VFC Index - Watershed (Plan)

Program: Watershed

IDEM Document Type: Plan

Document Date: 1/28/2005

Security Group: Public

Project Name: Swanfelt Ditch WMP

Plan Type: Watershed Management Plan

HUC Code: 05120201 Upper White

Sponsor: Madison County SWCD

Contract #: 01-379

County: Madison

Cross Reference ID: 15742052

Comments:

Additional WMP Information

Checklist: 2003 Checklist

Grant type: 319

Fiscal Year: 2002

IDEM Approval Date: 1/28/2005

EPA Approval Date:

Project Manager: Nathan Rice

Swanfelt Ditch Watershed Management Plan

Prepared by:
Madison County Soil & Water Conservation District
182 W. 300 N. Suite D.
Anderson, IN 46012
765-644-4249 Extension 3
www.madisonswcd.org

IDEM 319 Project: ARN A305-2-01-37

Swanfelt Ditch Watershed Management Plan
Madison County Soil & Water Conservation District

Table of Contents

Swanfelt Ditch Watershed Management Plan
Madison County Soil & Water Conservation District

Figures and Tables

List of Figures

List of Tables

1. Swanfelt Ditch Watershed Project History and Structure

Swanfelt Ditch Watershed Description

The Swanfelt Watershed is a 14 digit HUC (05120201050080) watershed that exists in northwestern Madison County. The watershed is approximately 11,264 acres in size. The watershed encompasses a large western portion of the town of Frankton. The watershed contains mixed topography and land use. Land uses include urban, suburban, and rural housing, light manufacturing, general municipal services, large and small agricultural operations.

The watershed also contains natural and constructed waterways. Pipe creek is the largest flowing body of water. The watershed is named for a small open ditch that extends from the northernmost point of the watershed to the point of the watershed where Pipe Creek and Swanfelt Ditch converge. Many small unnamed tributaries exist within the watershed. The population of the Swanfelt watershed is approximately 2,521 (source MCCOG interpolation).

The northern portion of the watershed is basically flat, farm ground. Very little topographical relief exists north of County Road 900 North in the watershed. However, south of 900 north, the watershed contains gently rolling to rolling topography. Throughout the watershed, there are natural areas, residential development, and small farmsteads.

Swanfelt Watershed Planning Group / Public Participation

The Madison County Soil & Water Conservation District (SWCD) applied for an Environmental Protection Agency Section 319 Clean Water Act grant during the fall of 2001. The project arose out of a desire by the SWCD Board of Supervisors and SWCD Staff to undertake a targeted approach to improving water quality with the help of watershed stakeholders. The SWCD was awarded the grant and received $107,000 to work on three projects. Those three main projects are as follows: 1. create a watershed management plan for a 14 digit Hydrologic Unit Code (HUC) watershed; 2. replace 4 failed, conventional septic systems with 4 new, alternative type septic systems (make those new systems serve as demonstration areas); 3. create and implement an education program centered on educating the owners of septic systems about septic system maintenance and its relation to water quality.

As part of project number 1., The SWCD put together a Steering Committee that consisted of the following individuals from the SWCD, Madison County Council of Governments, Phillippe Water Co., White River Watchers, Town of Orestes, Madison County Health Department, the Madison County Surveyor, and the City of Anderson Engineering Department. A total of nine individuals from each of these county stakeholder groups developed ground rules for the planning project and began a selection process to select a 14 digit watershed to for planning purposes. As the administrator of the project, the Madison County SWCD coordinated the project from the start to finish.

This is the first watershed planning project that the Madison County SWCD has coordinated. Since this was the first project for the SWCD, the group wanted to select a watershed that would be representative of the water quality concerns in most all watersheds. But still have a size and scope of concerns that the group could successfully plan for, and implement water quality improvements within the watershed.

The Primary Steering Committee members consisted of the following people:

John Shettle	Town of Orestes, municipal government expert
Don Zalokar	Phillippe Water, community relations expert
Patrick Manship	County Surveyor, drainage expert
Jerry Bridges	Madison County Council of Governments, planning expert
Allan Henderson	Madison County Council of Governments, architectural expert
Judy DeLury	White River Watchers, activist / environmental expert
Mike Spyers	City of Anderson Civil Engineer, engineering expert
Chad Pigg	Assistant Superintendent City of Anderson Stormwater Utility, regulations / water quality expert
Brandon Clidence	Madison County Health Department, septic system expert
Bob Ellis	Madison County SWCD, farming expert

Brett Canaday of the Madison County SWCD coordinated the project. Shannon Adams of the Madison County SWCD served as the administrative assistant.

Committee Recruitment

The SWCD recruited the Steering Committee by sending a recruitment packet to individuals and organizations that either had expressed interest in the SWCD's planning project or individuals and organizations that the SWCD felt would be an asset to the planning project. The intent was to make sure that every entity that was interested would not be left out of the planning process. In addition to targeted recruitment, at their Swanfelt Ditch kick off meeting on January 14, 2003, the SWCD and Steering Committee announced that anyone who was interested to take part in the project was welcome to do so. Furthermore, the SWCD sent out quarterly newsletters to a county wide mailing list of approximately 2,100 people and posted press releases on their web site that highlighted the project and engaged the public. There were also 8 civic group presentations given by the SWCD during the course of the 2 year grant cycle from July 1, 2002 through June 30, 2004 that centered on the project and nonpoint source pollution water quality education.

As one may see from the preliminary steering committee roster, numerous walks of life were represented. Each offered their area of expertise and relationship to the watershed planning process.

The Swanfelt Ditch Watershed Management Plan project is a volunteer based project. The efforts of the stakeholder Steering Committee were vital to the success of the project. Over the course of the two year grant project, 14 public stakeholder meetings were held. While the watershed was being selected by the initial Steering Committee, the meetings were held in Anderson. After the Swanfelt Ditch was selected as the watershed to be planned in December of 2002, all meetings were held at the Frankton Town Hall within the watershed. At each meeting, the Steering Committee's roles and responsibilities involved reviewing water quality information and offering local knowledge and information specific to the Swanfelt Ditch Watershed as it pertains to water quality and quality of life issues. This plan has been developed as a result of the efforts of the Steering Committee.

Narrative of Watershed Selection Process

With the assistance of Jim Dunaway, NRCS/IDEM Watershed Liaison, the initial Steering Committee set ground rules for the watershed planning process. Their responsibility was to use consensus based decision making to select a 14 digit HUC watershed that would make a good candidate for the Madison County SWCD's first watershed planning effort. Once selected, the initial Steering Committee believed that it would be a good idea to turn the planning effort over to stakeholders within the actual watershed that was chosen. The initial Steering Committee used the following criteria to select the 14 digit HUC watershed to be planned:

- Watershed contains the headwaters of a stream
- Watershed exists in its entirety within Madison County
- Watershed contains public wellheads
- Watershed contains 303 (d) listed stream
- Watershed is small in size but contains representative water quality issues of larger watersheds within the county.

Using the above criteria, the Committee selected the Swanfelt Watershed. They worked with the Madison County Council of Governments to develop the maps to illustrate the selection process for the watershed project. Figures 1.1 – 1.6 show this process of elimination.

