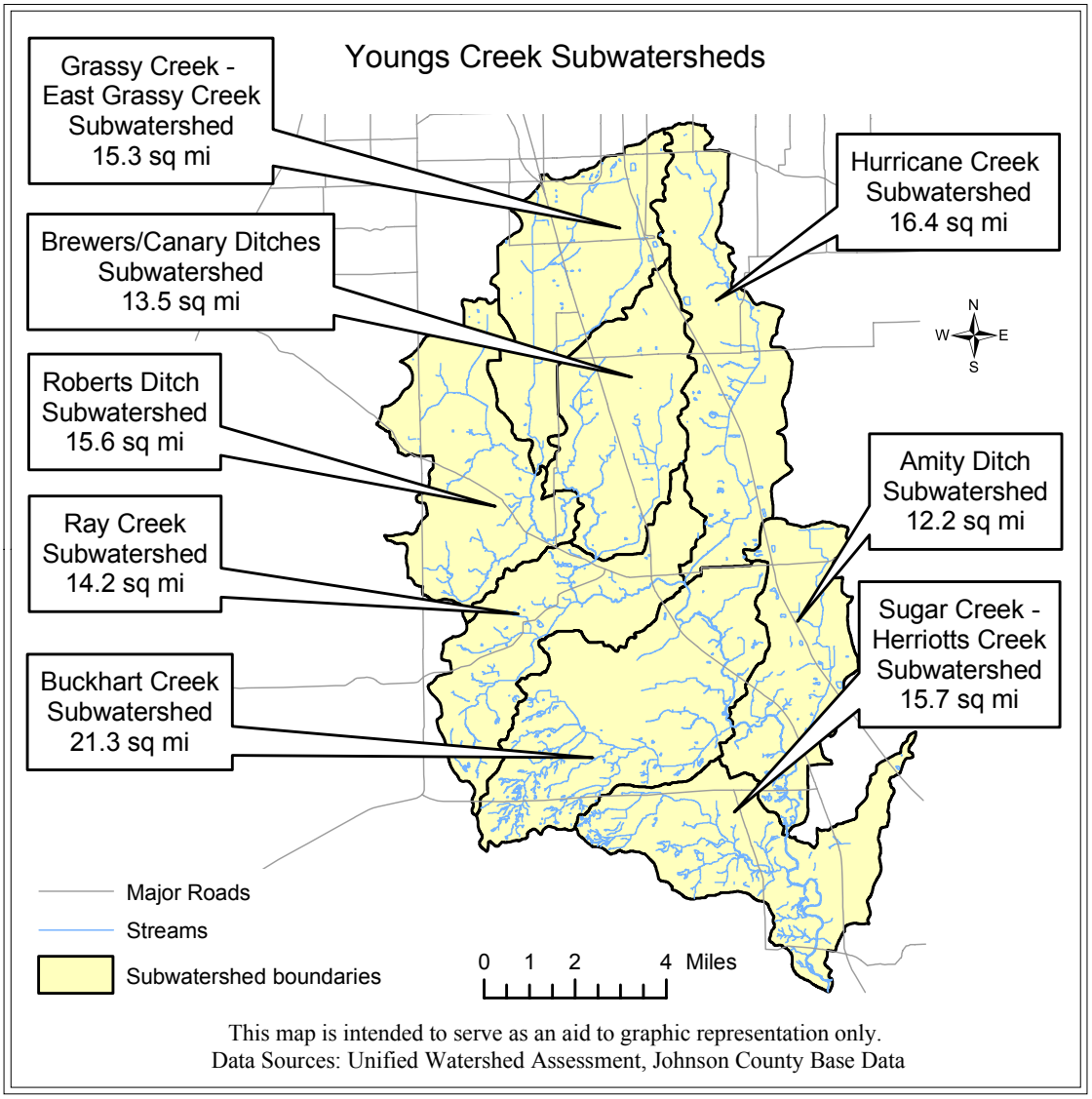

Figure 9. Youngs Creek Watershed: subwatersheds

Johnson County's Legal Drain System

A legal drain is a stream segment or a collection of stream segments whose primary purpose is to drain water from agricultural land. The Youngs Creek Watershed contains 20 legal drains, many of which are located in the northern portion of the watershed (Figure 10).

Most legal drains are maintained by the Johnson County Surveyor's Office and are funded by taxes from residents living within a legal drain's watershed boundary. Maintenance of legal drains includes occasional spraying of streambanks with herbicide to reduce vegetative material and occasional removal of sediment and debris. Major dredging projects, clearing of obstructions, or reconstruction of a drain happens infrequently, and must be approved by the Johnson County Drainage Board.

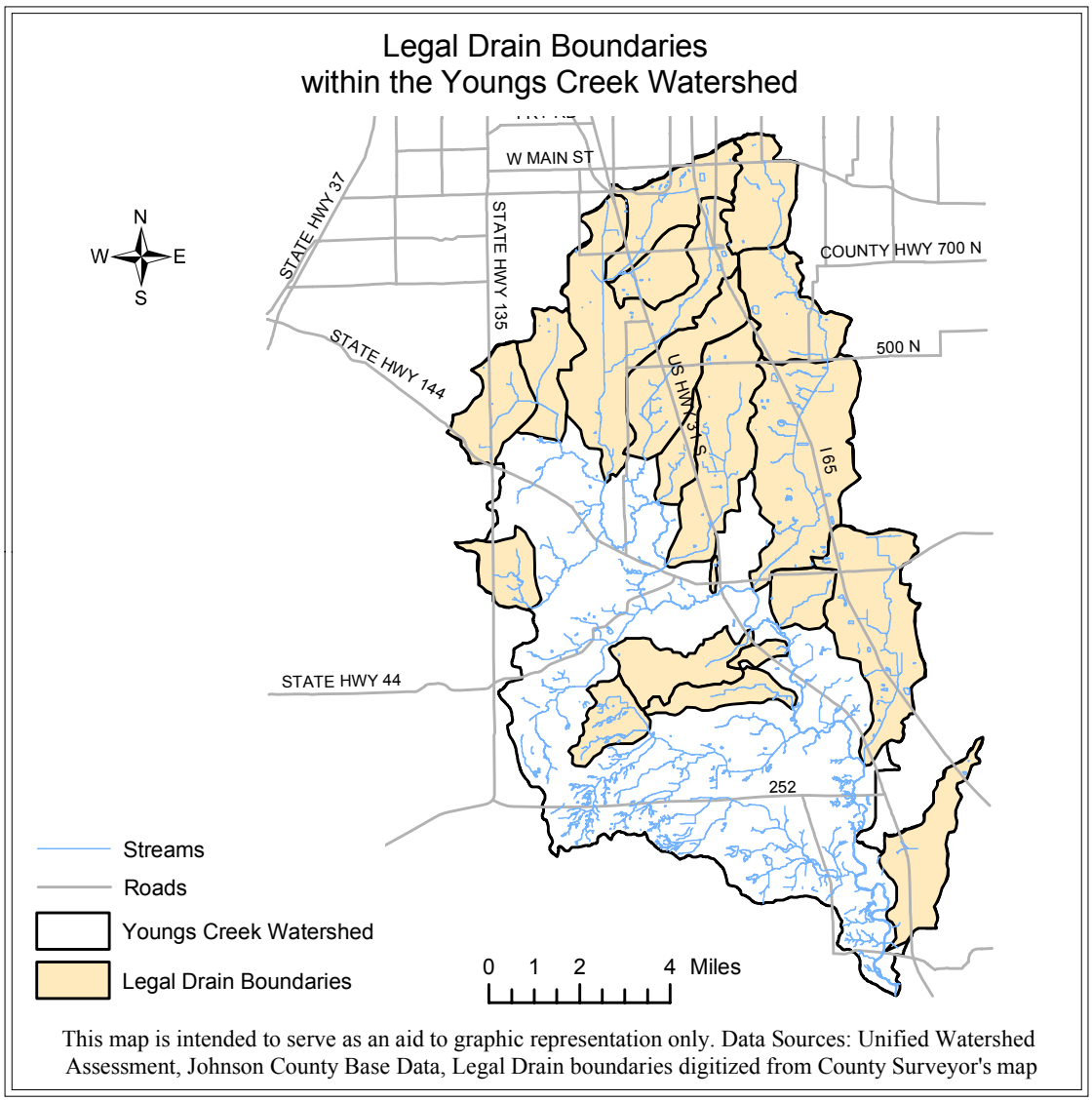

Figure 10. Youngs Creek Watershed: legal drains

Wetlands

The National Wetlands Inventory (NWI) of the U.S. Fish & Wildlife Service produces information about the extent, characteristics, and status of wetlands in the United States. The NWI has produced a digital map of wetlands in the Youngs Creek Watershed area, based on remotely sensed satellite data.

According to the National Wetlands Inventory database, very little (1.9%) of the Youngs Creek Watershed is classified as wetland. Most of the existing wetlands are located along Youngs Creek and Sugar Creek in the southern half of the watershed. The map of wetlands in the Youngs Creek Watershed is shown in Figure 11.

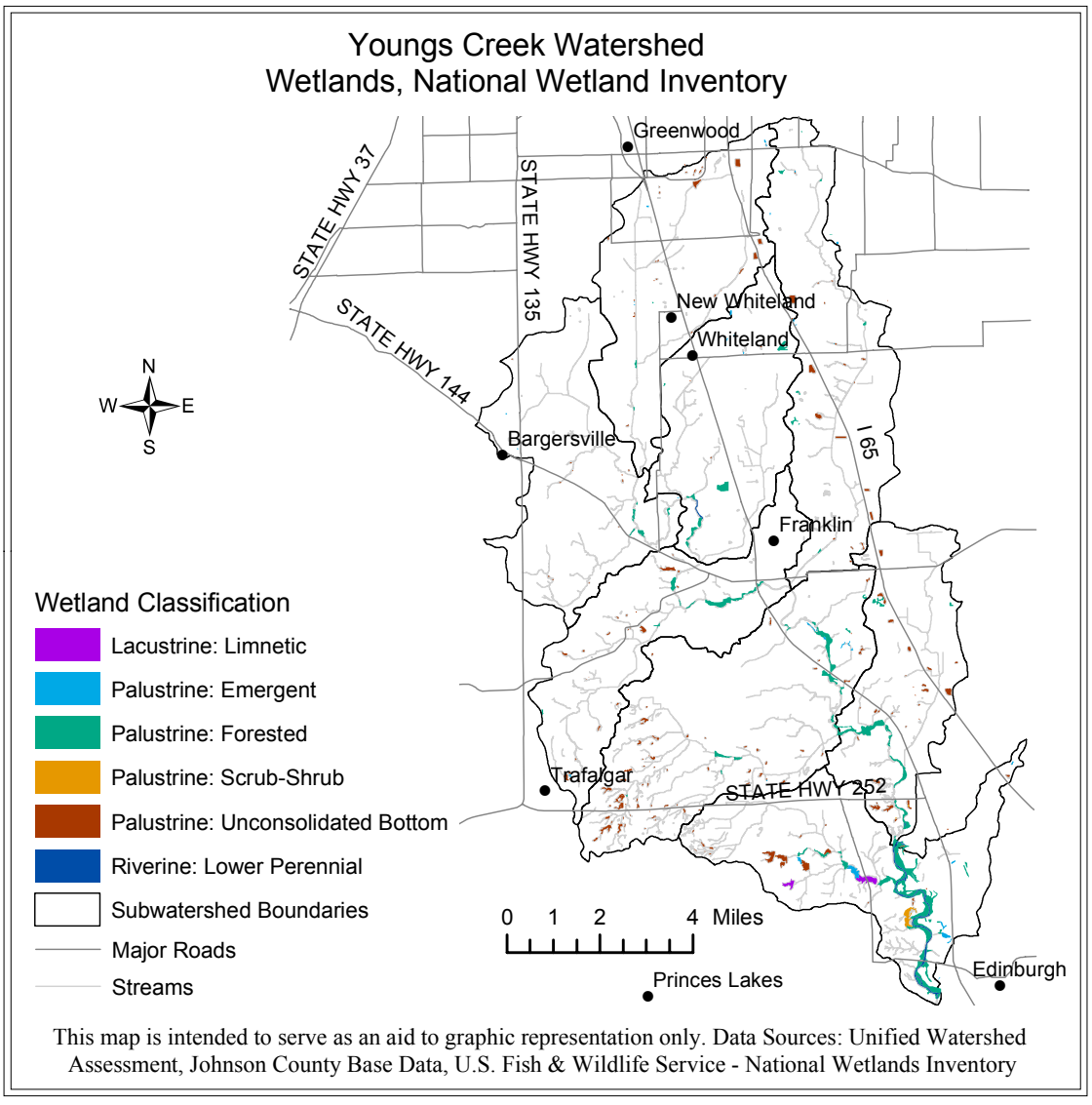

Figure 11. Youngs Creek Watershed: wetlands (NWI)

Ecoregions & Climate

An ecoregion is defined as an area with similar ecosystem functions based upon landform, soil, vegetation, and landuse. The entire Youngs Creek watershed is situated within the Eastern Corn Belt Plains ecoregion (Omernik and Gallant, 1988). This ecoregion is typically characterized by rolling plains and loamy, rich, well-drained soils. Today, this ecoregion is used extensively for corn, soybean, and livestock production.

The climate, temperatures, and precipitation data for the Youngs Creek Watershed are very similar to those of the Indianapolis area. The climate is continental, humid, and temperate, with warm humid summers and moderately cold winters. The median growing season in the region lasts 182 days, from the last spring frost in mid-April to the first fall frost in mid-October (MRCC, 2002). Monthly mean temperatures and precipitation values are shown in Figure 12.

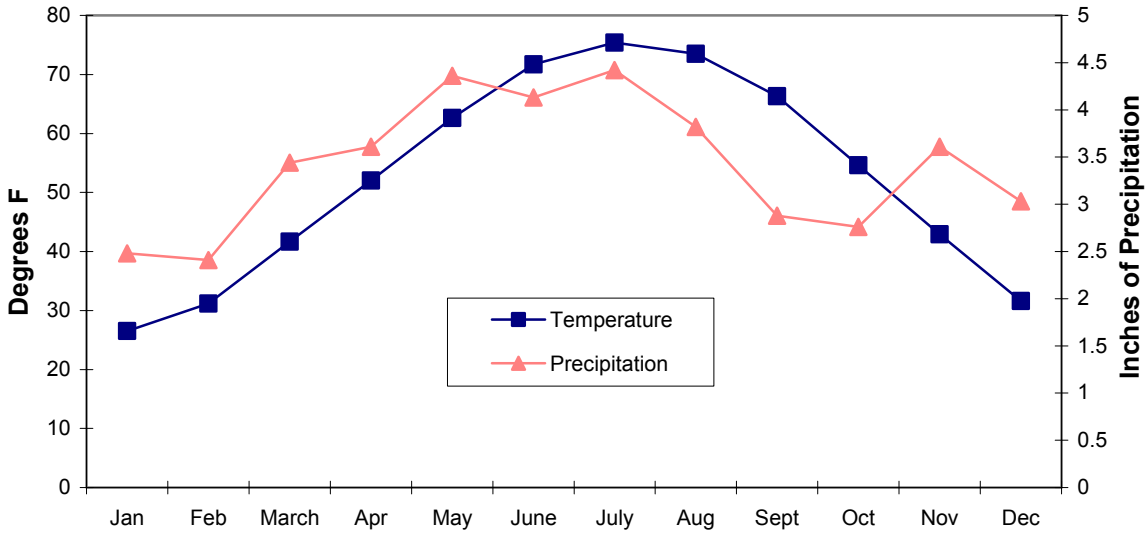

Figure 12. Indianapolis area monthly mean temperature and precipitation values

(Source, Midwestern Regional Climate Center)

Natural History

The natural history in the Youngs Creek Watershed is summarized by a description of current forests and native tree species as well as a list of threatened and endangered species in the area.

Forests and Tree Species

Although forest stands in Johnson County have diminished considerably since the early 1900s, forests still covered approximately 14% of the county's land area in 1992. Results of the USDA Forest Service Forest Inventory and Analysis of Indiana forests in 1998 reports that the maple-beech association is the most common forest type in much of northern Indiana (including the Youngs Creek Watershed), although the oak-hickory association is more common in the southern portion of the state (Tormoehlen et. al., 2000). A list of native tree species in Johnson County is provided in Table 3.

Table 3. Native tree species in Johnson County by forest type

(Branigin, 1913)

Upland	Poorly-drained	Bottomland	Understory
White Oak	Beech	Cottonwood	Blackberry
Black Oak	Maple	Ash or Linn Basswood	Wild Rose
Southern Red Oak	Ash	European White Willow	Black Locust
American Elm	Elm	Sycamore	Persimmon
Yellow Poplar or Tulip Tree			Sassafras
Sugar Maple			Sumac

Endangered, Threatened, and Rare Species

In addition to a wide variety of native tree species, Johnson County is home to several unique plant and animal species. Table 4 lists both the state and federal species within Johnson County that are classified as endangered, threatened, or rare. Since the Youngs Creek Watershed covers 40% of the county's land area and includes Atterbury Fish and Wildlife area, the watershed is likely to contain many of the species listed.

Table 4. State and federal endangered, threatened, or rare species in Johnson County

(Source Indiana Dept of Natural Resources, Division of Nature Preserves, 11/12/99)

Common Name	State Rank	Federal Rank
Vascular Plants		
Butternut	WL	**
Horned Pondweed	E	**
Mussels		
Slippershell Mussel	*	**
Northern Riffleshell	E	E
Snuffbox	E	**
Wavy-Rayed Lampmussel	SC	**
Round Hickorynut	SC	**
Clubshell	E	E
Kidneyshell	SC	**
Rabbitsfoot	E	**
Salamander Mussel	SC	**
Lilliput	*	**
Rayed Bean	SC	**
Little Spectaclecase	SC	**
Dragonflies; Damselflies		
Brown Spiketail	*	**
Band-Winged Meadowfly	*	**
Fish		
Harlequin Darter	E	**
Northern Studfish	SC	**
Reptiles		
Kirtlands's Snake	E	**
Birds		
Bachman's Sparrow	E	**
Henslow's Sparrow	E	**
Great Blue Heron	*	**
Upland Sandpiper	E	**
Northern Harrier	E	**
Edge Wren	E	**
Cerulean Warbler	SC	**
East Bittern	E	**
Black-Crowned Night-Heron	E	**
King Rail	E	**
Virginia Rail	SC	**
Barn Owl	E	**
Mammals		
Bobcat	E	**
Least Weasel	SC	**
Indiana Bat	E	E
American Badger	E	**

*E = Endangered, SC = Special Concern, WL = Watch List, * = No status but warrants concern, ** = not listed*

Section III: Landuse Description of the Watershed

This section includes an overview of the watershed's landuse in terms of settlement history, recent and historical population changes, recent landuse changes, an impervious surface analysis performed during the assessment, and particular areas of interest in the watershed, including locations of point source discharge facilities and unique recreational areas.

Landuse History

The Delaware Indians, a tribe of the Miami, inhabited what is now Johnson County until the land was sold in 1818. In 1819, the land within Johnson County was surveyed for purchase. Jacob Whetzel bought a tract of land in the White Water area and appealed to the Delaware Chief to allow him to cut a road to his purchase. This became known as the Whetzel Trace, and was traveled by many settlers.

In 1822 the area now known as Johnson County was a part of Delaware County. After a long struggle within the legislature, Johnson County was formed the December 31, 1822. The county was named in memory of John Johnson, the first judge of Indiana's Supreme Court. The population of Johnson County at the time was 550.

Youngs Creek was named for Joseph Young who settled in the fork of Sugar (named for the Sugar trees) and Lick Creeks in 1821. The early surveyors originally named Youngs Creek "Lick Creek" for the incredible salt licks in the area, but soon the Young cabin became better known, and Lick Creek became Youngs Creek. Youngs Creek furnished power for water mills, which were abandoned by 1850. The city of Franklin was sited in 1822 in the tract between Youngs Creek and Hurricane Creek.

During the early 1800s when Johnson County was settled, the lands within Johnson County were wet, swampy, and covered with vegetation. In an excerpt from D. D. Banta's *A Historical Sketch of Johnson County* (1881), Judge Franklin Harden describes the original condition of the land.

> Tall trees covered the whole county with their wide-spreading branches, depending to the ground, and the shrubbery below arose and united with the branches of the trees…In the open space, in the valleys, grew either prickly ash or nettles, both equally armed with sharp, fiery prickles…It was of the necessary to cover the horses' legs while plowing fresh land to prevent contact with the nettles. The soil, after a heavy rain, seemed to be afloat, and a deer, in its escape from the hunter, left so conspicuous a trail that he could be readily followed as in snow…Where spice-wood did not grow to thickly, male fern formed a solid mass three feet in depth, covering logs and pit falls so completely…The dry land along the creeks and rivers were first brought into cultivation. The highest lands were often table-lands, and the wettest. One-half of Johnson County was of this character...

The character of the landscape has changed dramatically since the county was settled. Hardly any of the original stands of forest exist in Johnson County. Most land was cleared in the early days of settlement for agriculture, as is described below in an additional excerpt from Harden's account.

> In passing over these wet lands in the rainy season, but little dry land would appear, except an occasional dry spot like an islet, with its crest lowly bowed as if in dread of submergence. If any attempt was made to cultivate these wet lands, by deadening the timber, and also opening the drains, nothing was produced. The crop was drowned by the percolation and infiltration of water from the adjoining wet lands. It was, therefore, indispensably necessary that large bodies be brought into cultivation at once. And so it was that for miles in extent, the lands were deadened and exposed to the action of the sun…During a dry time, two or three men might, by merely sowing and deadening over with fire, burn up the whole superincumbent covering over eight or ten acres in a single day. The sloughs, which abounded, and which, except for obstructions by fallen timber, might have been navigated by small crafts for miles, were thus opened, and the drainage further assisted by ticing, till the whole county, in an incredibly short time, was brought into cultivation.

With the addition of numerous drainage tiles and ditches during settlement, much of Johnson County became valuable farm ground, and agriculture became the primary landuse in Johnson County by 1900. However, like many midwestern counties on the urban fringe, there has been a steady decline in farmland as residential and commercial areas have grown. Since 1900, land in farms has declined 30% in Johnson County (Figure 13), and the number of individual farms has declined from 2,053 in 1900 to just 526 in 1997. However, land in farms still comprised 66% of Johnson County's total land area in 1997.

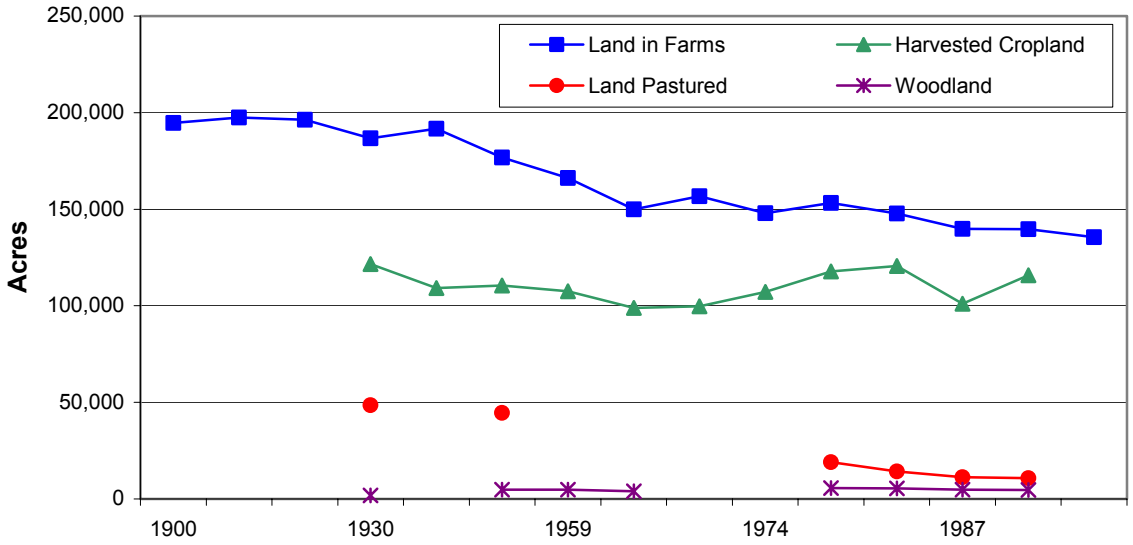

Figure 13. 1900-1997 Agricultural landuse for Johnson County, IN

(Source: Indiana Agricultural Statistics Service, 1997)

Much of this farmland has been used for residential, commercial, and industrial development near the major roadways of US 31 and I-65, around the cities of Greenwood, Whiteland, New

Whiteland, and Franklin. Johnson County planners addressed the issue of declining farmland in the 1997 comprehensive plan for Johnson County. The plan emphasizes that "farming should be preserved as a vital part of Johnson County's culture, economy, and tradition" (Woolpert LLP, 1997). However, current activities and future landuse plans within the watershed imply that land in farms will continue to decline.

Demographic History

Johnson County's population has grown steadily over the last century (Figure 14), but the most dramatic increase of over 80,000 residents has occurred since 1950. The major roadways of Interstate 65 and U.S. Highway 31 pass through the county and the watershed from north to south and provide quick transportation to the state's capitol. This close proximity and access to Indianapolis have supplied the momentum for demographic change over the last few decades. From 1980 to 1990, Johnson County's population increased by just over 10,000 people, approximately 14 percent. From 1990 to 2000, the population increased by over 27,000 people, a 30 percent increase. Johnson County recorded the second highest percent increase for the last decade of the nine counties surrounding Indianapolis, and the third highest increase in the state (IBRC, 2002).

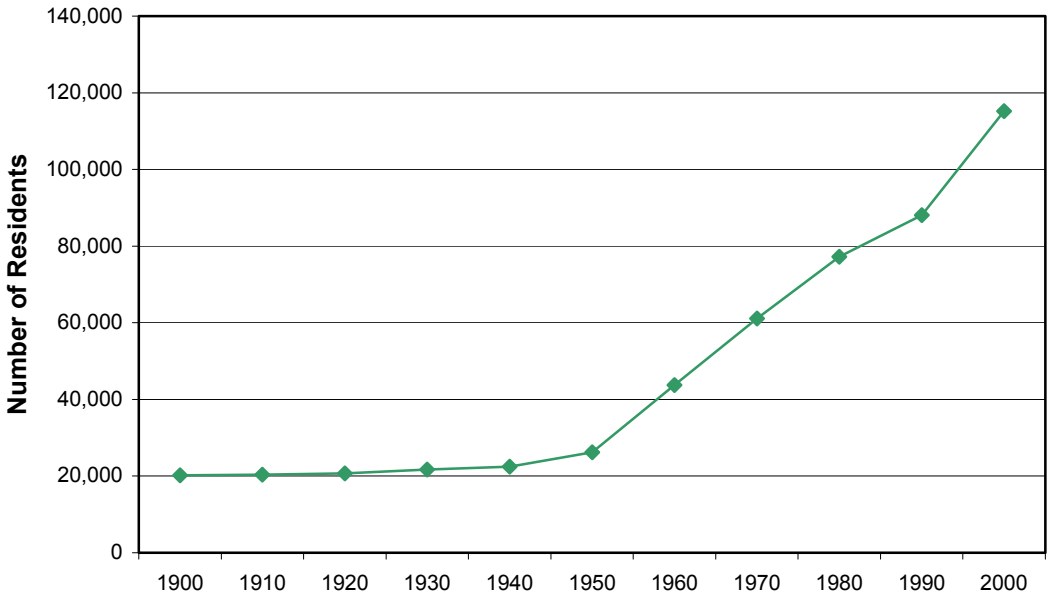

Figure 14. Johnson County population: 1900-2000

(Source: IBRC, 2002)

Growth patterns within the county illustrate the importance of proximity and access to Indianapolis. Table 5 depicts the population of major cities in Johnson County for 1980, 1990, and 2000, as well as the percent population change for each city between 1980-2000. The cities of

Franklin, Whiteland, New Whiteland, and Greenwood that frame the north-south corridor leading from the county seat to Indianapolis grew by more than 25,000 people from 1980 to 2000. This accounts for over 65% of the county's population growth for the same time period. These cities and their immediate surroundings also account for a large area of the watershed, and this population growth has resulted in dramatic changes upon the watershed's landscape.

Table 5. Population of Johnson County cities: 1980, 1990, and 2000

Johnson County total population				
Area	**1980**	**1990**	**2000**	**% change 1980-2000**
Johnson County	77,240	88,109	115,209	49.2%
Population of cities entirely within the watershed				
Area	**1980**	**1990**	**2000**	**% change 1980-2000**
Franklin	11,967	12,907	19,463	62.6%
Whiteland	1,956	2,446	3,958	102.4%
New Whiteland	4,502	4,097	4,579	1.7%
Population of Cities partially within the watershed				
Area	**1980**	**1990**	**2000**	**% change 1980-2000**
Greenwood	20,220	26,265	36,037	78.2%
Bargersville	1,647	1,681	2,120	28.7%
Trafalgar	NA	NA	798	
Edinburgh	4,856	4,536	4,505	-7.2%

Landuse History: GAP Analysis Project

The USGS – Biological Resources Division and the U.S. Fish and Wildlife Service are overseeing the National Gap Analysis Program (GAP). The purpose of GAP is to identify the extent of habitats for animal and plant species so land managers, planners, scientists, and policy makers have the information they need to identify priority areas for conservation (USGS, 2002). Indiana's Gap Analysis Project began in 1994 and involved the analysis of vegetation from satellite imagery. From this analysis, a 30 x 30 meter resolution land cover map for the state was developed at Indiana State

University (ISU, 1999), depicting land cover conditions in Indiana in 1992. Landuse in the Youngs Creek Watershed was inferred from this land cover layer (Figure 15). Appendix C includes a detailed description of the GAP data preparation.