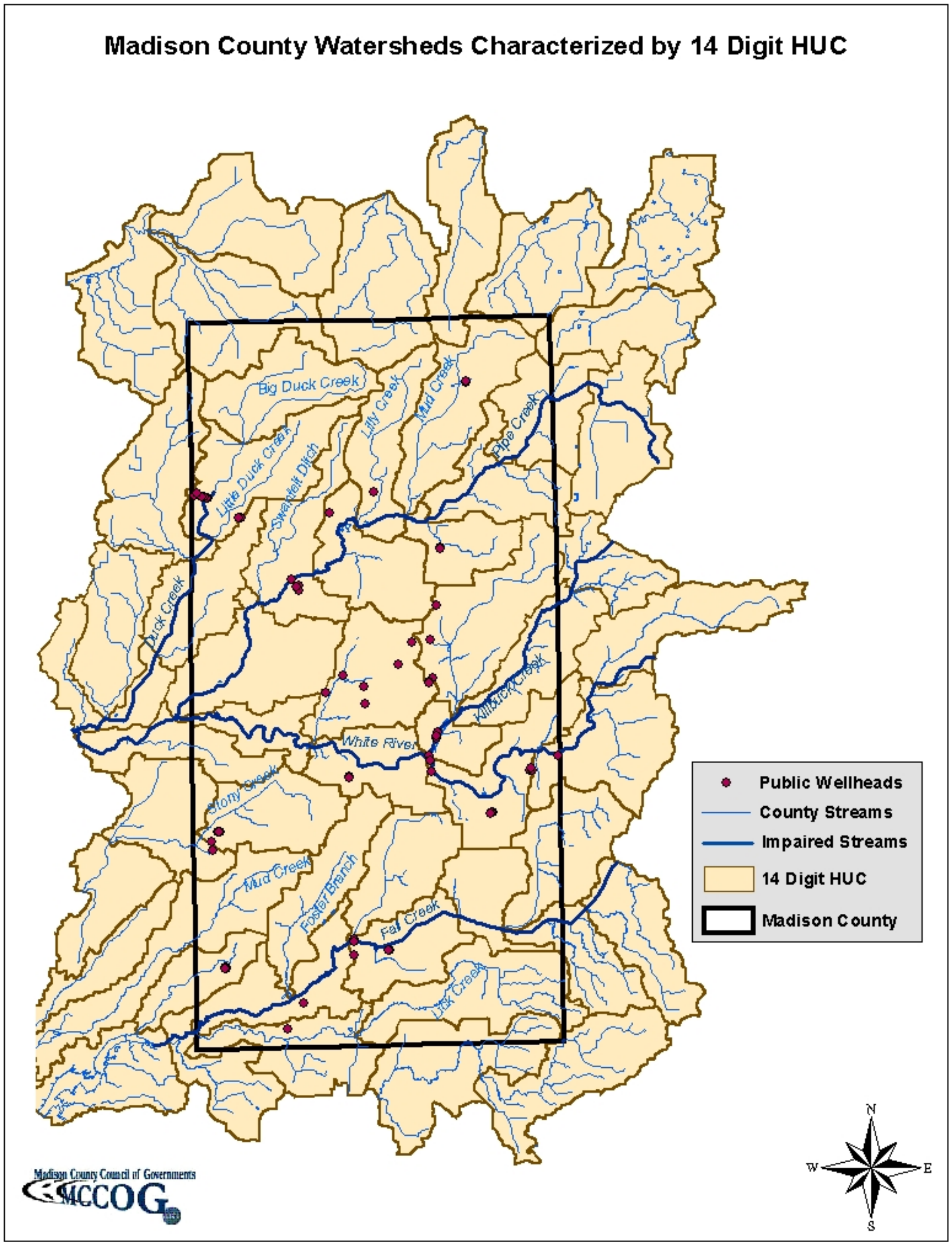


Figure 1.1 14 Digit HUC Watersheds of Madison County

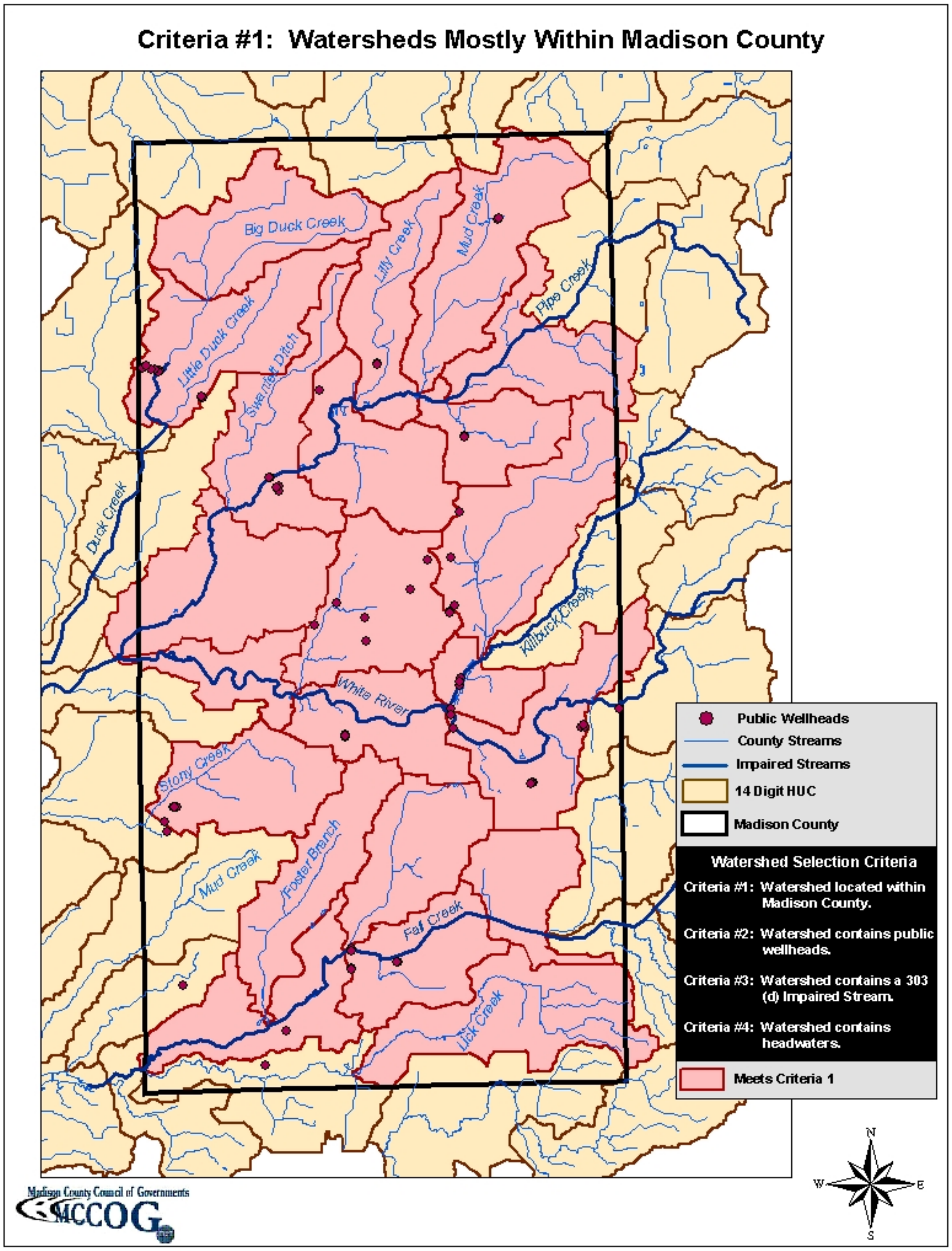


Figure 1.2 Watershed Selection Map – Criteria 1

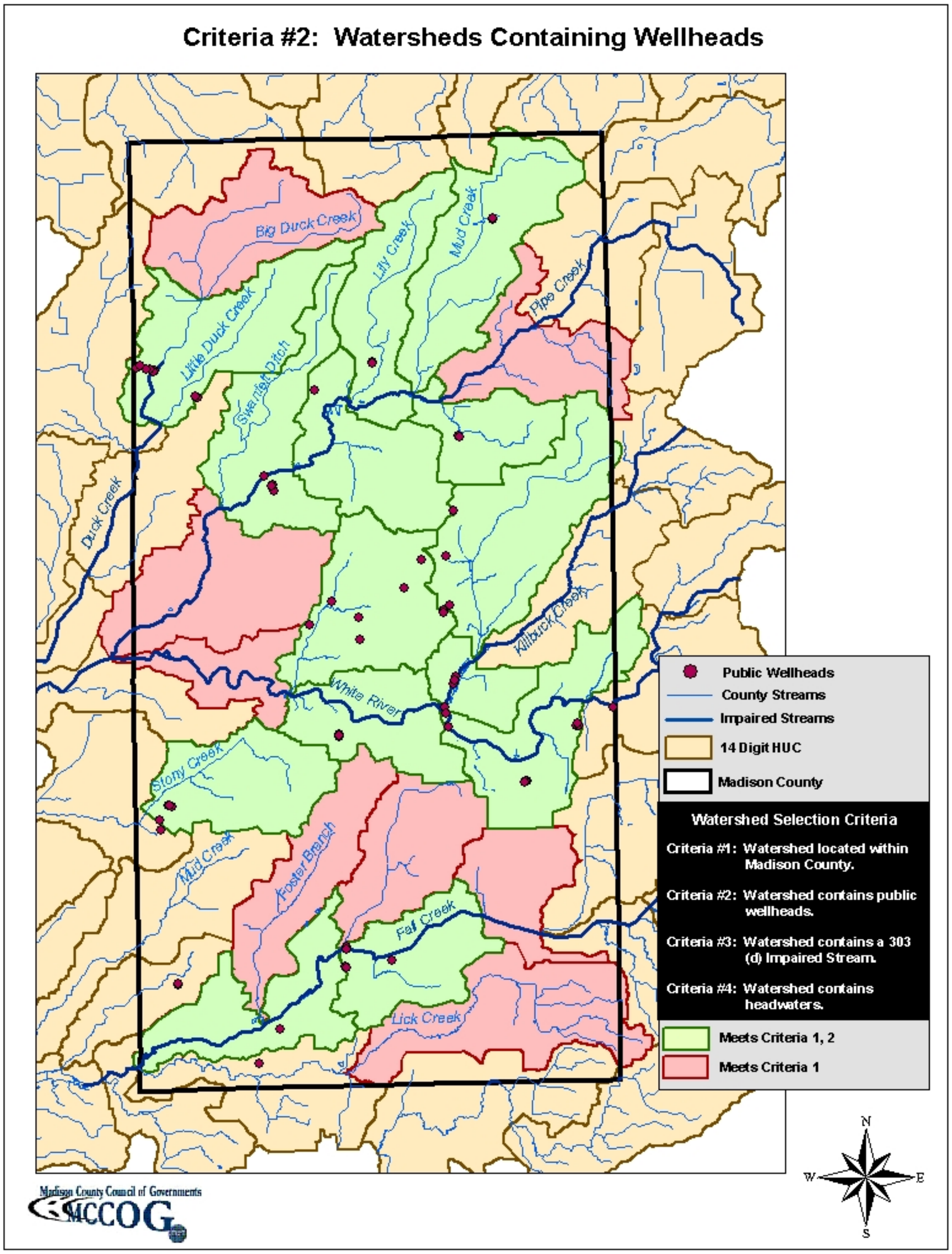


Figure 1.3 Watershed Selection Map – Criteria 2

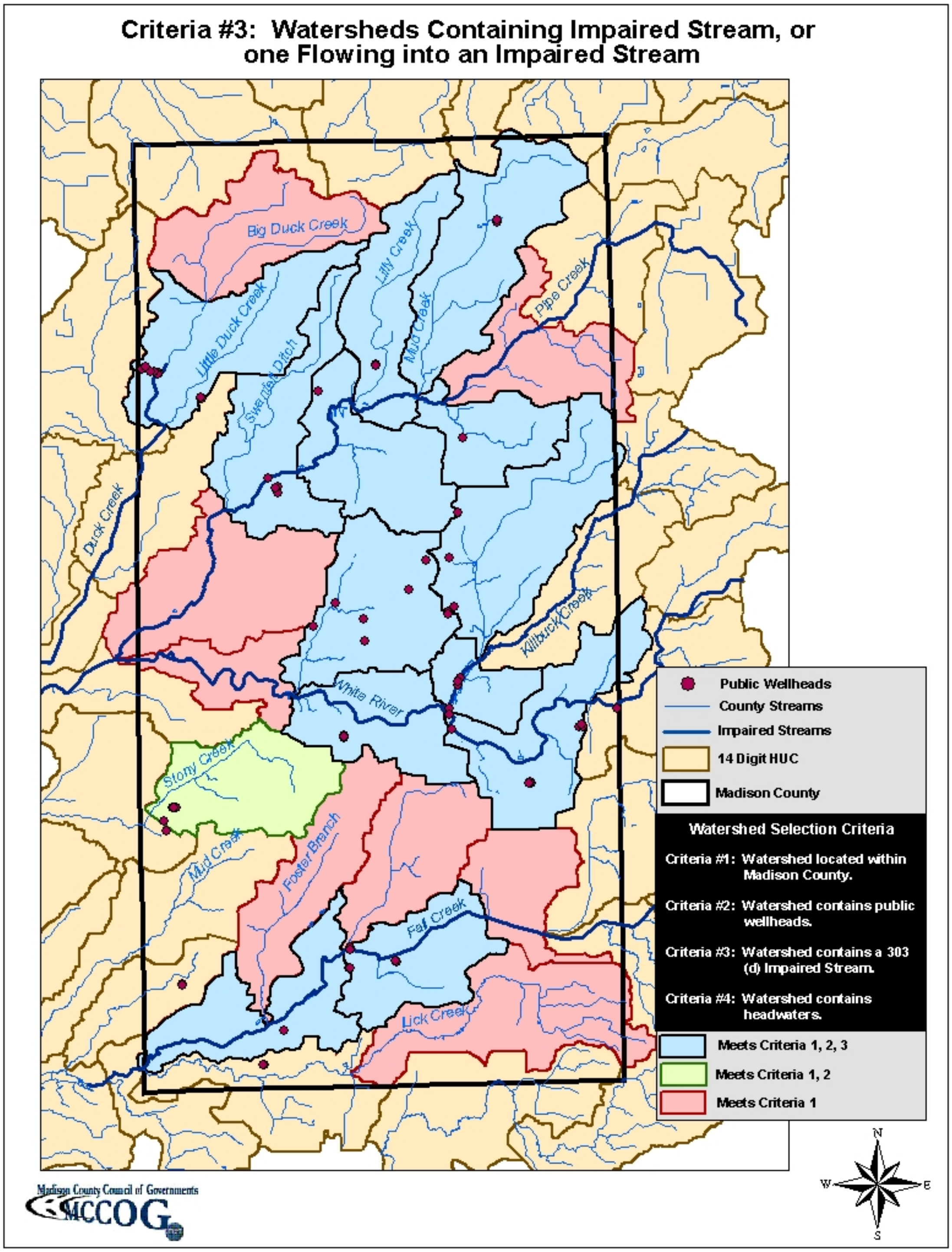


Figure 1.4 Watershed Selection Map – Criteria 3

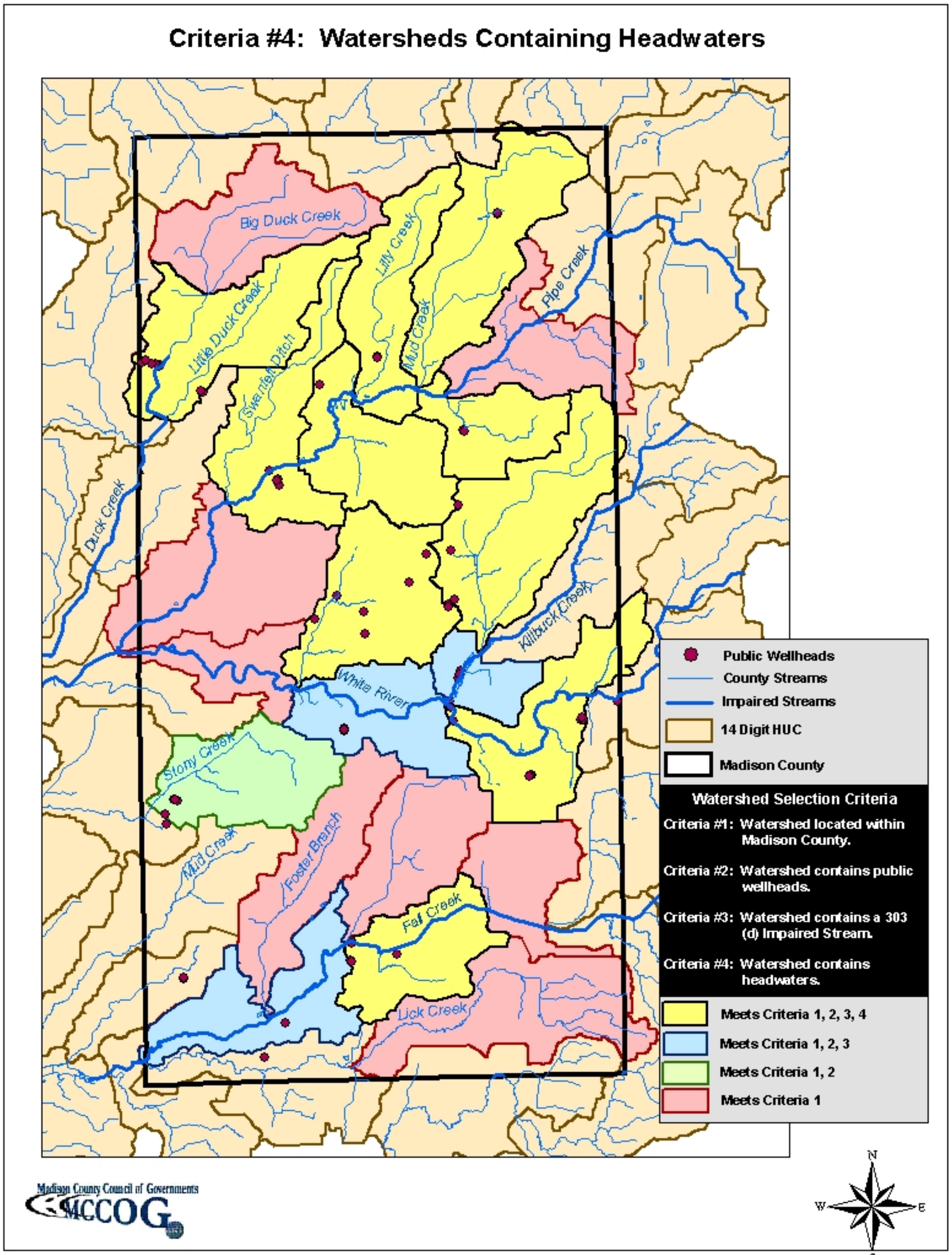


Figure 1.5 Watershed Selection Map – Criteria 4

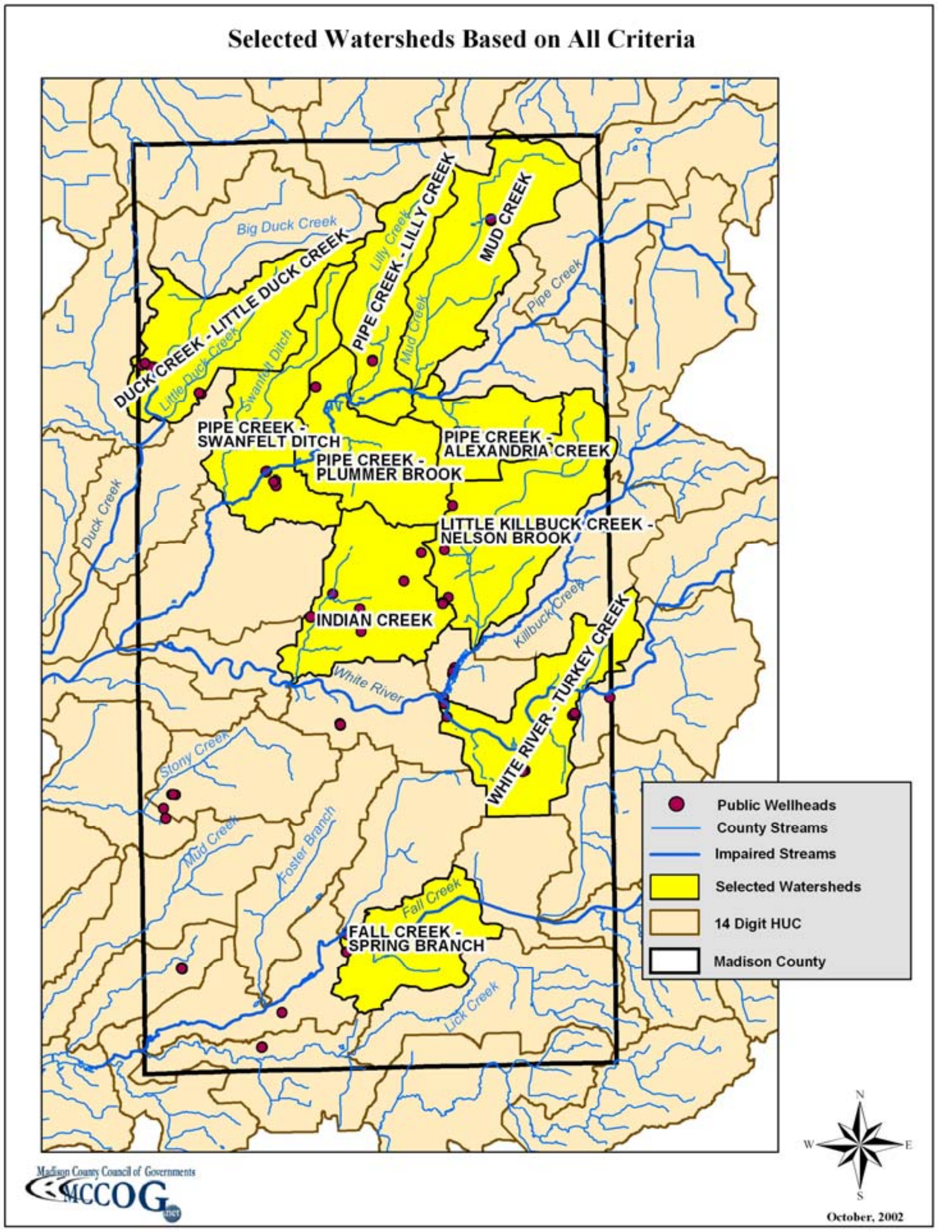


Figure 1.6 Watershed Selection Map – Using All Criteria

As one may see from Figure 1.6, the process narrowed the selection to 10 watersheds. The Committee then utilized the size of the watershed and whether or not the watershed contained a small urban environment to make the final watershed ranking. Taking those factors into consideration, the group selected the Swanfelt Ditch Watershed (05120201050080) as its planning candidate.

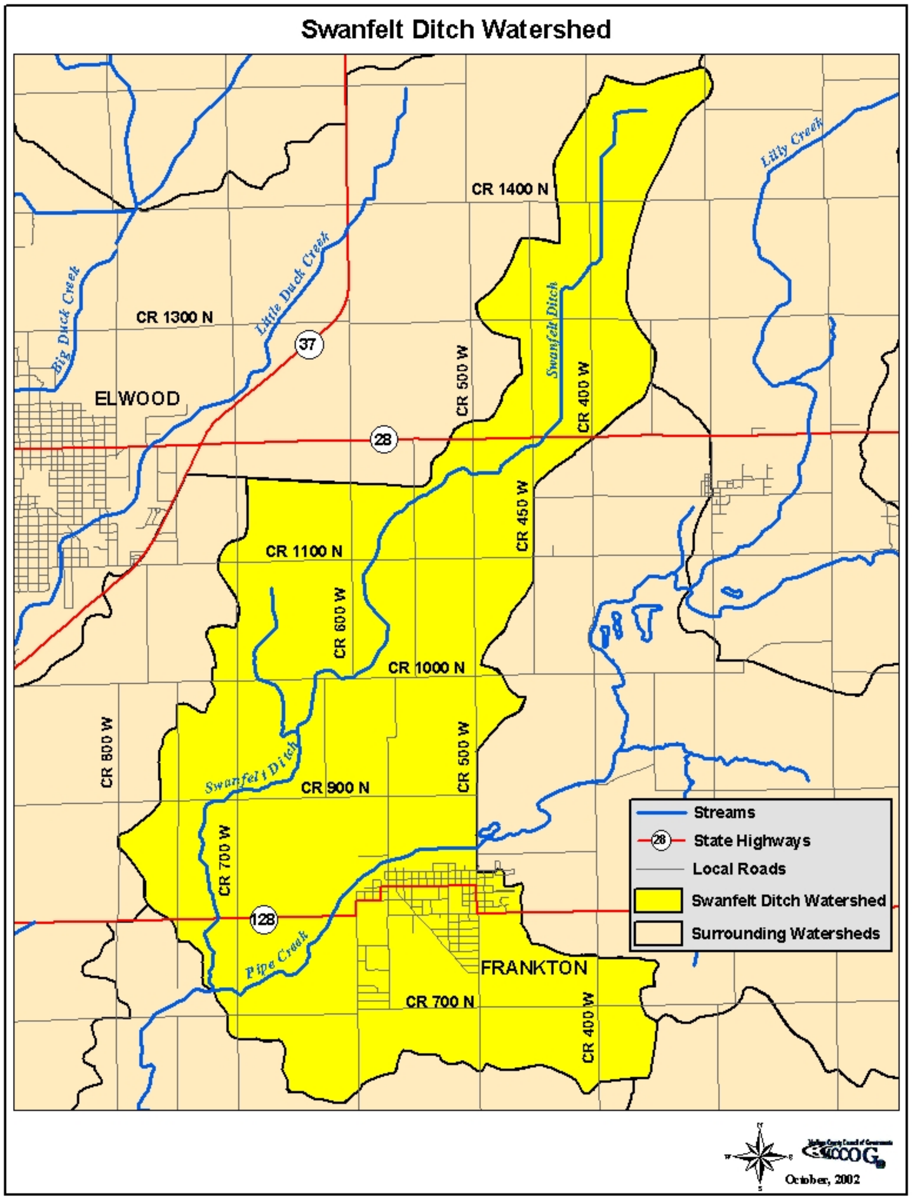


Figure 1.7 Watershed with Road Grids

Once they selected that watershed, the group conducted a public meeting on January 14, 2003 within the Swanfelt Ditch Watershed to kick-off the start of the Swanfelt Watershed Planning project. The public meeting served as an information meeting for the stakeholders within the watershed and also served as a call-out for potential, new steering committee members from within the Swanfelt Ditch Watershed itself.

The initial committee was able to recruit the following individuals from within the watershed to work on creating the plan for the Swanfelt Ditch Watershed.
The following people from the Swanfelt Watershed have served to develop the watershed management plan as the Secondary Steering Committee.