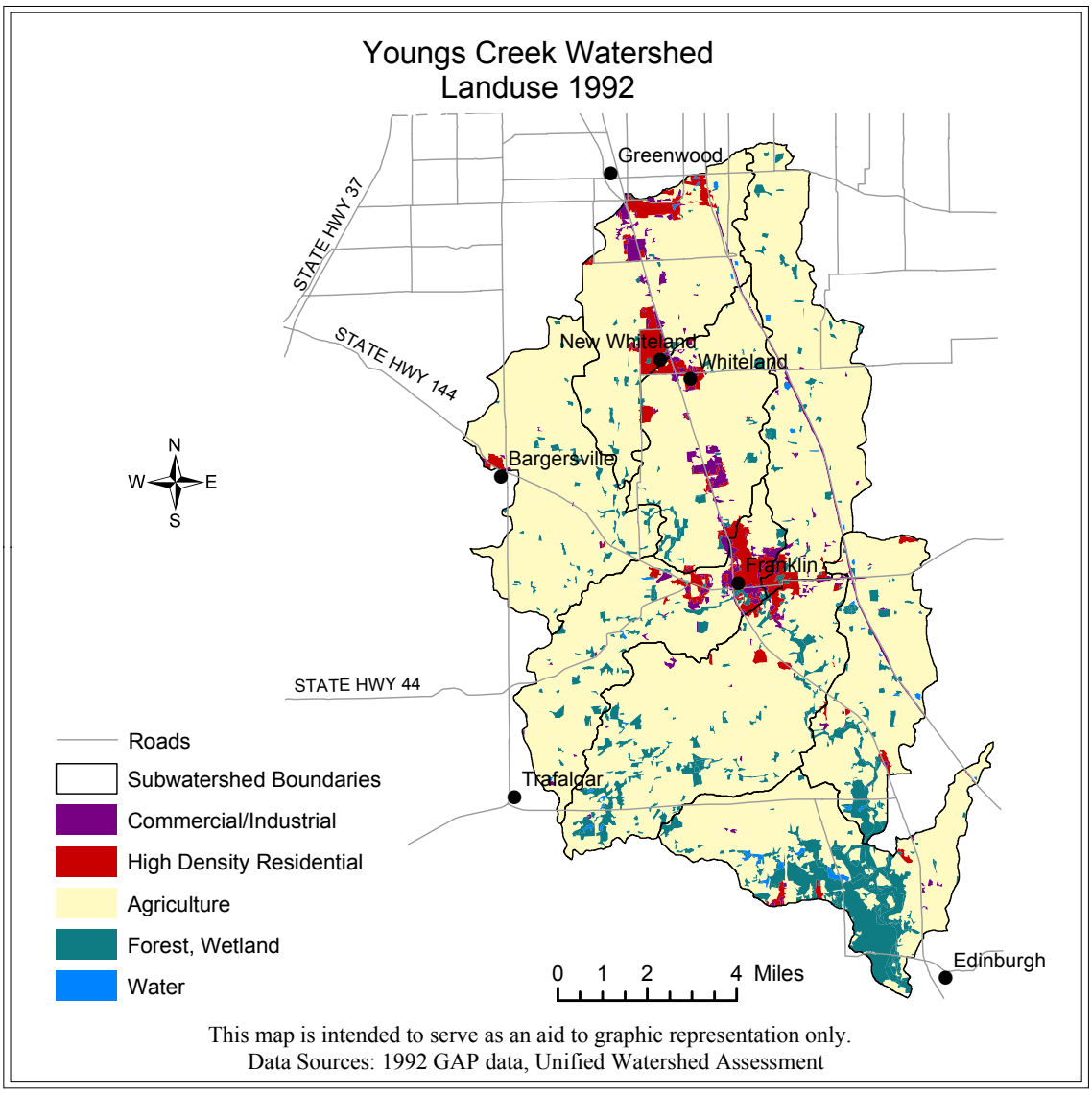

Figure 15. Youngs Creek Watershed landuse 1992

2001 Landuse Data Layer

In order to gain an understanding of how population growth in the Youngs Creek Watershed may be impacting landuse change, this assessment included the creation of a 2001 landuse layer for the watershed. Landuse within the watershed was digitized from aerial photographs obtained from Johnson County. A detailed description of the 2001 landuse layer procedure and classification is included in Appendix C. A map of the 2001 landuse layer is shown in Figure 16.

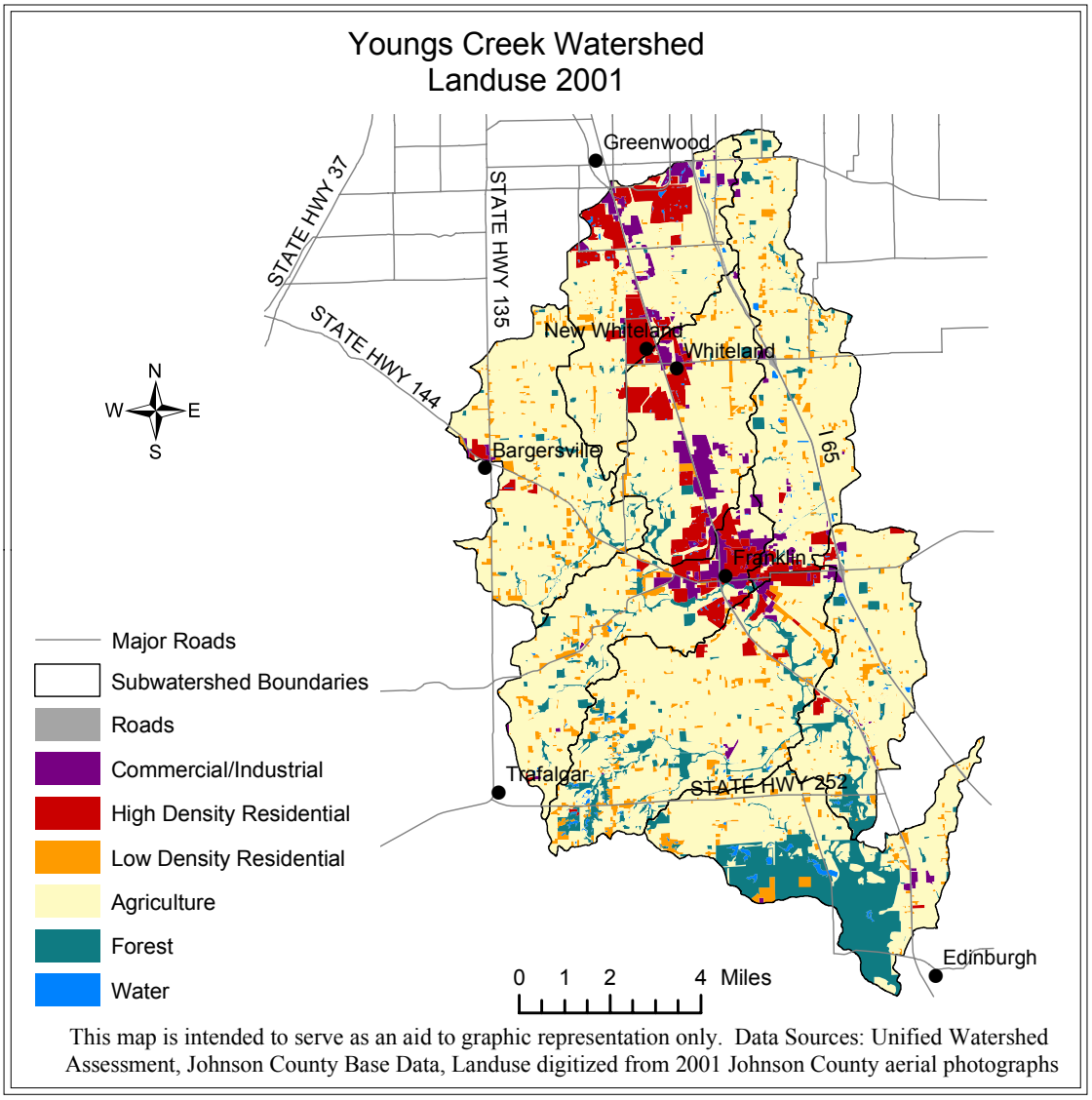

Figure 16. Youngs Creek Watershed landuse 2001

When comparing the 1992 map to the 2001 map, conversion of agricultural land to commercial and residential landuses is visible near the cities of Greenwood, Whiteland, New Whiteland, and Franklin, which is consistent with the population increases discussed previously. A quantitative comparison of the watershed's landuse in 1992 and 2001 provides a rough estimate of landuse change in the Youngs Creek watershed over the last decade (Table 6). Appendix D provides a breakdown of landuse percentages by subwatershed.

It should be noted that the classification scheme and resolution of each data set is different, and differences between landuse values in 1992 and 2001 are approximate. However, several trends can be established. Agriculture, the dominant landuse in 1992, continues to be the dominant landuse

in 2001. However, the last decade has seen a considerable amount of the watershed's agricultural land converted to residential and commercial landuses within the Youngs Creek Watershed.

Table 6. Youngs Creek Watershed landuse: 1992 and 2001

Landuse	1992 % of total area	2001 % of total area
Agriculture	84.8%	73.6%
Commercial / Industrial & Roads	2.5%	4.1%
Residential (high and low density)	3.5%	12.3%
Forest / Wetland	8.9%	9.3%
Water	0.3%	0.8%

Future Changes

Johnson County's population is projected to increase by 20,000 people over the next 20 years (Figure 17) (IBRC, 1998). Together with the projected population increase, recent local reports indicate that more than 7,000 new homes are being planned for development in Johnson County (Holtkamp, 2002). If the existing pattern of development continues, much of this construction will occur around Franklin, Whiteland, New Whiteland, and Greenwood, all of which are located within the watershed.

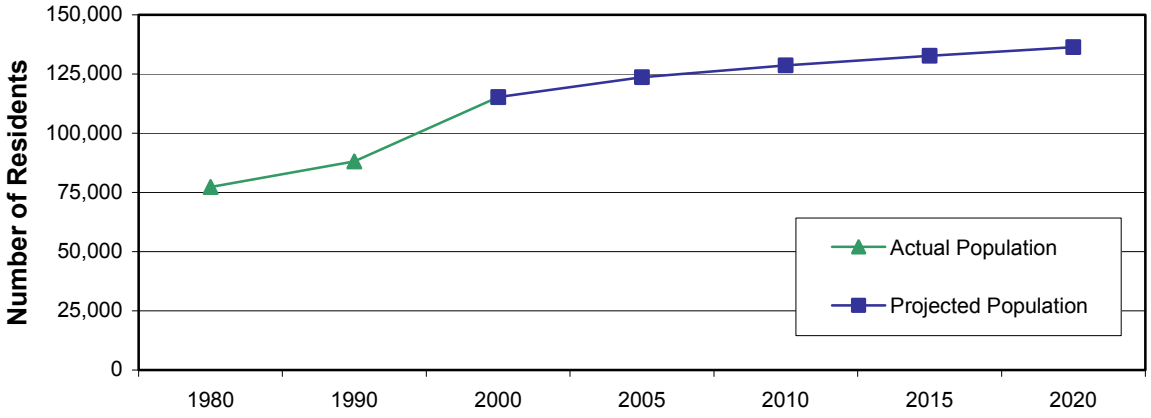

Figure 17. Johnson County: projected population

(Source: IBRC, 1998)

To quantify the impact that increased population and development will have on the watershed, potential future landuse was approximated for the watershed from a 2002 zoning map, which illustrates long-term landuse plans for Johnson County. A detailed description of this procedure is included in Appendix C. A map of potential landuse based on this zoning information is shown in Figure 18. According to this map, land surrounding the existing cities of Franklin,

Whiteland, New Whiteland, and Greenwood appears to be most likely to undergo landuse change from agricultural to commercial, industrial, and residential in the future.

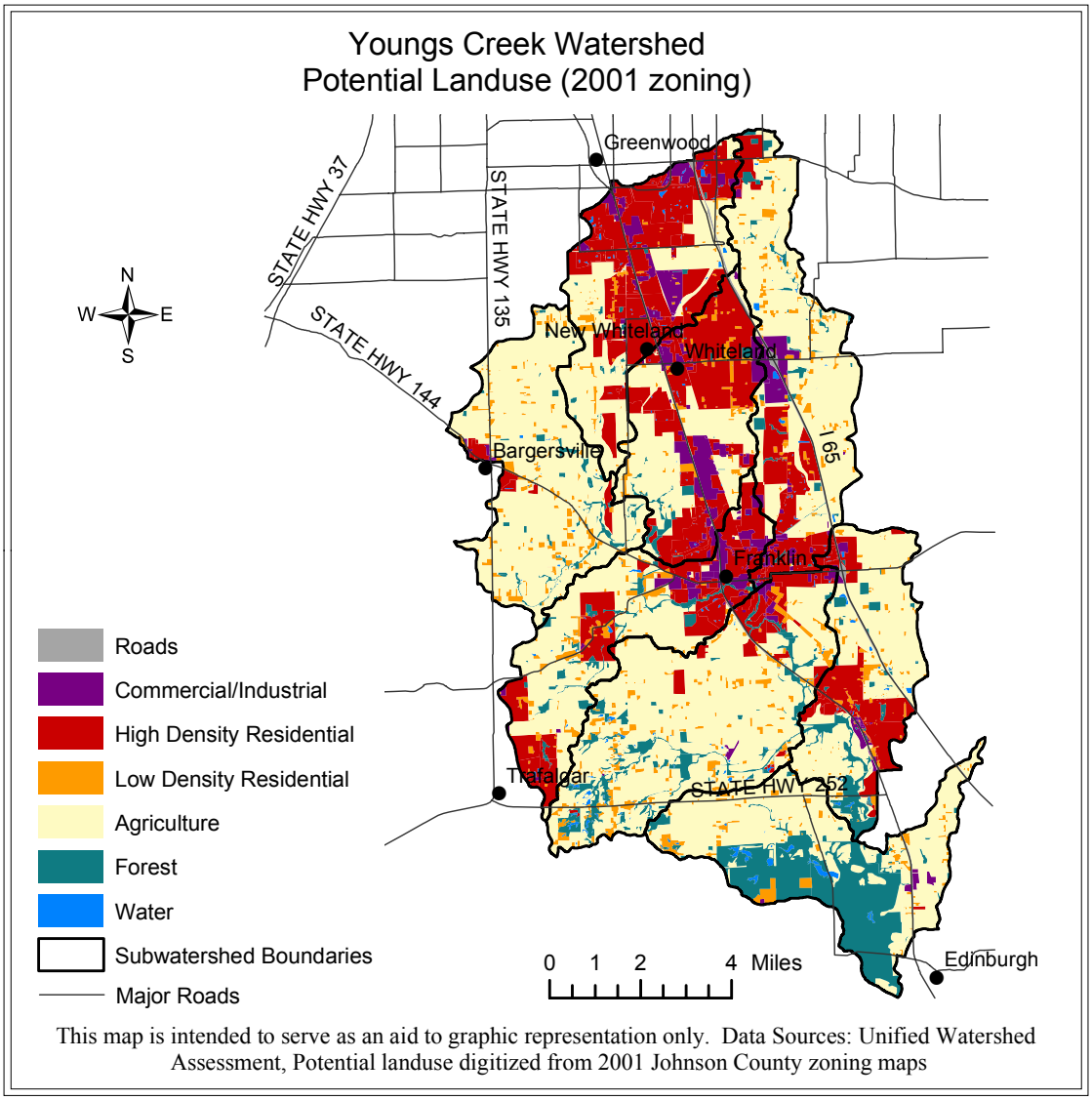

Figure 18. Youngs Creek Watershed potential future landuse (current zoning)

Impervious Surface Analysis

As the previous maps have shown, agricultural land has been converted for residential and commercial uses in the Youngs Creek Watershed. In order to examine the impact that these landuse changes can have on streams in the watershed, an impervious surface analysis was conducted. Impervious surfaces refer to the roads, rooftops, parking lots, and other impenetrable surfaces associated with residential and commercial landuses.

Ongoing research by the Center for Watershed Protection (CWP) has revealed a correlation between the percent of impervious surface in a watershed and stream quality indicators such as channel stability, habitat structure, water quality, and aquatic community diversity. CWP used the results of this research to create the Impervious Cover Model (ICM), a simple 3-tiered stream classification system (CWP, 2002). Based on this classification system, watersheds with impervious cover below 10% are termed "sensitive" and are likely to contain good to excellent stream quality indicators. Watersheds with impervious cover between 10% and 25% are termed "impacted," and stream indicators are likely to display signs of degradation. Watersheds with impervious cover above 25%-30% are termed "non-supporting" and are likely to display poor stream quality indicators. However, it is important to note that the ICM predicts potential rather than actual stream quality.

The percent impervious surface in 1992, 2001, and currently zoned land was calculated for each 14-digit subwatershed in the Youngs Creek Watershed (Figure 19). Calculations for the impervious cover model were based on landuse area totals. A detailed description of this procedure is included in Appendix E. Impervious surface percentages for each subwatershed are included with landuse percentages in Appendix D.

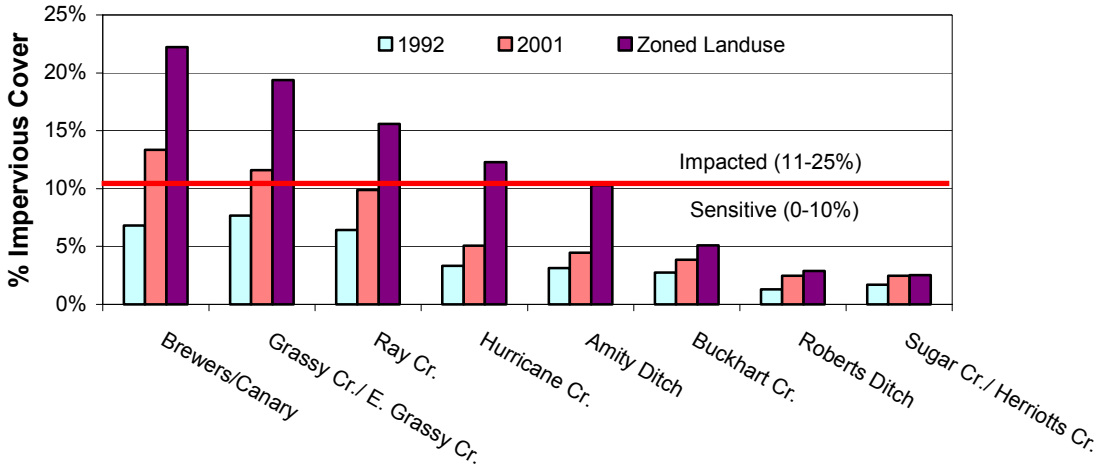

Figure 19. Impervious Cover (%) by subwatershed within the Youngs Creek Watershed

(based upon landuse data from 1992, 2001, and current zoning plans)

Impervious surface calculations using 1992 data indicated than none of the eight subwatersheds exceeded the 10% impervious surface area threshold. In 2001, five of the eight Youngs Creek subwatersheds contained less than 10% impervious surface. This analysis predicts that streams in these watersheds are capable of containing sensitive elements, but several factors can cause streams to deviate from this prediction. For instance, the CWP notes the importance of healthy

riparian zones in order for streams to contain sensitive elements. Cropping and grazing practices that alter riparian zones can prevent the stream from having sensitive stream properties.

Three of the eight Youngs Creek subwatersheds met or exceeded the 10% threshold in 2001 (Figure 20). The ICM predicts that streams in these subwatersheds are likely to be impacted by increased impervious surfaces that accompany high-density residential and commercial landuses. These impacts can include the degradation of physical stream habitat, erosion, channel widening, unstable stream banks, and the loss of sensitive aquatic species.

Spatially, the areas of the Youngs Creek watershed currently impacted by impervious surface area are located predominantly in the northern portion of the watershed. As development continues, subwatersheds on the eastern edge of the watershed will also be impacted. Both Amity Ditch and Hurricane Creek subwatersheds have the potential to exceed 10% impervious cover if development in the watershed follows the current zoning plan (Figure 20).

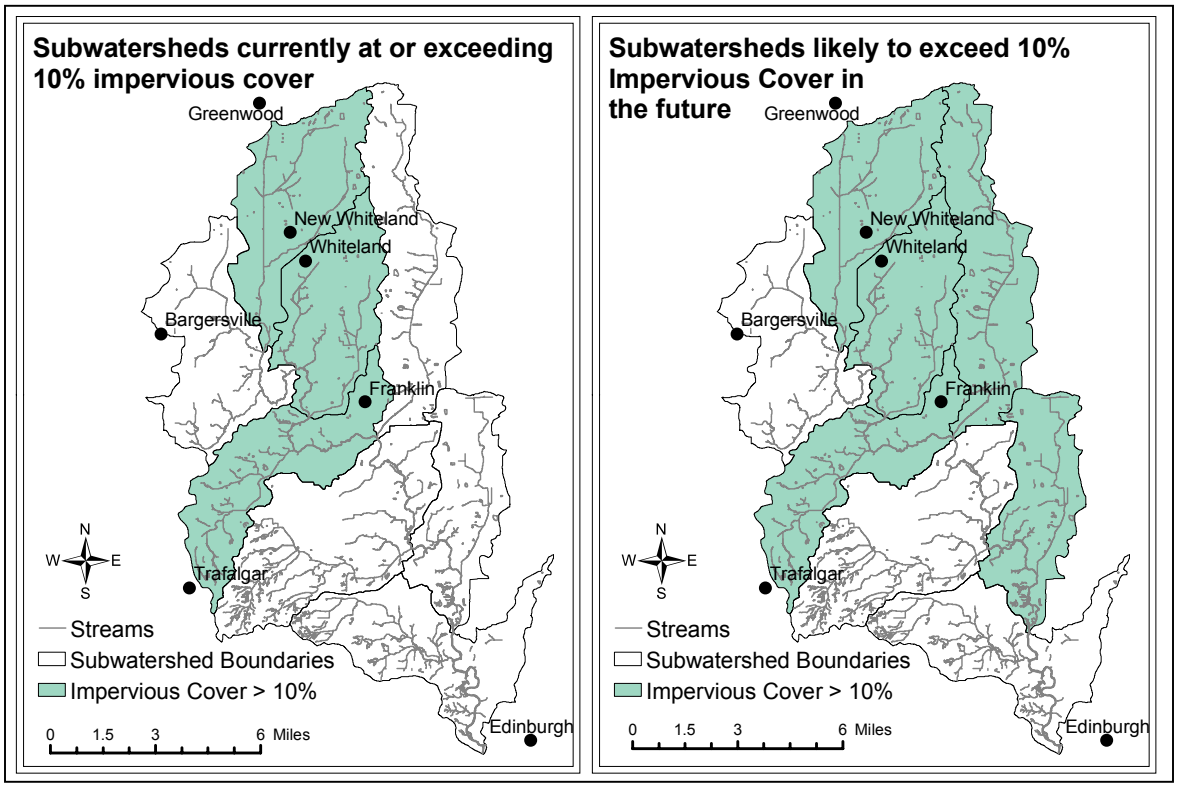

Figure 20. Subwatershed impacted by impervious surface

(current and potential future conditions)

Point Source Discharges

The Clean Water Act authorizes that all point source discharges into U.S. waters be regulated by the National Pollution Discharge Elimination System (NPDES). Point source discharges are discrete channels such as pipes or man-made ditches that flow directly into surface water.

The Permit Compliance System (PCS) is a national information system designed to support the NPDES program. Permits established by the NPDES program and managed by each individual state provide pollution limits and specify monitoring requirements for these point sources. The Indiana Department of Environmental Management (IDEM) had permitted 30 PCS facilities in Johnson County as of January 2003, and 17 of these are located within the watershed (Figure 21).

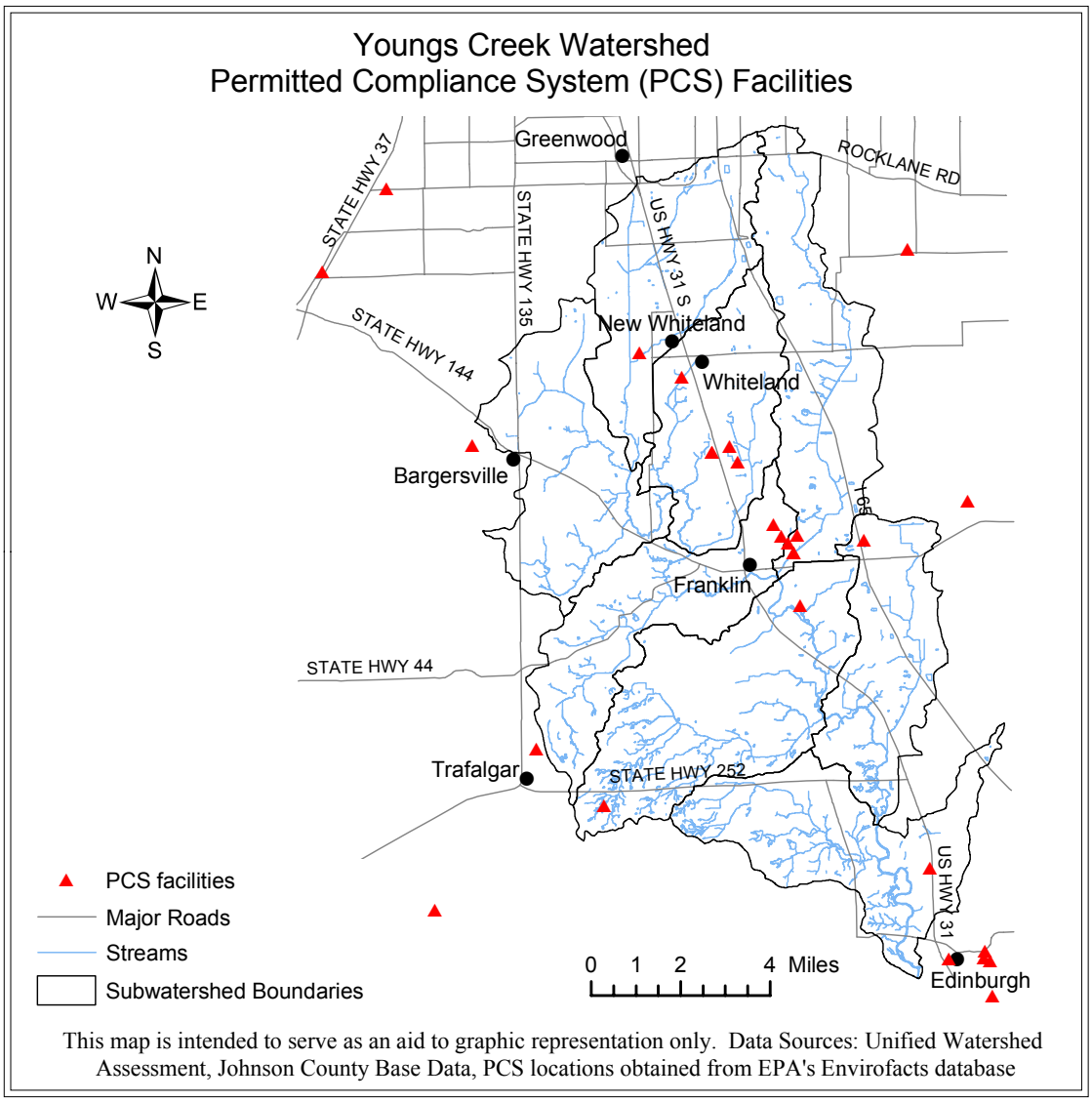

Figure 21. Youngs Creek Watershed: PCS facilities

Recreational Areas

The Atterbury State Fish and Wildlife Area is widely known in the watershed for the many recreational opportunities it offers. Atterbury contains excellent habitat, wetland areas, and lakes that provide for game hunting, wildlife watching, and fishing. Atterbury is also the only major state-owned tract of land in the watershed (Figure 22). It accounts for only 5% of the total area of the Youngs Creek Watershed but 42% of the Sugar Creek – Herriotts Creek Subwatershed. Atterbury State Fish & Wildlife Area was originally part of Camp Atterbury Military Training Center, an army training installation that was established in 1942. The state purchased over 6,000 acres of land from Camp Atterbury to create the Atterbury Fish & Wildlife Area in 1969. Today, the remaining portion of Camp Atterbury is still used for Army Reserve and National Guard training (IDNR, 2003).