The Secondary Steering Committee members consisted of the following people:

John Shettle	Town of Orestes, municipal government expert
Don Zalokar	Phillippe Water, community relations expert
Patrick Manship	County Surveyor, drainage expert
Jerry Bridges	Madison County Council of Governments, planning expert
Allan Henderson	Madison County Council of Governments, architectural expert
Judy DeLury	White River Watchers, activist, environmental expert
Chad Pigg	City of Anderson Assistant Superintendent Stormwater Utility, regulations / water quality expert
Brandon Clidence	Madison County Health Department, septic system expert
Bob Ellis	Madison County SWCD, farming expert
Mike Shuter	Farmer and Resident of the Swanfelt Watershed, farming expert
Tia Agnew	Farmer and Resident of the Swanfelt Watershed, watershed planning expert
Richard Fetty	White River Watcher and Resident of the Swanfelt Watershed, activist / water recreation expert
Bob Mills	Farmer and Resident of the Swanfelt Watershed, farming expert
Ray Utterback	Farmer and Resident of the Swanfelt Watershed, farming expert

Brett Canaday of the Madison County SWCD coordinated the project. Shannon Adams of the Madison County SWCD served as the administrative assistant.

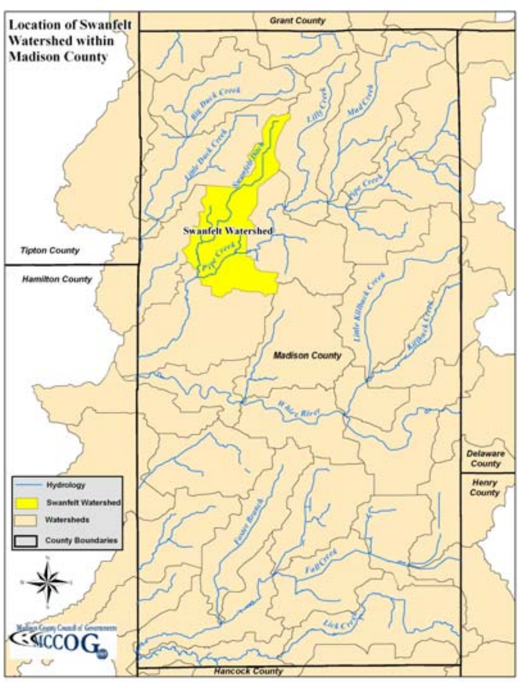


Figure 1.8 Swanfelt Ditch Watershed in Relation to Madison County

Partner Roles and Responsibilities in the Planning Process
The Swanfelt Ditch Watershed Stakeholder Steering Committee utilized consensus based decision making in their watershed planning efforts. The town of Frankton provided meeting space for stakeholder meetings. During those meetings, the SWCD Coordinator facilitated by providing information gathered during watershed driving tours, utilizing the stakeholder knowledge contained by the stakeholders because of their living / working relationship with the watershed. All stakeholders involved with the project brought individual strengths and knowledge to the project based on their career or familiarity with the watershed. No sub committees were created during this phase of the project. However, during the implementation phase of the project, it may be more likely that sub committees are formed.

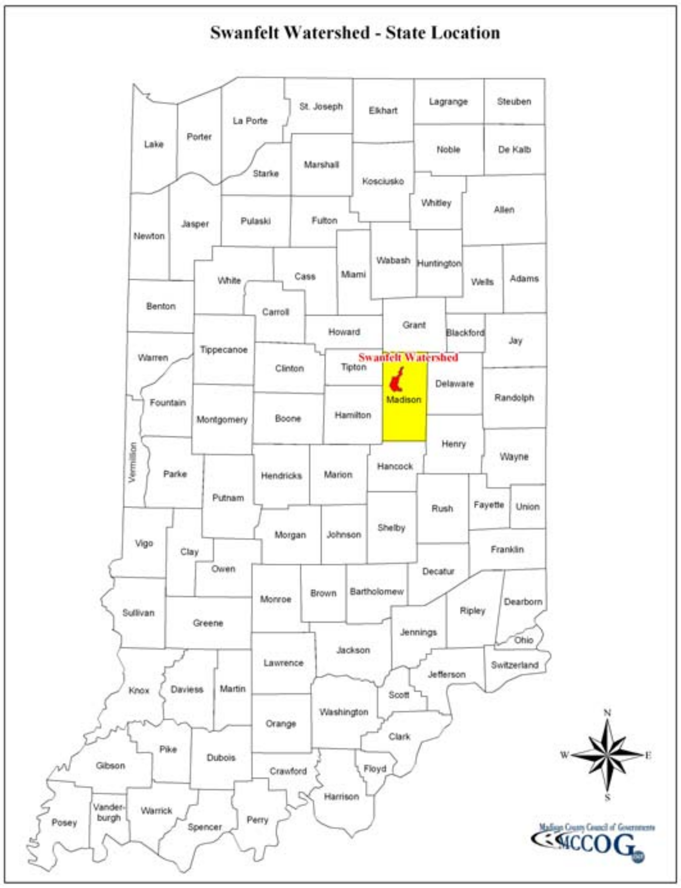


Figure 1.9 Swanfelt Ditch Watershed in Relation to the State of Indiana

Steering Committee Development
The SWCD was able to partner with all of the individuals and groups represented above by calling on them individually and inviting them to a meeting regarding the watershed project. With the help of the Watershed Conservationist Liaisons, the SWCD was able to explain the watershed planning process, what we wanted to ultimately accomplish in the project, and also what phases of the project would exist during and after this grant is completed. The Steering Committee immediately developed ground rules and mission statements for the watershed.

Vision
<u>The Swanfelt Watershed Steering Committee will:</u>
Create an aesthetically pleasing Swanfelt Watershed that fosters measurable improvements in water quality and quality of life.

Mission
<u>The Swanfelt Watershed Steering Committee will</u> survey the watershed, identify measurable goals, and promote, educate and facilitate conservation practices that will improve the water quality in the Swanfelt Watershed through an adaptable watershed management plan.

Initial Water Quality Concerns
As soon as the Swanfelt Ditch Watershed was selected as the watershed to be planned and the local Steering Committee was assembled, the next two meetings were used as a forum for the Steering Committee members to express their initial water quality concerns. Table 1.1 highlights those concerns. The committee used a basic method of asking the question "What do you think are the water quality concerns in the Swanfelt Ditch Watershed?" and then recording their thoughts on a flip chart. The committee used this list as the basis for further group discussion about water quality and the direction that the committee should proceed with the watershed management plan.

Table 1.1 Summary of Water Quality Concerns compiled by Steering Committee

Question Asked	
What do you think are water quality concerns in the Swanfelt Ditch Watershed?	Agricultural Concerns ▪ Surface Erosion ▪ Sedimentation – high total suspended solids ▪ E. coli ▪ Warm Blooded Animals in stream ▪ Is Livestock and / or Wildlife ▪ Lack of No-Till & Conservation Tillage Farming – Fall Tillage of Crop Fields ▪ Surface Run-off ▪ Excess Nutrients ▪ Excess Chemicals ▪ Excess Sediment ▪ Lack of Conservation Tillage ▪ Lack of Vegetated Filter Strips ▪ Oil Sheen (crop oil) noticed in streams in watershed ▪ Lack of set-back distances from streams ▪ Lack of Vegetated Filter Strips ▪ Lack of Integrated Pest Management ▪ Lack of Buffer Strips ▪ Loss of Wetlands ▪ Woody Vegetation has been removed from Legal Drains ▪ Lack of Balance between Farming, Legal Drain Maintenance, Drainage, and Conservation ▪ Impaired Biotic Communities Urban ▪ Volatile Automotive Runoff from Impervious Surfaces ▪ Lack of ordinances for development ▪ Lack of pervious surfaces "flow-thru" pavement vs. impervious pavement ▪ Unbridled development affects water quality – excessive runoff, etc. ▪ Lack of detention/retention ponds for new developments

	▪ Stormwater is not treated ▪ Lack of smart growth ideas - reducing street widths & increasing vegetated swale ditches for runoff control ▪ Lack of wetland vegetation for infiltration for surface water in urban areas ▪ Excessive nutrient, chemical and sediment from urban lawns ▪ Lack of IPM in yard maintenance ▪ Loss of riparian corridor in urban area ▪ Lack of setbacks for managed lawns next to Hulda-Miller legal drain in Frankton ▪ Excessive nutrient, chemical and sediment from urban lawns ▪ Lack of roof runoff infiltration ▪ Lack of ground water recharge ▪ E. coli from urban environment ▪ Town of Frankton CSO for treatment / separation ▪ Pet waste from urban owners ▪ Loss of Wooded Habitat for water purification purposes ▪ Contamination via Industry/Gas Station ▪ Illegal Dumping, Littering Education General Education needed to heighten nonpoint source pollution prevention awareness among residents of watershed Septic Systems ▪ Failed, failing and/or non-existent septic systems are directly contributing to water quality impairments ▪ Lack of rural septic district or waste district in swanfelt watershed area ▪ Lack of public funds used for repairing, replacing failed or failing septic systems Ground Water ▪ Groundwater Impairments from Industrial, Residential, Agricultural Influences ▪ Lack of ordinances for infiltration rates and quality of recharge ▪ Septic systems infiltration into personal wells ▪ Well contamination by auto fluids and hazardous materials ▪ Leaking underground storage tanks ▪ Lack of amnesty or recycling drop off for hazardous materials ▪ Road salt, cyanide levels high and heavy metals ▪ Service station runoff and the direction of the flow ▪ Contamination from farm operations ▪ Home fuel oil contamination from underground tanks

The concerns voiced by the Steering Committee can be grouped into the following categories of concern:

1. Agricultural Runoff
2. Urban Runoff
3. Failing Septic Systems
4. E. coli Contamination
5. Groundwater Contamination

Plan Development

The development of the Swanfelt Watershed Management Plan was a result of the combined effort of the Steering Committee(s), SWCD Staff and the SWCD Board of Supervisors. The Steering Committees met over the course of 14 meetings and advised the SWCD Watershed Coordinator on water quality issues, goals for the watershed, and voluntary actions that may be taken to improve the water quality. With regards to drafting of the plan itself, the SWCD watershed coordinator was responsible for its completion. The SWCD Board of Supervisors have maintained oversight of the grant project overall.

Total Maximum Daily Load

A Total Maximum Daily Load (TMDL) is the maximum amount of pollution that a water body can assimilate without violating state water quality standards. TMDL's were mandated by Section 303(d) of the Clean Water Act (passed in 1972).

At the time of this publication, a TMDL project is taking place within the Swanfelt Ditch Watershed for Pipe Creek. The TMDL project has just started in combination with Duck Creek and Stoney Creek. For Pipe Creek the TMDL is for E. coli and the reach of the project includes the entire reach of Pipe Creek from the headwaters in Delaware County through to the confluence of Pipe Creek and White River in Hamilton County. Pipe Creek, for that project, has a brief pass (2.8 mi.) through the Swanfelt Ditch watershed. The SWCD watershed coordinator has worked briefly with the consultant who is working on the project to inform them of the Swanfelt Ditch watershed planning project. As the project progresses, the watershed coordinator looks forward to assisting in any way possible to improve the outcome of the project. More discussion of TMDL activity within the watershed may be found in Section 3 of this watershed management plan.

2. Describing the Watershed

Natural History

The landscape in the Swanfelt watershed was formed based on the manner that the Wisconsin Glacier moved through the area. The soils that are present in the watershed are a direct result of glacial deposits that were left when the glaciers receded.

Before settlement of the area during the early 1800's all of the Swanfelt Ditch Watershed was dominated by hardwood forests, streams and wetlands. At the time of settlement, the new residents cleared most all of the forested areas and began installing subsurface tiles to drain the land for agricultural production. In addition, to the tile installation, the residents also constructed new, open ditches to assist draining areas that were not easily serviced by existing streams and/or areas. Current conditions on the streams include some areas of vegetation and some have little or no vegetation buffering the stream from adjacent land uses.

Drinking water is obtained throughout the Swanfelt Ditch Watershed entirely from subsurface water wells. Private citizens outside of the corporate limits of Frankton utilize private water wells. The town of Frankton utilizes municipal, subsurface water wells to deliver water to the residents

The Swanfelt Ditch Watershed consists of 5 streams and / or ditches. Their names and lengths are as follows:

Swanfelt Ditch	10.2 miles
McClure Ditch	3.5 miles
Pipe Creek	2.9 miles
Unnamed Tributary to Pipe Creek # 1*	0.9 miles
Unnamed Tributary to Pipe Creek # 2**	0.7 miles
Total Stream Miles	***18.2 miles***

* Unnamed tributary #1 is starts ½ mile north of county road 900 north approximately 1/8th of a mile west of county road 500 west and travels directly south to Pipe Creek.
** Unnamed tributary #2 starts ¼ mile east of 600 west approximately1/8th mile north of 700 north and travels directly west to Pipe Creek.

Land Use

As one may see from the Figure 2.3, the land use is dominated by agricultural production. Agricultural producers plant the majority of the farm acreage to corn and soybeans. However, wheat, alfalfa and tomatoes are also planted. There are a few small livestock operations in the watershed in addition to the 4 permitted livestock operations.

Outside of the urban area of the town of Frankton, the watershed is dotted by small hobby farms, larger full-time farm operations, and rural, residential home plots. Both within the urban and outlying areas, ownership of land is private in nature. Within the watershed, there are no significant public lands or public natural areas that exist.

According to the Madison County Council of Governments (MCCOG) interpolation, the total acreage of the Swanfelt Ditch Watershed is 11, 264. Of the total acreage, it is determined from MCCOG analysis that 67% of the Swanfelt Ditch Watershed is conventionally cropped equaling approximately 7,546 acres.

Climate
Madison County, including the Swanfelt Watershed, has a typical Midwest North American climate. The watershed receives average rainfall amounts of 38 inches. Average low temperature for the watershed is 18.3 ^{o}F. Average high temperature for the watershed is 83.8 ^{o}F. (Source: City of Anderson / Madison County Statistics http://www.city-data.com/city/Anderson-Indiana.html)

Soils & Topography
The soils and topography of the Swanfelt Ditch Watershed are typical of the Eastern Corn Belt Plains Ecoregion. That region contains glaciated, level to rolling glacial till plain, with end moraines and glacial outwash landforms. Common soil series include Fincastle, Treaty, Cyclone, Xenia, Ockley and Shoals. Common soil types within the watershed consist of Brookston, Crosby, Miami and Mahalasville. These soils grew Beech forests, oak-sugar maple forests, white oak forests, pin oak swamps, elm-ash swamps grew on nearly level terrain. At present, corn, soybean, small grains, hay and livestock are grown agriculturally on these soils. These soils are typified by Brookston – Crosby soil associations. This association is made up of nearly level to gently sloping rises and knobs that are interspersed with level and slightly depressional areas. The Brookston soils are dark colored, very poorly drained and have a silty or clayely surface layer and a dark gray clayey subsoil. They are underlain by grayish-brown to yellowish-brown, calcareous loamy till. The Crosby soils are lighter colored than the Brookston soils and have less clay in the surface layer. They are somewhat poorly drained and have a dark yellowish-brown clayey subsoil underlain by yellowish-brown, calcareous loamy till. Both soils typically require artificial drainage for commodity crop production. (Madison County Soil Survey, Soil Conservation Service 1969)

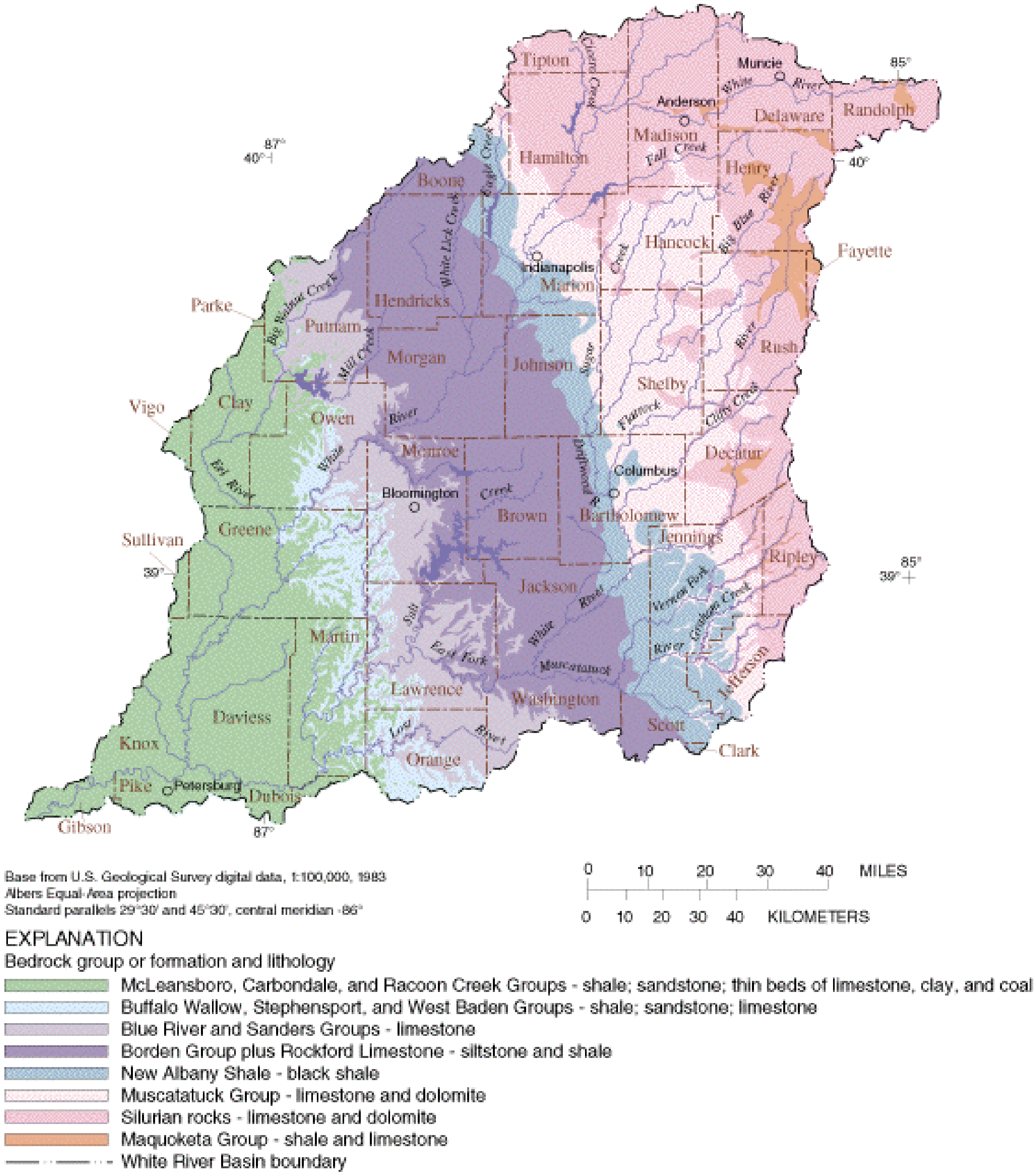


Figure 2.1 Upper White River Watershed Soils and Geology Map
(Source: USGS 2003 NAWQA Water Quality Study for White River Basin)

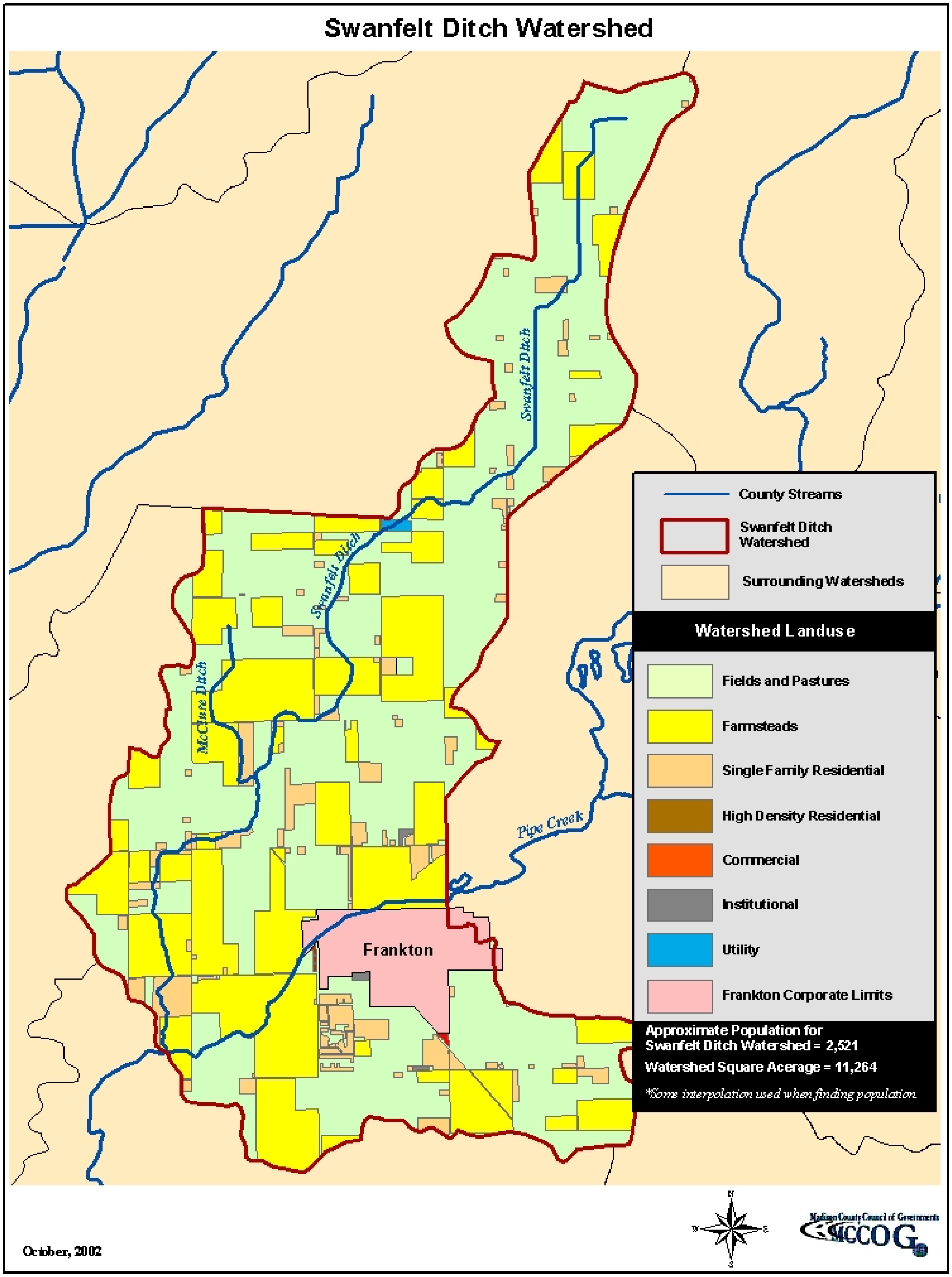


Figure 2.2 Swanfelt Ditch Watershed Land Use

Endangered Species

There are nine species of vascular plants, two species of mussels, one species of insect, four species of birds, one species of mammal, and three types of high quality natural areas that are endangered at a federal, state or both the federal and state level. These species mentioned are for the area of Madison County. A complete listing specific to Madison County may be accessed via Indiana Department of Natural Resources, Division of Nature preserves. http://www.state.in.us/dnr/naturepr/species/madison.pdf

No listing of endangered species specific to the Swanfelt Ditch Watershed was found.

Geology

The geology of the watershed is a direct result of the Wisconsinan glacier activity. This gave the Swanfelt Watershed loamy, high lime, late-Wisconsinan glacial till, glacial outwash and scattered loess overlie Paleozoic carbonates and shale.

(Source: Environmental Protection Agency "Characteristics of Ecoregions of Indiana and Ohio" ftp://ftp.epa.gov/wed/ecoregions/oh_in/ohin_back.pdf

3. Establishing Benchmarks

Known Water Quality Problems

In order to obtain baseline knowledge of water quality issues that had already been documented, the watershed coordinator performed a literature review of the water quality assessment reports that identify water quality impairments in the Swanfelt Ditch Watershed. Reports from both federal and state sources were reviewed. Very little monitoring data was found regarding the Swanfelt Ditch Watershed in particular. However, quite a lot of information was found regarding the Upper White River Basin, of which the Swanfelt Ditch Watershed exists. In addition to reviewing existing reports, the Committee chose to perform a watershed windshield survey to acquire visual confirmation of watershed conditions.

Stream Visual Survey – Watershed Windshield Survey

The watershed coordinator, along with a few Steering Committee members took part in an observatory drive and tour of the Swanfelt Watershed. The group finished the survey over the course of three driving events. During this survey, the participants started at the northernmost reaches of the watershed and traveled every road in the watershed observing the land use and potential areas where nonpoint source pollution may occur. While on the survey, they photographically documented the watershed so as to bring back to the Steering Committee pictures for discussing water quality concerns. The Committee then used the survey as a way to determine potential water quality problem sources and critical areas.

The participants of the watershed driving tour utilized worksheets from the Watershed Inventory Workbook for Indiana (Frankenberger, Mcloud, Faulkenburg, March 2002) to record stream and land use observations at 50 sites throughout the watershed. Photos were also taken to give photographic evidence of what was seen. Table A.1 in the appendix shows the results of the windshield survey.

The windshield survey proved useful for the purpose of verifying land use and visually inventorying the streams of the watershed as a whole through 50 representative points. The points were strategically selected to give a representative view of the watershed by area of topography and rural vs. urban areas. Figures 3.1 – Figures 3.6 show some photos from the watershed windshield survey.

Figure 3.1 Photo of Swanfelt Ditch in northern reaches of watershed exhibiting oil sheen on surface of water, no bank vegetation and high algae growth.

Figure 3.2 Photo of Swanfelt Ditch in northern reaches of watershed exhibiting sedimentation, low flow, water vegetation, no vegetative setback from top of bank, conventional tillage (occurring in photo at time of photograph), and subsurface drainage tiles.

Figure 3.3 Photo of Swanfelt Ditch just south of State Road 28. This photo exhibits no vegetative setback distances from cropping activity, numerous subsurface tile drainage outlets, slow moving water, high algae growth, and a rural residence that uses a septic system on high clay, poorly drained soils.

Figure 3.4 Photo of cattle pasture with an unnamed tributary to Pipe Creek #2 meandering through the pasture between 600 west and Pipe Creek just south of State Road 128. Note the cattle grazing directly in the center of photo.

Figure 3.5 Photo of Swanfelt Ditch with riparian corridor intact. Note tall trees growing on the bank of the stream, with a vegetated filter strip buffering the stream from the no-till soybean field on the right. Location is South of 1000 North between 700 West and 600 West.

Figure 3.6 View of Pipe Creek at 600 west Bridge on West side of Frankton. This scene typifies the proximity of urban residents, their lawns, to the muddy, waters of Pipe Creek.

Summary of Findings from Watershed Windshield Driving Survey

Based on the driving survey, the planning project was able to summarize the findings in the following way. Of the fifty survey points observed, 43 existed in rural, agricultural areas of the watershed. The remaining 7 existed within the town of Frankton. Agricultural area results show that of the 43 agricultural sites surveyed, 30 of those sites contained the following conditions:

- Conventionally tilled row cropping directly up to bank of stream
- No vegetative buffer between stream bank and cropping
- Slow water flow
- Excessive algae growth in stream
- Numerous systematic subsurface drainage tile inlets visible
- Scum, oil sheen, or trash visible
- Thick sediment layer on stream bottom and/or brown, muddy water

It was determined during the course of the survey that, of the 18.2 stream miles in the Swanfelt Ditch Watershed, 8 of those miles did not have any vegetative buffer from agricultural activities.

The other 13 agricultural sites maintained a combination of the following conditions:

- Permanent vegetation such as hay or pasture
- Wooded riparian cover over stream bank and stream
- Swift water flow
- Gravel stream bottom
- No trash or debris
- No subsurface drainage tile inlets visible

Of the 43 agricultural survey sites 7 contained livestock other than the permitted feeding operations reported by the IDEM. These 7 sites contained livestock that either had direct access to the stream or the pasture was fenced directly up to the bank of the stream. Total numbers of livestock, other than IDEM permitted livestock facilities, at the time of survey was estimated to be 267 animals. (230 cattle, 30 goats and 7 horses) (IDEM permitted livestock numbers within the Swanfelt Ditch watershed are listed as being 600 nursery pigs, 3400 grower/finisher pigs, and 587 cattle.) See Table 5.3 for details on permitted livestock operations.

Seven of the fifty survey sites existed within the corporate limits of the town of Frankton. Within the town of Frankton, the survey indicated the town had only five storm drain inlets. These inlets existed in the immediate downtown area. The outfall for these storm drains and the Hulda-Miller legal drain feed into Pipe Creek at a point just west of the intersection of Pipe Creek bridge and County Road 575 West. All other areas within the town exhibit mostly single family dwellings on small city lots, usually with trees and grassed yards. The Hulda-Miller legal drain passes through the town of Frankton starting at the southeast corner of the corporate limits. It exists both in an open ditch manner and as a completely closed, subsurface legal drain. The Hulda-Miller legal drain is bordered by residential dwellings with grass yard buffers on all sides the drain. At the headwaters of the legal drain, there is a large area of impervious parking lots that exist from a small gas station, elementary school, small grocery store and small restaurant. However, the inlet to the drain is surrounded by 200 feet of grass buffer except at the intersection of SR 128 and 500 West. Runoff from homes and business parking lots and roofs have the opportunity to travel over grass lots prior to entering the legal drain or infiltrate through the soil in grass / vegetated areas. At the time of the survey, there was no running water visible at the open ditch areas of the legal drain. Lisa Cory and Kathy Hudson, both town of Frankton officials, commented that the drain only has water present during rain events.

Within the town of Frankton, it appeared that there was minimal usage of lawn care products (herbicides, pesticides, fertilizers and/or turf care services) based on the existence of only a few “manicured” lawns. However all lawns were mowed directly up to the inlets to the legal drain or directly up to the bank of the legal drain.

The entire corporate limits of the town of Frankton exist on municipal water and sewer services. Just south west of the corporate limits of Frankton exists the Alexander’s Addition residential area which is not serviced by municipal services. Each home utilizes individual wells and septic systems. Both town of Frankton officials and the Madison County Health Department commented on the severity of the septic system failure rate within this residential area. Approximately 100 single family homes exist in this residential area. A small un-named tributary to Pipe Creek passes through this residential area.

At the time of the survey, no construction, development or disturbed soil areas were observed. Also, only one Rule 5 erosion and sediment control plan had been received by the SWCD indicating that only one planned development of soil disturbance of 1 acre or greater are planned any time in the near future. Therefore there appears to be very little development and construction activity within the corporate limits of Frankton.

Baseline Water Quality Reports

The Steering Committee utilized the following reports to ascertain the water quality of the Swanfelt Ditch Watershed as it was determined by others.

National Water Quality Assessment Program (NAWQA) Water Quality in the White River Basin, Indiana, USGS 1992-96 http://www-dinind.er.usgs.gov/nawqa/wr03002.htm

“The mission of the U.S. Geological Survey (USGS) is to assess the quantity and quality of the earth resources of the Nation and to provide information that will assist resource managers and policymakers at Federal, State, and local levels in making sound decisions. Assessment of water-quality conditions and trends is an important part of this overall mission. The long term goals of the NAWQA program are to describe the status and trends in the quality of a large, representative part of the Nation's surface- and ground-water resources, and to provide a sound, scientific understanding of the primary factors affecting the quality of these resources. The White River Basin in Indiana is one of many large river basins being studied throughout the United States.”

The NAWQA report specifically points out that within agricultural areas of the White River basin, nutrient concentrations, ammonia, pesticides and herbicide concentrations were present and exceeded water quality standards. They also mention that land use, differing types of agricultural practices and seasonal changes in nutrient uptake and runoff from varying levels

of precipitation affect the quantity of the pollutants that are found through their water quality monitoring in the White River Basin.
The report also states that ammonia and nitrites levels were 2 times and 5 times greater, respectively, in an agricultural watershed affected by farm animals.

The following was taken directly from the 1992 – 1996 NAWQA White River Basin Report. A variety of pesticides were commonly found in streams throughout the White River Basin. In contrast, only a few pesticides were detected in ground water, and these were at much lower concentrations (p. 6).

In streams:

- Pesticide concentrations at urban and agricultural sites were among the highest in the Nation (p. 20).
- Twenty-five different pesticides or pesticide degradation products were detected in at least 5 percent of samples near the mouth of the White River. Atrazine and metolachlor were always detected, whereas cyanazine and alachlor were frequently detected (p. 6). In a few samples, concentrations of atrazine, alachlor, or cyanazine exceeded Federal drinking-water standards or advisories (p. 26); however, annual average concentrations of each of these compounds in the White River were below their respective standard or guideline.

In shallow ground water:

- Fourteen different pesticides were detected in a network of 94 monitoring wells; six were detected more than once (p. 6). No pesticide concentration came close to exceeding a Federal drinking-water standard or advisory.
- In cropland areas with a surficial sand and gravel aquifer that is vulnerable to contamination but is also an important source of drinking water for residents of the basin, atrazine compounds were commonly detected (found in two-thirds of monitoring wells) but only at trace levels.

The occurrence of pesticides in streams is controlled by a variety of factors (p. 8-11).

Regional patterns in pesticide use (p. 8):

- Concentrations of individual pesticides in streams are greatest where pesticide use is greatest.

Temporal patterns in pesticide use (p. 9):

- New pesticides introduced to the market can quickly show up in streams. Within 2 years of its registration in 1994, maximum concentrations of the corn herbicide acetochlor in the White River were about 2 µg/L, similar to those of other commonly used herbicides. In contrast, concentrations of alachlor in the White River are declining as alachlor use in the basin declines.

Land use (p. 10):

- Pesticide concentrations in streams differ according to land use. Lawn insecticides (such as diazinon) are more commonly detected in urban watersheds, whereas corn herbicides (such as atrazine) are more commonly detected in agricultural watersheds.