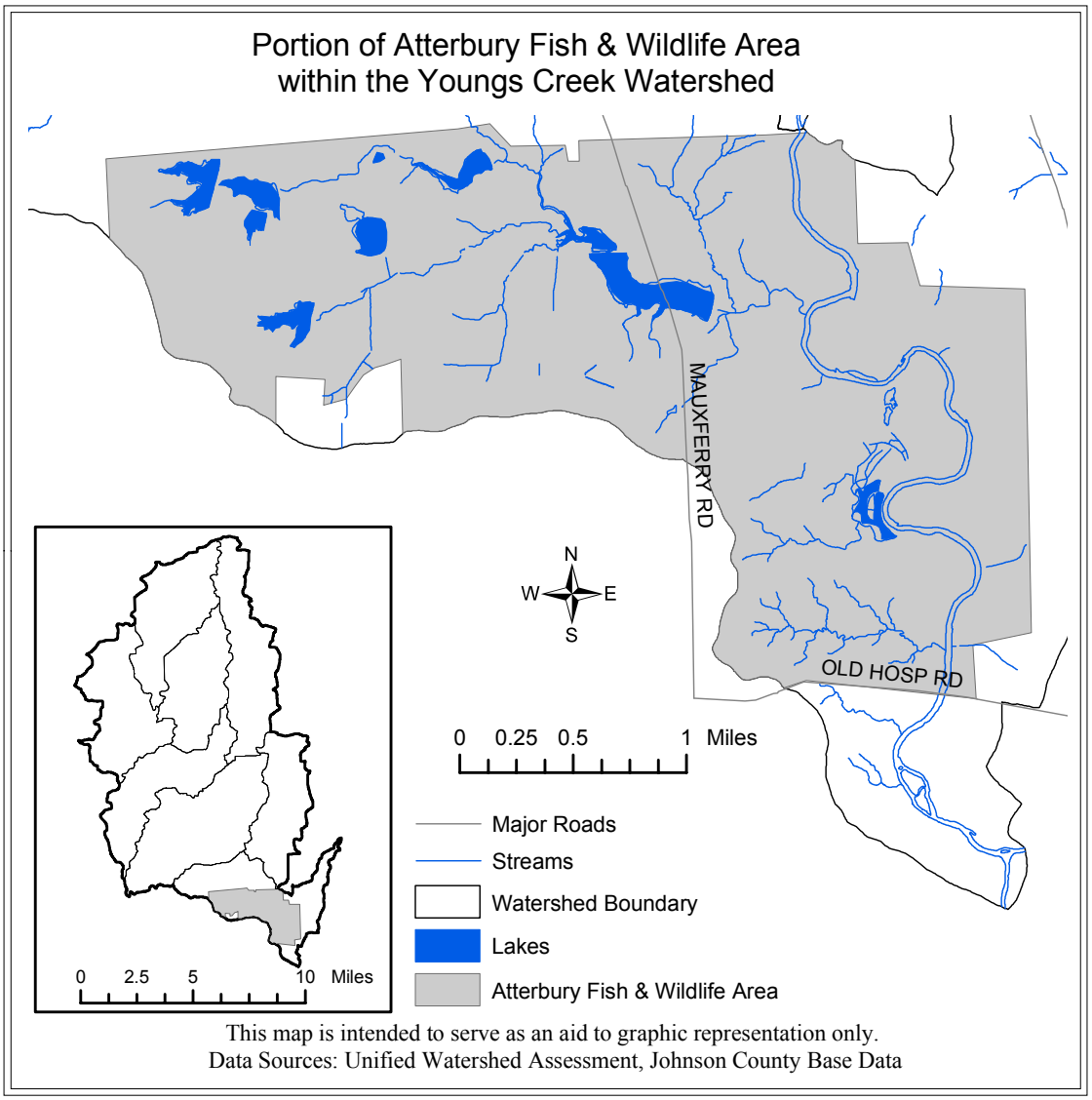

Figure 22. Youngs Creek Watershed: Atterbury Fish & Wildlife Area

Section IV: Investigation of Water Quality Issues and Benchmarks

This section provides an overview of existing water quality data in the watershed. After discussing how waterbodies are deemed to be impaired, this section summarizes a number of water quality studies that have been conducted in the watershed, and examines county tillage transect data and local opinions about conservation tillage. In addition, this section contains the results of habitat and visual assessments conducted during this project.

Designated Uses

Under the provisions of the Clean Water Act, the Indiana Water Pollution Control Board, part of the Indiana Legislative Services Agency (1997) has designated state waters, except waters within the Great Lakes system (327 IAC 2-1.5), for the following uses (327 IAC 2-1-3): Full-body contact recreation (April – October); capable of supporting a well-balanced, warm water aquatic community and where temperatures permit, capable of supporting put-and-take trout fishing.

Within the Youngs Creek Watershed, the exception to this rule is Brewer Ditch from the Whiteland sewage treatment plant to County Road 250 N Bridge (327 IAC 2-1-11(a)(20)), which is designated for limited use (327 IAC 3(a)(5)). This section states that waterbodies that have naturally poor physical characteristics, including low or no flow, poor chemical quality, or harmful man-made conditions are classified as limited. This segment of Brewer Ditch must still meet bacteriological criteria and be free from substances that settle out to form deposits, produce color, sheen, or odor, or in amounts capable of injuring or killing aquatic life.

Impaired Waterbodies

Every two years, under Section 303(d) of the Federal Clean Water Act, states are required to identify waterbodies that do not meet water quality standards for designated uses. Impaired waterbodies may be impacted by both point and nonpoint sources of pollution. From the 303(d) list, states must establish priority rankings to develop Total Maximum Daily Loads (TMDL). A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards.

In November 2002, The Indiana Department of Environmental Management (IDEM) released the 2002 303(d) Impaired Waters list (IDEM, 2002). This list includes segments of Youngs Creek and its tributaries as being impaired for pathogens and for fish consumption advisories due to polychlorinated biphenyls (PCBs). Figure 23 shows the impaired stream segments.

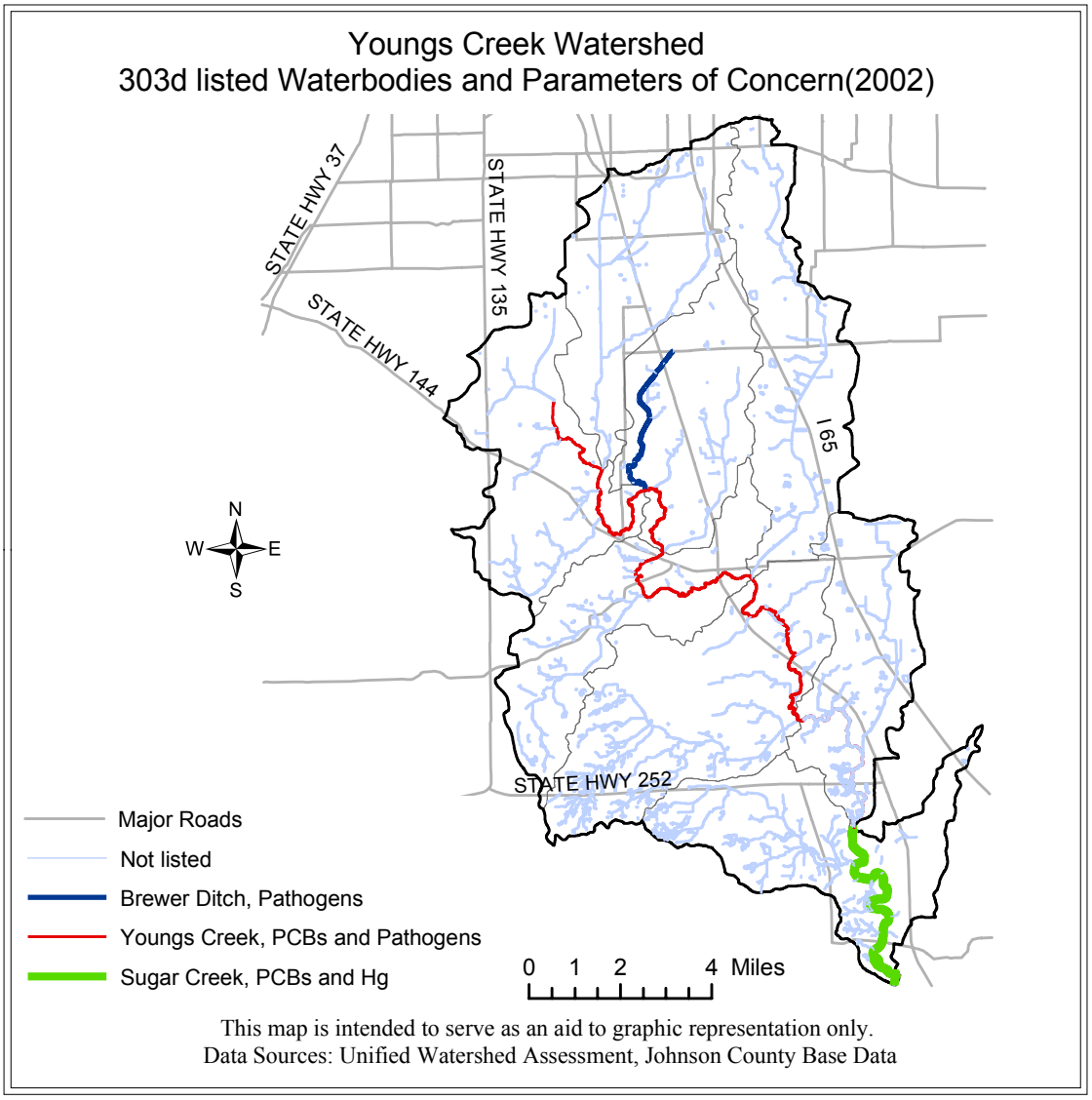

Figure 23. Impaired stream segments within the Youngs Creek Watershed

(2002 303(d) list)

PCBs were once widely used in transformers, and hydraulic and heat transfer systems as well as in rubber, ink, and wax. They entered the environment through uncontrolled disposal of products. In 1997, production of PCBs ended in North America; therefore, contaminated waters are a result of previous dumping. In 1998, the 303(d) list of impaired waters included Youngs Creek for fish consumption advisories, but neither Youngs Creek nor its tributaries were listed for pathogens.

IDEM Study: Sampling to verify 303(d) Impairments for Pathogens

Waterborne pathogens may cause diseases, such as eye, ear, and skin infections, diarrhea, and even hepatitis. The detection of these pathogens is crucial to evaluating water quality. Coliform bacteria are present in the digestive tracts and feces of humans and warm-blooded animals (cats, dogs, livestock) and can be readily detected wherever waterborne pathogens are found. However, the coliform group of bacteria includes a variety of organisms, some of non-fecal origin. So, coliforms are not a 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 in the intestinal tracts of warm-blooded animals and nowhere else. The presence of *E. coli* indicates the presence of waterborne pathogens and the potential for waterborne diseases

To verify the 2002 303(d) listing for pathogens, IDEM's Environmental Toxicology and Chemistry Section sampled 20 surface water locations for *E. coli* over a five-week period in July 2002 throughout the Driftwood River Watershed. Of these 20 sites, 14 were located within the Youngs Creek Watershed. Appendix F includes dates, sampling locations, and raw data. Figure 24 shows the *E. coli* concentrations at the 14 sampling locations. Indiana Water Quality Standards for *E. coli* state that for the period of April through October (the recreational season), full-body recreational use should not exceed a geometric mean of 125 colony forming units (cfu)/100ml based upon no less than five (5) samples equally spaced over 30 days, nor exceed 235 cfu/100ml in any one (1) sample in a 30-day period (327 IAC 2-1-6(d)).

Grassy Creek at Whiteland Road was the only location to meet Indiana Water Quality Standards for *E. coli*. All other sites exceeded the allowable *E. coli* concentration. Grassy Creek at Whiteland Road is a headwater site in the watershed, with very low housing density and little to no livestock farming upstream. The largest *E. coli* concentrations were obtained at Buckhart Creek at Mauxferry Road and Youngs Creek at 250 South, which both exceeded a geometric mean of 2500 cfu/100ml. Youngs Creek at 250 South is located downstream of a high-density urban area, numerous livestock operations, and several wastewater treatment plants. Buckhart Creek at Mauxferry Road is located downstream of low-density housing and many small livestock farms.

During this sampling period, rain events were scarce, and samples were collected during low-flow conditions. Rain events may increase the concentration of *E. coli* if water washes fecal material from livestock, cats, dogs, birds, and other wildlife into waterways. However, rain events may also decrease the *E. coli* concentration if rainwater dilutes existing bacterial concentrations present in groundwater.

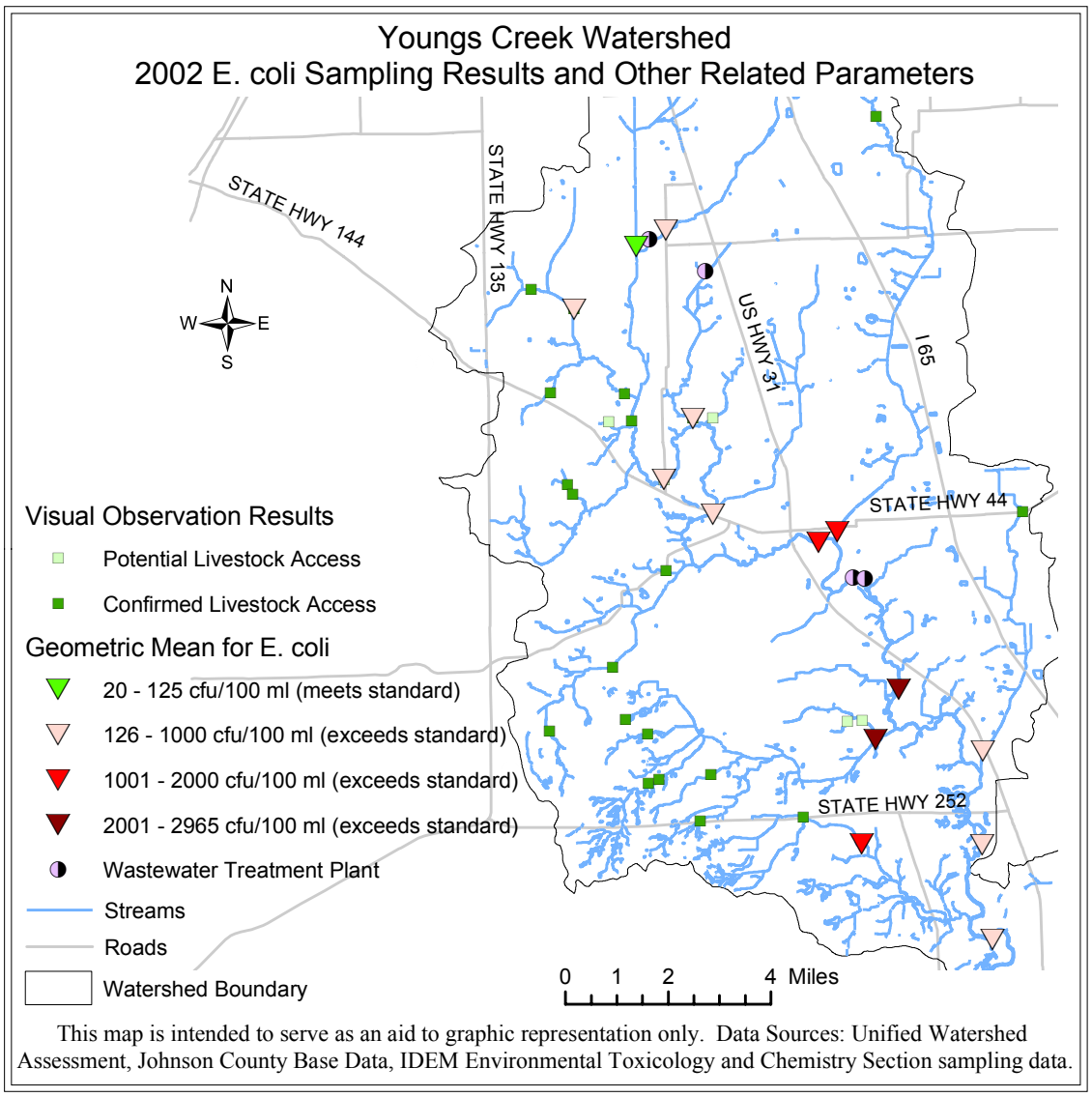

Figure 24. *E. coli* geometric mean counts, Youngs Creek Watershed sampling locations

The presence of waterborne pathogens in the Youngs Creek Watershed is probably due to a combination of sources, including failures in septic systems or malfunctions in wastewater treatment equipment at wastewater treatment plants (WWTPs), agricultural run-off, or livestock access to streams. All of these events have the potential to introduce pathogens to waterbodies in the watershed. However, the YCAG wanted to focus efforts on nonpoint sources of pollution in the watershed and felt that sampling data and visual assessment results provided enough data to support efforts to reduce livestock access to streams. In order to adequately address other potential sources of waterborne pathogens, further analysis is required to determine more precisely the source locations, extent, and magnitude of pathogen contamination.

Driftwood River Watershed Restoration Action Strategy

In May of 2001, IDEM released a Restoration Action Strategy for the Driftwood River Watershed. The Driftwood River Watershed includes portions of Madison, Henry, Hancock, Marion, Rush, Shelby, Johnson, Brown, and Bartholomew counties (Figure 25). This strategy is a plan for the Driftwood River Watershed that provides reference material to aid local water quality efforts.

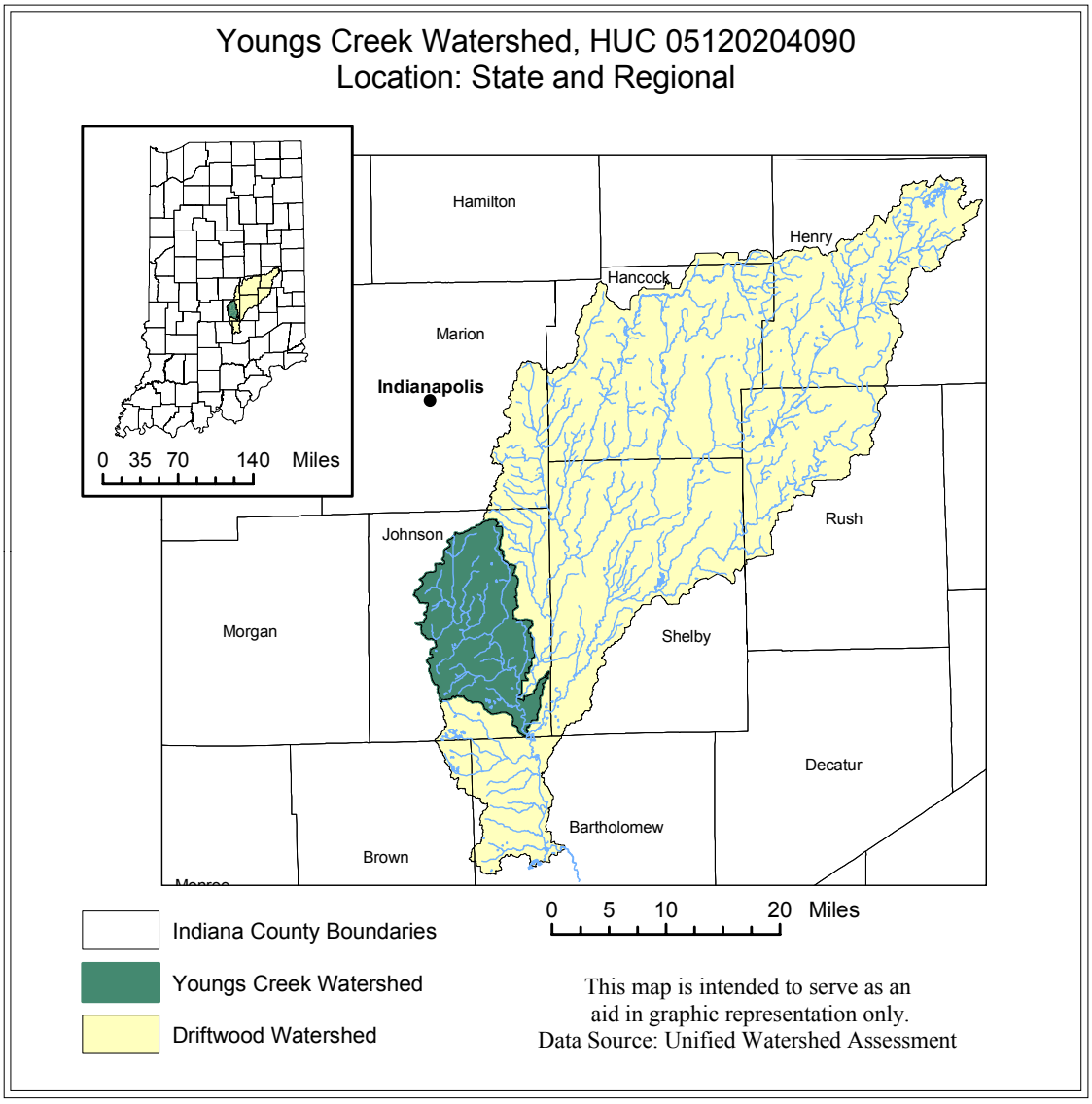

Figure 25. Driftwood River Watershed

Although the strategy refers to the entire watershed, it provides some data regarding specific 11-digit HUCs. Data from IDEM's fixed monitoring station program, which studies surface water chemistry, were analyzed using the Seasonal Kendall Test. This test uses statistics to determine whether there was a change in the water chemistry over a period of time. Samples were collected from Sugar Creek at Edinburgh from 1986 through 1995 (Figure 26). Youngs Creek drains into Sugar Creek, which is located at the base of the watershed. Therefore, water quality conditions at the monitoring station most likely reflect the conditions of the watershed. Table 7 shows the results of the Seasonal Kendall Test for this location.

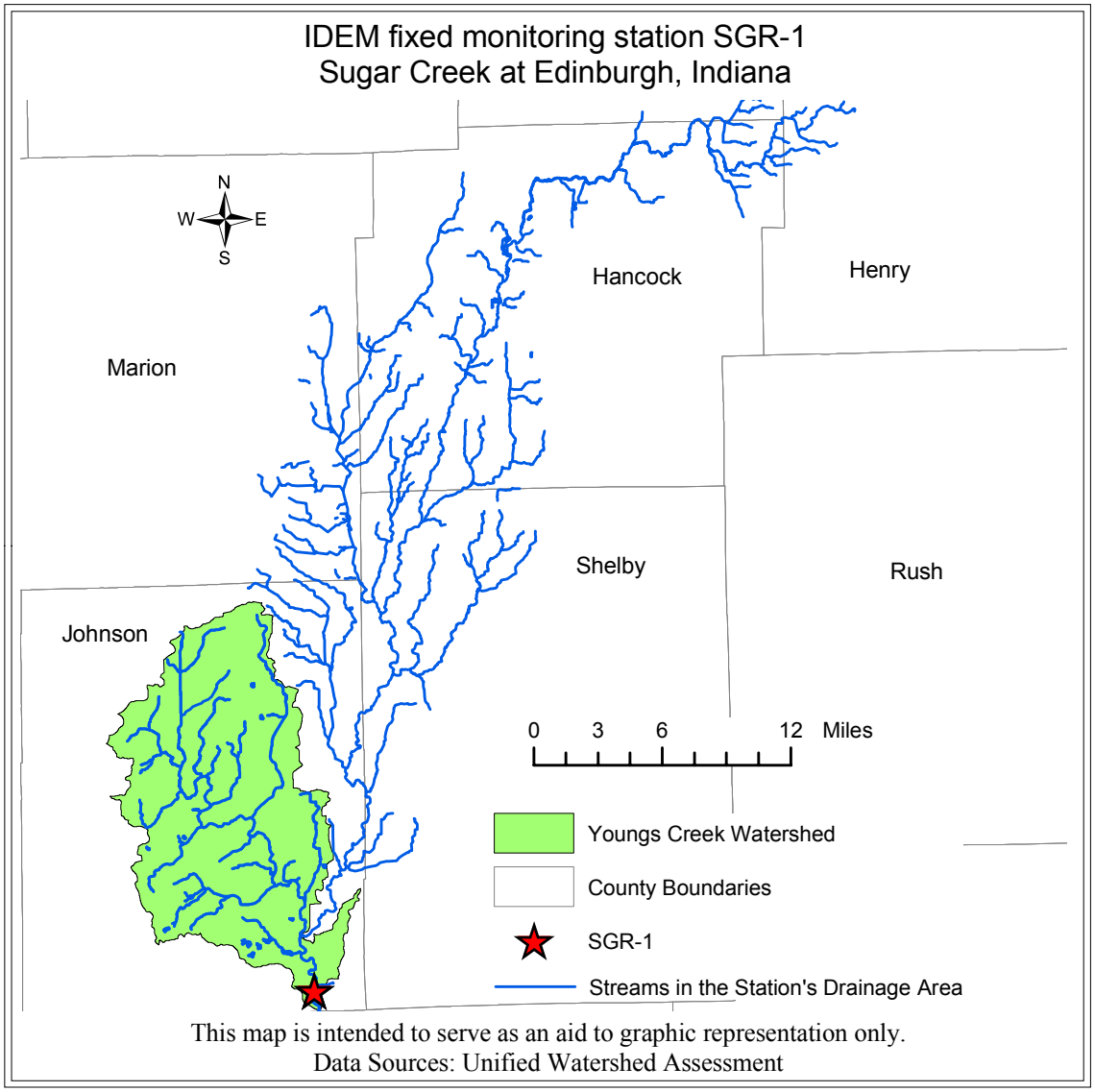

Figure 26. Location of IDEM fixed monitoring station SGR-1 (Sugar Creek)

Table 7. Results of Seasonal Kendall Analysis for Sugar Creek at Edinburgh

(taken from the Driftwood River Restoration Action Strategy)

Parameter	Results
Biological Oxygen Demand	↓
Chemical Oxygen Demand	↔
Dissolved Oxygen	↔
E. Coli	↔
Ammonia	↔
Nitrate + Nitrite	↘
Effects of Septic	↔
Total Phosphorus	↔
Total Residue	↔
Total Residue, Filterable	?
Total Residue, Non-filterable	↔

Legend:

↔ No statistical Change; significance < 80% or reported slope = 0.00000

↓ Statistically Decreasing; significance > 95% with a negative slope

↘ Potentially Decreasing; significance > 80% with negative slope

? Insufficient Data for Analysis

For the period of 1986 through 1995 the Seasonal Kendall Analysis results indicate no statistical change for the majority of parameters tested. Two parameters did show statistically significant change, biological oxygen demand (BOD), which statistically decreased, and Nitrate + Nitrite, which potentially decreased. Both of these results indicate an encouraging trend for the water quality within the watershed.

Biological (or biochemical) oxygen demand is a measure of the amount of oxygen used by bacteria as they break down organic matter. Streams that are polluted or have excessive plant growth

generally have a high BOD level; low BOD levels indicate that dissolved oxygen is available for aquatic organisms.

Nitrate + Nitrite is indicative of the amount of nutrients found in the water. Nutrients can enter the water by way of human and animal waste, decomposing organic matter, and run-off from fertilizers on lawns, golf courses, or farms. Low Nitrate + Nitrate levels are indicative of streams with good water quality.

Unified Watershed Assessment

A Unified Watershed Assessment (UWA) is one of 111 action items identified by President Clinton in 1997 through the Clean Water Action Plan. In September 1998, a workgroup consisting of staff from the USDA Natural Resources Conservation Service (NRCS) and IDEM developed a first version of the UWA, which ranked each 8-digit hydrologic unit watershed in Indiana according to the condition of the water. The resulting data layers provided information regarding the water column, ability to support aquatic ecosystems, and aquatic life. Each layer was divided by percentiles into five scores, with a score of one (1) representing good water quality, and five (5) representing impacted or degraded water quality. These scores indicated a watershed's ability to meet designated uses or act as a natural resource. The initial assessment targeted eleven 8-digit watersheds within Indiana for priority funding. The Driftwood Watershed was not listed as a priority in this assessment.

In the summer of 1999, the workgroup used additional layers to evaluate each of the 361 11-digit hydrologic unit watersheds in Indiana for resource concerns and stressors. This assessment provided information at the local level in order to prioritize needs and allocate resources to address water quality issues. Table 8 provides information on results of the 2000-2001 UWA for the Youngs Creek Watershed. The parameters of greatest concern within the Youngs Creek Watershed include recreation (body contact), aquifer vulnerability, and septic system density. Because of these scores, the Youngs Creek watershed has been listed as a higher priority watershed and is eligible for incremental funding.

Recreation (body contact) scores indicate whether waterbodies meet state water quality standards for recreational use. The Youngs Creek Watershed scored a 5, indicating a severe impairment for this parameter. The scores were based upon *E. coli* contamination and other measures. Data were scored based upon the ratio of water classified as "fully supporting" for designated uses to "not supporting" and "partially supporting" for designated uses.

Aquifer vulnerability indicates the concern level regarding protection of groundwater used for drinking or other uses. Youngs Creek's score of 4 was based upon a subjective ranking of the sensitivity of the aquifer in question and the connectivity of aquifers and surface waters.

Septic system density indicates the potential for water quality problems due to the density of private septic systems. Scores were based upon an EPA standard that considers more than 40 septics per square mile to be a water quality threat. Based upon this standard, an 11-digit watershed with a septic density of 40 septics per square mile scored a 5. Youngs Creek scored a 4 for this parameter.

Table 8. Youngs Creek Watershed Unified Watershed Assessment results (2000-2001)

Data Layer	What it tells us	Score
Recreation (Body Contact)	Whether the waters meet designated recreational uses for full-body contact; based on *E. coli* and other measures. The 303(d) listed waters that did not support recreation were included in this assessment.	5
Aquifer Vulnerability	Level of concern regarding protection of groundwater for drinking and other uses.	4
Septic System Density	The density of private septic systems; may indicate potential surface water and groundwater quality problems.	4
Critical Biological Resources	Level of concern for reported endangered and threatened species and critical biological communities.	3
Crop Production	Reflects the potential for crop production impacts on a watershed.	3
Surface Drinking Water Intakes	Level of concern regarding drinking water protection in regards to surface water.	2
Urbanization	Reflects the potential for impacts on a watershed due to run-off from developed areas.	2
Livestock Production	Reflects the potential for livestock production impacts on a watershed.	2
Mussel Diversity	Incidence of fresh water mussel beds, with consideration given to the rarity and diversity of the species found. In this case no data may have meant no record, or may have meant that there were no mussels found.	1
Aquatic Life Use Support	The livability of the water column for aquatic life; whether the waterbody meets designated use for aquatic life; made up of many metrics related to physical, chemical, and biological characteristics of the water. The 303(d) listed waters that did not support aquatic life were included in this assessment.	1
Stream Fishery	Measure of the small mouth bass community in streams. Score indicates recreational stream fishery resource.	1
Mineral Resource Extraction	Reflects the potential for mineral resource extraction impacts on a watershed.	1
Lake Fishery	Large mouth bass harvest information for lakes only; a measure of fish diversity and fish community health. Score indicates quality of recreational fishery resource.	nd
Eurasian Milfoil	Lakes affected with Eurasian Water Milfoil, an invasive exotic; this is an indicator of the impact of recreational use by boats.	nd
Lake Trophic Scores	Lake condition based on trophic scores, containing several metrics; an indicator for the rate at which a lake is aging due to inputs of nutrients and other factors.	Nd
Score: 1 = good water quality; 5 = severe impairment; nd = no data		

Johnson County Board of Health: Groundwater Study

In late spring of 1991 and 2000, the Johnson County Board of Health conducted a voluntary groundwater study of private wells throughout the county. Water samples were collected and tested for nitrate, alachlor, and atrazine. Nitrate is naturally occurring in soils but is also applied to farm fields to encourage crop growth. Alachlor and atrazine are major chemicals found in pesticides. The results indicated that these major farm chemicals did not turn up in large amounts in the county's groundwater supply. In 1991 (n=211), 4% of the wells tested over the Indiana water quality standard for nitrate, set at 10 milligrams per liter. In 2000 (n=139), only 1% of the wells tested over the nitrate standard. In 2000, only 6% of the wells tested did not meet the Indiana standard set for pesticides, a maximum contaminant level of two parts per billion.