Soil drainage (p. 10-11):

- Pesticide concentrations in streams are highest in watersheds with permeable, well-drained soils, all other factors being equal. Agricultural tile drains play a major role in transporting pesticides to streams in areas with poorly drained soils where drainage has been enhanced with tile drains.

Nitrate concentrations in ground water are low (commonly not detected) in some aquifer settings and high (sometimes exceeding the Federal drinking-water standard) in others. Nitrate concentrations in stream water typically are between these extremes (p. 12-15).

In streams:

- Median concentrations of nitrate at monitoring sites generally ranged from 2 to 6 mg/L-higher than those at most other NAWQA monitoring sites in the United States (p. 20). Sample concentrations rarely exceeded the Federal drinking-water standard.

In ground water:

- Surficial sand and gravel aquifers underlying cropland had high nitrate concentrations. Samples from 17 percent of shallow monitoring wells in this setting exceeded the Federal drinking-water standard of 10 mg/L. However, deeper wells (25 to 50 feet below the water table) in these unconfined aquifers typically had little or no detectable nitrate.

- In many parts of the basin, nitrate concentrations in ground water were low. For example, sand and gravel aquifers protected by overlying clay typically had low concentrations of nitrate. Such aquifers are present in more than half the basin and are a common source of water for rural domestic users.

Urban areas degrade the quality of streams and ground water (p. 16-17).

In streams:

- Concentrations of trace metals and organic compounds in streambed sediments tended to be above background concentrations in urban areas, particularly Indianapolis. Measured concentrations are generally not a human-health concern; however, fish-consumption advisories for PCBs and mercury are in effect for some areas of the basin. Several chemicals whose use has long been banned (chlordane, dieldrin, and PCBs) persist in streambed sediments and are concentrated in organisms such as freshwater clams.

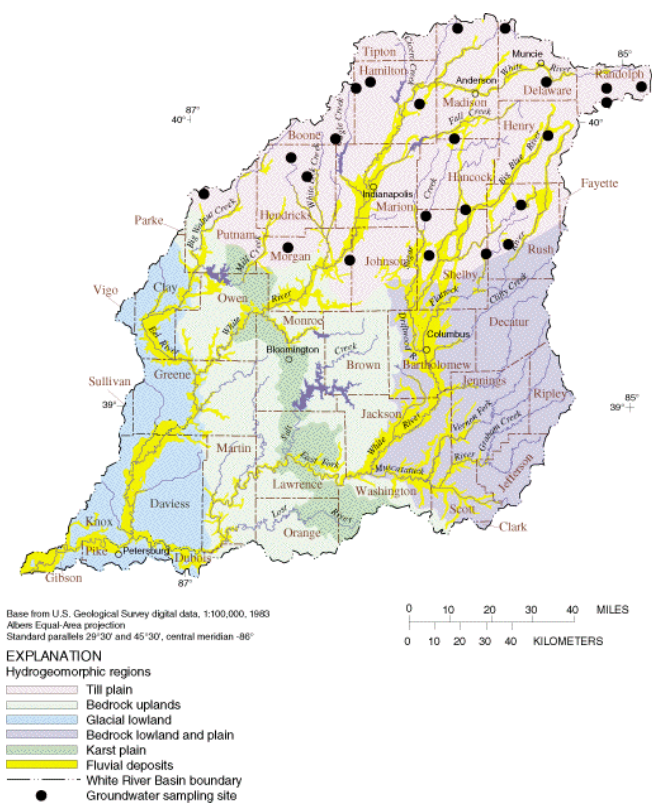
- Stormwater runoff and sewer overflows are a continuing problem and have contributed to fish kills in the basin by depleting oxygen in the stream water. One such incident in the White River at Indianapolis in 1994 killed 510,000 fish.

In ground water:

- Volatile organic compounds were detected in more than half the shallow monitoring wells in urban areas, as compared to 6 percent of shallow wells in cropland areas. Chloroform was the most common volatile organic compound found in urban ground water. No volatile organic compound was measured at a concentration in ground water that exceeded a Federal drinking-water standard or guideline.

Fish communities have significantly improved since the early 1970's. However, poor communities of fish are still found in streams with poor water quality (p. 18-19).

- Some streams with good fish habitat presently have poor communities of fish, a disparity indicating nonhabitat stresses (such as poor water quality). In areas where the fish communities are poorer than expected on the basis of fish habitat, nutrient and pesticide concentrations are high."



USGS NAWQA Study Area http://in.water.usgs.gov/nawqa/wr05002.htm
Figure 3.7 Upper White River Watershed NAWQA Geology Map

Madison County Tillage Transect
The Tillage Transect is completed each year by Indiana Conservation Partnership employees stationed in Madison County (SWCD, DNR, & NRCS). The purpose is to give a summary of trends associated with the adoption of no-till and/or conservation tillage with relation to crop residue and soil loss within Madison County. The surveys are completed each spring after crops have emerged but while the soil residue conditions are still visible. Data is recorded and compiled statewide by most all counties and viewed on a state level as well.

Based on the data collected in the spring of 2004, Madison County conventionally tilled 81% of it corn crop, with the remaining 11% and 8% being no tilled and mulch tilled respectively. Also, the survey shows that 16% of the soybean crop was conventionally tilled, 68% no tilled, and 16% mulch tilled. These results and definitions of no till, mulch till and conventional till cropping systems may be seen in figure 3.8.

This data is an average of the sites viewed in Madison County and can be taken as significant for the Swanfelt Ditch watershed. Conservation tillage, be it no till, reduced till or other type of conservation system reduces the off site sedimentation and agricultural input runoff from agricultural fields via subsurface tiles and surface runoff into surface drains, open ditches and streams of the watershed.

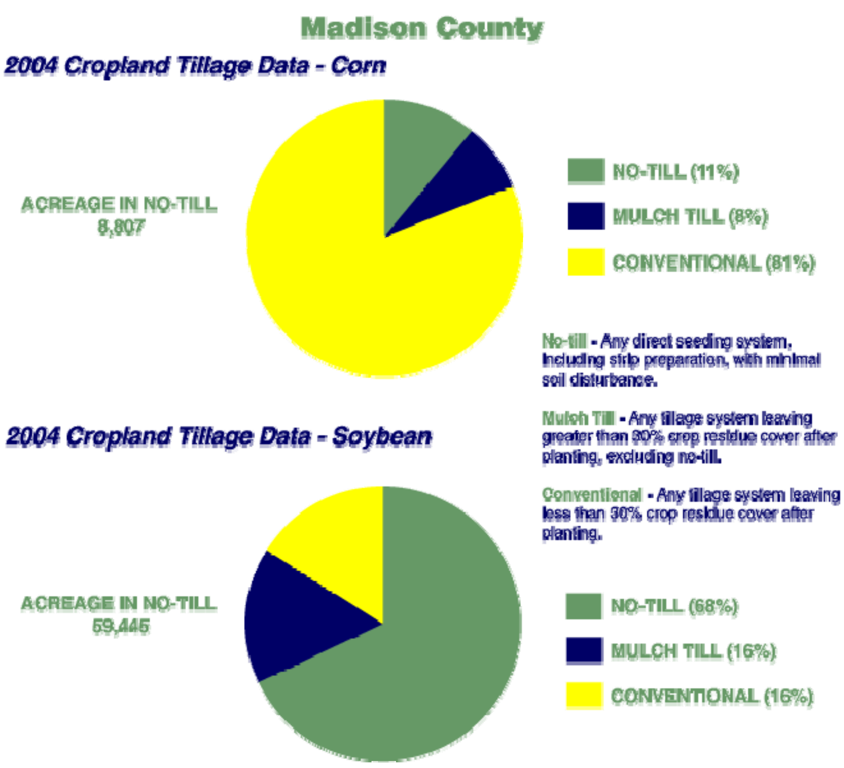


Figure 3.8 Madison County 2004 Cropland Tillage Data for Corn and Soybeans

Conservation Tillage Update, November 2000, Purdue University, Agronomy Department

This update provides a summary of trends associated with the adoption of no till crop production. The data was obtained as a result of spring surveys of Indiana cropland. In an average sized county, a sample size of 450 crop fields produces a 95 percent level of confidence in the report.

The report states that "no till is without question the most effective conservation practice for reducing soil erosion and improving water quality. The crop residue cover and infiltration rates associated with no till maximize the volume reduction agricultural runoff and contaminants, when compared to other conservation tillage systems." The report then rates minimal tillage of both corn and soybean production systems as less effective at conserving soil and reducing runoff as compared to no-till. The report states that there are few if any tillage practices that may pass the definition of soil conservation by maintaining at least 30% residue soil cover. The 30 percent soil cover that is achieved by conservation tillage is significant to reducing soil erosion by 50% or more compared to bare soil. Sedimentation and agricultural runoff are considered by volume the greatest contaminant of surface water in most Indiana watersheds according to this report. Agricultural sediment, combined with agricultural inputs, (i.e. nutrients, herbicides or pesticides) contribute significantly to the degradation of water quality according to this report.

Numbers provided by this report show that on average in Indiana, conservation tillage was used on 29% of all corn production acres and 74 % of all soybean acres in 2000. The report also shows that in 2000, Madison County ranked 62nd out of 89 counties surveyed in percent of corn planted using a no till system (14% no till corn acres). With regards to no till soybean acres, Madison County ranked 5th out of 89 counties in 2000 by planting 83% of its soybeans utilizing no till systems.

Using the numbers from this report and comparing them to the 2004 Madison County Tillage Transect, it is evident that soybean no-till acreage has decreased in Madison County from 83% to 68% in 4 years. The comparison also shows that no-till corn acreage has decreased from 14% no-till in 2000 to 11% in 2004.

The report gives a good summary of how tolerable soil loss (T) is calculated. "T" is given as terminology for the tolerable amount of soil that can be lost while maintaining the productivity of the soil through natural formation processes. It shows that T calculated by the Universal Soil Loss Equation (USLE) on conventionally tilled fields was 5.3 tons per acre compared to 1.6 tons per acre for all no tilled fields.

2001 Indiana Fish Consumption Advisory, Indiana Department of Natural Resources (IDNR), Indiana Department of Environmental Management (IDEM), Indiana State Department of Health (ISDH) http://www.in.gov/isdh/dataandstats/fish/fish_2001/toc.htm

Each year since 1972, members from IDNR, ISDH, and IDEM meet to discuss the findings of recent fish monitoring data and to develop the new statewide fish consumption advisory.

The 2001 advisory is based on levels of polychlorinated biphenyls (PCBs) and mercury found in fish tissue. In each area, samples were taken of bottom-feeding fish, top-feeding fish, and fish feeding in between. More than 1,600 fish tissue samples were analyzed for polychlorinated biphenyls (PCBs), pesticides, and heavy metals. Of those samples, the majority contained at least some mercury. However, not all fish tissue samples had mercury at levels considered harmful to human health. If they did, they are listed in the advisory.

Because of past, widespread agricultural and industrial use of these materials, their great stability and persistence in the environment, and the potential for bioaccumulation, it is not surprising that concentrations exceeding safe levels have been found in some species.

Criteria for the statewide 2001 Indiana Fish Consumption Advisory are developed from the Great Lakes Task Force risk-based approach.

Pipe Creek appears on the FCA report. Pipe Creek's entire reach within the Swanfelt Ditch Watershed contains an advisory (Table 3.2). Also, all streams within the watershed that contain carp have a fish consumption advisory. Indiana State Department of Health definitions for fish consumption advisories are presented in Table 3.1.

Table 3.1 Indiana State Department of Health Fish Consumption Advisory Definitions

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

Table 3.2 Fish Consumption Advisories for Swanfelt Ditch Watershed (ISDH, 2002)

Fish Species	Size	Contaminant	FCA Group (Table 3.1)	Streams
Carp	15-20 inches	Mercury, PCB	Group 3	All
Carp	20-25 inches	Mercury, PCB	Group 4	All
Carp	25 + inches	Mercury, PCB	Group 5	All
Longear Sunfish	4 + inches	Mercury	Group 2	Pipe Creek
White Sucker	10-15 inches	Mercury, PCB	Group 2	Pipe Creek
White Sucker	15 + inches	Mercury, PCB	Group 3	Pipe Creek

Table 3.2 shows that all streams in the watershed that possess carp contain a mercury and PCB advisory for carp from 15 inches in size up to 25 + inches in size. Pipe Creek contains advisories for Longear Sunfish and the White Sucker in addition to the advisories for carp.

Indiana Department of Environmental Management (IDEM) 303 (d) Report
http://www.in.gov/idem/water/planbr/wqs/prop303d2004.pdf

The Office of Water Quality (OWQ) is the office within IDEM responsible for protecting public health and the environment by: assessing the quality of surface water and groundwater through biological and chemical testing; regulating and monitoring drinking water supplies (including wellhead protection), wastewater treatment facilities and the construction of such facilities; and protecting wetlands for proper drainage, flood protection and wildlife habitat. OWQ serves the citizens of Indiana through the fulfillment of its responsibilities as set forth in the Clean Water Act.

Section 303 (d) of the Clean Water Act is produced biennially. This Section requires States to identify waters that do not or are not expected to meet applicable water quality standards with federal technology based standards alone. States are also required to develop a priority ranking for these waters taking into account the severity of the pollution and the designated uses of the waters. Once this listing and ranking of waters is completed, the states are required to develop Total Maximum Daily Loads (TMDLs) for these waters in order to achieve compliance with the water quality standards. Tables 3.3 and 3.4 show the 303 (d) listed streams for the 2002 and 2004, respectively that exist in the Swanfelt Ditch Watershed.

Table 3.3 2002 303(d) List for Swanfelt Ditch Watershed (Category 5)

Listing of Database Stream Segment Designations (Column 1)

Under designated uses, F= Fully Supporting, P= Partial Support,
N= Non-support, X = Not Assessed ; 20= Aquatic Life Use, 21=
Fish Consumption, 42= Recreational Use

Database Stream Segment Designation Number	Water body Name	Designated Uses	Parameter(s) of Concern	303(d) Number	14 Digit HUC Code	Year Placed on 303(d) List
INW0158_T1025	PIPE CREEK	N20,N42,X21	Impaired Biotic Communities, PCBs, Hg, Pathogens	136	05120201050080	1998
INW0159_T1026	PIPE CREEK - Swanfelt Dt to county line	N20,N42,P21	PCBs, Hg	136	05120201050090	1998
INW0159_T1026	PIPE CREEK - Swanfelt Dt to county line	N20,N42,X21	Impaired Biotic Communities, Pathogens	136	05120201050090	1998

This report shows the streams that do contain water quality impairments and what those parameters of concern are. Specifically, Pipe Creek within the Swanfelt Ditch Watershed (05120201050080) has been added to the 303 (d) report for containing the impairments of impaired biotic communities, pathogens, and fish consumption advisories for PCBs (poly chlorinated biphenyls) and Hg (Mercury). The report also shows that that stream reach was placed on the list in 1998. Under designated uses, the stream is ranked as having non-support for aquatic life and non-support for recreational use

The 2004 303 (d) list also includes Pipe Creek as it exists in the Swanfelt Ditch Watershed (05120201050080). Table 3.4 shows that on the 2004 listing, Pipe Creek continues to have the impairments of impaired biotic communities, E. coli, and fish consumption advisories for PCB's and Mercury.

Table 3.4 303 (d) list for Swanfelt Ditch Watershed

Due to the unique issues and questions associated with TMDL's based on fish consumption advisories for polychlorinated biphenyls (PCBs) and mercury, stream segments with these impairments are listed separately in subcategory 5B. Category 5A shows all other impairments.

303 (d) Number	Major Basin	14 digit Hydrologic Unit Code	County	Segment ID Number	Water Body Name	Parameters of Concern
Category 5A						
136	West Fork White	05120201050080	Madison	INW0158_T1025	Pipe Creek	Impaired Biotic Communities, E. coli
136	West Fork White	05120201050090	Madison	INW0158_T1026	Pipe Creek – Swanfelt Ditch to County Line	Impaired Biotic Communities, E. coli
Category 5B						
136	West Fork White	05120201050080	Madison	INW0158_T1025	Pipe Creek	Impaired Biotic Communities, E. coli
136	West Fork White	05120201050090	Madison	INW0158_T1026	Pipe Creek – Swanfelt Ditch to County Line	Impaired Biotic Communities, E. coli

IDEM 305 (b) Report Indiana Integrated Water Quality Monitoring and Assessment Report 2002 & 2004 http://www.in.gov/idem/owm/planbr/wqs/quality/part1.pdf

This report used the results from five monitoring programs and integrated all of these reports into one assessment. The assessment shows that within the state of Indiana and within the Upper White River Basin water quality standards are not met due to pesticides, priority organics, unionized ammonia, cyanide, low dissolved oxygen, chlorides, non-flow habitat alteration, pathogens (*E. coli*), and oil and grease.

The report also indicates that Indiana has zero stream miles, which fully support aquatic life use as measured by fish consumption advisories.