In addition, the Health Department completed bacteriological analyses of 17 wells throughout the county in May 2000. Coliforms, a group of microscopic bacteria, are present in the digestive tracts and feces of humans and warm-blooded animals (cats, dogs, livestock). The results showed that eight of the 17 wells tested unsatisfactory for the total coliforms present. The Health Department followed up with unsatisfactory cases to ensure the water was disinfected.

2002 Cropland Transect Survey

In the spring of 2002, Indiana Department of Natural Resource (IDNR) and NRCS employees conducted a cropland transect survey throughout Johnson County. This roadside survey is designed to collect information about tillage practices within the county on an annual basis, if possible. Based upon crop residues, employees classified approximately 315 fields into one of the following tillage methods: no-till, strip-till, ridge-till, mulch-till, reduced-till, or conventional till. The following set of standardized conservation tillage system definitions were taken from the National Crop Residue Management Survey (CTIC, 1994).

Conservation tillage includes any tillage and planting system that **covers 30% or more** of the soil surface with crop residue, after planting, to reduce soil erosion by water. Where soil erosion by wind is the primary concern, a conservation tillage system is any system that maintains at least 1,000 pounds per acre of flat, small grain residue equivalent on the surface throughout the critical wind erosion period. Conservation tillage practices include no-till, ridge-till, and mulch-till systems.

In a no-till system, the soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Planting or drilling is accomplished using disc openers, coulter(s), row cleaners, in-row chisels, or rototillers. Weed control is accomplished primarily with crop protection products. Cultivation may be used for emergency weed control.

In a ridge-till system, the soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Planting is completed on the ridge and usually involves the removal of the top of the ridge. Planting is completed with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges. Weed control is accomplished with crop protection products (frequently banded) and/or cultivation. Ridges are rebuilt during row cultivation.

Mulch-till systems use full-width tillage that involves one or more tillage trips, disturbs the entire soil surface, and is done prior to and/or during planting. Tillage tools such as chisels, field cultivators, disks, sweeps, or blades are used. Weed control is accomplished with crop protection products and/or cultivation.

Tillage systems that cannot be classified as conservation tillage include reduced-till and conventional till. A reduced-till system uses full-width tillage that involves one or more tillage trips, disturbs the entire soil surface, and is performed prior to and/or during planting. There is 15-30 percent residue cover after planting or 500 to 1,000 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Weed control is accomplished with crop protection products and/or row cultivation.

Conventional or intensive till systems also use full-width tillage that involves one or more tillage trips, disturbs the entire soil surface, and is performed prior to and/or during planting. There is less than 15 percent residue cover after planting, or less than 500 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Weed control is accomplished with crop protection products and/or row cultivation.

The data collected during the transect survey provides accurate records on the adoption of conservation tillage methods. It also provides information to SWCDs and other agencies in establishing priorities for improvement. Further, it evaluates the progress in reaching county or state goals for tolerable soil loss.

Conservation tillage systems can help mitigate the impact of soil erosion and reduce run-off. At the field level, erosion causes the loss of productive land and reduces infiltration rates. Productive soil is important because it covers seedlings and provides support as they grow. Soil particles also hold on to nutrients, either applied or found naturally, and gradually deliver them to growing plants (Daily et al., 1997). As soil particles wash into a waterway, water quality is reduced. Aquatic communities may be impacted as increased sediment levels may smother spawning beds, reduce sunlight available for photosynthesis, or increase water temperatures. Further, sedimentation may increase flooding potential due to barriers in water flow and increase costs for maintenance (e.g. dredging).

According to the 2002 transect data from Purdue University, Johnson County ranks 85 out of the 92 counties for the percent of corn acres in no-till and 67 out of 92 counties for the percent of soybean acres in no-till. Figure 27 illustrates the trend in tillage methods for corn within Johnson County for 2000 through 2002. There is a large disparity between the percent of corn acres using conservation tillage methods and the percent using conventional till. Further, the percent of corn acres using conventional till increased from 2000 to 2002. This contradicts a trend seen in many other Indiana counties.

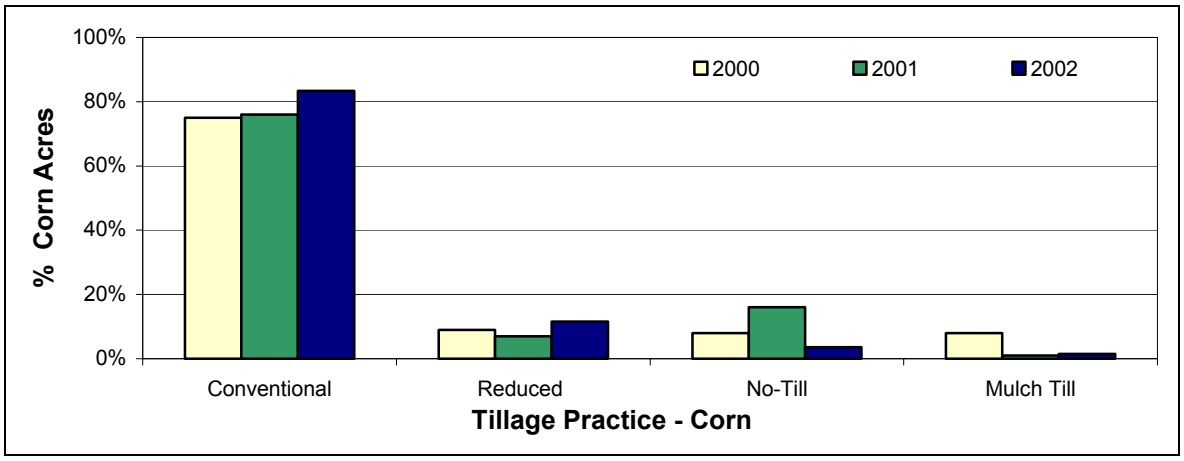

Figure 27. Corn cropland tillage data within Johnson County 2000-2002

(Source: Purdue University - Transect Survey Data)

Soybeans, however, show a greater percentage of acres in conservation tillage versus conventional tillage methods (Figure 28). This acreage is still considerably lower than the majority of other Indiana counties. The low percentage of corn acres in conservation tillage systems compared to beans may be because local farmers have seen positive trends in yields and lower costs with no-till beans. No-till beans are also better able to deal with weather-related stress, unlike no-till corn.

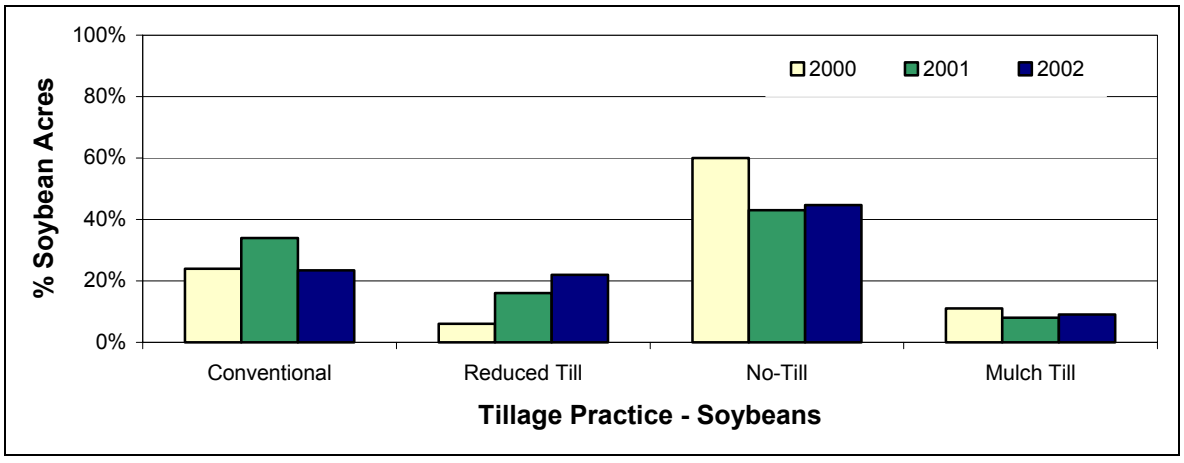

Figure 28. Soybean cropland tillage data within Johnson County 2000-2002

(Source: Purdue University - Transect Survey Data)

Tillage Survey

The low acreage in conservation tillage prompted the Agricultural Research Team to develop a tillage survey (Appendix G), targeted to individuals in the agricultural community. The YCAG wanted to determine why conservation tillage practices were not being adopted, especially on corn crops. In addition, the YCAG wanted to know what sources operators used to find information on conservation practices. This survey was distributed at the Johnson County SWCD's Annual Meeting in January 2003 and at an Ag Breakfast co-sponsored by Farm Bureau and the SWCD in March 2003. In addition, it was published on the SWCD website for online submittal.

Of the 44 respondents, 11% did not know much about conservation tillage, 13% had tried conservation tillage in the past, but quit after an average of two years, and 61% were still using conservation tillage after an average of 11 years. The large percentage of farmers using conservation tillage, despite the small number of acres throughout the county, was most likely due to the conservation-based nature of the meetings where the surveys were distributed. The audiences at these meetings are people typically involved and interested in soil and water conservation. The survey results still provide valuable information regarding local perceptions about conservation tillage and will enable the YCAG and other partners to develop effective outreach programs.

Individuals responded that in order to start using or do more conservation tillage, they would either adapt current equipment (32%) or purchase equipment (32%). Seventy-five percent of the respondents said they would no-till corn if there were a monetary incentive, although it was not stated what the incentive would have to be. Current incentives in the 2002 Farm Bill include a $20 per acre incentive for no-till corn.

Table 9 shows the number of responses illustrating why individuals started using conservation tillage. The dominant reasons were as follows: (1) reduced soil erosion, (2) lowered production costs, and (3) saved time and fuel.

Table 9. Responses of agricultural decision makers who use conservation tillage

Question: I started using conservation tillage because (check all that apply):

Choice	# Responses
Reduced soil erosion	30
Lowered production costs	27
Saved time and fuel	26
Other farmers had success	9
Increased yield per acre	8
Required by government policy	6
Other	1

Table 10 shows the number of responses to why individuals do not use conservation tillage. The dominant reasons were as follows: the equipment is not suitable, conservation tillage reduces yield per acre, poor stands, and expense.

Table 10. Responses of agricultural decision makers who do not use conservation tillage

Question: I do not use conservation tillage because (check all that apply):

Response	# Responses
Equipment is not suitable	7
Reduced yield per acre	6
Poor stands	4
Expense	4
My landowner or operator is against it	3
Couldn't control weeds	2
Increased production costs	2
Increased time	1
Other	1

Individuals were also asked to rate their perceptions on a variety of topics related to conservation tillage on a scale of 1 to 4 (descriptions of numerical value stated in the question). The mean scores were calculated based on the individuals' responses to their use of conservation tillage practices and for all of the surveys combined. Surveys were divided into these categories to determine if there was a difference in the perception of quality of information available for conservation tillage, cost of conservation tillage, alignment of goals, and whether erosion was an issue on the farm based upon users and non-users. Table 11 compares the means across these categories.

Respondents who did not know much about conservation tillage believed that it was somewhat difficult finding information about the topic. Further, they believed that these tillage methods were costly and complex. Individuals who had tried conservation tillage but quit felt that soil erosion was not a problem on their farm, and conservation tillage did not fit into their production goals. In addition, they doubted the quality of information available on conservation tillage and found it unreliable. Individuals currently using conservation tillage on their fields felt that soil erosion was a problem that needed to be addressed. Additionally, they found that conservation tillage could be economical.

Table 11. Mean score of conservation tillage perceptions

(based upon respondents use of conservation tillage and all surveys combined)

Question	No, I do not know much (n=5)	Yes, but quit (n=6)	Yes and still use (n=30)	All Surveys (n=41)
	Mean Response	Mean Response	Mean Response	Mean Response
Obtaining information on conservation tillage is: (1=difficult; 4=easy)	2.2	3.3	3.3	3.2
Complexity of conservation tillage practices or systems: (1=complex; 4=easy)	2.0	3.0	2.9	2.8
Cost of conservation tillage practices or systems: (1=costly; 4=economical)	2.2	2.2	3.0	2.8
Quality of information available on conservation tillage practices: (1=inconsistent and unreliable; 4=consistent and reliable)	2.4	1.8	2.8	2.7
My knowledge with respect to conservation tillage: (1=inadequate; 4=sufficient)	2.4	2.7	2.9	2.8
Conservation tillage and my current production goals: (1=do not fit; 4=completely fit)	2.6	1.4	2.9	2.7
On my farm soil erosion is: (1=not an issue; 4=important issue)	2.6	1.8	3.4	3.0

The results from this survey will enable the SWCD and NRCS staff to tailor strategies and programs to increase the acreage in conservation tillage systems. Continued research on no-till systems, especially corn, has led to the development of new technologies and better ways to manage fields. This information needs to be disseminated throughout the county so farmers are aware that there are options, adaptations, and funds available to begin using no-till. Furthermore, there needs to be an increased awareness of the impact of soil erosion on personal property and waterbodies.

Qualitative Habitat Evaluation Index

The Qualitative Habitat Evaluation Index (QHEI) was developed by the Ohio EPA to provide a qualitative evaluation of the stream habitat by measuring the physical features that affect aquatic communities. This index provides information on a stream's ability to support fish and macroinvertebrate communities (Rankin, 1989). The QHEI is composed of six parameters that are related to stream fish communities: substrate, instream cover, channel morphology, riparian and bank conditions, pool and riffle quality, and gradient.

In order to more thoroughly examine the watershed, a QHEI was conducted at 18 sites throughout the watershed during November 2001 and August 2002 (Figure 29). Sites were randomly selected based upon safety issues and the ability to access the stream via a bridge location. Upon entering the waterbody, staff moved upstream or downstream no less than 150 meters so as not to consider physical effects of the bridge. After determining a center point, a width measurement was taken and multiplied by three to determine the reach. The stream reach provided the information for the QHEI.

Each parameter is scored individually and then summed to provide a total score, not to exceed 100. Based upon EPA 305(b) guidelines (USEPA, 1997), QHEI scores can typically be interpreted as follows:

$\geq$64	fully supporting for designated uses
<64 and $\geq$51	partially supporting for designated uses
<51	not supporting for designated uses

Figure 29 also illustrates the breakdown of scores based upon the criteria for use support assessment. A report of each parameter score per site as well as a sample QHEI form can be found in Appendix H.

Although the QHEI is typically used in conjunction with fish sampling, these results can be used to characterize instream habitat throughout the watershed. The results show that most sites located in agricultural areas north of Franklin are classified as “not supporting.” In addition, most sites that were found to be “not supporting” are located within legal drains. In general, these reaches are straight, an indication of channelization, and were designed to move water away from the land quickly. Due to their straight nature and lack of streamside vegetation, they have little opportunity to score high on the QHEI parameters. The sites classified as “partially supporting” occured on stream reaches that have increased channel morphology. On these channels, streambanks are more stable, and sinuosity increases. The two sites classified as “fully supporting” are located on Youngs Creek, south of Franklin. Youngs Creek is fairly wide in this area and has abundant streamside vegetation, instream cover, and well-developed riffle– run–glide reaches. This area south of Franklin is characterized by predominantly agricultural land and some low-density housing and is under much less developmental pressure that other areas in the northern portion of the county.

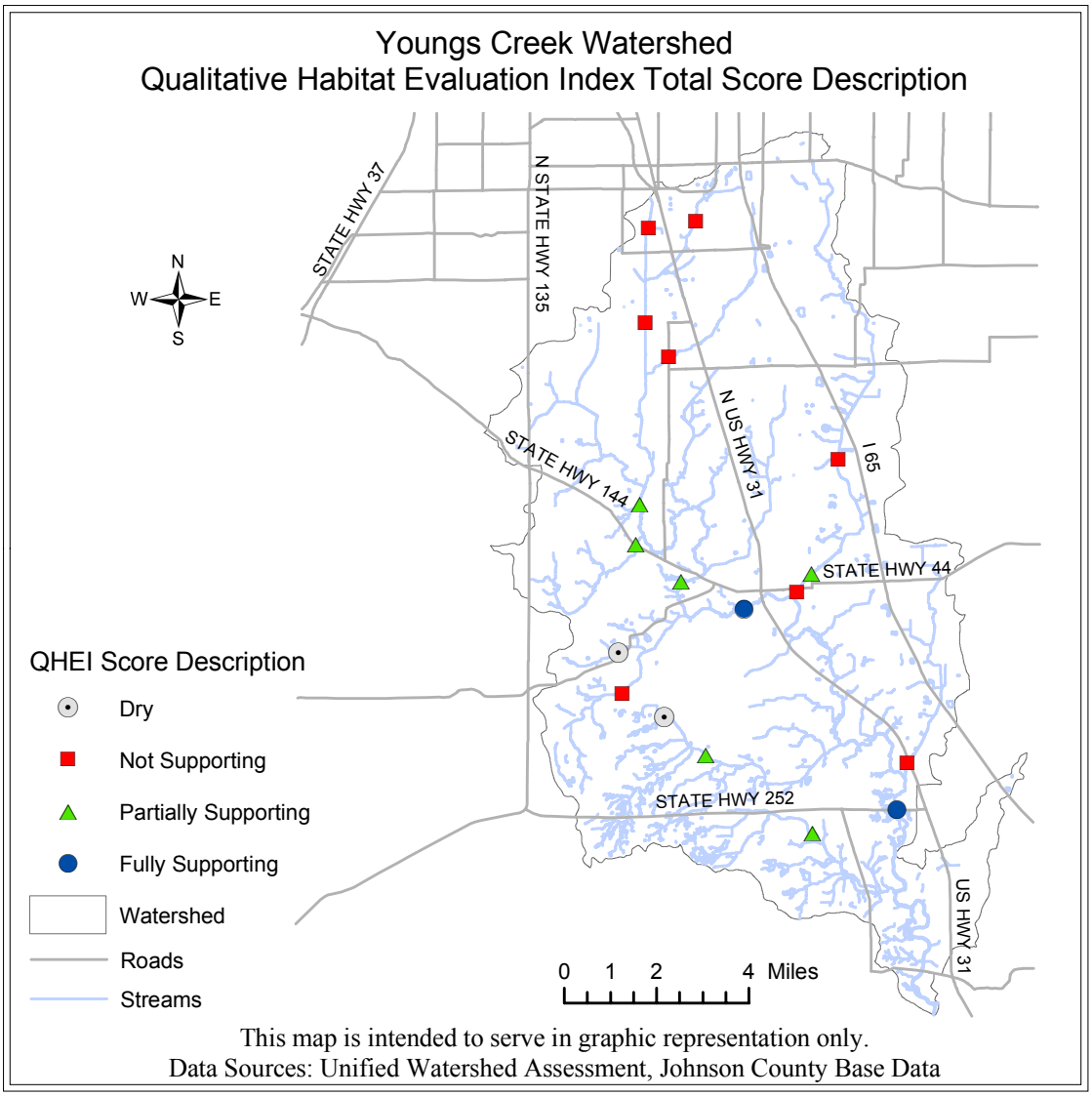

Figure 29. QHEI locations and scores within the Youngs Creek Watershed

Visual Assessment Results

As part of the watershed assessment, a windshield survey was conducted to obtain direct visual observations of streams and the surrounding land. In order to efficiently observe as many streams and creeks as possible while respecting private property, observations were made from bridges. Observations were made both upstream and downstream at 129 sites throughout the watershed. The survey was conducted four times during the project (April 2002, July 2002, November 2002, and March 2003) to observe temporal and seasonal changes in streams and surrounding landuses.

Observation sites were photographed with a digital camera, and survey observations were recorded on data sheets (Appendix I). Parameters recorded for each observation include basic stream characteristics, water appearance, surrounding landuse, riparian buffer width, percent summer canopy cover, and potential sources of pollution such as the presence of trash, livestock access to the stream, and streambank erosion. Survey results were compiled in a Microsoft Access database and exported to ArcView GIS. This section provides an overview of survey results for the watershed.

Water Clarity

The clearness of the water can indicate a number of things about water quality. Water becomes turbid or cloudy when suspended particles obscure sunlight from reaching the stream bottom. These particles can consist of clay, silt, and organic materials that are often washed into the stream from streambanks or surrounding land. Too much suspended sediment can threaten the health and habitat of aquatic plants, fish, and macroinvertebrates. These soil particulates can also carry chemicals and nutrients into streams that encourage the growth of algae and other unwanted organisms.

Due to time constraints and the scope of the project, specific measurements of turbidity and transparency were not conducted. Instead, a visual observation of water clarity was made. Water was classified as clear (stream bottom visible, no algae or other material on surface) or turbid (cloudy water, stream bottom obscured).

Water clarity can be influenced by several factors, particularly precipitation. Rain events can stir up existing creek sediment and introduce new silt through run-off. Since sediment is a nonpoint source pollutant, the specific source of sediment in the streams is difficult to determine. However, in some survey observations, the source of sediment was obvious. Inadequate soil erosion control measures implemented on several construction projects adjacent to streams caused erosion that directly affected water clarity in the watershed (Figure 30).

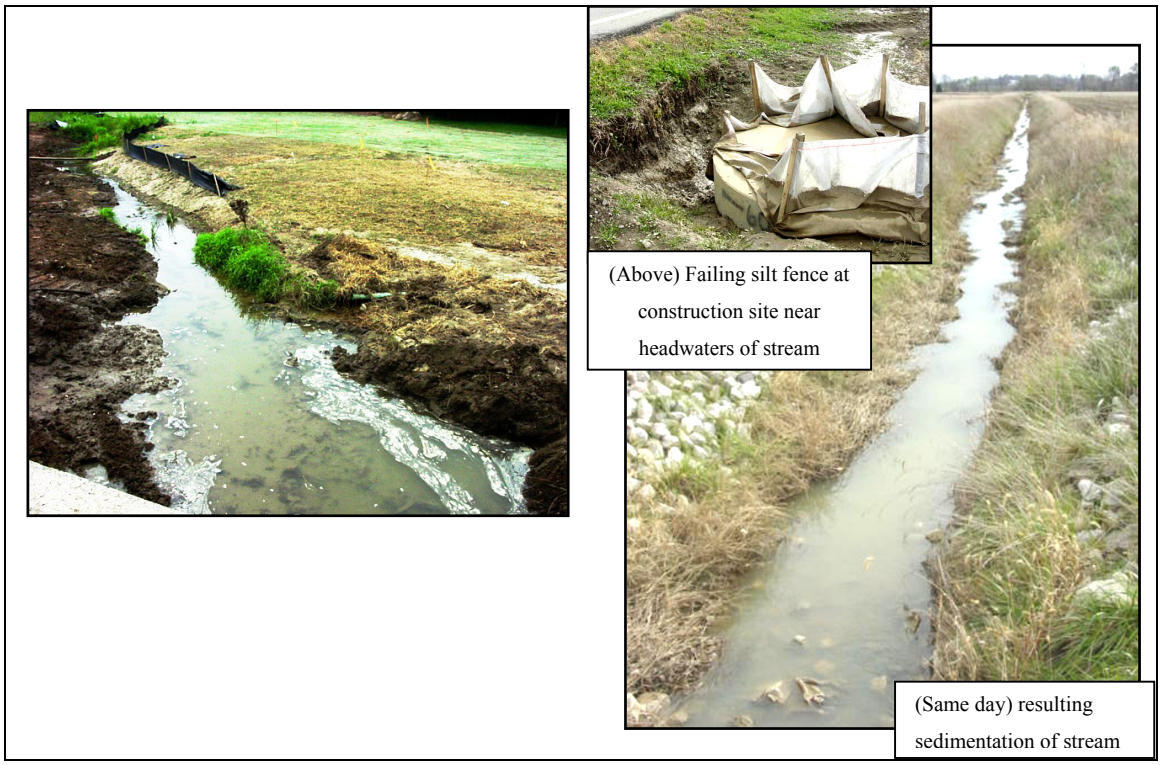

Figure 30. Stream observations of turbid water resulting from poor soil erosion control

The presence of algae was also noted during the survey of water clarity (Figure 31). Algae are microscopic plant organisms that, under the right conditions, can reproduce rapidly and form large visible clumps known as blooms. High nutrient levels, particularly phosphorus, are key to algal growth. High nutrient levels occur when streams receive run-off or leaching from nutrient-rich sources such as fertilized fields, lawns, manure, storm drains, septic systems, or sediment. Although algae do not usually produce toxic substances, oxygen depletion can take place when large amounts of algae decay in streams. The decomposing algae can deprive aquatic organisms of their oxygen supply, and the decay can also produce an unpleasant smell.

Figure 31. July 2002 observations of algal growth (residential and agricultural streams)

Algae are most productive and noticeable when streams are warm, clear, and calm. The growth of most algal species is limited in cool water temperatures, and turbid water prohibits growth by blocking sunlight from algal organisms. Calm water allows individual algal organisms to rise to the surface and absorb the maximum amount of sunlight. When on the surface, microscopic algal organisms often join together to form a visible scum, which was noted during the visual assessment.

Algal growth was seldom detected during the spring, fall, and winter surveys, when temperatures were lower. However, dramatic algal growth was observed during the July 2002 survey, most often in smaller headwater streams (Figure 32). These headwater stream sites where algae were observed possessed many beneficial characteristics for algal growth. In July, water temperatures were relatively warm, and water was mostly clear and calm. In addition, most sites provided plenty of exposure to sunlight; of sites where algal growth was observed, 79% were observed to have very little (less than 20%) stream surface shading. Also, the flow in these smaller streams decreased during the summer months, so the water surface was usually very calm. The results also indicate that nutrients were readily available in July to support algal growth in the streams.

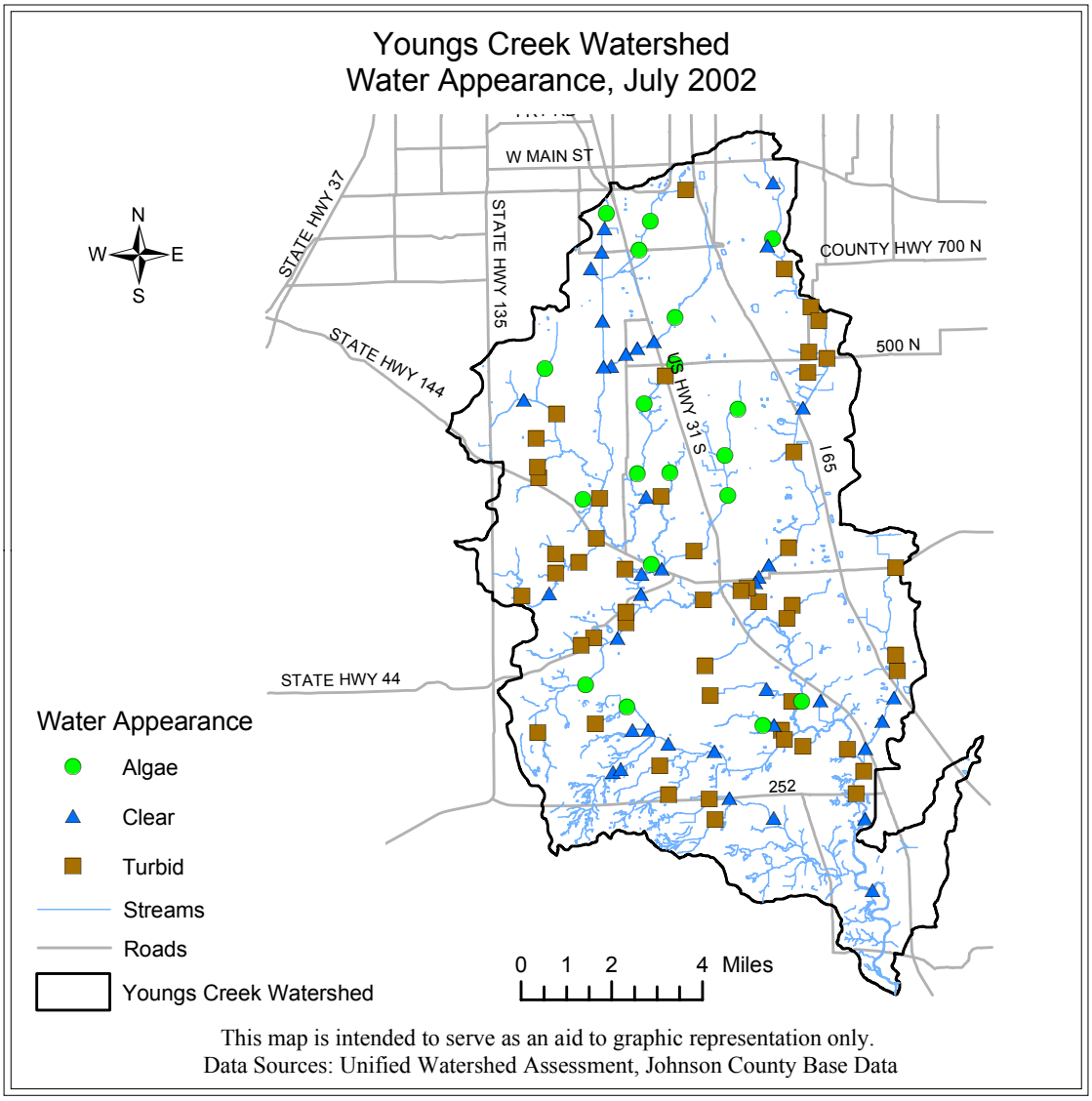

Figure 32. Water appearance, July 2002

Vegetated Riparian Buffer Width

Riparian buffer refers to the zone of land directly adjacent to stream channels. When left undisturbed, this buffer zone helps maintain stream water quality and healthy aquatic life. Tall grass or woody vegetation along this riparian buffer provides important water quality benefits. Vegetation filters sediment, nutrients, and other pollutants from run-off water during rain events, and it reduces erosion potential by stabilizing streambanks. In addition to direct water quality benefits, vegetated buffers provide habitat for wildlife, they help to shade the surface water and reduce the stream temperature, and they help slow and store floodwater.