The report summarizes that fifty percent of Indiana's population served by public water supplies depend on ground water as a source of that water. Major sources of ground water contamination in Indiana are listed in the report as commercial fertilizer application, confined animal feeding operation, underground storage tanks, surface impoundments, landfills, constructed prior to 1989, septic systems, shallow injection wells, industrial facilities, materials spills, and salt storage and road salting.

As part of the 305 (b) reports from 2002 and 2004, the Indiana Integrated Water Quality Monitoring and Assessment Report gives water quality reference to site specific water body assessments. Tables 3.5 and 3.6 show how the specific water bodies within the Swanfelt Watershed were assessed during 2002 and 2004 respectively.

Table 3.5 2002 305(b) Indiana Integrated Water Quality Monitoring and Assessment Report 2002, IDEM for Swanfelt Ditch Watershed

HUC	Stream	Size	Aquatic Life	Fish Consum-ption	Primary Contact (recreation)	Biotic Community Status	PCB's	Mercury	Other Habitat Alterations	Pathogens
05120201-050080	Pipe Creek	2.86 mi	N	P	N	S	M	S	S	S
05120201-050080	Swanfelt Ditch & other tributaries	10.2 mi	F		F					

Table 3.6 2004 305(b) Indiana Integrated Water Quality Monitoring and Assessment Report, 2004 IDEM for Swanfelt Ditch Watershed

HUC	Stream	Size	Aquatic Life	Fish Consum-ption	Primary Contact (recreation)	Biotic Community Status	PCB's	Mercury	Other Habitat Alterations	Pathogens
05120201-050080	Pipe Creek	2.86 mi	N	P	N	S	M	S	S	S
05120201-050080	Swanfelt Ditch & other tributaries	10.2 mi	F		F					

Referencing Table 3.5 and Table 3.6, all water bodies in Indiana are designated for Aquatic Life Use, Primary Contact (Recreational Use), and Fish Consumption Use. Some are designated for Drinking Water Use as well. Water quality assessments indicate how well a specific water body supports these uses with the following codes:
F = fully supporting P = partially supporting N = not supporting X = not assessed
If the water body is partially or not supporting one or more uses, the cause(s) and magnitude of the impairment(s) will appear in the columns at the right hand side of the table:
S = slightly impaired M = moderately impaired H = highly impaired T = not impaired, but threatened

Results from 2004 were not different from the 2002 results. Pipe Creek as it exists within the Swanfelt watershed is shown to have non-support for aquatic life, partial support for fish consumption and non-support for primary contact (recreation). To support those assessments the causes and magnitude of the impairment is given in the reports. For Pipe Creek as it exists within the Swanfelt Ditch watershed, biotic community status is listed as slightly impaired, the stream is moderately impaired by PCB's, and slightly impaired by Mercury, other habitat alterations and pathogens.

Total Maximum Daily Load (TMDL) Project
A Total Maximum Daily Load (TMDL) is the maximum amount of pollution that a water body can assimilate without violating state water quality standards. TMDL's were mandated by Section 303(d) of the Clean Water Act (passed in 1972).

At the time of this publication, a TMDL project is taking place within the Swanfelt Ditch watershed for Pipe Creek. (Duck Creek and Stoney Creek are also part of the project being assessed for an E. coli TMDL.) The reach of the project includes the entire reach of Pipe Creek from the headwaters in Delaware County through to the confluence of Pipe Creek and White River in Hamilton County. The Swanfelt Ditch watershed has been listed on the 2004 303 (d) list for impaired water bodies. Table 3.3 and Table 3.4 show streams from the Swanfelt Ditch watershed as they exist on the 2002 and 2004 303 (d) lists, respectively, and the parameters of concern listed for the Swanfelt Ditch watershed.

The SWCD watershed coordinator has worked briefly with the consultant who is working on the project to inform them of the Swanfelt Ditch Watershed planning project. As the project progresses, the watershed coordinator looks forward to assisting in any way possible to improve the outcome of the TMDL project. The SWCD and Swanfelt Ditch project will work with the current and any future TMDL process by providing information that they have garnered to best assist IDEM. The SWCD watershed coordinator will serve as the contact for the current and future TMDL projects. Table 3.7 lists the TMDL development schedule for Pipe Creek as it exists within the Swanfelt Ditch watershed.

Table 3.7 TMDL Development Schedule, IDEM 2002 for Swanfelt Ditch Watershed

Water Body	**County**	**Major Basin**	**Parameter(s) of Concern**	**TMDL Development Schedule**	**303(d) #**
Pipe Creek	Madison	West Fork White	E. coli	2001 - 2006	136
Pipe Creek	Madison	West Fork White	Impaired Biotic Communities	2001 - 2018	136
Pipe Creek	Madison	West Fork White	Fish Consumption Advisory for PCB's & Hg	2016 - 2023	136

IDEM Office of Water Quality Upper White River Watershed Restoration Action Strategy (WRAS) January 2001
http://www.in.gov/idem/water/planbr/wsm/05120201part1.pdf

IDEM staff members drafted this report as an additional resource for those groups working at the watershed level to improve water quality through watershed planning activities. The authors listed considerable research from stakeholders within Madison County regarding water quality. Stakeholders included the Madison County Health Department, Madison County Soil & Water Conservation District and USDA Natural Resources Conservation Service. The authors also included water quality information from state and federal agencies via the 1998

Unified Watershed Assessment and IDEM's 1998 303(d) list. The WRAS offers a summarization of water quality problems in the Upper White River Watershed and strategies regarding actions that local groups can use to restore their specific watershed area of the Upper White River.

The WRAS denotes the following major problems that occur in Madison County:

Both the Madison County SWCD and Madison County Health Department state that failing septic systems and straight pipe discharges from septic systems in areas with older rural homes and high clay content soils are a distinct problem in all areas of the county. Specifically those areas that have high water tables and poorly or somewhat poorly drained soil types such as those that exist within the Swanfelt Ditch watershed. As a result of this condition, high ammonia and E. coli counts result. This specifically applies to the Swanfelt Ditch watershed due to its rural nature and soils with low permeability and high water table.

The entire reach of Pipe Creek is listed for medium severity ranking for the parameters of concern for Fish Consumption Advisories for Poly Chlorinated Biphenyls (PCB's) & Mercury and E. coli. Pipe Creek passes through the Swanfelt Ditch watershed. A medium severity ranking indicates "waters with chronic criteria violations of state water quality standards for toxic substances, ammonia or dissolved oxygen; waters threatened or scoring poor on biological assessments; and waters which had group 3 or 4 fish consumption advisories for mercury or group 2, 3, or 4 for PCB's."

The report lists erosion and off site sedimentation from urban construction areas as a major problem in urban areas of the watershed. In addition to reporting erosion and off site sedimentation in urban areas, the report lists sedimentation in rural areas due to cropping adjacent to county drains and installing subsurface drain tile in flat, poorly drained soils as a major problem. The report list four main types of pollutants that have been identified in the White River Watershed. They are: nutrients, toxic chemicals, oxygen-consuming substances, and *E. coli.*

Assessing the Fish Communities and Habitat Quality of the Upper White River Tributaries from Indianapolis to Muncie, Indiana
Department of the Interior
U.S. Fish and Wildlife Service, Thomas P. Simon
February 29, 2004

This report was compiled using data collected during August and October of 2002. The author used a full range of water quality monitoring that centered on suitability for fish communities and fish habitat quality. Several streams were sampled throughout Marion, Hamilton, and Madison counties. The author conducted sampling on Pipe Creek and Swanfelt Ditch (listed as tributary to Pipe Creek). Using fish types as indicator species for water quality, coupled with water quality monitoring data, the author was able to show that habitat quality and water quality is directly related to land use in the watershed where the water body exists.

The author also showed that stream segments influenced by pollutant loadings had increased values in salinity, specific conductance, and total dissolved solids. The author's data shows that turbidity, total dissolved solids, nitrates and nitrites are high. This, coupled with low dissolved oxygen suggest that sedimentation from agricultural activities, and nutrient loading from failed, failing or non-existent septic systems are all potential water quality concerns within the watershed. Table 3.8 shows the sampling locations that were used in the Swanfelt

Ditch watershed. Table 3.9 shows chemistry and Qualitative Habitat Evaluation Index (QHEI) results for the sites sampled in the Swanfelt Ditch watershed.

Table 3.8 Sampling locations for Fish Community & Habitat Quality Report, USF&WS.

Waterbody	Site ID	Location
Swanfelt Ditch	49	Cr 900 N Bridge
	50	Cr 1100 N Bridge
Pipe Creek	48	Cr 700 W Bridge

Table 3.9 Water chemistry and QHEI scores for stream reaches in the Swanfelt Watershed during August and October 2002, USF&WS.

Waterbody	Site ID	Date	D.O.	pH	Sal	NO 3	NH 4	Water Temp	Sp Cond	ORP	TDS	Turb	QHEI
Pipe Creek	48	8/16	4.98	7.88	0.5			25	878	-50	468		59
	48	10/15	7.47	8.39	0.5	11.17	1.94	22	922	362	593.8	30	
Swanfelt Ditch	49	10/3	4.19	8.06	0.1	2.04	0.34	21	429	348	274.3	17	57
	49	8/21	4.52	7.41	0.1			20	214	-16	107.5		
Swanfelt Ditch	50	8/21	4.03	7.51	0.3			22	658	-30	329		47
	50	10/3	7.11	8.32	0.3	1.89	0.88	22	617	352	394.5	29	

Unified Watershed Assessment, US EPA

The Clean Water Action Plan, released by the President in February 1998, presents a plan and certain incentives directed toward accelerating the control of nonpoint source pollution in America. States have been requested, as one of the 111 Action Items presented in the Plan, to prepare a Unified Watershed Assessment (UWA). This Assessment is to be developed through the cooperation of state, federal, and local agencies and the public, hence the term "Unified". The Guidance for completing the UWA, published by the USEPA in June 1998, charged the USDA Natural Resources Conservation Service (NRCS) and the state water quality agency (IDEM) with convening the assessment process. What sets this assessment apart from other lists and reports regarding watersheds is the involvement of numerous organizations, the participation of all states, and the recognition of both impaired and healthy watersheds.

The following parameters were used as data layers and decision criteria for each 8 digit HUC watershed:

- Mussel Diversity and Occurrence
- Aquatic Life Use Support
- Recreational Use Attainment
- Stream Fishery
- Lake Fishery
- Eurasian Milfoil Infestation Status
- Lake Trophic Status
- Critical Biodiversity Resource
- Aquifer Vulnerability

- Population Using Surface Water for Drinking Water
- Residential Septic System Density
- Degree of Urbanization
- Density of Livestock
- Percentage Cropland
- Mineral Extraction Activities

1999 - 2000 UWA

In the first version of the UWA, the workgroup ranked the 8-digit hydrologic unit watersheds according to the present condition of the water in lakes, rivers, and streams. The data provided information about the water column, organisms living in the water, or the suitability of the water for supporting aquatic ecosystems. Each layer of data was partitioned by percentiles into 5 scores, with "1" being indicative of good water quality or minimum impairment, and "5" indicating heavily impacted or degraded water quality.

Scores for each 8-digit watershed were compiled, and the watersheds were sorted into four categories as required by the USEPA guidance. The four categories are as follows:

I. Watersheds in need of restoration: waters do not meet designated uses or other natural resource goals. 25% or more of the waters that have been assessed do not meet state water quality standards. (Note that in some watersheds, only a very small percentage of waters have been recently assessed.)

II. Watersheds that on average meet state water quality goals and require attention to sustain water quality. In most of these watersheds, there is habitat which is recognized as critical for threatened or endangered species.

III. Watersheds with pristine or sensitive aquatic systems on federal or state managed lands.

IV. Watersheds with insufficient data to make an assessment.

The Assessment targeted 11 eight-digit hydrologic units for restoration funding during 1999-2000.

(Little Calumet-Galien, Kankakee, Iroquois, St Joseph-Lake Michigan, St Marys, Wildcat, ***Upper White***, Eel-Big Walnut, Lower White, Patoka, Middle Ohio-Laughery, and Highland-Pigeon.)

The 1999 – 2000 UWA Fact Sheet shows that all of the 8 digit Upper White River Watershed is listed as Category I or “Other Restoration Needed”.

Table 3.10 2000-2002 Unified Watershed Assessment Parameters and Subsequent Scores for the 11 digit HUC Pipe Creek Watershed (05120201050)

Assessment Parameter	**Score**
Mussel Diversity and Occurrence	No Data
Aquatic Life Use Support	4
Recreational Use Attainment	4
Stream Fishery	No Data
Lake Fishery	No Data
Eurasion Milfoil Infestation Status	No Data
Lake Trophic Status	1
Critical Biodiversity Resource	2
Aquifer Vulnerability	4
Population Using Surface Water for Drinking	4
Residential Septic System Density	4
Degree of Urbanization	2
Density of Livestock	3
Percentage Cropland	5
Mineral Extraction Activities	3

The UWA Scores range from one to five, with a score of one indicating good water quality and a score of five indicating a severe impairment.

2000 - 2001 UWA

During the summer of 1999 the workgroup used additional layers of information to identify the resource concerns and stressors for each of the 361 11-digit watersheds in Indiana. Examination of the human activities that have the potential to impact the ecosystem will help planners to focus on those areas where restoration may be most critical. Organizations can identify opportunities to use their programs and resources to address those areas.

This focusing process will illuminate areas where the interests of two or more partner agencies may converge. It is intended that this will lead to more effective allocation of resources for restoration and protection activities. At the local level, this information can assist groups to prioritize watershed activities and provide some discussion points for planning.

This amended assessment has the following benefits:

- Provides a logical process for targeting funds, which may be expanded or updated without changing the basic framework.
- Provides information at a finer resolution (11-digit hydrologic units) to agencies and local groups interested in watershed assessment.
- Identifies data gaps.
- Can be used as a compliment to other assessments, such as the 305(b) Report and 303(d) List.

In order to target the allocation of FFY 2001-2002 Section 319 funds made available through the Clean Water Action Plan, 11-digit hydrologic units with the greatest indication of existing or potential problems have been given a higher priority. Based on the additional information gathered in this iteration of the UWA, all watersheds in the State are now considered to be in Category I.

Watersheds (11-digit) with two or more scores of 5, one score of 5 and two or more scores of 4, or three or more scores of 4 (in any category) have been given a higher priority. Note that there are significant gaps in data, especially for water quality, and this assessment should be evaluated in the context of available local information. This funding targeting process is known to be imperfect but uses the best information available to us at this time.

Based on the system used, the Pipe Creek 11-digit watershed (HUC 05120201050) (the Swanfelt Ditch watershed exists within the Pipe Creek 11-digit watershed), received a “5” score for “percentage cropland” and five “4” scores for aquatic life use support, recreational use attainment, aquifer vulnerability, population using surface water for drinking water, and residential septic system density. This places the Swanfelt Ditch watershed in the area that qualified for 2001 incremental funding.

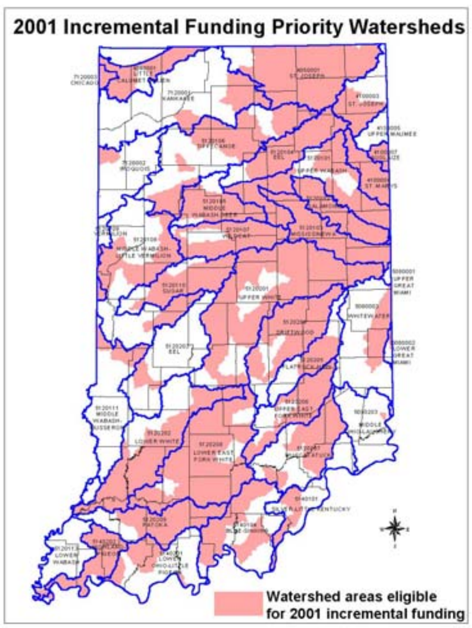


Figure 3.9 2000 – 2001 Unified Watershed Assessment Incremental Funding Priority Watersheds

4. Identifying Problem Causes & Stressors

Causes of Water Quality Problems

For the sake of the Swanfelt Ditch Watershed Management Plan, sources of pollution are divided into the two categories of *point source (PS)* and *nonpoint source (NPS).* Point source pollution means that the discharge that enters the surface water enters through a specific, well-identified point. These sources can be associated with industrial activity, municipal or industrial waste water treatment plants, and also from municipal separate storm sewer systems (MS4s). Contaminants associated with point source pollution most commonly consist of heavy metals, toxic chemicals, nutrients, sediment, oxygen consuming wastes and ammonia. Point source dischargers in Indiana must comply with both state and federal (EPA) regulations by applying for and receiving a National Pollutant Discharge Elimination System (NPDES) permit from the state. This watershed management plan is mainly concerned with identifying nonpoint source pollution as opposed to point source pollution. However, steps have been taken to identify registered dischargers for the sake of information.

Nonpoint source pollution occurs when rainfall, snowmelt, or irrigation runs over land or through the ground, picks up pollutants, and deposits them into rivers, lakes, and coastal waters or introduces them into ground water. Imagine the path taken by a drop of rain from the time it hits the ground to when it reaches a river, ground water, or the ocean. Any pollutant it picks up on its journey can become part of the NPS problem. NPS pollution also includes adverse changes to the vegetation, shape, and flow of streams and other aquatic systems.

NPS pollution is widespread because it can occur any time activities disturb the land or water. Agriculture, forestry, grazing, septic systems, recreational boating, urban runoff, construction, physical changes to stream channels, and habitat degradation are potential sources of NPS pollution.

The latest *National Water Quality Inventory* indicates that agriculture is the leading contributor to water quality impairments, degrading 60 percent of the impaired river miles and half of the impaired lake acreage surveyed by states, territories, and tribes.

The most common NPS pollutants are sediment and nutrients. These wash into water bodies from agricultural land, small and medium-sized animal feeding operations, construction sites, and other areas of disturbance. Other common NPS pollutants include pesticides, pathogens (bacteria and viruses), salts, oil, grease, toxic chemicals, and heavy metals. Unsupported recreational uses, destroyed habitat, unsafe drinking water, fish kills, and many other severe environmental and human health problems result from NPS pollutants. The pollutants also ruin the beauty of healthy, clean water habitats. Each year the United States spends millions of dollars to restore and protect the areas damaged by NPS pollutants. (EPA)

There is any number of ways that NPS pollution occurs. Most related directly to the type of land use that surrounds the watershed. The quality of the water often times reflects the quality of land care in the surrounding watershed land area. Land use such as agriculture, extensive subsurface drainage tile, land development through on construction sites, failed septic systems, runoff from impervious surfaces, roads, animal feeding and pastures, among others, can all contribute to the level of nonpoint source pollution. The severity of the pollution problem can be influenced by a number of different variables such as rainfall, soil types, topography, types of vegetation and proximity of pollutant loading to surface water.

Each cause of pollution can ultimately lead to water quality impairment(s). Impairments are then referred to by way of certain indicators such as nutrient loads, toxic substances (i.e. PCBs and heavy metals), E. coli bacteria, and biochemical oxygen demand (BOD). The following paragraphs will discuss the causes of impairment and the activities in the watershed that have introduced the impairments into the surface waters of the Swanfelt Ditch Watershed.

Since this phase of watershed planning for the Swanfelt Ditch Watershed did not include water quality monitoring, the planning project relied on the visual observations of the watershed windshield survey and the personal expertise of the area by the Steering Committee. We also had to rely heavily on existing monitoring data that was collected and reports generated by others for the streams in the Swanfelt Ditch Watershed. For additional knowledge, the planning project also utilized assessment reports that gave more general information regarding impairments in the larger watershed basin (Upper White River Basin) and the 11 digit HUC watershed that the Swanfelt Ditch Watershed is a constituent of. These assessment reports gave impairment information for the streams closest to and in adjacent watersheds that contained similar land uses and watershed characteristics to those that exist in the Swanfelt Ditch watershed.

The following paragraphs discuss water quality problem causes by type. Source for the summary of these types was taken from the Indiana Watershed Planning Guide, IDEM, 2003 and US EPA.

Oxygen Consuming Wastes
Oxygen

Oxygen is critical to sustain life for most organisms, including plants and animals. Plants produce oxygen during the day but consume oxygen at night or in cloudy conditions. Low oxygen can cause degradation or death by disruption development or killing eggs and embryos; increasing toxicity of some chemicals; and reducing energy available to find food, fight disease, and reproduce. Animals that live or nest in shallow water are particularly susceptible to rapid changes in the amount of oxygen in water due to heating or decomposition. Pollution that occurs as a result of oxygen consuming waste usually involves a decomposition of organic matter or chemicals of some type. As these materials decompose they utilize oxygen from the water, therefore reducing the available, dissolved oxygen in the water. Indicators of oxygen consuming wastes are the biochemical oxygen demand (BOD), chemical oxygen demand COD, and dissolved oxygen (DO). All three of these indicators can be used to ascertain the general quality of water. **Low Dissolved Oxygen / Organic Enrichment:** Dissolved oxygen is a basic requirement for a healthy aquatic ecosystem. Most fish and beneficial aquatic insects "breathe" oxygen dissolved in the water column. Some fish and aquatic organisms (such as carp and sludge worms) are adapted to low oxygen conditions, but most desirable fish species (such as trout and salmon) suffer if dissolved oxygen concentrations fall below 3 to 4 mg/L (3 to 4 milligrams of oxygen dissolved in 1 liter of water, or 3 to 4 parts of oxygen per million parts of water). Larvae and juvenile fish are more sensitive and require even higher concentrations of dissolved oxygen. Many fish and other aquatic organisms can recover from short periods of low dissolved oxygen availability. Prolonged episodes of depressed dissolved oxygen concentrations of 2 mg/L or less can result in "dead" water bodies. Oxygen concentrations in the water column fluctuate under natural conditions, but severe depletion usually results from human activities that introduce large quantities of biodegradable organic materials into surface waters. In polluted waters, bacterial degradation of organic materials can result in a net decline in oxygen concentrations in the water. Oxygen depletion can also result from chemical reactions that place a chemical oxygen demand on receiving waters. Other factors (such as temperature and salinity) influence the amount of oxygen dissolved in water. Prolonged hot weather will depress oxygen concentrations and may cause fish kills even in clean waters because warm water cannot hold as much oxygen as cold water.

There are water quality standards for DO that streams must adhere to. Indiana code 327 IAC Section 2-1-6 (b) (3) states that concentrations of dissolved oxygen shall average at least five milligrams per liter per calendar day and shall not be less than four milligrams per liter at any time. In addition to biological and chemical effects of DO, physical conditions can affect the levels of dissolved oxygen. Turbulent water in riffles, cooler water and swift moving waters generally will hold more oxygen especially during the colder months of the year. In converse, slow, stagnant, warm water will hold less oxygen. This is compounded during the warmer months of the year. Referring to table 3.9, dissolved oxygen levels ranged from 4.03 mg/L to 7.47 mg/L as recorded by US F&WS during tests taken in August and October in 2002. Only two of the results taken were over 5 mg/L, however all of the samples were over the water quality standard of 4 mg/L for those samples that are taken at any time. These results place dissolved oxygen readings right on the border line of meeting state water quality standards. High DO in water is very beneficial for water quality. While the results recorded by the US F&WS did not violate State standards, they were not particularly good results either.

Toxic Substances

Pesticides: Pesticides are synthetic chemicals developed to control insect and plant pests. Pesticides disperse into the environment after application, and can cause contamination of surface water and ground water. Some pesticides can persist in an aquatic ecosystem for years and bioaccumulate in aquatic food chains. Many of the potential effects of pesticides on humans and aquatic ecosystems are difficult to evaluate because of inadequate information on effects of low-level mixtures, transformation products, and seasonal exposure. Examples of pesticides with adverse impacts on water bodies include alachlor, malathion, diazinon, chlordane, and carbofuran.

Fish Consumption Advisory: Consumption advisories are issued by EPA or the states to protect people from the health risks of consuming contaminated fish and wildlife. They do this by issuing consumption advisories for the general population as well as for sensitive subpopulations. These advisories inform the public that high concentrations of chemical contaminants have been found in local fish and wildlife and include recommendations to limit or avoid consumption of certain fish and wildlife species from specific water bodies.

PCBs: Polychlorinated biphenyls (PCBs) are a family of man-made chemicals that contain 209 individual compounds with varying levels of toxicity. Some are recognized carcinogens. Eating contaminated fish is a major source of PCB exposure for humans because PCBs bioaccumulate in some species of fish found in contaminated waters. PCBs were widely used as coolants and lubricants in transformers, capacitors, and other electrical equipment until they were banned in 1977. Although PCBs are no longer manufactured, exposure still occurs as a result of historical contamination and the decommissioning of older transformers and capacitors, which have lifetimes of 30 years or more. **Mercury:** Mercury is a naturally occurring element that can be toxic when consumed by animals and humans. Sources of mercury include weathering of the earth's crust, the burning of garbage and fuels, and industrial emissions.

Both the 303 (d) list from 2004 and the ISDH fish consumption advisory report from 2002 show that all streams in the watershed that contain carp have a fish consumption advisory for PCB's and mercury. Also the reports both show that Pipe Creek has fish consumption advisories for longear sunfish and white suckers.

Vegetative Buffer Habitat Loss

The habitat of the stream determines many aspects of the stream or lake structure and affects some chemical characteristics. Vegetation along the bank filters nutrients and sediment in runoff. Trees and large shrubs at the waterline shade the stream, lowering the temperature and reducing algae growth. Tree roots, fallen logs and large boulders in shallow areas provide cover and nesting sites for fish and other animals. Many insects and sport fish species in Indiana streams require clean sand or gravel for nesting sites. Another form of habitat loss that affects water quality is wetland loss. Wetlands include swamps, marshes, bogs, and similar areas. In their natural condition, wetlands provide many benefits, including food and habitat for fish and wildlife, water quality improvement, flood protection, shoreline erosion control, ground water exchange, as well as natural products for human use and opportunities for recreation, education, and research. Wetlands help maintain and improve water quality by intercepting surface water runoff before it reaches open water, removing or retaining nutrients, processing chemical and organic wastes and reducing sediment loads to receiving waters. Wetlands also function like natural basins, storing floodwater that overflows riverbanks and protecting adjacent and downstream property from flood damage. Other habitat alterations that adversely affect water quality are the degradation, loss, or alteration of aquatic habitat due to physical degradation, riparian alteration, channel modification, or hindrance of fish passage or migration.

The watershed windshield survey that was conducted as part of this planning project indicated that critical habitat is missing adjacent to most of the Swanfelt Ditch and McClure Ditch. Vegetation in any form was replaced with conventionally tilled row crops at 30 of the 43 agricultural survey points. In an area that was historically dominated by wooded wetlands, very few such areas exist currently.

Physical Characteristics

Physical characteristics of water include temperature, turbidity, and velocity, like humans, plants and animals are adapted to a particular range of temperature. In a hot environment, body processes speed up and organisms need more food and fluids, and use more energy to regulate body temperature, leaving less energy for other important activities like finding food or shelter. In a cold environment, body processes and behavioral activities slow down. Animals will move to a part of the water where temperature is more comfortable. Cold water has space for oxygen because molecules move more slowly. Warm water drives out oxygen. The toxic effects of some chemicals increase as water heats. **Temperature:** Changes in the temperature of a water body that lower its value as habitat or increase the adverse effects of other impairment causes such as low dissolved oxygen. **Water Velocity** The velocity of the water describes the amount and speed of water in the stream. Plants and taller algae forms rarely grow in fast-moving water due to damage from the force of the water. Only streamlined animals or animals with appendages for clinging to rocks or sticks live in fast moving water. Energy spent in maintaining position in fast currents is not available for other important functions such as feeding or reproducing. In general, fast-moving or turbulent water contains more oxygen and is well-mixed chemically, with an even temperature, than slower or ponded water that may have warm and cool spots, less oxygen, and areas with higher and lower pollution levels.

The watershed windshield survey that was conducted as part of this planning project noted slow moving, stagnant water within the Swanfelt Ditch in 30 of the 43 agricultural sites. These sites also included muddy, sediment layers on the stream bed, and scum layer on the water surface.

Sedimentation

Sedimentation can cause a cascade of negative effects in water soil increases water temperature by absorbing heat. Poor water clarity interferes with feeding in predators that hunt by sight (including many sport fish), can cause hybridization if species that select mates by sight (e.g., sunfish) clogs gills during breathing and feeding, smothers nests and eggs, and fills crevices in gravel beds. Soil can carry attached toxic chemicals and phosphorus into the water. Erosion can carry dead plant and animal matter into water, which increase the fertilizing effect and burns oxygen through decomposition. Insects and other small organisms that thrive on breaking down plant matter increase at the expense of other organisms. Sedimentation refers to soil particles that enter the water column from eroding land. Depending on climate, geology, and vegetation, watersheds experience a natural sediment load. Sedimentation is considered a pollutant when it exceeds this natural level and has a detrimental effect on water quality. Rain washes silt and other soil particles off of plowed fields, construction sites, logging sites, urban areas, and strip-mined lands into water bodies. Sedimentation and siltation can severely alter aquatic communities. Sediment may clog and abrade fish gills or suffocate eggs and aquatic insect larvae on the bottom. Suspended silt may interfere with recreational activities and aesthetic enjoyment of water bodies by reducing water clarity. Nutrients and toxic chemicals may attach to sediment particles on land and ride the particles into surface waters where the pollutants may settle with the sediment or detach and become soluble in the water column.

Through the watershed windshield survey, it was determined that there was sedimentation occurring throughout the agricultural area of the watershed, lack of vegetative buffers combined with extensive subsurface drainage tiles and conventional tillage all contribute sediment to the surface waters within the Swanfelt Ditch Watershed. The 2001Watershed Restoration Action Strategy from IDEM 2001 also notes sedimentation as a significant impairment to water quality in agricultural areas of Madison County. The Conservation Tillage Update published by Purdue University in 2000 confirms that lack of conservation tillage or no-till cropping systems is contributing to the degradation of water quality. Sedimentation and agricultural runoff are considered by volume the greatest contaminant of surface water in most Indiana agricultural watersheds according to this report. Agricultural sediment, combined with agricultural inputs, (i.e. nutrients, herbicides or pesticides) contribute significantly to the degradation of water quality according to this report.

Nutrients

Nutrients or fertilizers include any chemical that is required to increase the growth of plant or animal communities. Many of these chemicals are generally abundant enough to support populations. However, the key to managing plant or animal growth is to identify the nutrient that is required for growth and is in short supply. On land, most plant populations are largely limited by the availability of nitrogen. In water, most plant populations are limited by phosphorus. Additionally, sources of phosphorus are more easily controlled than sources of nitrogen. Plants or microscopic organisms that remove nitrogen from the air and convert it for use by other plants are often abundant. Phosphorus originally comes from rocks and is recycled in living systems by the process of consumption and decay. **Nutrients:** All plants require nutrients for growth. In aquatic environments, nutrient availability usually limits plant growth. Nitrogen and phosphorus generally are present at background or natural levels below 0.3 and 0.05 mg/L, respectively. When these nutrients are introduced into a stream, lake, or estuary at higher rates, aquatic plant productivity may increase dramatically. This process, referred to as cultural eutrophication, may adversely affect the suitability of the water for other uses. Increased aquatic plant productivity results in the addition to the system of more organic material, which eventually dies and decays. The decaying organic matter produces unpleasant odors and depletes the oxygen supply required by aquatic organisms. Excess plant growth may also interfere with recreational activities such as swimming and boating. Depleted oxygen levels, especially in colder bottom waters where dead organic matter tends to accumulate, can reduce the quality of fish habitat and encourage the propagation of fish that are adapted to less oxygen or to warmer surface waters. Highly enriched waters will stimulate algae production, with consequent increased turbidity and color. Increased turbidity results in less sunlight penetration and reductions in submerged aquatic vegetation. Since this vegetation provides habitat for small or juvenile fish, its loss has severe consequences for the food chain.

Phosphorus

Phosphorus is not directly toxic to plants or animals, but can kill fish or other oxygen-breathing animals through the indirect effect of increasing plant populations. Plants produce oxygen during the day and consume oxygen at night. An overabundance of plants causes so much oxygen in water that gas bubbles are often seen on plant stems and leaves on sunny days (super saturation). The large plant or algae population consumes an equally large amount of oxygen at night and can drive oxygen levels to nothing. This effect commonly causes fish or frog kills.

Nitrogen

Nitrogen occurs in water in four different chemical forms: organic, or TKN; nitrate; nitrite; and ammonia. **Ammonia** is found in surface and waste waters but is usually low in ground water because it attaches to soil. It is an inorganic form of nitrogen. Under specific conditions of temperature and pH, the un-ionized component of ammonia can be toxic to aquatic life. The un-ionized component of ammonia increases with pH and temperature. Ammonia can be found as a result of wastewater treatment plant discharges, failed septic system discharges or runoff carrying fertilizers. Sources of ammonia in the Swanfelt Ditch Watershed are likely to be failed septic systems and agricultural fertilizer runoff.

Ammonia can be toxic to fish, especially at high temperature. Ammonia decomposes into nitrate. **Nitrate** usually is low in surface waters but may be might in ground water or tile drainage. Nitrate can cause sickness and death of unborn or infant humans and animals through an effect commonly know as "blue baby syndrome." Nitrate can interfere with the ability of iron to carry oxygen in blood, causing the young animal to chemically suffocate. The national standard for nitrate is set at 10 mg/l to prevent this effect. Organic nitrogen represents a combination of most forms of nitrogen that are carbon-based molecules and byproducts of plant or animal decay, including proteins, urea, and numerous synthetic materials. Measurement of organic nitrogen is often called "TKN" or total kjeldahl nitrogen after the technique used to perform the test.

There are many natural and human sources of nutrients in water. Human sewage can enter from treatment plants and septic systems. Livestock waste can enter from animals grazing in or adjacent to streams or runoff following land application on fields. Wild animals and pets are also a source of nutrients. Eroding soil can carry phosphorus and ammonia. Drain tiles carry nutrients dissolved in water. Decay of organic matter from leaves, grass clippings, wood, dead plants and animals, and landfills can contribute organic nitrogen and phosphorus. Surface erosion, drain tiles, failed septic systems and fertilized agricultural areas were all identified in the watershed windshield survey.