A visual survey of the riparian buffer within the watershed provided a rough estimate of the watershed's capacity to provide these benefits. Results in Figure 33 show that most streams within

the watershed lack any vegetated buffer, and buffers that did exist were less than 30 feet in width, except for buffers in Atterbury State Fish & Wildlife Area. In addition, the visual survey revealed that streams outside legal drain boundaries were more likely to have vegetated buffers than streams inside legal drain boundaries.

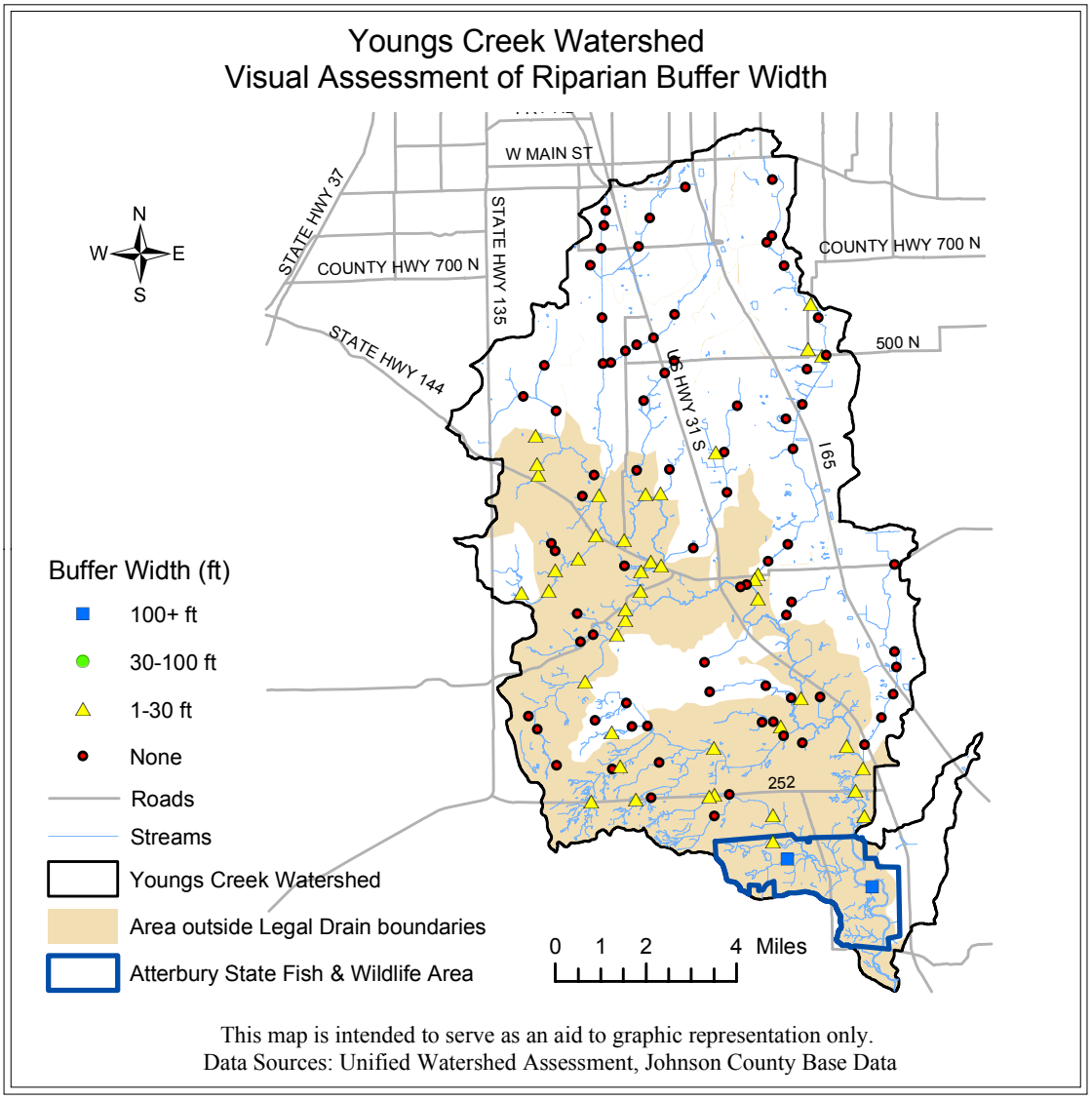

Figure 33. Vegetated riparian buffer width

The best example of a well-vegetated riparian buffer was found in Atterbury State Fish & Wildlife Area. Landuse surrounding the streams in Atterbury has been almost exclusively preserved for wildlife habitat, so the buffers are well developed (Figure 34). These buffers were dense with mature vegetation, and spanned over 100 feet on each side of the creek.

Figure 34. Wide forested stream buffer at Atterbury State Fish & Wildlife Area

By contrast, in most residential areas and urban neighborhoods within the watershed, vegetated buffer of stream segments was notably absent (Figure 35). In Whiteland, Greenwood, and Franklin neighborhoods, stream segments were often surrounded by mowed lawn. Tall vegetation adjacent to the creek was rare. Therefore, these stream segments are unprotected from the nutrients, sediment, and other pollutants often found in urban run-off water.

Figure 35. Stream segments in urban and residential areas with no vegetated buffer

Row crop agriculture constitutes the largest landuse in the watershed by area, and most streams in the watershed are surrounded, at least in part, by agricultural land. Thus, riparian buffers on agricultural land offer perhaps the greatest opportunity to protect stream segments in the watershed from run-off water. However, visual assessment results indicate that stream segments on agricultural land were often poorly protected. Woody vegetation was scarce. Narrow short grass buffers were typical, spanning less than 30 feet on either side of the streambank (Figure 36).

Figure 36. Stream segments in agricultural areas with marginal grass buffers

Several factors could be contributing to the lack of vegetated buffers in agricultural areas within the watershed. The installation of buffers on agricultural land requires the agricultural producer to remove riparian land from production. Existing federal programs such as the Conservation Reserve Program (CRP) are available to compensate producers for such practices, but enrollment of land in this and other such programs in the county has been relatively low.

In addition, most of the watershed's agricultural land is drained by legal drainage ditches, which are managed by the County Surveyor. Johnson County's current legal drain management strategies prohibit the development of woody riparian buffer zones within legal drain easements in order to prevent obstacles to legal drain maintenance. Legal drain maintenance includes the occasional removal of sediment and debris.

Visual survey results confirm that streams outside legal drain boundaries were more likely to have vegetated buffers than streams inside legal drain boundaries. An examination of the relationship between site location and riparian buffer size concludes that of 54 buffer sites within legal drains, 87% of these were observed to have no buffer (Table 12). The remaining 13% of sites were

categorized as having a vegetated buffer width of 1-30 feet. However, of the 60 sites observed outside legal drain boundaries, only 44% had no buffer, and 63% of sites had a vegetated buffer with a width of 1-30 feet.

Table 12. Analysis of vegetated buffer width within legal drain boundaries

	No Buffer	1-30 ft Buffer	30-100 ft Buffer	100+ ft Buffer
Sites within Legal Drain Boundaries (n=54)	87%	13%	0%	0%
Sites outside Legal Drain Boundaries (n=60)	44%	63%	0%	4%

Percent Summer Canopy Cover

The percent summer canopy cover refers to the amount of stream at a given site that is shaded by surrounding vegetation. Stream shading is important in providing fish habitat and preventing excessive water temperatures during the summer. Excessive water temperature can lead to depleted oxygen supply in the streams, which could adversely affect fish and macroinvertebrates. In addition, many aquatic species are adapted to a specific range of temperatures. Canopy cover for this survey was observed during July of 2002.

Canopy cover is related to woody riparian buffer vegetation. Mature trees and shrubs provide the stream with excellent shade cover during the summer months. Therefore, streams with well-developed riparian buffer often had abundant canopy cover, whereas streams with short grass buffer or no buffer at all did not (Figures 37 and 38).

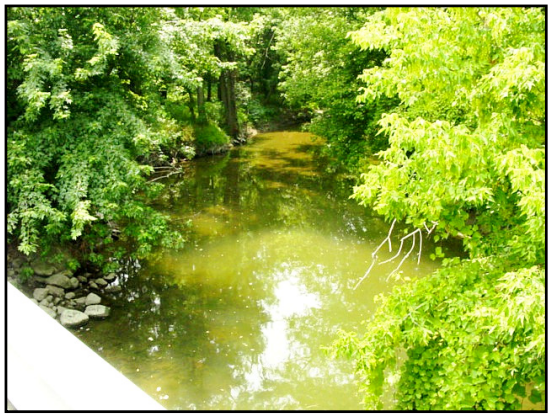

Figure 37. Well-shaded stream

Figure 38. Poorly shaded stream

For the same reason that vegetated riparian buffer zones were more likely to exist outside legal drain boundaries, streams outside legal drain boundaries were also more likely to have canopy

cover. The county's current legal drain management strategy prohibits the establishment of permanent woody vegetation within stream buffer zones. Table 13 supports that relationship, showing that of 56 observations recorded within legal drains, 80% of sites had streams with less than 20% canopy cover, and 98% of sites within legal drains had streams with less than 60% canopy cover. However, of 58 sites observed outside legal drains, only 26% of sites had streams with less than 20% canopy coverage, and 30% of sites had streams with canopy cover greater than 60%.

Table 13. Analysis of percent summer canopy cover within legal drain boundaries

	Canopy Cover				
	0-20%	**21-40%**	**41-60%**	**61-80%**	**81-100%**
Sites within Legal Drain Boundaries (n=56)	80%	5%	13%	2%	0%
Sites outside Legal Drain Boundaries (n=58)	26%	22%	22%	16%	14%

The percent summer canopy cover map illustrates the distribution of stream canopy cover at observation sites throughout Youngs Creek Watershed. The watershed area outside legal drains is shaded (Figure 39).

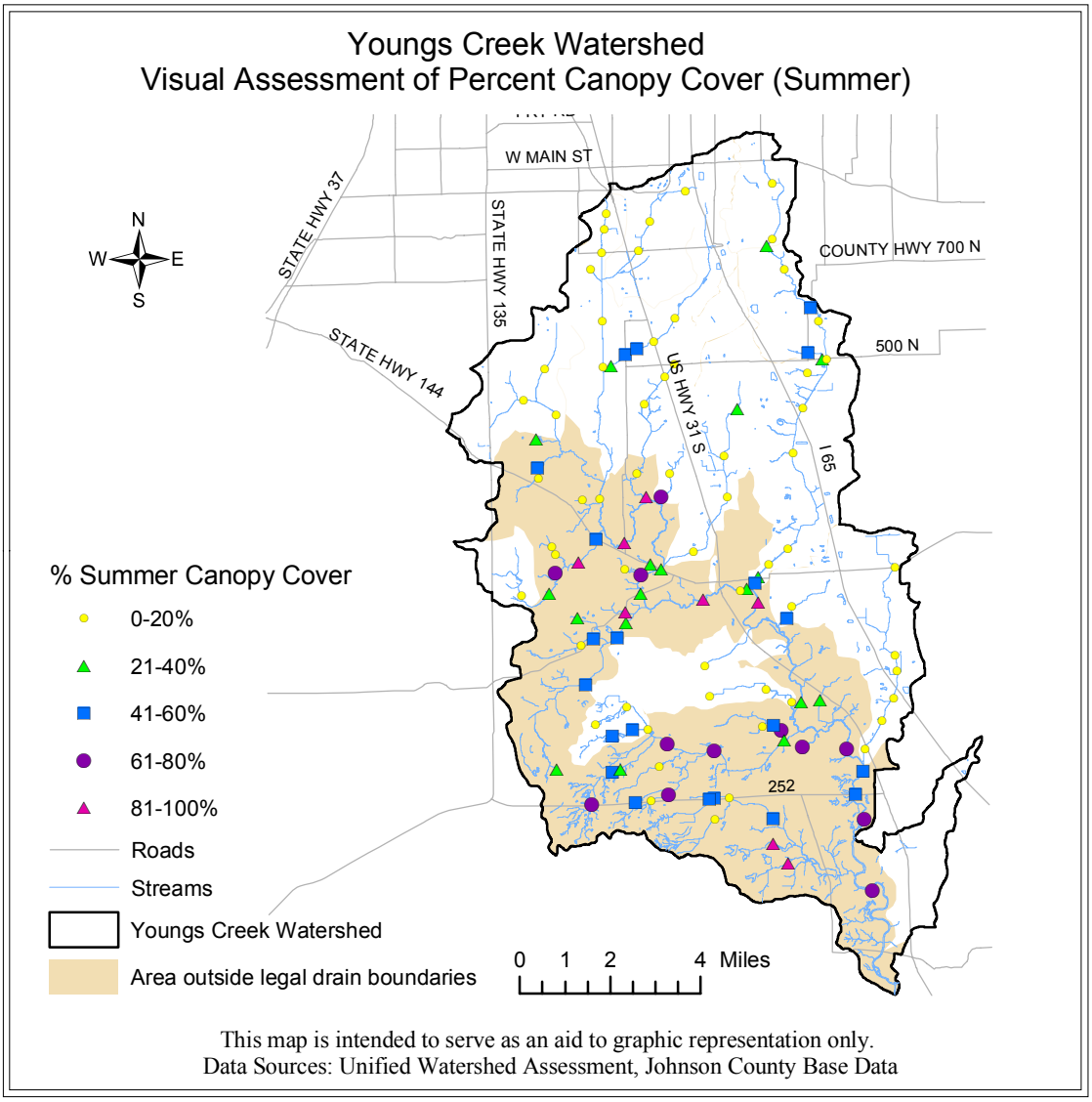

Figure 39. Percent summer canopy cover

Trash

During the survey, the presence or absence of trash in or near a stream was recorded. Trash can be introduced to the stream by several different methods. It can be deposited directly into streams by littering, it can be carried by run-off water or wind into the stream, or it can be picked up from the land by the stream itself. Once in the water, trash can float along the surface or sink to the bottom. In either scenario, trash can interfere with aquatic habitat, impede navigation, decompose, and harm wildlife. In addition to the water quality impacts, in-stream trash can also destroy the stream's aesthetic benefits.

Although large quantities of trash were not observed in any one location, trash was observed in small quantities at many sites throughout the watershed. Trash was most noticeable in and around

urbanizing areas and along major roadways, especially in Greenwood, Franklin, and New Whiteland (Figure 40). Trash observed during the survey, included beverage containers, plastic packaging, cigarette butts, tires, discarded appliances, and furniture (Figure 41).

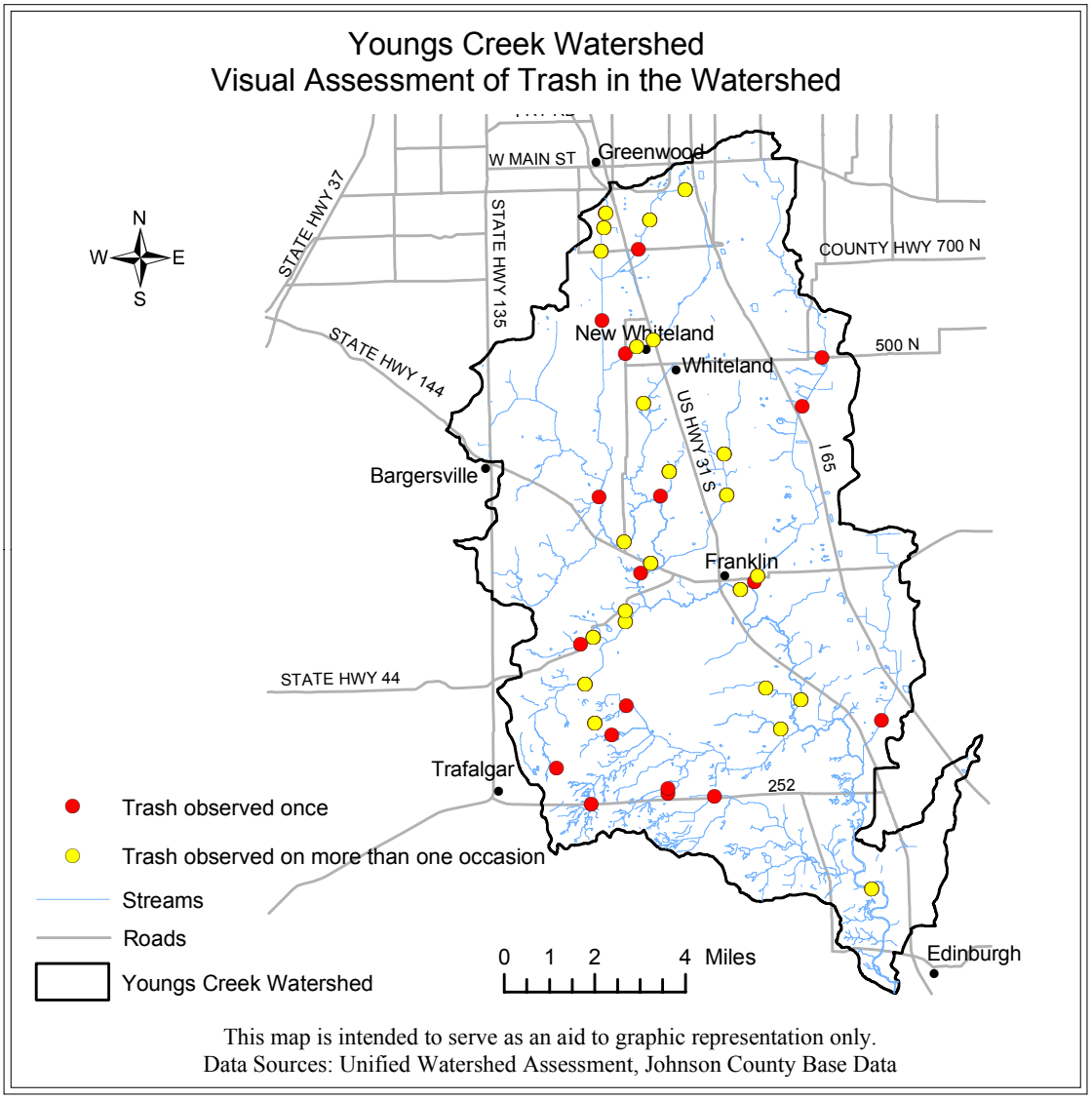

Figure 40. Trash in streams

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During the survey, the type of livestock observed was recorded and classified as "direct access" if the livestock were observed on pastureland with no barrier preventing access to a stream (Figure 42). An observation was classified as "potential access" if no livestock were present at the time of observation, but signs of livestock were noticed (i.e. fenced land for grazing and the presence of a barn, hoof tracks, or feeding troughs) (Figure 43).

Figure 42. Stream segments with cattle and horse access

Figure 43. Stream segments with signs of livestock access (tracks and trampling)

Figure 44 illustrates the distribution of sites where livestock access was observed, by livestock type. Most livestock access observations were located in the western portion of the watershed, specifically, in Roberts Ditch, Ray Creek, and Buckhart Creek subwatersheds. Of sites in the watershed with confirmed livestock access, types of livestock observed in or near streams during the survey included cattle (72% of sites with livestock access) and horses (28% of sites with livestock access).

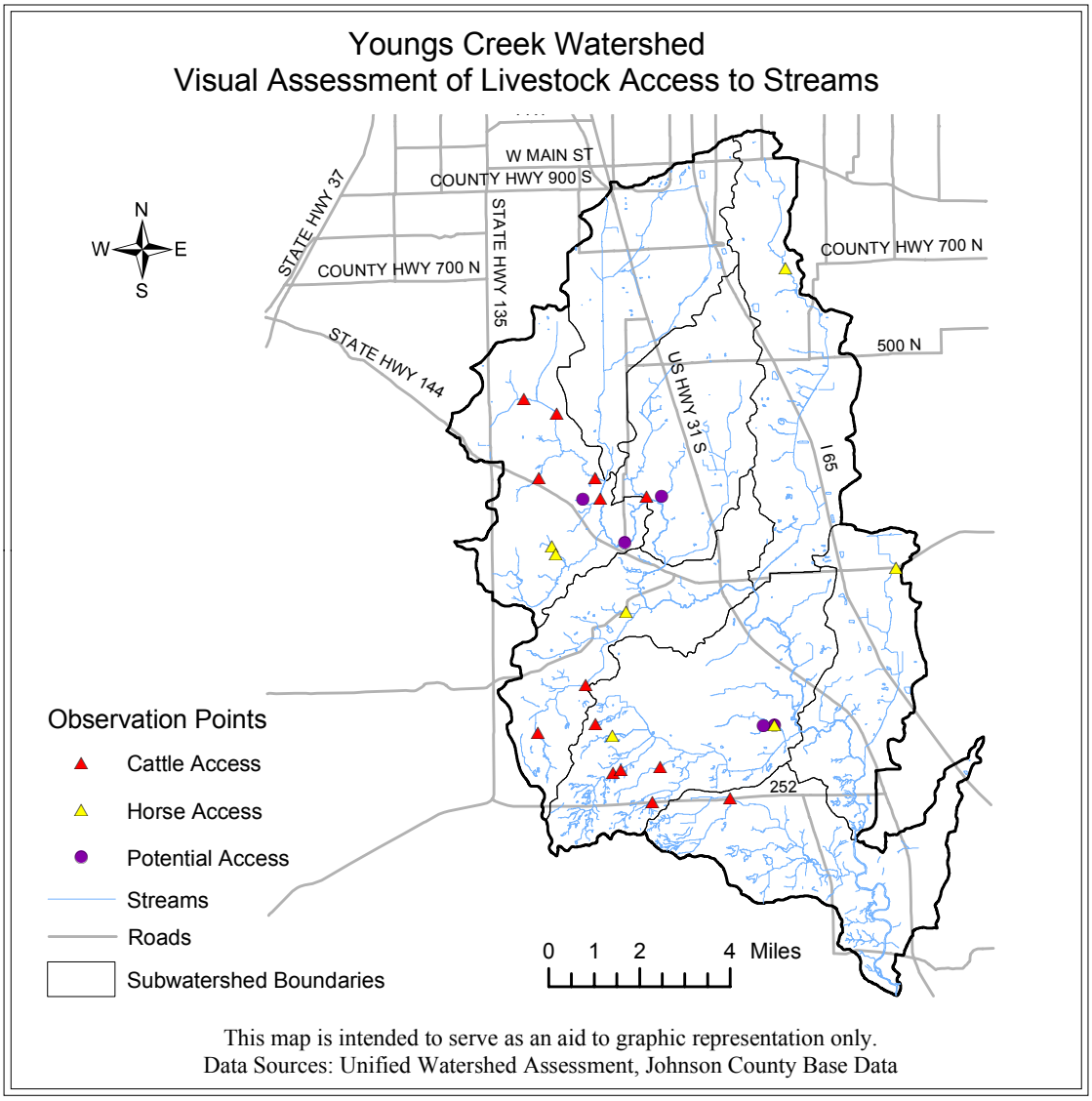

Figure 44. Livestock access to streams

Streambank 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 their banks, 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 aggravated by the lack of vegetated riparian buffer and direct livestock access to streams.

Excessive streambank erosion can lead to a number of water quality problems. As streambanks are eroded, vegetation and habitat for aquatic organisms are also lost. High sediment loads can reduce water clarity, respiration and feeding of aquatic organisms, and the penetration of

light needed for photosynthesis. The 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 excessive 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 greater energy applied to streambanks and greater potential for erosion.

In order to categorize evidence of streambank erosion, several parameters were considered: the presence of streambank vegetation, erosion along straight stretches, erosion along outer and inner bends of streams, overhanging vegetation, mature trees fallen into the stream (Figure 45), and slope failures or slumping (Figure 46).

Figure 45. Streambanks with erosion, overhanging vegetation, and fallen mature trees

Figure 46. Streambanks with evidence of slope failures

Based on these factors, erosion occurrence at each site was categorized as one of the following: none (stable banks), occasional (mostly stable banks, with some erosion or overhanging vegetation along outside bends), common (erosion occurring along outside and inside bends, may have slope failures or mature trees falling into stream), or heavy (severe slope failures, abundance of mature trees falling into stream, erosion occurring along straight stretches in addition to outside and inside bends, or the presence of artificial stabilization structures).

The results of the streambank erosion survey are mapped in Figure 47. In general, erosion was commonly seen in areas that received heavy stream flow but lacked adequate bank protection to absorb the stream's energy. However, several instances of streambank erosion observed depended greatly on site-specific factors such as surrounding landuse, management practices, topography, and soil characteristics.

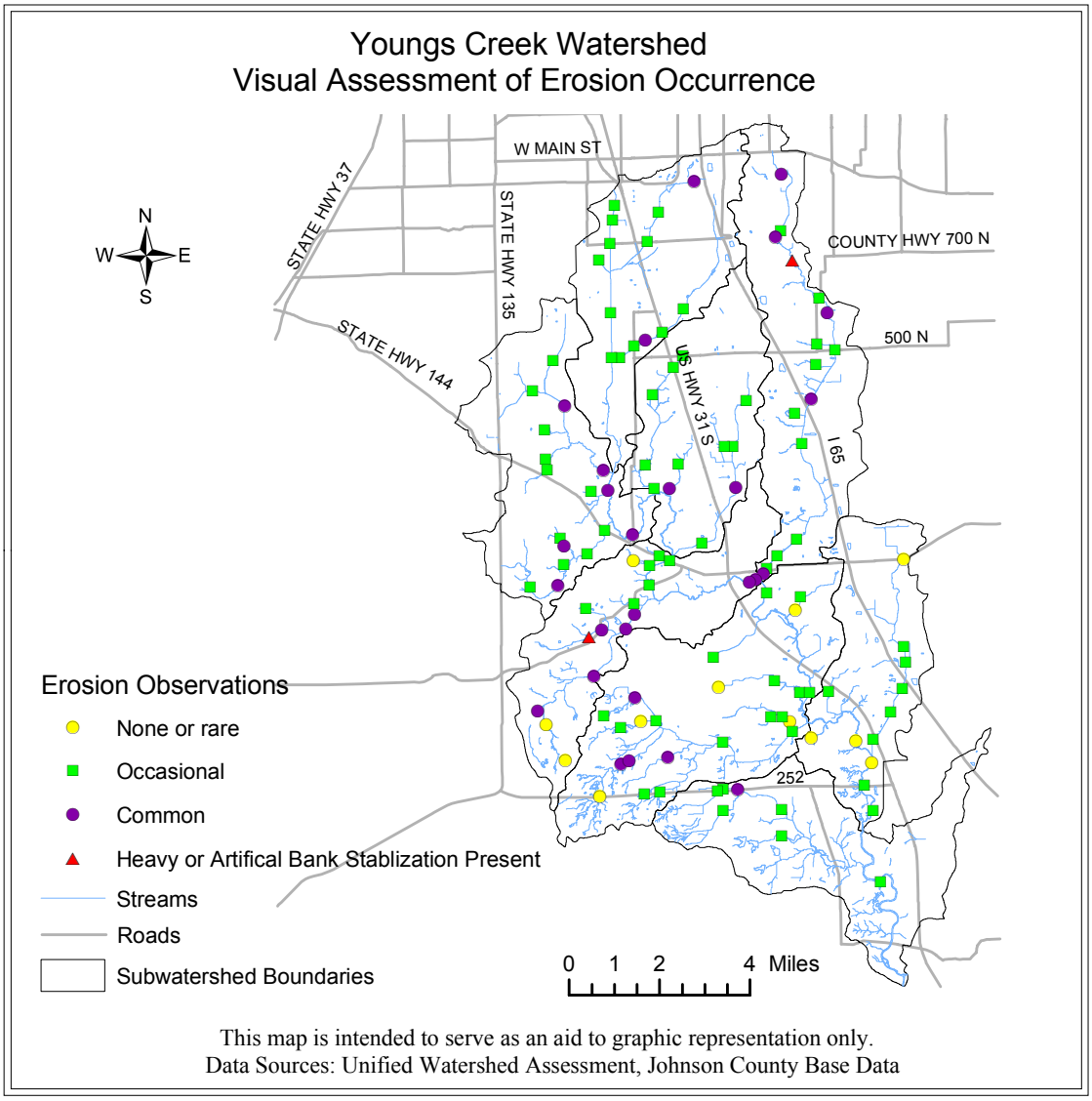

Figure 47. Erosion observations

Section V: Development of Problem Statements and Goals

The three Research Teams investigated the benchmark data and existing water quality information to determine the scope of each water quality concern and develop problem statements that adequately summarize the main concerns within the watershed. The following paragraphs and Table 14 summarize the discussions and decisions made by the Research Teams.

Problem Statements

The Agricultural Nonpoint Source Team (Ag Team) determined that existing data established the presence of waterborne pathogens in many streams in the watershed, and visual assessment results confirmed the presence of livestock in some streams and evidence of trampling, resulting in eroded streambanks. In addition, tillage transect survey results for Johnson County indicated that rates of conservation tillage adoption are low, especially for corn crops, and the Tillage Survey identified that local farmers face barriers to the adoption of conservation tillage. Based on this evidence, the Ag Team adopted the following problem statements:

1. Livestock with uncontrolled access to waterbodies may trample riparian areas, leading to increased bank erosion and sediment pollution. Further, pathogens from animal waste can cause digestive and other health problems in humans.

2. Conventional tillage methods leave exposed soils resulting in sedimentation and nutrient contributions to waterbodies in the watershed.

3. Results from the tillage survey indicate that operators/landowners are not informed about conservation practices on farmland and how farmland practices impact water quality. Additionally, they are unaware of the potential funding sources and manpower available to assist with conservation efforts.

The Loss of Riparian Corridors Team (Riparian Team) determined from landuse maps and visual observations that many buffer zones in the watershed are poorly vegetated, especially in the northern half of the watershed. The team also noted from visual observations that poor canopy cover was often correlated with the presence of algae, especially in summer months, and that streams within the county's legal drain system were less likely to have adequate riparian buffer zones. The lack of adequate buffer impacts a variety of water quality parameters, including aquatic habitat, stream temperature, the ability to filter pollutants from run-off water, and decreased aesthetic qualities. Based on this evidence, the Riparian Team adopted the following problem statement:

> The lack of protective vegetated buffer impacts the health of the streams in the Youngs Creek Watershed. This is exhibited by increased sedimentation, erosion, flooding, and algal blooms in summer, increased *E. coli* contamination, decreased in-stream habitat (temperature, contaminants, sediment), and decreased aesthetic qualities.

Table 14. Concerns, Stressors, Sources, and Problem Statements

Water Quality Concern (see section I)	Stressor (see section IV)	Source (see section IV)	Problem Statement
Agricultural Nonpoint Source Pollution	Trampling of streambanks	Livestock farming practices	Livestock with uncontrolled access to waterbodies may trample riparian areas, leading to increased bank erosion and sediment pollution. Further, pathogens from animal waste can cause digestive and other health problems in humans.
	Presence of waterborne pathogens		
	Sediment leaves cropland and is carried in run-off water into streams	Low rate of conservation tillage adoption, especially with corn crops	Conventional tillage methods leave exposed soils resulting in sedimentation and nutrient contributions to waterbodies in the watershed.
			Results from the tillage survey indicate that operators/landowners are not informed about conservation practices on farmland and how farmland practices impact water quality. Additionally, they are unaware of the potential funding sources and manpower available to assist with conservation efforts.
Loss of Riparian Corridors	Occurrence of streambank erosion	Inadequate bank cover and shading	The lack of protective vegetated buffer impacts the health of the streams in the Youngs Creek Watershed. This is exhibited by increased sedimentation, erosion, flooding, and algal blooms in summer, increased *E. coli* contamination, decreased in-stream habitat (temperature, contaminants, sediment), and decreased aesthetic qualities.
	Presence of algae during low-flow conditions		
	Inability of streams to support aquatic habitat		
	Sediment and other pollutants entering streams in run-off water	Inadequate buffers to filter sediment and other pollutants from run-off water	
Increased Impervious Surface / Urban Nonpoint Source Pollution	Evidence of trash, illicit dumping, and poor management of riparian zones in urban and urbanizing areas	Increased population in the watershed, resulting in increased amounts of impervious surfaces and urban landuses	Future increases in impervious surfaces and urban landuses threaten to increase pollutants that degrade aquatic health.
	Sediment entering streams	Lack of adequate erosion control implemented on construction sites in developing areas	

The Increased Impervious Surface / Urban Nonpoint Source Pollution Team (Urban Team) determined that landuse maps show a definite increase in urban areas and impervious surfaces in the watershed, and these increases have the potential to impact water quality in the watershed. In addition, the growing urban population in a traditionally agricultural watershed requires the need for more urban-based water quality education. Visual observations confirmed that trash material is entering waterbodies in and around urban areas and that run-off from construction areas often contains sediment that enters waterbodies in the watershed. Based on this evidence, the Urban Team adopted the following problem statement:

> Future increases in impervious surfaces and urban landuses threaten to increase pollutants that degrade aquatic health.

Development of Goals

Based on the problem statements in the previous section, each Research Team reviewed existing data, considered alternatives, and developed twelve main goals to address water quality issues in the Youngs Creek Watershed:

Agricultural Goals

1. By August 2007, implement no-till on 40% of corn after soybeans and 80% of beans after corn.
2. Increase awareness about how farmland practices may impact water quality. Increase participation in conservation programs by 100% through cost-share, Farm Bill programs, and other efforts by 2007.
3. Encourage and promote the use of watering and manure management systems.

These efforts will be directed to existing agricultural land within the watershed and will be specifically targeted to land that is not likely to undergo landuse change; this area is shaded in green in Figure 48.

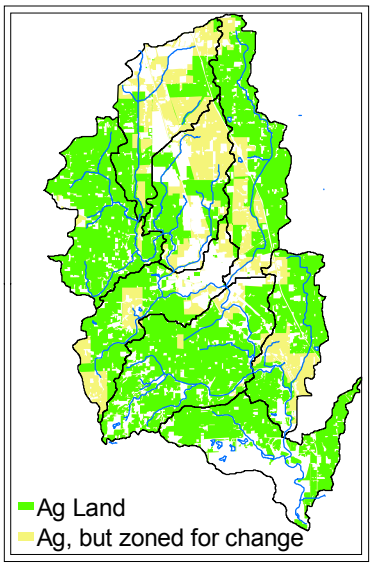

Figure 48. Area of focus for Agricultural Goals

Riparian Goals

These goals will be targeted to areas that currently do not have adequate buffer, located predominantly in the northern half of the watershed. Current buffers are shaded in green in Figure 49. More precise prioritization will occur at the completion of the riparian buffer assessment (Goal #4).

4. Assess the status of riparian buffers in the Youngs Creek Watershed.
5. Prioritize riparian buffer restoration areas within the Youngs Creek Watershed.
6. Improve or maintain riparian buffers adjacent to streams (natural, man-made, or altered), ponds, and wetlands throughout the watershed. This consists of an ongoing and incremental goal of increasing buffers where absent or insufficient, maintaining existing buffers, and connecting existing buffers where possible.
7. Promote riparian buffer installation through outreach efforts targeted at three primary audiences within the watershed: agricultural producers urban residents, and rural or low-density residential.
8. Equip policy makers with information they need to improve and maintain riparian buffers in the watershed.

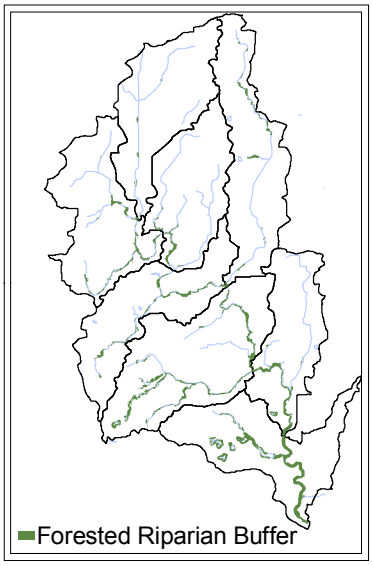

Figure 49. Current locations of adequate forested buffer

Urban Goals

These strategies will be targeted to urban and urbanizing areas, shown in Figure 50.

9. Promote water-friendly behaviors among residents and officials in urban and urbanizing areas of the watershed.
10. Promote dialogue among engineers, officials, and other professionals in the watershed about the installation and maintenance of structures and/or practices (BMPs) that counterbalance impervious surface run-off.
11. Determine the need to re-design or alter retention ponds in existing subdivisions to meet design standards set forth in the Johnson County Subdivision Control Ordinance, and share this information with the subdivision residents.
12. Provide input to Stormwater Phase II entities in Johnson County during the Phase II planning process.

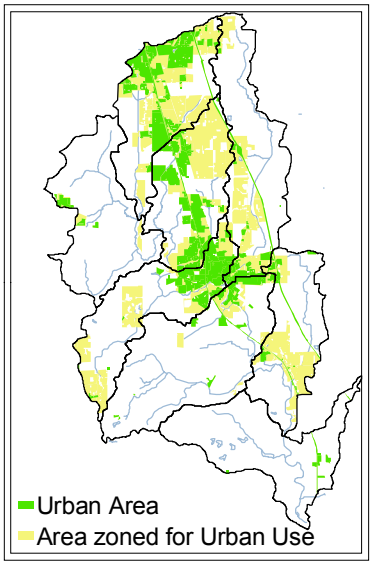

Figure 50. Area of focus for urban goals

For each goal, the research teams developed a list of objectives, action items, target audiences, responsible parties, tentative schedules, and potential indicators to measure progress. The Agricultural Goals and objectives are listed in Table 15; the Riparian Goals and objectives are listed in Table 16; and the Urban Goals and objectives are listed in Table 17. Each Research Team also created an action register, listing each action item, description of the action, technical resources, estimated costs, financial resources, and potential financial partners. Appendix J includes action registers for the Agricultural Goals, the Riparian Goals, and the Urban Goals.

Table 15. Agricultural Goals and Objectives

Agricultural Problem Statement:
Conventional tillage methods leave exposed soils resulting in sedimentation and nutrient contributions to waterbodies in the watershed.

Goal 1:
By August 2007, implement no-till on 40% of corn after soybeans and 80% of beans after corn.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Provide up-to-date information about conservation tillage.	Evaluate current studies on conservation tillage. Develop and distribute fact sheets.	Agricultural landowners/ operators	SWCD Youngs Creek Project – Ag Outreach Specialist	Dec 2003-Dec 2008	# Farmers who convert to no-till or reduced till
Promote existing educational and incentive programs for conservation tillage.	Inform operators about USDA programs through mailings. Hold informational meetings about existing incentive programs. Develop web-based resource site about USDA programs.	Agricultural landowners/ operators	SWCD Youngs Creek Project – Ag Outreach Specialist	On-going	# Program applicants # People at meetings
Create a cost-share program that encourages conservation tillage.	Develop criteria for cost-share program. Promote the cost-share program. Implement the program.	Agricultural landowners/ operators	SWCD Youngs Creek Project – Ag Outreach Specialist	Development Dec 2003-June 2004 Cost-share distribution July 2004-Dec 2005	# Projects funded through cost-share Estimated amount of soil erosion reduced through cost-share

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Conduct adult and youth education programs related to conservation practices	Develop basic series for adults on the economics of conservation tillage, focusing on "how to make it work."	Landowners/ operators Agency personnel	SWCD Youngs Creek Project – Ag Outreach Specialist	Program development Dec 2003-Dec 2005 Education on-going	# Program applicants # Attendees at programs # Participants in youth activities
	Develop youth education series on the economics of soil erosion and land use decisions.	4-H FFA Youth Board			
Showcase successful practices and operators.	Develop criteria for conservation award.	General public Landowners/ operators	SWCD Youngs Creek Project	Jan 2004-June 2004	Conservation tillage transect data
	Provide awards and public recognition to operators succeeding with conservation tillage.			Initiate Awards by 2005 and distribute on an on-going basis	
	Provide tours of successful operations			Tours, annual beginning in 2005	

Agricultural Problem Statement:
Results from the tillage survey indicate that operators/landowners are not informed about conservation practices on farmland and how farmland practices impact water quality. Additionally, they are unaware of the potential funding sources and manpower available to assist with conservation efforts.

Goal 2:
Increase awareness about how farmland practices may impact water quality. Increase participation in conservation programs by 100% through cost-share, Farm Bill programs, and other efforts by 2007.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Secure personnel to promote existing programs, encourage the use of BMPs, and conduct education and outreach programs.	Hire an Ag Outreach Specialist	---	SWCD	Begin in Nov 2003	--

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Solicit input of agricultural leaders on how to reach rural/ag community.	Meet with representatives of local agencies and businesses to identify respected leaders in the ag community.	Agricultural landowners/ operators	Youngs Creek Project – Ag Outreach Specialist NRCS	Identify leaders on-going Mailing List completed by Dec 2004	# People reached by mailings
	Develop improved mailing lists for newsletters, publications, and special event mailings.				
Educate stakeholders about environmental stewardship on their land.	Research and illustrate economic benefits of conservation practices.	Agricultural landowners/ operators	Youngs Creek Project – Ag Outreach Specialist NRCS Youngs Creek Project – Ag Outreach Specialist NRCS	Economic research completed by Oct 2004 Meetings on-going Infrared photos available in May 2004 Worksheets developed Dec 2004 Field Day completed by Dec 2004	# of people contacted through personal contacts and public meetings # of participants and sponsors for field day
	Discuss conservation practices with stakeholders through public meetings and personal contact.				
	Utilize infrared photography to help stakeholders recognize need and opportunities for conservation projects.				
	Develop worksheets to record environmental stewardship and land concerns.				
	Develop an Ag Water Quality Field Day.				

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Develop relationships and collaborations with local agribusinesses.	Identify and develop contact list for local agriculture-related businesses. Inventory existing events that offer the potential to involve agribusinesses. Utilize businesses to help promote existing conservation and incentive programs and distribute informational material.	Agribusiness owners and employees	Youngs Creek Project – Ag Outreach Specialist NRCS	Contact list completed June 2004 Collaboration ongoing	# of agricultural businesses involved in conservation initiatives
Enroll participants in incentive programs and provide technical services for practices including grassed waterways, WASCOBs, grade stabilization structures, filter strips, riparian forest buffer, nutrient management, and pest management.	Discuss with potential applicants the benefits of conservation programs and the assistance they can receive. Assist participants with cost-share applications for Farm Bill and other incentive programs.	Agricultural landowners/ operators	Youngs Creek Project – Ag Outreach Specialist NRCS	Contact on-going	# of participants in Farm Bill Programs # acres with conservation plans and practices

Agricultural Problem Statement:
Livestock with uncontrolled access to waterbodies may trample riparian areas, leading to increased bank erosion and sediment pollution. Further, pathogens from animal waste can cause digestive and other health problems in humans.

Goal 3:
Encourage and promote the use of watering and manure management systems.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Investigate new technologies for watering and manure management systems.	Gather information and evaluate current research	Livestock Operators	Young Creek Project NRCS	Investigation on-going, complete by 2008	--
Provide information to producers about manure management alternatives.	Develop and distribute fact sheets about water quality. Host a seminar series.	Livestock Operators	Youngs Creek Project – Ag Outreach Specialist NRCS	Meetings on-going Fact sheets complete by 2005	# of people who receive information
Promote livestock exclusion and manure management practices by utilizing incentive programs.	Meet individually with livestock producers.	Livestock Operators	SWCD/Youngs Creek Project NRCS	Promotion on-going	# Plans developed for nutrient management and livestock watering facilities , # Participants enrolled in incentive programs, # of livestock observed in streams, *E.coli* counts in watershed streams

Table 16. Riparian Goals and Objectives

Riparian Problem Statement:
The lack of protective vegetated buffer impacts the health of the streams in the Youngs Creek Watershed. This is exhibited by increased sedimentation, erosion, flooding, and algal blooms in summer, increased *E. coli* contamination, decreased in-stream habitat (temperature, contaminants, sediment), and decreased aesthetic qualities.

Goal 4:
Assess the status of riparian buffers in the Youngs Creek Watershed.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Identify riparian vegetated buffers in the watershed.	Conduct visual field assessments.	SWCD/Youngs Creek Assessment	SWCD/Youngs Creek Assessment	Present to 2 years	Watershed-wide map of existing stream buffer types and widths.
	Map the watershed using all data sources.				
	Document status of riparian buffers by ground photography, aerial photography, and/or satellite imagery.				

Goal 5:
Prioritize riparian buffer restoration areas within the Youngs Creek Watershed.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Identify the appropriate riparian buffer type, width, and distribution for each land use category in the watershed.	Determine ranking criteria.	SWCD/Youngs Creek Assessment	SWCD/Young Creek Assessment	Year 1 to Year 3	Watershed-wide map of riparian-buffer restoration priority areas (ranked).
	Identify primary land use categories.				
	Identify future zoning and areas of potential development.				
	Apply criteria to the watershed to determine restoration priorities.				

Goal 6:
Improve or maintain riparian buffers adjacent to streams (natural, man-made, or altered), ponds, and wetlands throughout the watershed. This consists of an ongoing and incremental goal of increasing buffers where absent or insufficient, maintaining existing buffers, and connecting existing buffers where possible.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Increase stream buffers by 40% in the northern part of the watershed near agricultural land use. Also concentrate on any high priority areas in the rest of the watershed identified in Goal #2.	Determine criteria for various funding-grant-incentive programs. Attempt to predetermine qualification for programs for farmers and present the options to each one as a "package" of options.	Agricultural producers.	SWCD/Young Creek Assessment; Agricultural outreach personnel, NRCS	Present to Year 5	Visual assessment. QHEI scoring after five years should show whether additional buffers are having an impact on stream health.
Increase stream buffers in the northern part of the watershed so that nearly 100% of streams have at least a minimum width of riparian vegetated buffer.	Determine criteria for various funding-grant-incentive programs. Attempt to predetermine qualification for programs for farmers and present the options to each one as a "package" of options	Landowners in the northern portion of the watershed, including agricultural and urban areas.	SWCD/Young Creek Assessment; Agricultural outreach personnel, NRCS	Year 5 to Year 10	Visual assessment. QHEI scores.
Connect existing buffers to create continuous buffers where possible throughout the entire watershed.	Provide cost-share funding, education, outreach, and demonstration projects.	Landowners in the northern portion of the watershed, including agricultural and urban areas.	SWCD/Young Creek Assessment	Year 5 to Year 10 (ongoing)	Visual assessment. QHEI scores.
Improve buffers throughout entire watershed so that appropriate buffer types and widths exist for 50% of the entire watershed.	Provide cost-share funding, education, outreach, and demonstration projects.	Landowners in the northern portion of the watershed, including agricultural and urban areas.	SWCD/Young Creek Assessment; Agricultural outreach personnel, NRCS	Year 10 to Year 15	Visual assessment. QHEI scores.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Improve buffers throughout entire watershed so that appropriate buffer types and widths exist for nearly 100% of the entire watershed.	Provide cost-share funding, education, outreach, and demonstration projects.	Landowners in the northern portion of the watershed, including agricultural and urban areas.	SWCD/Young Creek Assessment; Agricultural outreach personnel, NRCS	Year 15 to Year 20	Visual assessment. QHEI scores.
Reassess riparian vegetated buffers in the watershed.	Conduct visual field assessments.	SWCD/Young Creek Assessment	SWCD/Young Creek Assessment	Year 20 (Assessment will occur every 5 years, but the current goal is to have a watershed-wide riparian buffer corridor by Year 20).	Thorough description and assessment. QHEI scores.
	Map the watershed using all data sources.				
	Document status of riparian buffers by ground photography, aerial photography, and/or satellite imagery.				

Goal 7:
Promote riparian buffer installation through outreach efforts targeted at three primary audiences within the watershed:

1. Agricultural producers
2. Urban or high-density residential (homeowners' associations, apartment complexes, schools, some businesses)
3. Rural or low-density residential (individual homeowners who are personally responsible for decisions made on their properties)

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Promote riparian buffer installation adjacent to agricultural lands within the watershed.	Market existing programs (CRP, EQIP, WRP, WHIP, etc.) to agricultural producers.	Agricultural producers FFA, Farm Bureau, Extension Advisory Board	Agricultural outreach personnel, NRCS	Present to Year 20. (ongoing)	Number of participants/acres enrolled in programs.
	Develop system of recognition.				

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Promote riparian buffer installation adjacent to retention ponds in subdivisions.	Install a buffer demonstration project in a subdivision.	Urban audiences	SWCD/Young Creek Assessment	Present to Year 5. (ongoing)	Number of homeowners' associations who agree to receive information; number of visitors to demonstration areas; number of cost-share projects funded; and number of associations or communities that qualify for recognition (number of associations implementing water-friendly practices).
	Educate homeowners by providing information.				
	Install a demonstration project at a local school showing plant species that are attractive, easily maintained, and appropriate for buffers.				
	Make cost-share funds available to homeowners' associations for buffer installation in urban areas.				
	Develop a system of recognition for homeowners' associations or local communities.				
Initiate a targeted campaign to raise awareness about stream buffers and promote riparian buffer installation adjacent to streams in rural non-agricultural areas of the watershed.	Cooperate with experts and businesses to develop literature that gives specific guidance for buffer installation and create opportunities for discounted purchase of buffer plants (i.e., local nurseries or home/garden stores).	Rural audiences	SWCD/Young Creek Assessment	Present to Year 5. (ongoing)	Number of stores participating in campaign; number of coupons redeemed; number of homeowners recognized.
	Develop a system of recognition to reward individual homeowners.				

Goal 8:
Equip policy makers with information they need to improve and maintain riparian buffers in the watershed.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Promote riparian buffer installation adjacent to waterways within city/county control.	Monitor governmental agenda, upcoming decisions or legislation that have the potential to impact water quality.	City/County Councils (local government); Drainage Board; county commissioners; County Surveyor;	SWCD/Young Creek Assessment	Present to Year 5. (ongoing)	Number of issues where experts provided information about impacts to water quality; number of special speakers/ meetings.
	Identify and organize local experts who are willing to provide information to decision-makers when such information is needed.				
	Identify opportunities for agencies such as the Central Indiana Land Trust, IDNR, or IDEM to speak to local decision-makers.				
Encourage county government to take green space, buffers, and corridors into account when planning for future zoning and development. (**Important for stream health as well as aquifer recharge and subsurface water quality.)	Monitor governmental agenda, upcoming decisions or legislation that have the potential to impact water quality.	County Planning and Zoning Board, County government officials, boards, commissions, task forces, study groups.	SWCD/Youngs Creek Assessment	Present to Year 5. (ongoing)	Number of issues where experts provided information about impacts to water quality; number of special speakers/ meetings.
	Identify and organize local experts who are willing to provide information to decision-makers when such information is needed.				
	Identify opportunities for agencies such as the Central Indiana Land Trust, IDNR, or IDEM to speak to local decision-makers.				

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Encourage county officials to change maintenance practices along legal drains to include vegetated riparian buffer installation and less chemical application.	Monitor governmental agenda, upcoming decisions or legislation that have the potential to impact water quality.	County Surveyor, County government officials, boards, commissions, task forces, study groups.	SWCD/Youngs Creek Assessment	Present to Year 5. (ongoing)	Number of issues where experts provided information about impacts to water quality; number of special speakers/ meetings.
	Identify and organize local experts who are willing to provide information to decision-makers when such information is needed.				
	Identify opportunities for agencies such as the Central Indiana Land Trust, IDNR, or IDEM to speak to local decision-makers.				

Table 17. Urban Goals and Objectives

Urban Problem Statement:
Future increases in impervious surfaces and urban landuses threaten to increase pollutants that degrade aquatic health.

Goal 9:
Promote water-friendly behaviors among residents and officials in urban and urbanizing areas of the watershed.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Initiate large-scale campaign to make residents of urban and urbanizing areas aware of water quality issues.	Publish a series of articles in existing newsletters or newspapers	General public	SWCD/Youngs Creek Project	Initiate by year 2, with a target of 4 articles released/ year.	Estimated audience.
	Exhibit a series of displays about water-friendly behaviors.	General public – targeted to urban locations.	SWCD/Youngs Creek Project	Initiate by year 2, with a target of 2 displays/year.	Number of locations hosting displays.
	Display a video and distribute related promotional items at county and community fairs.	General public	SWCD/Youngs Creek Project	Initiate by year 2, with a target of 1 display/year.	Estimated audience at each fair.
Promote existing programs (Indy Tox-drop and Spring Cleanup Day) that collect household hazardous wastes.	Initiate a targeted literature campaign.	General public	SWCD/Youngs Creek Project, Johnson County Solid Waste Management District	Initiate campaign in year 1 (Indy Tox-Drop is ongoing, Cleanup Day is yearly).	Number of Tox-Drop vouchers issued, number of cars served at Franklin clean-up, number of HHW lbs collected.
Promote awareness of storm drain pollution among residents of subdivisions within the watershed.	Sponsor storm drain labeling projects	Residents of subdivisions with storm drains.	SWCD/Youngs Creek Project	Initiate by year 2, with a target of 4 subdivisions labeled/year.	# of subdivisions labeled, articles or press releases issued, civic groups involved in labeling, total flyers passed out
Promote automobile maintenance among watershed residents.	Initiate a targeted literature campaign.	Citizens who change their own motor oil/ other auto fluids.	SWCD/Youngs Creek Project	Initiate by year 2, with materials made available on an ongoing basis.	Quantity of literature distributed, before/after rates of local oil/fluid recycling

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Promote proper retention pond maintenance to homeowners' associations (HAs) and other groups.	Distribute informational material to each HA.	HA representatives.	SWCD/Youngs Creek Project	Information to be made available within the next 2 years.	# HAs reached # of residents represented by each HA
	Hold a field day/workshop for HAs and other related groups.	HAs, planners, developers, others who design or maintain ponds	SWCD/Youngs Creek Project	To be initiated after completion of the riparian buffer demonstration project.	# of participants
Encourage homeowners to reduce applications of fertilizers and other yard chemicals.	Initiate a targeted literature campaign.	People who purchase and apply synthetic chemicals to lawns and gardens.	SWCD/Youngs Creek Project	Initiate by year 2, with materials made available on an ongoing basis.	# of places where educational materials are made available # of printed materials distributed.
Promote proper use of road salt and sand among city and county officials within the watershed.	Provide literature to city and county street departments. Hold a 2-hr special meetings for officials.	City and county officials	SWCD/Youngs Creek Project	Initiate by year 2, with materials made available on an ongoing basis.	# of participants, amount of literature distributed.
Analyze the impact of septic systems on watershed streams in order to target education about proper septic system maintenance to residents in the watershed.	Study the distribution of *E. coli* in watershed streams.		SWCD/Youngs Creek Project County Health Department	Begin in year 1.	
	Targeted literature campaign.	Septic system owners.		To be initiated after completion of the study.	# of places where materials are made available.

Goal 10:
Promote dialogue among engineers, officials, and other professionals in the watershed about the installation and maintenance of structures and/or practices (BMPs) that counterbalance impervious surface run-off.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Encourage builders, developers, contractors, and other onsite workers to implement appropriate sediment control measures during construction	Hold meeting or workshop for builders, developers, and contractors to discuss or demonstrate BMPs.	Builders, developers, contractors, and other onsite workers.	SWCD/Youngs Creek Project	Initiate by year 1. Depending on success, it may become an annual event.	Number of people who attend the meeting or receive information.
	Make information about proper techniques and procedures available.	Onsite workers	SWCD/Youngs Creek Project	Initiate by year 1, through planning dept and IDNR soil conservationist.	Number of printed materials distributed.
Encourage discussion about more stringent water quality standards for retention ponds among city officials.	Hold a meeting for town boards, councils, and other interested officials to discuss their subdivision control ordinances.	City and county officials	SWCD/Youngs Creek Project	Initiate by year 2, with information made available continuously.	# of people at the meeting. # of towns/cities represented.
Promote impervious surface alternatives in the watershed	Construct a permeable surface demonstration plot and signage in a visible area to raise awareness.	General public, officials, planners, etc.	SWCD/Youngs Creek Project	To be initiated when an opportunity is provided for construction of a new parking lot.	

Goal 11:
Determine the need to re-design or alter retention ponds in existing subdivisions to meet design standards set forth in the Johnson County Subdivision Control Ordinance, and share this information with the subdivision residents.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Evaluate pond standards in existing subdivisions in Johnson County	Conduct a records survey.	NA	SWCD/Youngs Creek Project	To be initiated within 1 year.	Number of subdivisions examined.
	Share survey results with the public.	General public, HA's	SWCD/Youngs Creek Project	To be completed at the end of the records survey.	Number of people informed about the status of their subdivisions

Goal 12:
Provide input to Stormwater Phase II entities in Johnson County during the Phase II planning process.

Objective	Action Items	Target Audience	Responsible Party	Schedule	Indicators
Distribute results of the Youngs Creek Assessment and Management Plan to Phase II entities in the county.	Obtain contact information for and distribute watershed-related materials to all Phase II entities in the county.	Phase II entities	SWCD/Youngs Creek Project	To be completed within 1 year.	Number of entities receiving information.
Participate in the Phase II planning process.	Attend public meetings and other open forums to discuss issues.	Youngs Creek Advisory Group Concerned citizens;	Youngs Creek Advisory Group	To be initiated when the Phase II process gets underway.	Attendance at public meetings.
Provide other support to Phase II entities as needed.	Provide technical support, assistance in communication and advertising, and other cooperation to Phase II entities.	Phase II entities.	SWCD/Youngs Creek Project Youngs Creek Advisory Group	To be initiated when the Phase II process gets underway.	

Section VI: Plan for Implementation and Evaluation

During the development of this Plan, the SWCD applied for and received a Section 319 grant for the Youngs Creek Watershed Management Plan Implementation. Implementation will begin in November 2003 and continue through December 2005. This second grant will provide funding for personnel to provide assistance to residents of the watershed, a cost-share program to implement specific BMPs within the watershed, and educational efforts to raise awareness of water quality issues within the watershed. These efforts will be directed by the strategies set forth in this Plan. This second grant will also be supervised by the SWCD and directed by the Youngs Creek Watershed Advisory Group.

The Advisory Group will meet occasionally throughout the Implementation Phase to revisit the Plan and review progress toward the group's goals. Indicators have been established to monitor progress toward the plan's goals, and progress reports will be made to the Advisory Group according to the schedule in Table 18. The SWCD will ultimately be responsible for tracking progress of Plan achievements, making any changes to the Plan that the Advisory Group deems necessary, keeping all Plan-related records and documents, and distributing copies of the Plan to necessary participants. If future TMDL development occurs in the watershed, the SWCD in conjunction with the Advisory Group will work closely with IDEM staff. Any questions about this Plan or the Youngs Creek Watershed Project can be directed to the following:

Johnson County Soil and Water Conservation District
550 E Jefferson St
Franklin, Indiana 46131
(317) 736-9540

Table 18. Monitoring Plan for Goal Indicators

Progress Reports	Indicator Description and Responsible Party	Estimated load reduction (where applicable)
Goal 1: By August 2007, implement no-till on 40% of corn after soybeans and 80% of beans after corn.		Through adoption of conservation tillage, sediment load will be reduced by 1570 tons/yr, phosphorus by 1660 lbs/yr and nitrogen by 3320 lbs/yr in the first two years.*
Annually	The SWCD will estimate load reduction as a result of conservation tillage adoption using IDEM's load calculation worksheet. Estimated conservation tillage adoption rates will be based on available tillage transect survey data.	
Quarterly	The SWCD will also track participation in special meetings and cost-share programs.	
Goal 2: Increase awareness about how farmland practices may impact water quality. Increase participation in conservation programs by 100% through cost-share, Farm Bill programs, and other efforts by 2007.		
Annually	The USDA-NRCS will report enrollment in Farm Bill and other federal conservation assistance programs to the SWCD.	
Quarterly	The SWCD will track the number of participants in 319 cost-share projects and the number of people contacted by various outreach methods (mailings, special meetings, field days, etc.).	
Goal 3: Encourage and promote the use of watering and manure management systems.		
Annually	The USDA-NRCS will report the number of manure management plans developed for farmers in the watershed.	
Quarterly	The SWCD will track participation in outreach activities and enrollment in cost-share projects that focus on manure management.	
Every two years	The SWCD will repeat visual observations of watershed streams and report on the presence of livestock.	

Progress Reports	Indicator Description and Responsible Party	Estimated load reduction (where applicable)
Goal 3 (cont'd): Encourage and promote the use of watering and manure management systems.		
Every two years	The SWCD will conduct *E. coli* sampling in the Youngs Creek Watershed (sampling plan and sites TBD) and gather *E. coli* data from other available sources (Hoosier Riverwatch, further IDEM sampling in the watershed, etc.). This data will help to more clearly identify the source of *E. coli* and illustrate trends in pathogen levels.	
Goal 4: Assess the status of riparian buffers in the Youngs Creek Watershed.		
Quarterly	The Indiana Geological Survey in cooperation with the SWCD will develop a map of existing buffers in the Youngs Creek Watershed using remote sensing technologies.	
Goal 5: Prioritize riparian buffer restoration areas within the Youngs Creek Watershed.		
Quarterly	Once the map of existing buffers in the watershed has been established, areas will be prioritized for protection based on criteria developed by the Advisory Group. The IGS in cooperation with the SWCD will create a map of these prioritized areas.	
Goal 6: Improve or maintain riparian buffers adjacent to streams (natural, man-made, or altered), ponds, and wetlands throughout the watershed. This consists of an ongoing and incremental goal of increasing buffers where absent or insufficient, maintaining existing buffers, and connecting existing buffers where possible.		
Every two years	The SWCD will repeat visual observations of watershed streams and report on the condition of riparian areas.	
As needed	After buffer restoration areas have been identified and prioritized, QHEI scores for the restoration areas will be determined by the SWCD. QHEI assessment will be repeated five years after restoration to determine improvement to habitat.	

Progress Reports	Indicator Description and Responsible Party	Estimated load reduction (where applicable)
Goal 7: Promote riparian buffer installation through outreach efforts targeted at three primary audiences within the watershed.		As a result of buffer installation, sediment load will be reduced by 244 tons/yr, phosphorus by 288 lbs/year, and nitrogen by 536 lbs/year in the first two years.†
Annually	In cooperation with the USDA-NRCS, the SWCD will monitor the number of participants in federal and local assistance programs that promote the development of riparian areas. Load reductions as a result of installing filter strips or other vegetation adjacent to streams will be calculated using IDEM's load reduction workbook.	
Quarterly	The SWCD will monitor the level of participation in outreach activities and special meetings as well as the number of individual landowners, neighborhoods, and homeowners' associations who meet the criteria for recognition.	
Goal 8: Equip policy makers with information they need to improve and maintain riparian buffers in the watershed.		
Quarterly	The SWCD will track participation in special meetings and other outreach activities as well as the issues in which experts provided information to local decision-makers about impacts to water quality.	
Goal 9: Promote water-friendly behaviors among residents and officials in urban and urbanizing areas of the watershed.		
Quarterly	The SWCD will track the estimated audience reached by outreach activities (including displays, literature, and special events).	
Goal 10: Promote dialogue among engineers, officials, and other professionals in the watershed about the installation and maintenance of structures and/or practices (BMPs) that counterbalance impervious surface run-off.		
Quarterly	The SWCD will track the estimated audience reached through meetings and materials.	

Progress Reports	Indicator Description and Responsible Party	Estimated load reduction (where applicable)
Goal 11: Determine the need to re-design or alter retention ponds in existing subdivisions to meet design standards set forth in the Johnson County Subdivision Control Ordinance, and share this information with the subdivision residents.		
Quarterly	The SWCD will track the progress of the records survey and distribution of information.	
Goal 12: Provide input to Stormwater Phase II entities in Johnson County during the Phase II planning process.		
Quarterly	The SWCD will track the estimated audience reached through meetings and materials.	

* Load reduction estimates for the goals concerning conservation tillage were made using the IDEM Loading Workbook. If conservation tillage is implemented on a 40-acre field, the workbook estimates that sediment will be reduced by 314 tons/year, phosphorus will be reduced by 332 lbs/year, and nitrogen will be reduced by 664 lbs/year. The Youngs Creek Watershed Project estimates that, over the next two years, conservation tillage will be adopted for five 40-acre fields within the watershed. This would reduce sediment loading to watershed streams by 1570 tons/year. The workbook also predicts that phosphorus would be reduced by 1660 lbs/year and nitrogen would be reduced by 3320 lbs/year.

†Estimated load reductions for riparian filter strips are also being estimated using the IDEM Loading Workbook. The calculations assume a 10-acre contributing area for each ¼ mile of stream segment. Therefore, using the model and estimating that the Youngs Creek Watershed Project will implement approximately 1 mile of riparian filter strips over the next two years, sediment reduction to watershed streams would be 244 tons/year, phosphorus reduction would be 288 lbs/year, and nitrogen reduction would be 536 lbs/year.

Section VII: References and Appendices

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Appendix A. Advisory Group Participants

Melinda Antell	Johnson County Solid Waste Management District
Alvin Balmer	NRCS
Barry Barnett	Johnson County SWCD
Tom Bechman	Johnson County SWCD Youth Board
Jeff Beck	Johnson County SWCD
John Bonsett	Johnson County Health Department
Dan Ernst	IDNR
Steve Ernst	Resident
Jim Facemire	Johnson County SWCD
Bill Gervsio	Johnson County Drainage Board
Irv Goldblatt	IDEM
Sally Letsinger	Indiana Geologic Survey
Bill Manifold	Custer Baker Middle School
Duane McCoy	IDNR
Beth McNabb	Landowner
Joe Bill Misiniec	Landowner
Andy Nelson	Greenwood High School
Rich Nicholson	Indiana-American Water Co.
Andi Pierce	Hoosier Environmental Council
Corky Prast	IDEM
Brad Ott	Main Street Consulting
Jerry Ott	Franklin Engineering
Bob Weaver	Johnson County SWCD
Kim Wininger	IDNR

Appendix B. Initial Concern List

Need for Coordination

1. Multiple jurisdictions with conflicting priorities operating in the watershed (without coordination).
2. Need regional approach to stormwater detention.
3. Potential for multiple uses along streams.
4. Education/community involvement needed.
5. Better communication between entities.
6. What are rights and responsibilities of landowner?
7. Need for increased awareness.
8. Lack of funding for ditch maintenance.

Landuse Change

1. Increasing impervious and semi-pervious layer impacting water quality and quantity negatively.
2. Loss of forest and farmland in the watershed.
3. Agriculture loss within the watershed – urbanization concerns throughout the watershed.
4. Urban development in Northern part of the county. Parks Dept in Franklin seems to notice greater flooding in the past few years, possibly due to development.
5. Loss of natural hydrological systems within the watershed.

Water Quality Concerns

1. Protection of well fields from septic systems.
2. Private septics and their effects.
3. Septic tanks.
4. Past pollution problems (soil, cattle livestock, other)
5. Accidental or regular discharge from WWTP's.
6. Accidental spills from industry or transportation
7. Improper household hazardous water disposal, including Hg contamination.
8. Fish kills.
9. Decreasing water quality.
10. A lot of trash/debris coming from Franklin.
11. I would also hope that some cost-share cleanup program could be established. We have tires, trees, bedsprings, and other items partially buried in the creek bed that would be nice to remove.

12. Debris clogging streams (large trees/limbs).

Flooding, Sedimentation, and Erosion Concerns

1. Flooding.
2. I believe that development has produced more run-off resulting in the creek rising faster and more often than in the past. I would like to see some policy changes requiring an appropriate number of retention and detention ponds required of developers within the watershed area
3. Greater flooding in Franklin parks in recent years.
4. Erosion control.
5. Creek bank erosion due to flooding.
6. Control of erosion from new development.
7. Sedimentation problems.
8. Sedimentation causing blockages therefore flooding and ponding, causing damage to roadways, other channels, and field tile.
9. Stormwater management – urban and agriculture.
10. Negative impacts of ditch and legal drain maintenance.
11. Increased run-off.
12. Whiteland Road floods.
13. Drainage changes.
14. Flooding results in erosion of existing property.
15. More frequent and intense flooding.
16. Increased flooding damaging bridge support systems.

Biological Concerns

1. I believe that development has reduced open space.
2. Loss of intact riparian corridors.
3. Identify wildlife and habitat.
4. Loss of habitat

Appendix C. Procedures for Preparing and Processing Landuse Data

GAP Reclassification

The overall land cover classification system for Gap Analysis refers to the surface cover on the ground and consists of three primary categories: natural terrestrial cover (Terrestrial), natural aquatic cover (Palustrine), and cultural or developed cover (Developed). Each of these is subsequently classified according to specific attributes shown in Table 19.

Reclassification of the 1992 GAP data was undertaken to more accurately compare GAP data to the 2001 digitized landuse data. From the 1992 GAP land cover classifications and basic familiarity with the watershed, general landuse classifications were inferred for the watershed. Landuse differs from land cover in that it refers to the purpose for which the land is being used. Landuse classification descriptions are also shown in Table 19.

Table 19. GAP landuse classification

GAP Class/Value	Land Cover Description	Landuse classification
1	Unclassified: Cloud/Shadow	
2	Developed: Other Non-Vegetated	Commercial/Industrial
3	Developed: Urban High Density	Commercial/Industrial
4	Developed: Urban Low Density	High Density Residential
6	Developed: Agriculture Row Crop	Agriculture
7	Developed: Agriculture Pasture/Grassland	Agriculture
8	Terrestrial: Shrubland Deciduous	Forest/Wetland
9	Terrestrial: Woodland Deciduous	Forest/Wetland
10	Terrestrial: Forest Deciduous	Forest/Wetland
11	Terrestrial: Forest Evergreen	Forest/Wetland
12	Terrestrial: Forest Mixed	Forest/Wetland
13	Palustrine: Forest, Deciduous	Forest/Wetland
14	Palustrine: Woodland Deciduous	Forest/Wetland
15	Palustrine: Shrubland Deciduous	Forest/Wetland
16	Palustrine: Herbaceous Deciduous	Forest/Wetland
17	Palustrine: Sparsely Vegetated Point Bar/Flood Zone/Shoreline	Forest/Wetland
18	Water	Water

2001 Digital Aerial Photographs

Black and white digital aerial photographs, taken in March 2001 with six inch pixel resolution, were provided by Johnson County government. These photographs were imported into ArcView and used to digitize 2001 landuse for the Youngs Creek Watershed. Landuse categories were created primarily to assess impervious cover in the watershed. The classification, description, and criteria used to classify the landuses are listed in Table 20.

Table 20. Classification, description, and criteria for the 2001 landuse layer

Classification	Description	Criteria
Roads	Major roadways	4-lane highways
Commercial/Industrial	Commercial and Industrial areas	Areas characterized by non-residential buildings, usually surrounded by parking lots
High Density Residential	High Density residential areas	Subdivision developments and high-density urban housing with lots typically less than 1/3 acre
Low Density Residential	Low density residential areas	Rural farmsteads and isolated houses outside urban areas
Agriculture	Pasture and Row Crop	Large fields/tracts of land that do not contain forests, houses, or other buildings
Forest/Wetland	Areas covered with forest or woodland	Any land covered with dense tree stands
Water	Open water	Visible ponds and lakes

The digitizing of 6-inch pixel aerial photographs provided a much more accurate view of landuse in the watershed than GAP data provided. The photographs allowed the detection of rural residential areas (isolated homes and farmsteads) that were not detected by GAP analysis. However, accurately differentiating between forest and wetland was not possible on the black and white photographs, so these two categories were combined.

2001 Zoning Map

A digital copy in AutoCAD format of the February 2002 zoning map for Johnson County was obtained from the county Surveyor's Office. The county map consisted of nine separate AutoCAD files, one for each township in the county. These maps were imported into ArcView, and the 2001 landuse layer for the Youngs Creek Watershed was overlaid. Areas that were zoned for residential development that were not already classified as residential were digitized onto the existing 2001 landuse map and classified as "high density residential." The categories, descriptions, and criteria in the 2001 zoning map are identical to those used in the 2001 landuse layer, listed in Table 20.

Appendix D. Landuse and Impervious Surface Area

Table 21 depicts the percent area of each subwatershed in each landuse category and the percent impervious cover in each subwatershed.

Table 21. Landuse and impervious surface area in the Youngs Creek subwatersheds

(1992 and 2001, values are percentage of subwatershed area. Sources, 1992: GAP data; 2001: SWCD landuse layer digitized from aerial photographs)

	Brewers-Canary Ditches		Hurricane Creek		Grassy Creek-East Grassy Creek		Roberts Ditch		Ray Creek		Buckhart Creek		Amity Ditch		Sugar Creek-Herriotts Creek	
																
	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001	1992	2001
Agriculture	85.7%	66.9%	92.5%	83.8%	83.4%	69.4%	95.5%	85.4%	81.5%	69.7%	85.8%	76.4%	85.7%	80.2%	70.2%	55.4%
Commercial/Industrial and Roads	5.5%	10.6%	2.1%	3.4%	5.1%	7.3%	0.2%	0.4%	4.2%	7.3%	1.3%	1.6%	1.9%	2.8%	0.5%	1.2%
Residential (High and Low Density)	4.8%	19.0%	1.5%	8.0%	9.5%	21.3%	0.5%	9.9%	8.0%	17.0%	2.5%	11.7%	1.3%	6.7%	0.8%	5.4%
Forest and Wetland	4.0%	3.1%	3.5%	4.0%	1.7%	0.9%	3.8%	4.1%	6.1%	5.4%	10.1%	9.2%	10.6%	9.6%	27.4%	36.5%
Water	0%	0.4%	0.4%	0.7%	0.4%	1.1%	0.0%	0.2%	0.2%	0.6%	0.3%	1.1%	0.6%	0.7%	1.1%	1.4%
Impervious Surface Area	6.8%	13.3%	3.3%	5.1%	7.7%	11.6%	1.3%	2.5%	6.4%	9.9%	2.7%	3.8%	3.1%	4.4%	1.7%	2.5%

Appendix E. Impervious Surface Analysis

The percent impervious surface in each subwatershed was calculated by multiplying the area of land in each landuse by the impervious cover coefficient for each landuse. Each coefficient and its origin are listed in Table 22.

Table 22. Coefficients used for impervious surface run-off calculation

(Sources: USDA-NRCS 1986 and Frankenberger et al. 2002)

	Road	Commercial/ Industrial	HD Residential	LD Residential	Agriculture	Forest	Water
Impervious Surface Coefficient	0.980	0.800*	0.250	0.100	0.010	0.010	0.000
Coefficient source	Frankenberger et al. 2002	USDA-NRCS 1986	USDA-NRCS 1986	USDA-NRCS 1986	Frankenberger et al. 2002	Frankenberger et al. 2002	Frankenberger et al. 2002

*This coefficient was estimated based on published values to more accurately represent the combined commercial and industrial landuse classification.

Appendix F. IDEM Sampling Logistics

Environmental Toxicology and Chemistry staff sampled waterbodies within the Driftwood River Watershed, including sites within the Youngs Creek Watershed, to evaluate *E.coli* concentrations. Twenty (20) sites were selected and pre-surveyed on May 22, 2002 to determine site accessibility, safety, time constraints, and other issues that may arise during sampling. Field sampling began on July 2, 2002 and continued for five consecutive weeks (July 9, July 16, July 23, and July 30) for a total of five sampling events. Additional field parameters were also collected during sampling (dissolved oxygen, pH, temperature, and turbidity).

Surface water samples were collected using a de-ionized water rinsed, stainless steel bucket. A 120 ml plastic bottle containing sodium thiosulfate ($Na_2S_20_3$), a preservative, was dipped into the stainless steel bucket to collect the water for lab analysis. The samples were stored on ice and transported to the Indiana State Department of Health for analysis. Table 23 shows the results for all sampling locations.

To ensure quality control, field blanks and field duplicates were collected at a rate of one for every 20 water samples collected. Field blanks were collected by filling the 120 ml plastic sample bottle with de-ionized water. Field duplicates were generated by collected two samples from the same stainless steel bucket.

Table 23. 2002 E. coli results for the Driftwood River Watershed

Site Name	Sampling Location	Sample Date	E.coli (CFU)	E.coli Geometric Mean
Driftwood River	Tellman Road	7/2/2002	310	123
		7/9/2002	82	
		7/16/2002	68	
		7/23/2002	290	
		7/30/2002	58	
Driftwood River	Lowell Road	7/2/2002	610	195
		7/9/2002	120	
		7/16/2002	78	
		7/23/2002	520	
		7/30/2002	96	
Driftwood River	C.R. 625 N	7/2/2002	610	456
		7/9/2002	610	
		7/16/2002	190	
		7/23/2002	820	
		7/30/2002	340	

Site Name	Sampling Location	Sample Date	E.coli (CFU)	E.coli Geometric Mean
Driftwood River	C.R. 950 W	7/2/2002	400	184
		7/9/2002	190	
		7/16/2002	120	
		7/23/2002	210	
		7/30/2002	110	
Big Blue River	S.R. 252	7/2/2002	520	229
		7/9/2002	180	
		7/16/2002	160	
		7/23/2002	260	
		7/30/2002	160	
Sugar Creek	North Street	7/2/2002	820	218
		7/9/2002	99	
		7/16/2002	86	
		7/23/2002	500	
		7/30/2002	140	
Herriotts Creek	Schoolhouse Road	7/2/2002	>2420	1656
		7/9/2002	920	
		7/16/2002	1100	
		7/23/2002	>2420	
		7/30/2002	2100	
Sugar Creek	C. R. 550 E	7/2/2002	730	443
		7/9/2002	370	
		7/16/2002	390	
		7/23/2002	580	
		7/30/2002	280	
Youngs Creek	C.R. 500 S	7/2/2002	920	266
		7/9/2002	240	
		7/16/2002	70	
		7/23/2002	410	
		7/30/2002	210	
Amity Ditch	C.R. 350 E	7/2/2002	550	469
		7/9/2002	330	
		7/16/2002	190	
		7/23/2002	1600	
		7/30/2002	410	

Site Name	Sampling Location	Sample Date	E.coli (CFU)	E.coli Geometric Mean
Buckhart Creek	Mauxferry Road	7/2/2002	>2420	2965
		7/9/2002	2000	
		7/16/2002	2100	
		7/23/2002	5500	
		7/30/2002	4100	
Youngs Creek	C.R. 250 S, W of US 31, South of Franklin	7/2/2002	>2420	2965
		7/9/2002	2400	
		7/16/2002	3100	
		7/23/2002	4400	
		7/30/2002	2400	
Hurricane Creek	Monroe Street	7/2/2002	1400	1740
		7/9/2002	980	
		7/16/2002	2000	
		7/23/2002	>2420	
		7/30/2002	2400	
Youngs Creek	Main Street	7/2/2002	1600	1147
		7/9/2002	1200	
		7/16/2002	820	
		7/23/2002	520	
		7/30/2002	>2420	
Youngs Creek	S.R. 144	7/2/2002	1600	577
		7/9/2002	870	
		7/16/2002	170	
		7/23/2002	690	
		7/30/2002	390	
Youngs Creek	Centerline Road	7/2/2002	980	277
		7/9/2002	460	
		7/16/2002	86	
		7/23/2002	150	
		7/30/2002	280	
Brewers Ditch	C.R. 200 N	7/2/2002	520	541
		7/9/2002	370	
		7/16/2002	290	
		7/23/2002	1600	
		7/30/2002	520	

Site Name	Sampling Location	Sample Date	E.coli (CFU)	E.coli Geometric Mean
Youngs Creek	C.R. 400 N	7/2/2002	1600	872
		7/9/2002	1300	
		7/16/2002	440	
		7/23/2002	550	
		7/30/2002	1000	
Grassy Creek	Whiteland Road	7/2/2002	19	20
		7/9/2002	17	
		7/16/2002	15	
		7/23/2002	56	
		7/30/2002	13	
East Grassy Creek	Centerline Road	7/9/2002	1400	972
		7/16/2002	>2420	
		7/23/2002	240	
		7/30/2002	1100	

Appendix G. Tillage Survey

Please answer the following questions for your operation. When answering, please think of conservation tillage as including no-till, ridge till, reduced tillage, mulch till, or any practice that leaves at least 30% crop residue. **All individual responses will be confidential.** Only group summarizations will be released.

Please Check One (1).

1. I am a:
   - _____ Landowner
   - _____ Operator
   - _____ Landowner/Operator
   - _____ Other (please specify) _____

2. How many acres of land are you cultivating for crops this year (excluding permanent pasture)?
   - _____ Acres of cropland for 2003

3. At any time in the past, have you used conservation tillage?
   - _____ No, I do not know much about conservation tillage
   - _____ No, I looked into conservation tillage, but decided against it
   - _____ Yes, I tried it but quit after _____ years
   - _____ Yes, I tried it and still use it after _____ years

4. Of your cropland, what percentage is under conservation tillage, leaving 30% crop residue or more?
   - _____ Percent cropland under conservation tillage

5. To be able to do more, or start using, conservation tillage, would you:
   - _____ Rent equipment, if available
   - _____ Custom hire services
   - _____ Purchase equipment
   - _____ Adapt present equipment

6. *If Applicable*: I started using conservation tillage because: **(Check all that apply)**
   - _____ Required by government policy
   - _____ Other farmers had success
   - _____ Saved time and fuel
   - _____ Lowered production costs
   - _____ Reduced soil erosion
   - _____ Increased yield per acre
   - _____ Other (if other, please fill in reason) _____

7. *If Applicable:* I do not use conservation tillage because: **(Check all that apply)**
   - _____ Equipment is not suitable
   - _____ My landowner or operator is against it
   - _____ Couldn't control weeds
   - _____ Poor stands
   - _____ Expense
   - _____ Increased time
   - _____ Increased production costs
   - _____ Reduced yield per acre
   - _____ Other (if other, please fill in reason) _____

8. Would you no-till corn if you received a monetary incentive?

_____ Yes
_____ No

For questions 9 – 15, circle the number to indicate what you think about the topic compared to the two extremes.

9. Obtaining information on conservation tillage is:

difficult [1----------2---------3----------4] easy

10. Complexity of conservation tillage practices or systems:

complex [1----------2---------3----------4] easy

11. Cost of conservation tillage practices or systems:

costly [1----------2---------3----------4] economical

12. Quality of information available on conservation tillage practices:

inconsistent and unreliable [1----------2---------3----------4] consistent and reliable

13. My knowledge with respect to conservation tillage:

inadequate [1----------2---------3----------4] sufficient

14. Conservation tillage and my current production goals:

do not fit [1----------2---------3----------4] completely fit

15. On my farm, soil erosion is:

not an issue [1----------2---------3----------4] important issue

Where do you find information to make decisions on your farm?

Please check the TOP 5 information sources for both (a) conservation tillage and (b) USDA cost-share programs.

Other Farmers	Conservation Tillage	USDA Cost-Share Programs
Extension staff		
Government agency staff (NRCS, SWCD, DNR)		
Extension meetings or other organized group discussion		
Private Consultants		
Custom operators		
Fertilizer representatives		
Equipment dealers		
Seed representatives		
Promotional literature		
Newspapers, magazines, or trade journals		
Radio or TV		
Internet		

Favorite Agricultural or Conservation Internet Sites (we do not need the web address):

_____

Appendix H. QHEI Scores and Sample Form

Table 24 contains the stream locations and scores for the QHEI sampling.

Table 24. QHEI locations and scores

Stream Name	Location	Date	Substrate	Instream Cover	Channel Morphology	Riparian Zone/Erosion	Pool/Glide Riffle/Run Quality	Riffle/Run Quality	Gradient	QHEI Total Score	Notes
UN Trib Ray Creek	100 W	8/6/02	0	0	0	0	0	0	0	**0**	Dry
Vandivier Ditch	250 S	8/6/02	0	0	0	0	0	0	0	**0**	Dry
Tracy Ditch	Stop 18 (d/s)	8/7/02	5	2	5	4	0	0	10	**26**	
Ray Creek	200 S (u/s)	8/6/02	5	6	7	3.5	1	0	8	**30.5**	
Hurricane Creek	300 N (u/s)	8/7/02	13	3	7	4	0	0	4	**31**	
Grassy Creek	Village Circle	8/7/02	5	2	5	5	3	3	8	**31**	
Amity Ditch	CR 350 S (d/s)	8/8/02	11	5	9	5	0	2	6	**38**	
Grassy Creek	600 N (u/s)	11/16/01	13	2	4	4.5	5	3	8	**39.5**	
E. Grassy Creek	Centerline Road (u/s)	8/7/02	12	6	8	4	5	0	8	**43**	
Hurricane Creek	Monore Street (d/s)	8/5/02	13	6	9	4	9	4	6	**51**	
Buckhart Creek	100 E (d/s)	8/6/02	13	10	12	2.5	6	0	10	**53.5**	
Heriotts Creek	325 E (u/s)	8/6/02	13	12	11	3	7	0	10	**56**	
Youngs Creek	UN Trib Creekside	8/8/02	9	13	14	5	7	3	6	**57**	
Youngs Creek	200 N (d/s)	8/9/02	13	9	17	4.5	5	3.5	6	**58**	
Moores Creek	SR 144 (u/s)	11/16/01	13	10	16	4	4	3	10	**60**	
Hurricane Creek	Forsythe Rd (u/s)	8/5/02	15	13	11	4	7	4	10	**64**	
Youngs Creek	Blue Heron Bridge	8/6/02	17	17	17	6	9	4	6	**76**	
Youngs Creek	SR 252	11/15/01	16	13	20	10	10	5.5	8	**82.5**	Ref. Site

Qualitative Habitat Evaluation Index (QHEI)

Stream Name:_____ Site ID:_____ Date._____

T_____ County:_____ Location_____

Quad Name._____ Weather (Now)._____ Weather (Past 24 hours)_____

1] Substrate (Check *Only* Two Substrate TYPE BOXES; Check all types Present)

Type	Pool	Riffle		Pool	Riffle
☐ ☐-Bldr/Slabs[10]			☐ ☐-Gravel[7]		
☐ ☐-Boulder[9]			☐ ☐-Sand[6]		
☐ ☐-Cobble[8]			☐ ☐-Bedrock[5]		
☐ ☐-Hardpan[4]			☐ ☐-Detritus[3]		
☐ ☐-Muck[2]			☐ ☐-Artificial[0]		

Substrate Origin (check all)
☐-Limestone[1] ☐-Rip/Rap[0]
☐ Tills[1] ☐-Hardpan[0]
☐-Sandstone[0] ☐-Shale[-1]
☐-Coal Fines[-2]

Silt Cover (Check One)
☐-Silt Heavy[-2] ☐ Silt Moderate[-1]
☐-Silt Normal[0] ☐-Silt Free[1]

Extent of Embeddedness (Check One)
☐-Extensive[-2] ☐ Moderate[-1]
☐-Low[0] ☐-None[1]

Total Number of Substrate Types: ☐->4[2] ☐-<4[0]

2] Instream Cover
Type (Check *All* That Apply)

☐-Undercut Banks[1]
☐-Overhanging Vegetation[1]
☐-Shallows (in slow water)[1]
☐-Deep Pools[2]
☐-Rootwads[1]
☐-Boulders[1]
☐-Oxbows[1]
☐-Aq. Macrophytes[1]
☐-Logs or Woods Debris[1]

Amount (Check *Only* One or Check 2 and Average)
☐-Extensive >75%[11]
☐-Moderate 25-75%[7]
☐-Sparse 5-25%[3]
☐-Nearly Absent < 5%[1]

3] Channel Morphology: (Check *Only* One per Category or Check 2 and Average)

Sinuosity	Development	Channelization	Stability	Modifications	
☐-High[4]	☐-Excellent[7]	☐-None[6]	☐-High[3]	☐-Snagging	☐-Impound
☐-Moderate[3]	☐-Good[5]	☐-Recovered[4]	☐-Moderate[2]	☐-Relocation	☐-Islands
☐-Low[2]	☐-Fair[3]	☐-Recovering[3]	☐-Low[1]	☐-Can.Removal	☐-Leveed
☐-None[1]	☐-Poor[1]	☐-Recent or no Recovery[1]		☐-Dredging	☐-Bank Shaping
					☐-One side channel modifications

4] Riparian Zone and Bank Erosion (Check *One* per Bank or Check 2 and Average)
**River Right Looking Downstream*

Riparian Width L R (Per Bank)	Erosion/Runoff – Floodplain Quality L R (Most Predominant Per Bank)		Bank Erosion L R (Per Bank)
☐ ☐-Wide >50m[4]	☐ ☐-Forest, Swamp[3]	☐ ☐-Urban/Industrial[0]	☐ ☐-None/Little[3]
☐ ☐-Moderate 10-50m[3]	☐ ☐-Open Pasture/Rowcrop[0]	☐ ☐-Shrub/Old Field[2]	☐ ☐-Moderate[2]
☐ ☐-Narrow 5-10m[2]	☐ ☐-Resid./Park/New Field[1]	☐ ☐-Conserv. Tillage [1]	☐ ☐-Hvy./Sev.[1]
☐ ☐-Very Narrow 1-5m[1]	☐ ☐-Fenced Pasture[1]	☐ ☐-Mining/Construction[0]	☐ ☐-None[0]

5] Pool/Glide and Riffle/Run Quality

Max. Depth (Check *One*)	Morphology (Check *One*)	Pool/Riffle/Run Velocity (Check *All* that Apply)	
☐->1m[6]	☐-Pool Width > Riffle Width[2]	☐-Torrential[-1]	☐-Eddies [1]
☐-0.7-1m[4]	☐-Pool Width = Riffle Width[1]	☐-Fast[1]	☐-Interstitial[-1]
☐-0.4-0.7m[2]	☐-Pool Width < Riffle Width[0]	☐-Moderate[1]	☐-Intermittent[-2]
☐-<0.4m[1]		☐-Slow[1]	
☐-<0.2m (Pool=0)[0]			☐-*No Pool[0]*

Riffle/Run Depth	Riffle/Run Substrate	Riffle/Run Embeddedness	
☐-Generally >10cm, Max>50[4]	☐-Stable (e.g., Cobble, Boulder)[2]	☐-Extensive[-1]	☐-Moderate [0]
☐-Generally >10cm, Max<50[3]	☐-Mod. Stable (e.g., Pea Gravel)[1]	☐-Low[1]	☐-None[2]
☐-Generally 5-10cm[1]	☐-Unstable (e.g., Gravel, Sand)[0]		
☐-Generally >5cm[Riffle=0]			☐-*No Riffle[0]*

Figure 51. QHEI form, page 1

6] Gradient (feet/mile):

Average width: **Average depth:** **Max. Depth:**

% Pool: **% Riffle:** **% Run:**

Additional Information

Canopy: (%) open Photo #:

Subjective Rating (1-10):

Aesthetic Rating (1-10):

Picture:

Recorder:

Figure 52. QHEI form, page 2

Appendix I. Visual Observation Worksheet

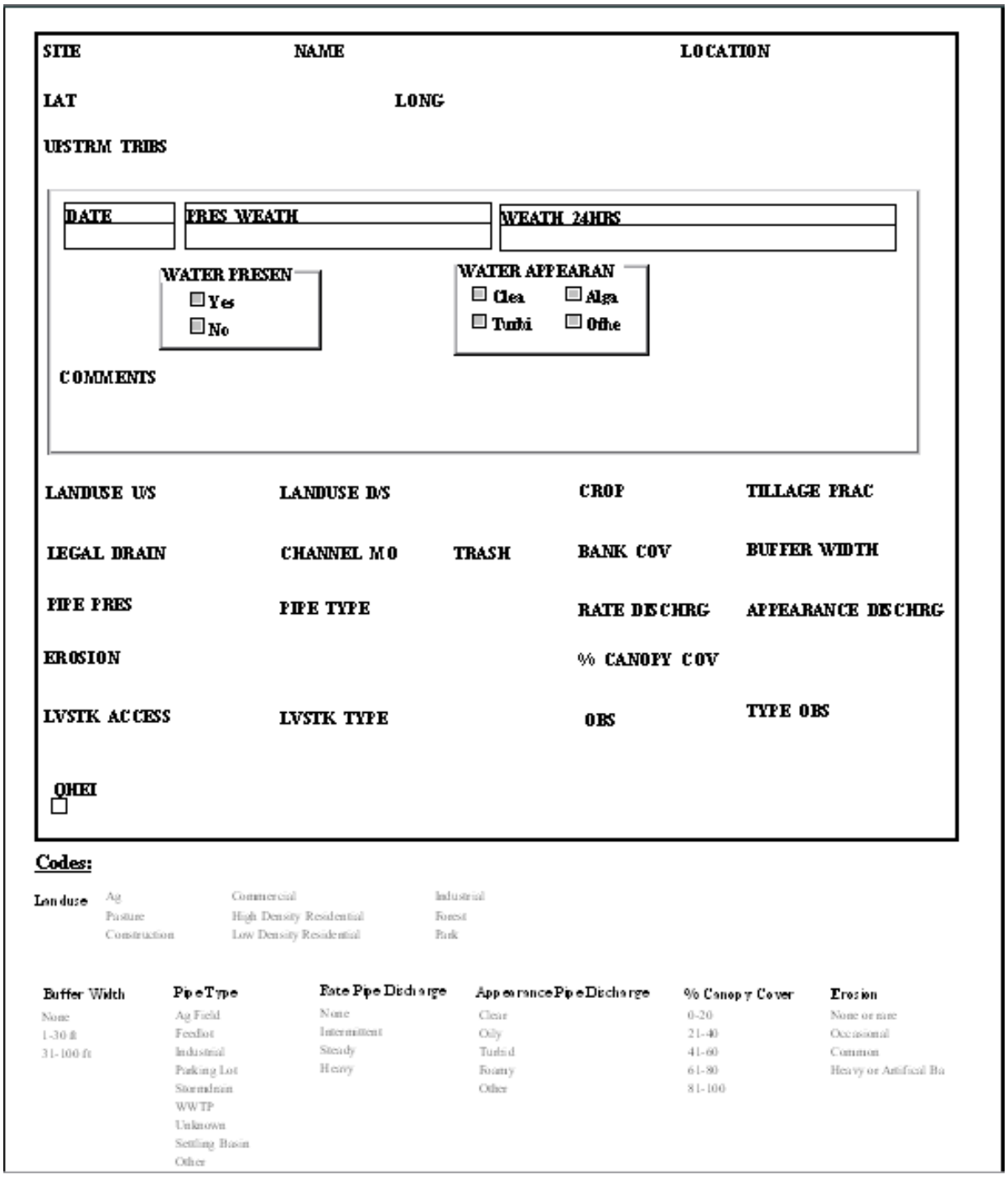

Figure 53. Visual Observation Worksheet

Appendix J. Action Register

Agricultural Action Register

Agricultural Problem Statement:
Conventional Till can leave exposed soils leading to sedimentation and increased nutrient levels in waterbodies.

Goal 1:
By August 2007, implement no-till on 40% of corn after soybeans and 80% of beans after corn.

Objective:
Provide up-to-date information about conservation tillage.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Evaluate current studies on conservation tillage.	Research current trends, economics, and equipment adaptation.	NRCS CTIC Conservation Tillage Initiative	Small	319 Grant	
Develop and distribute fact sheets.	Based on research, develop fact sheets for producers.	NRCS CTIC	Moderate	319 Grant	

Objective:
Promote existing educational and incentive programs for conservation tillage.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Inform operators about USDA programs through mailings.	Simple mailings will provide important information about programs and other opportunities.	NRCS, SWCD, FSA, Ag Extension, Farm Bureau	Moderate	319 Grant	
Hold informational meetings about existing incentive programs.	Supplement mailings with personal contact.	NRCS, SWCD, FSA, Ag Extension, Farm Bureau	Small	319 Grant	
Develop web-based resource site about USDA programs.	USDA program information will be made available online.	NRCS, SWCD, FSA, Ag Extension, Farm Bureau	Moderate	319 Grant	

Objective:
Create a cost-share program that encourages conservation tillage.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Develop criteria for cost-share program.	With producers' input, determine best use of cost-share money to promote conservation tillage.	Agricultural landowners/operators NRCS, SWCD, Ag Extension, FSA	Small	319 Grant	--
Promote the program.	Utilize newspaper, co-ops, magazines, etc. to promote the program.	NRCS, SWCD, FSA, Ag Extension, Farm Bureau, other local agencies	Moderate	319 Grant	--
Implement the program.	Get program up and running.	NRCS, SWCD, FSA, Ag Extension, Farm Bureau, other local agencies	Large	319 Grant	--

Objective:
Conduct adult and youth education programs related to conservation practices.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Develop basic series for adults on the economics of conservation tillage, focusing on "how to make it work."	Using up-to-date research, develop a series of seminars that discuss the basics of conservation tillage and economic benefits to operators.	NRCS, SWCD, FSA, Ag Extension, Farm Bureau, other local agencies	Moderate	319 Grant	SWCD
Develop youth education series on the economics of soil erosion and landuse decisions.	Series will focus on how to make landuse decisions to benefit soil and water resources.	NRCS, SWCD, FSA, Ag Extension, FFA, 4-H, Farm Bureau, other local agencies	Moderate	319 Grant	SWCD

Objective:
Showcase successful practices and operators.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Develop criteria for conservation award.	In cooperation with sponsors and local producers, review and determine criteria for conservation award.	NRCS, SWCD, FSA, Ag Extension, FFA, 4-H, Farm Bureau, other local agencies	Small	--	--
Provide awards and public recognition to operators succeeding with conservation tillage.	Recognize the landowner/operator in a special segment at the SWCD annual meeting. Send a press release recognizing the landowner/operator.	NRCS, SWCD, FSA, Ag Extension, FFA, 4-H, Farm Bureau, other local agencies	$500/yr	319 Grant	NRCS, SWCD, FSA, Ag Extension, FFA, 4-H, Farm Bureau, other local agencies
Provide tours of successful operations.	Organize and promote event to showcase successful farming operations using conservation practices.	NRCS, SWCD, FSA, Ag Extension, FFA, 4-H, Farm Bureau, other local agencies			

Problem Statement:
Results from the tillage survey indicate that operators/landowners are not informed about conservation practices on farmland and how farmland practices impact water quality. Additionally, they are unaware of the potential funding sources and manpower available to assist with conservation efforts.

Goal 2:
Increase awareness about how farmland practices may impact water quality. Increase participation in conservation programs by 100% through cost-share, Farm Bill programs, and other efforts by 2007.

Objective:
Hire an Ag Outreach Specialist.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Hire an Ag Outreach Specialist	Recruit candidates, interview, and hire personnel to perform agricultural education and outreach.	NRCS, SWCD	Large	319 Grant NRCS SWCD	--

Objective:
Solicit input of agricultural leaders on how to reach rural/ag community.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Meet with representatives of local agencies and businesses to identify respected leaders in the ag community.	These meetings will help to build relationships with community leaders.	Local equipment, fertilizer, and chemical dealers Local agencies	Small	--	--
Develop improved mailing lists for newsletters, publications, and special event mailings.	Update current mailing list on a regular basis to ensure that information reaches the ag community in the watershed.	NRCS, SWCD, FSA, Ag Extension, FFA, 4-H, Farm Bureau, other local agencies	Small	--	--

Objective:
Educate stakeholders about environmental stewardship on their land.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Research and illustrate economic benefits of conservation practices.	Economic benefits create an incentive for adopting conservation practices.	NRCS, CTIC	Small	319 Grant	--
Hold meetings to discuss conservation practices with stakeholders.	Meetings of various types will be held, including meeting one-on-one with individual stakeholders as well as focus group meetings.	NRCS, SWCD, IDNR	Small	319 Grant	--
Utilize infrared photography to help stakeholders recognize need and opportunities for conservation projects.	Infrared photos will help landowners identify and interpret the underground drainage system on agricultural land in the watershed.	SWCD, NRCS, IDNR	$50,000 to acquire countywide photos	319 Grant NASA Grant Landowners Johnson County govt.	--
Develop worksheets to record environmental stewardship and land concerns.	Worksheets will help to categorize and track landowner concerns.	NRCS, SWCD, IDNR	Small	--	--
Develop an Ag Water Quality Field Day.	Targeted to the agricultural community to promote water quality awareness.	NRCS, SWCD, FSA, Ag Extension, FFA, 4-H, Farm Bureau, other local agencies	Moderate	319 Grant	Local businesses Local agencies

Objective:
Develop relationships and collaborations with local agribusinesses.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Identify and develop a contact list for local, state, and regional agriculture-related businesses.	Contact list will include business location, mailing address, and personal contact.	Landowners/ operators, local agencies	Small	--	--
Inventory existing events that offer the potential to involve agribusinesses.	Research local, state, and regional events about water quality and land use.	CTIC, NRCS, SWCD, IDNR, other local agencies	Small	--	--
Utilize businesses to help promote existing conservation and incentive programs and distribute informational material.	Agribusinesses can be an avenue to reach a larger segment of the agricultural population.	Agricultural-related businesses	Small	319 Grant	--

Objective:
Enroll participants in incentive programs and provide technical services for practices including grassed waterways, WASCOBs, grade stabilization structures, filter strips, riparian forest buffer, nutrient management, and pest management.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Discuss with potential applicants the benefits of conservation programs and the assistance they can receive.	Make landowners/operators aware of existing programs and benefits of conservation.	NRCS, IDNR, SWCD, other local agencies	Small	--	--
Assist participants with cost-share applications for Farm Bill and other incentive programs.	Provide support and guidance during the application process	NRCS, IDNR, SWCD, other local agencies	Small	--	--

Problem Statement:
Livestock with access to waterbodies may trample riparian areas, leading to increased bank erosion. Further, E.coli from animal waste can cause digestive and other health problems in humans.

Goal 3:
Encourage and promote the use of watering and manure management systems.

Objective:
Investigate new technologies for watering and manure management systems.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Gather information and evaluate current research	Research current trends, economics, and equipment adaptation.	NRCS Grazing Lands Specialist, local agencies	Small	319 Grant	--

Objective:
Provide information to producers about manure management alternatives.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Develop and distribute fact sheets about water quality.	Fact sheets would provide introductory information.	NRCS, SWCD, IDNR, agencies	Moderate	319 grant	--
Host a seminar series.	Seminar series would provide in-depth information for livestock farmers.	NRCS, SWCD, IDNR, local agencies	Moderate	319 grant	--

Objective:
Promote livestock exclusion and manure management practices by utilizing incentive programs.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Meet individually with livestock producers to discuss incentive programs and other opportunities	Meetings will make livestock producers aware of existing programs.	NRCS, SWCD, IDNR, GLCI, local agencies	Small	--	--

Riparian Buffer Action Register

Problem:
The lack of protective vegetated buffer impacts the health of the streams in Youngs Creek Watershed. This is exhibited by increased sedimentation, erosion, flooding, and algal blooms in summer, increased *E. coli* contamination, decreased in-stream habitat (temperature, contaminants, sediment), decreased aesthetic quality, etc.

Goal 4:
Assess the status of riparian buffers in the Youngs Creek Watershed.

Objective 1:
Identify riparian vegetated buffers in the watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Visual field assessments.	Seasonal observations of conditions in watershed.	IGS NRCS IDEM IDNR	This project is already in progress through the Indiana Geological Survey, and the cost estimate for this portion is ~$50,000.	IDEM-Section 319	IGS IDEM EPA
Mapping using all data sources.	Integrate field observations with GIS data sets, aerial photography, satellite imagery.				
Document status of riparian buffers by ground photography, aerial photography, and/or satellite imagery.	Ground photography (film or digital), aerial photography, and/or satellite imagery.				

Goal 5:
Prioritize riparian buffer restoration areas within the Youngs Creek Watershed.

Objective 1:
Identify the appropriate riparian buffer type, width, and distribution for each land use category in the watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Determine ranking criteria.	Identify parameters that will be considered in ranking.	IGS NRCS IDEM IDNR	This project will be completed by the Indiana Geological Survey after completion of Goal 1, and the cost estimate for this portion is ~$50,000.	319 Grant	IGS IDEM EPA
Identify primary land use categories.	Determine appropriate buffer widths for ranking criteria for each land use (present and/or future)				
Identify future zoning and areas of potential development.	Assess impacts of future zoning decisions on land use change.				
Apply criteria to the watershed to determine restoration priorities.	Compare needed buffers vs. present buffers. Apply prioritization.				

Goal 6:
Improve or maintain riparian buffers adjacent to streams (natural, man-made, or altered), ponds, and wetlands throughout the watershed. This consists of an ongoing and incremental goal of increasing buffers where absent or insufficient, maintaining existing buffers, and connecting existing buffers where possible.

Objective 1: Present to Year 5
Increase stream buffers by 40% in the northern part of the watershed on and near agricultural land use. Also concentrate on any high priority areas in the rest of the watershed identified in Goal #2.

Objective 2: Year 5 to Year 10
Increase stream buffers in the northern part of the watershed so that nearly 100% of streams are at least partially buffered.

Objective 3: Year 5 to Year 10 (ongoing)
Connect existing buffers to create continuous buffers where possible throughout the entire watershed.

Objective 4: Year 10 to Year 15
Improve buffers throughout entire watershed so that appropriate buffer types and widths exist for 50% of the entire watershed.

Objective 5: Year 15 to Year 20
Improve buffers throughout entire watershed so that appropriate buffer types and widths exist for 50% of the entire watershed.

Objective 6: Year 20
Improve buffers throughout entire watershed so that appropriate buffer types and widths exist for nearly 100% of the entire watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Determine criteria for various funding-grant-incentive programs.	Collect data on criteria for existing federal, state, county, and private cost-share and other funding programs.	NRCS IDNR	Small	CRP EQIP	NRCS, Cinergy

Attempt to predetermine qualification for programs for farmers and present the options to each one as a "package" of options	Utilize GIS and other methods to predetermine qualifications of various agricultural producers in the watershed for funding programs, and present this information to targeted individuals.	NRCS IDNR	Small		
Cost-share, education, outreach, and demonstration projects.	See Goal #4	SWCD, NRCS	Large	319 Grant	To be determined

Objective 7:
Reassess riparian vegetated buffers in the watershed.

Action Items	**Description**	**Technical Resources**	**Cost Estimate**	**Funding Source(s)**	**Potential Financial Partners**
Visual field assessments.	Seasonal observations of conditions in watershed (to occur every 5 years during 20-yr phase)	IGS NRCS IDEM IDNR	Moderate	319 Grant	IGS IDEM EPA
Mapping using all data sources.	Integrate field observations with GIS data sets, aerial photography, satellite imagery (to occur every 5 years during 20-yr phase)				
Document status of riparian buffers by ground photography, aerial photography, and/or satellite imagery.	Ground photography (film or digital), aerial photography, and/or satellite imagery (to occur every 5 years during 20-yr phase)				

Goal 7:
Promote riparian buffer installation through outreach efforts targeted at three primary audiences within the watershed:
1. Agricultural producers
2. Urban or high-density residential (homeowners' associations, apartment complexes, schools, some businesses)
3. Rural or low-density residential (individual homeowners who are personally responsible for decisions made on their own property)

Objective 1:
Promote riparian buffer installation adjacent to agricultural lands within the watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Market existing programs (CRP, EQIP, WRP, WHIP, etc.) to agricultural producers.	Marketing will focus on opportunities for cost-share of buffer installation.	NRCS IDNR	Moderate	To be determined	To be determined
Develop system of recognition for agricultural producers.	Identify and promote agricultural producers who have successfully implemented riparian buffers.	Youngs Creek Watershed Assessment; SWCD			

Objective 2:
Promote riparian buffer installation adjacent to retention ponds in subdivisions.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Install a buffer demonstration project in a subdivision.	Demonstration will show plant species that are attractive, easily maintained, and appropriate for buffers, and before-after pictures will illustrate benefits.	NRCS IDNR	Large	To be determined	To be determined
Educate homeowners by providing buffer-related information.	Obtain a mailing list of homeowners' associations that would be willing to receive periodic information about water quality/buffer issues.	Youngs Creek Watershed Assessment; SWCD	Moderate	To be determined	To be determined
	Develop materials highlighting benefits of buffers (aesthetic, economic) and distribute to other homeowners' associations/communities within YCW.	Youngs Creek Watershed; SWCD; IDNR; NRCS		To be determined	To be determined
	Send articles/press release about the buffer demonstration that homeowners' associations can use in their newsletters.	Youngs Creek Watershed Assessment; SWCD		--	--
	Make information about correct use of pesticides and herbicides, nutrient pollution, etc. available to homeowners.	Youngs Creek Watershed Assessment; SWCD, Ag Extension, SWMD		To be determined	To be determined
	Develop literature that gives specific guidance for buffer installation (specific plant species/landscape designs or options)	Youngs Creek Watershed Assessment; SWCD, Ag Extension		To be determined	To be determined

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Install a demonstration project at a local school showing plant species that are attractive, easily maintained, and appropriate for buffers.	Take pictures before/after installation of demonstration plot.	Youngs Creek Watershed Assessment; SWCD	Large	Staff time	--
	Promote the site by offering tours (scouts, other schools, clubs, 4H)	Youngs Creek Watershed Assessment; SWCD		To be determined	To be determined
Make cost-share funds available to homeowners' associations for buffer installation in urban areas.	Identify homeowners or associations that are installing buffers; award cost share and volunteer design assistance and labor.	Youngs Creek Watershed Assessment; SWCD	Large	IDEM-Section 319	To be determined
Develop a system of recognition for homeowners' associations or local communities.	System would reward HAs or communities that implement water-friendly practices such as buffers, stream clean ups, monitoring. System could utilize plaques or signs to recognize accomplishments.	Youngs Creek Watershed Assessment; SWCD	Moderate	To be determined	To be determined

Objective 3:
Promote riparian buffer installation adjacent to streams in rural areas of the watershed through a targeted campaign to raise awareness about stream buffers.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Initiate a targeted campaign to raise awareness about stream buffers and promote riparian buffer installation adjacent to streams in rural non-agricultural areas of the watershed.	Cooperate with experts and businesses to develop literature that gives specific guidance (specific plant species/landscape designs or options) for buffer installation and create opportunities for discounted purchase of buffer plants (i.e., local nurseries or home/garden stores).	NRCS IDNR Local landscaping businesses, landscape architectural services, nurseries, home centers (e.g., Home Depot)	Large	To be determined	Local landscaping businesses, landscape architectural services, nurseries, home centers (e.g., Home Depot)
Develop a system of recognition to reward individual homeowners.	System would reward individuals that implement water-friendly practices such as buffers, stream clean ups, monitoring.	Youngs Creek Watershed Assessment; SWCD			

Goal 8:
Equip policy makers with information they need to make water-friendly decisions.

Objective 1:
Promote riparian buffer installation adjacent to waterways within city/county control.

Objective 2:
Encourage county government to take green space, buffers, and corridors into account when planning for future zoning and development. (**Important for stream health as well as aquifer recharge and subsurface water quality.)

Objective 3:
Encourage county officials to change maintenance practices along legal drains. Promote vegetated riparian buffer installation and less chemical application.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Monitor governmental agenda, upcoming decisions, or legislation that have the potential to impact water quality.	Communication of relevant county and city landuse decisions will offer the opportunity for watershed concerns to be voiced during the county and city planning processes.	Youngs Creek Watershed Assessment; SWCD; CILTI; IDNR; NRCS; IGS; IDEM	Moderate	To be determined	To be determined
Identify and organize local experts who are willing to provide information to decision-makers when such information is needed.	Information from experts and professionals, combined with voiced concerns, will empower policy makers to act in the best interest of the watershed.				
Identify opportunities for agencies such as the Central Indiana Land Trust, IDNR, or IDEM to speak to local decision-makers.					

Urban NPS Action Register

Problem:
Future increases in impervious surfaces and urban landuses threaten to increase pollutants that degrade aquatic health.

Goal 9:
Promote water-friendly behaviors among residents and officials in urban and urbanizing areas of the watershed.

Objective 1:
Initiate large-scale campaign to make residents of urban and urbanizing areas aware of water quality issues.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Publish a series of articles in existing newsletters or newspapers.	Article topics will include stormwater pollution, dangers of improper disposal of lawn chemicals, etc.	SWCD	Small	--	--
Exhibit a series of displays about water-friendly behaviors in urban locations.	Displays will vary and rotate among locations frequented by urban populations, including local libraries, stores, malls, movie theaters, post offices, or local government buildings.	SWCD	$500-$1000 Creation of display(s)	Grant/SWCD	Local businesses, city and county governments.
Display a video and distribute related promotional items at county and community fairs.	Video will educate urban, suburban, and rural residents about nonpoint source pollution topics. Promotional items will correlate.	SWCD	$1100 Purchase of video(s), promotional items for fairs.	Grant/SWCD	Local businesses, city and county governments.

Objective 2:
Promote existing programs (Indy Tox-drop and Spring Cleanup Day) that collect household hazardous wastes (HHWs).

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Initiate a targeted literature campaign.	Literature will inform users of HHWs of opportunities for proper disposal/recycling. Literature will be placed near the point of sale of HHWs.	Solid Waste Management District, local businesses	Moderate	Grant	SWCD, solid waste management district

Objective 3:
Promote awareness of storm drain pollution among residents of subdivisions within the watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Sponsor storm drain labeling projects	Program will entail recruiting and organizing volunteer groups, securing labels and supplies, training group leaders, delivering flyers or door-hangers to subdivision residents, and awarding prizes to volunteer groups.	SWCD Franklin DPW	~$1500 /year	Grant	SWCD, Solid Waste Management District, Franklin DPW, city and county governments

Objective 4:
Promote automobile maintenance among watershed residents.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Initiate a targeted literature campaign	Literature will explain the correct ways to change fluids, list local recycling centers for motor oil and other fluids, and include contact information. This information will be placed in stores adjacent to where oil is sold and online.	Local Auto Shops	Moderate	Grant	Solid Waste Management District

Objective 5:
Promote proper retention pond maintenance to homeowners' associations (HAs) and other groups.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Distribute informational material to each HA.	Pamphlets or folders will include proper way to manage retention ponds for water quality and opportunities for assistance.	Builders Associations Planning agencies	Moderate	Grant	Local businesses/ pond management companies
Hold a field day/workshop for HAs and other related groups.	Invite speakers to talk about pond maintenance at the riparian buffer demonstration project. Field day invitations should include HAs, developers, and planners.	Planning agencies, Drainage Board	Moderate	Grant	Local businesses/ pond management companies

Objective 6:
Encourage homeowners to reduce applications of fertilizers and other yard chemicals.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Initiate a targeted literature campaign.	Brochures, tear-offs, or other materials outlining consequences of excessive chemical applications will be distributed at locations where chemicals are purchased.	Stores Ag Extension office Solid Waste Management District	Moderate	Grant	--

Objective 7:
Promote proper use of road salt and sand among city and county officials within the watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Provide literature to city and county street departments.	Literature will explain the water quality implications of road salt and sand, new methods for effective applications, and alternative substances.	Solid Waste Management District	Moderate	Grant	Solid Waste Management District SWCD
Hold a 2-hr special meeting for city and county officials.	Meeting will raise awareness of the issue of road sand and salt pollution and encourage discussion among city and county officials.	Solid Waste Management District, SWCD	Small	--	--

Objective 8:
Analyze the impact of septic systems on watershed streams in order to target education about proper septic system maintenance to residents in the watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Study the distribution of *E. coli* in watershed streams.	Collect and analyze new and existing data to determine possible sources and locations of *E. coli* contribution to watershed streams.	Johnson County Health Department	Small	SWCD	Hoosier Riverwatch Project WET
Targeted literature campaign.	Literature will dispel some common septic system myths and encourage proper practices. Literature could be distributed by local agencies, real estate agents, and businesses.	Johnson County Health Department	Moderate	Grant	Johnson County Health Department Local businesses

Problem:
Future increases in impervious surfaces and urban landuses threaten to increase pollutants that degrade aquatic health.

Goal 10:
Promote dialogue among engineers, officials, and other professionals in the watershed about the installation and maintenance of structures and/or practices (BMPs) that counterbalance impervious surface run-off.

Objective 1:
Encourage builders, developers, and contractors to implement appropriate sediment control measures during construction.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Hold a meeting or workshop for builders, developers, and contractors to discuss or demonstrate BMPs	Meeting or workshop will emphasize the importance of preventing soil erosion and focus on demonstrating proper BMP installation to onsite workers.	IDNR staff SWCD Planning dept	Moderate	Grant	SWCD
Make information about proper techniques and procedures available.	Information will be made available to onsite workers in a usable format.	IDNR staff SWCD Planning dept	Moderate	Grant	SWCD

Objective 2:
Encourage discussion about more stringent water quality standards for retention ponds among city officials.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Hold a meeting for town boards, councils, and other interested officials to discuss their subdivision control ordinances.	Meeting will focus on the importance of incorporating water quality into subdivision control ordinances, highlight benefits, and provide example ordinances.	Drainage Board Johnson County Planning	Small	Grant SWCD	--

Objective 3:
Promote impervious surface alternatives in the watershed.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Construct a permeable surface demonstration plot and signage in a visible area.	This project will be designed and funded in conjunction with a host agency.		Large	--	--

Problem:
Future increases in impervious surfaces and urban landuses threaten to increase pollutants that degrade aquatic health.

Goal 11:
Determine the need to re-design or alter retention ponds in existing subdivisions to meet design standards set forth in the Johnson County Subdivision Control Ordinance which controls for water quality parameters and share this information with residents of county subdivisions.

Objective 1:
Evaluate pond standards in existing subdivisions in Johnson County.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Conduct a records survey.	Records survey will determine which retention ponds in the watershed were designed to meet water quality standards and which were not.	SWCD	Moderate	--	--
Share survey results with the public.	The status of ponds within subdivisions will be shared with that subdivision's representative or HA. A press release will be submitted, describing results of survey.		Moderate	--	--

Problem:
Future increases in impervious surfaces and urban landuses threaten to increase pollutants that degrade aquatic health.

Goal 12:
Provide input to Stormwater Phase II entities in Johnson County during the Phase II planning process.

Objective 1:
Distribute results of the Youngs Creek Assessment and Management Plan to Phase II entities in the county.

Action Items	Description	Technical Resources	Cost Estimate	Funding Source(s)	Potential Financial Partners
Obtain contact information for and distribute watershed-related items to all Phase II entities in the county.	The Assessment results and Plan contain water quality information and public input that will be helpful to Phase II entities during the planning process.	SWCD/ Youngs Creek Project	Small	Grant	--
Attend public meetings and other open forums to discuss issues.	Members of the Youngs Creek Advisory Group will be kept up-to-date about Phase II proceedings and opportunities for involvement.	SWCD/ Youngs Creek Project	Small	--	--
Provide technical support, assistance in communication and advertising, and other cooperation to Phase II entities.	Phase II entities can utilize the existing Youngs Creek Advisory Group as a resource in planning and implementing Stormwater programs.	SWCD/ Youngs Creek Project	Moderate	--	--