Pathogenic Organisms

Pathogenic (disease-causing) organisms are small, difficult to sample and identify, and dangerous to maintain for testing in the laboratory. Coliform and fecal streptococci are two groups of bacteria found in the waste of warm-blooded animals. As such, their presence is an indicator of wastewater (fecal) contamination and potential for the presence of other disease-causing organisms. Eschericia coli, or E. coli, is a single species of fecal coliforms that is only found in waste from humans and other warm-blooded animals. For drinking water, total coliforms are the standard test because their presence indicates contamination of a water supply by any outside source. For recreational waters, the US Environmental Protection Agency (EPA) recommends using E. coli as the best indicator of health risk in water. In the past, tests were done to compare the relative abundance of fecal coliforms and fecal streptococci to indicate whether the probable source of contamination was human or animal. This comparison is no longer considered reliable. Some waterborne bacteria, viruses, and protozoa can cause human illnesses, ranging from typhoid and dysentery to minor skin diseases. These pathogens may enter waters through a number of routes, including inadequately treated sewage, storm water drains, septic systems, runoff from livestock pens, and sewage dumped overboard from recreational boats. Because it is impossible to test waters for every possible disease causing organism, regulatory agencies usually measure E. coli indicator bacteria. The presence of indicator bacteria suggests that the water body may be contaminated with untreated sewage and that other, more dangerous organisms may also be present. Bacterial criteria are frequently used to determine if waters are safe for contact recreation.

The state of Indiana has a water quality standard for E. coli with relation to drinking water supplies and recreation. Indiana code 327 IAC 2-1-6 Section 6 (d) indicates that the standard that uses membrane filter count method shall not exceed 125 colony forming units per 100 milliliters as a geometric mean based on not less than five samples equally spaced over a 30 day period. Any sample taken may also not exceed 235 colony forming units per 100 milliliters in any one sample in a 30 day period.

E. coli may exist in water via both point and nonpoint source pollution. Point source discharges from industrial or municipal waste water treatment plants will contribute E. coli to surface water. Non point source runoff E. coli can be contributed to surface water from failing or non existent septic systems, livestock access to streams or manure runoff and, wildlife and domestic pets.

IDEM has determined through monitoring that Pipe Creek as it exists within the Swanfelt Ditch watershed is impaired by E. coli for both the 2002 and 2004 303 (d) list. The TMDL for this stream section is currently under development.

Aesthetics: The presence of unnatural scum or foam or changes in water color, taste, or order can prevent a water body from being used as a drinking water source, recreational area, or limit viability as an aquatic habitat. Trash, litter, debris, and other types of solid waste from human activities can impair the recreation value and habitat quality of a water body.

It was noted in the watershed windshield survey that scum was present on the surface of the stream in the Swanfelt Ditch. Numerous survey points contained trash ranging from discarded refuse to used automobile tires.

Impaired Biological Community: Natural, undisturbed aquatic ecosystems provide habitat for a broad variety of biota, exhibiting taxonomic richness and complex trophic structure. Such robust aquatic communities can be impaired when a water resource is adversely affected by human activities.

The Swanfelt Ditch watershed was included on both the 2002 and 2004 303 (d) list for impaired biological communities for Pipe Creek as it exists within the watershed.

The Consolidated Listing Methodology for 2004 303 (d) list, IDEM (http://www.in.gov/idem/water/planbr/wqs/notice04.pdf) gives details on the methodology for how impaired biological community assessments are determined.

5. Identifying Pollution Sources

This section will identify the specific sources of water quality pollutants found within the Swanfelt Ditch watershed. Sources are categorized into point sources of pollution and non point sources of pollution.

Point Sources of Pollution

On the 2004 National Pollutant Discharge Elimination System (NPDES) active facility list, there is one active permitted discharger within the Swanfelt Ditch Watershed. Information for this facility is listed in Table 5.1.

Table 5.1 IDEM 2004 NPDES Active Facility List for Swanfelt Ditch Watershed

Permit Number	Facility Name	County	City	Receiving Stream
IN0020028	Frankton Municipal Sewage Treatment Plant	Madison	Frankton	Pipe Creek

There was initial concern voiced by the Steering Committee that the town of Frankton maintained a combined sewer overflow (CSO). A CSO is the discharge from a combined sewer system at a point other than the wastewater treatment plant. However, the town of Frankton does not maintain a CSO.

Although there is only one permitted NPDES facility in the Swanfelt Ditch Watershed, there is a high potential for illegal discharges of septic system effluent from old or improperly functioning septic systems. This is well documented by conversations with the Madison County Health Department’s Sanitarian Brandon Clidence and Madison County Surveyor Patrick Manship. This is further documented in the Upper White River Watershed Restoration Action Strategy published by IDEM in 2001. These types of illegal discharge are problems because they contribute excessive bacteria (E. coli), toxic substances, oxygen consuming wastes, and nutrients.

Storm water runoff from construction sites may also be considered point source pollution. At current, city and county municipalities are developing strategies for managing storm water runoff. Certain municipalities are required to submit management plans to IDEM detailing how they will manage storm water under the Phase II program. Currently, the Swanfelt Ditch Watershed exists within the Madison County’s MS4 designation. Any development that disturbs 1 acre or more during the course of their project must submit an erosion and sediment control plan to the SWCD that outlines how off-site sedimentation will be minimized.

Non Point Sources of Pollution

Nonpoint source (NPS) pollution comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, and underground sources of drinking water. The major non point source pollutants discovered through this planning project are sediment, nutrients, and E. coli. Other pollutants include toxic chemicals from agricultural runoff. For the sake of this planning project, discussion will be divided to sources of non point source pollution from urban areas and those from agricultural areas.

Sources of Water Quality Problems from Agriculture

Agricultural production often emits pollutants that affect the quality of water resources. Activities that can contribute to water pollution include confined animal facilities, grazing, plowing, pesticide spraying, fertilizing, planting, and harvesting. The major agricultural pollutants that result from these activities are sediment, nutrients, pathogens, toxic chemicals and salts. Agricultural activities also can damage habitat and stream channels.

These pollutants make their way into streams by traveling overland through surface runoff and erosion or infiltrating through the soil to subsurface tile drains. Sediment comes from sheet, rill and gully and stream bank erosion particularly when tillage activities or land clearing have occurred. Nutrients come from commercial fertilizers and manure. Toxic chemicals come from herbicides, pesticides and fungicides that are applied to crops.

According to the Madison County Council of Governments (MCCOG) interpolation, the total acreage of the Swanfelt Ditch Watershed is 11, 264. Of the total acreage, it is determined from MCCOG analysis that 67% of the Swanfelt Ditch Watershed is conventionally cropped equaling approximately 7,546 acres.

The planning project separated agricultural pollution into the categories of:

- **Crop Production**
- **Livestock Production**

Within the category of **crop production** the following subcategories of pollutants are discussed:

- *Tillage Practices*
- *Erosion and Sedimentation*
- *Nutrients*
- *Toxic Chemicals*
- *Vegetative Buffers*

Within the category of **livestock production** the following subcategories of pollutants are discussed:

- *Pasture Management*
- *Pathogens*

Crop Production

The Swanfelt Ditch Watershed is very similar to the rest of Madison County in that conventional row crop production of corn and soybeans dominate the landscape. Of Madison County's 289,920 acres, 220,034 acres were reported to have crop acres harvested in 2002 (USDA, NASS). Thus approximately 75% of the total land area was planted to agricultural row crops. According to MCCOG analysis the Swanfelt Ditch watershed had approximately 67% of its acreage dedicated to row crop production equaling 7,546 acres.

Tillage Practices

Based on the data collected in the spring of 2004 during the Madison County tillage transect, farmers conventionally tilled 81% of the corn crop, with the remaining 11% and 8% being no tilled and mulch tilled respectively. Also, the survey shows that 16% of the soybean crop was conventionally tilled, 68% no tilled, and 16% mulch tilled. Comparison of the 2004 transect report with the 2000 transect show that no-till practices are trending down in use. Reasons may be a lack of education regarding the economic advantages of no-till or the desire to plant crops in warmer tilled soil as early as possible. Fall tillage practices have been reported to take place due to a tenant farmers desire to complete work on a landlord's farm and show intent to work hard and maintain tenant-landlord relations. By estimating that approximately half of the planted acreage was corn and half was soybeans and using the 2004 tillage transect results it can be shown that:

3,773 corn acres were planted; 3056 corn acres were conventionally tilled. Using IDEM's tool titled "Estimating Load Reductions for Agricultural & Urban BMP's" it can be calculated that the 3,056 acres of conventionally tilled corn acres, at a predicted average soil loss of 0.69 ton per acre per year, would contribute 2,108 tons of sediment every year to the waterways of the Swanfelt Ditch Watershed.

3,773 soybean acres were planted; 1,207 soybean acres were conventionally tilled. Using the same estimation tool, it can be calculated that 1,207 acres of conventionally tilled soybean acres, at a predicted average soil loss of 0.69 ton per acre per year, would contribute 832 tons of sediment every year to the waterways of the Swanfelt Ditch Watershed.

By converting the 4,263 acres of conventionally tilled corn and soybean crops to no-till, the predicted average soil loss would be reduced to 0.16 ton per acre per year and would offer combined erosion reduction from 2,941 tons of soil per year to 682 tons of soil per year. This means that 2,259 tons per year of sediment would be prevented from entering the receiving streams of the Swanfelt Ditch Watershed.

Erosion and Sedimentation

Excessive sedimentation occurs when erosion takes place as a result of soil particles being detached by wind or water. Sedimentation is highly possible when tillage occurs and sheet, rill or gully erosion takes place. Based on reports presented in Chapter 3 combined with the results of the watershed windshield survey, sedimentation as a result of conventional crop tillage has been identified as a major concern.

Nutrients

The major nutrient pollutants associated with crop production are nitrogen and phosphorus. Contributions of nitrogen and phosphorus come from fertilization inputs such as commercial fertilizer, manure / sewage sludge and crop residue. These inputs are used by farmers as a means to enhance the production of their crops.

The major problem with excessive nutrient loading is that it stimulates algae and other plants to grow extremely fast and reduce the dissolved oxygen content of the water. As the plants grow, respire and ultimately decompose, oxygen is made unavailable to aquatic organisms such as fish and aquatic insects. Minor accumulations of nutrients may not harm aquatic life, but major accumulations may result in aquatic die off and fish kills.

Using the Office of Indiana State Chemist's 2002 listing of annual fertilizer distribution for Madison County, the planning project determined the following estimate of nutrients that were applied to the cropped lands of the Swanfelt Ditch Watershed:

The Swanfelt Ditch Watershed accounts for 3.9% of the total area of Madison County. Total Nitrogen distributed in Madison County was 9,014 tons. Total Phosphorus distributed was 6,563 tons. Multiplying 3.9% times each amount of Nitrogen and Phosphorus equals 352 tons of Nitrogen and 256 tons of Phosphorus. This means that approximately 704,000 pounds of Nitrogen and 512,000 pounds of Phosphorus were applied to the crop ground of the Swanfelt Ditch Watershed.

Toxic Chemicals

Pesticides are used by farmers to stop or limit insects and weeds from damaging crops. According to Purdue University Extension's publication "A Guide for Watershed Partnerships", approximately 1% of all applied pesticides end up in surface waters in the watersheds that they are applied. Unlike fertilizers, the Indiana State Chemist's Office does not distribute numbers of pesticides applied on a state or county basis. Therefore, the planning project used a matrix taken from the Purdue "Guide for Watershed Partnerships" to estimate the pesticide loading for the Swanfelt Ditch Watershed.

Table 5.2 Estimate of Pesticide Pounds Applied in the Swanfelt Ditch Watershed

Crop Type	Crop Acres	X	Pesticide	2000 Fraction of Acres Treated in Indiana	X	2000 Average Rate of Application in lbs per acre	=	Estimated Pounds of Pesticides Applied
Corn	3,773	X	Atrazine	.80	X	1.41	=	4,256
			Metolachlor	.41		1.5		2,320
			Acetochlor	.26		2.01		1,972
			Primisulfuron	.8		.02		60
			Cyanazine	--		--		--

			Tefluthrin	.13		.1		49
			Chlorpyrifos	.08		1.04		314
Soybeans	3,773	X	Glyphosate	.71	X	.97	=	2,598
			Chlorimuronethyl	.19		.01		7
			2,4-D	.14		.46		243
			Imazathapyr	.09		.04		14
			Paraquat	--		--		--
						Estimated Total Pesticides Applied		11,833 lbs
						Estimated Pesticides Received by Streams (1%)		1,183 lbs

Vegetative Buffers

Vegetative buffers are the areas directly adjacent to streams and in between streams and row crop production or agricultural activities. The ultimate function of vegetative buffers is to filter sediment, nutrients and chemicals from agricultural production as water runs off a crop field. In addition they provide wildlife habitat, and enhance the conditions for aquatic life and aquatic insects. These buffers can exist naturally with a mixture of shrubs trees and grasses or they can be planted more uniformly as part of a conservation program. Typical vegetative buffers through a conservation program involve a swath of vegetation from 20 feet up to 120 feet consisting of a mixture of grasses and / or trees suited to the soil type of that area. It has been shown by the USDA that a vegetative filter strip as narrow as 30 feet wide can reduce sediment, nutrient and chemical loads by as much as 95% when used in conjunction with conservation tillage or no-till systems.

Based on information collected on the watershed windshield survey, it was determined that of the 18.2 stream miles in the watershed, 8 miles did not have any buffer whatsoever. These stream miles were farmed directly up to the top of bank with no vegetation to buffer sediment, nutrient and chemical runoff. The other stream miles exhibit either natural buffers or planted conservation buffers.

Livestock Production

Livestock operations in the Swanfelt Ditch Watershed consist of either permitted or non-permitted operations. Table 5.3 shows the permitted operation statistics for the Swanfelt Ditch Watershed.

Table 5.3 Permitted Livestock Operations in the Swanfelt Ditch Watershed

Log #	Operation Information							
	Operation Name		Animal Numbers					
		City of Owner	Nursery Pigs	Grower Finisher Pigs	Sows & Boars	Beef	Beef Calves	Dairy
938	Shuter Sunset Farms	Frankton	150	850	0	87	30	0
3540	McCord Farms Inc #1	Frankton	0	0	0	500	0	0
6228	Patrick Shuter	Frankton	300	1700	0	0	0	0
6235	Brian Shuter	Frankton	150	850	0	0	0	0

Permitted livestock operations are regulated by the IDEM Office of Land Quality. With regards to their impact on water quality, these facilities are regulated on amount of animals on site, areas and amount of manure application, and manure storage. In addition to the facilities listed above, the Willemson Dairy operation (1200 dairy cows) exists just south of the Swanfelt Ditch Watershed. Manure from this operation is applied on fields operated by McCord Farms, Inc. within the watershed.

The non-permitted livestock operations are those that fall under IDEM's permit requirements in terms of animal numbers. These operations are not high in numbers but exist in conditions that may directly affect water quality. As a result of the watershed windshield survey, seven non-permitted livestock operations were located. Of these seven, 4 were cattle operations, 1 was a goat operation and two operations had horses. The survey team estimated 230 cattle, 30 goats and 7 horses existed on non permitted operations.

Pasture Management

Pasture management is mainly a practice for those non-permitted livestock operations. Pasture management is the practice of animal management for the best utilization of grazing efficiency. Ultimate grazing efficiency is a balance of animal numbers and time of access that the animals have to the pasture being grazed. With good pasture management, animal health, pasture health, and ultimately, water quality are preserved. If an area is over grazed, grasses will die out only to be replaced by bare soil that is prone to runoff into streams. Runoff from overgrazed pastures contributes manure and soil to the streams. As a result of manure and soil runoff, bacteria, pathogens and sediment enter the streams, thus negatively affecting water quality.

Of the 230 cattle observed during the watershed windshield survey, two of the operations contained approximately 100 cattle each. Each one of these operations allowed direct grazing access to streams. One operation is undertaking hay feeding operations and barn lot holding areas that exist on a sloped area directly adjacent to the Swanfelt Ditch. Pasture conditions are very muddy most of the time especially after rain events. There is no apparent rest given to the pasture areas adjacent to the stream. However the operation does appear to implementing rotational grazing strategies on the pastures that are not adjacent to the stream. This location is approximately 1 mile north of the confluence of Pipe Creek and the Swanfelt Ditch. There is sediment, nutrient and E. coli loading present at this site. Pipe Creek is listed as being impaired for E. coli on both the 2002 and 2004 IDEM 303 (d) list. This operation appears to be a source of contribution to the E. coli impairment.

The second 100 cow operation permits grazing with direct access to the unnamed tributary to Pipe Creek #2. This operation only allows grazing access to the stream with no feeding or holding area activities taking place anywhere near the stream. The pasture areas appear to be loosely managed for rest and animal rotation with no signs of overgrazing. Grass appears to be in good condition with no muddy areas visible.

Pathogens

Pathogens from manure, namely the indicator E. coli, from the permitted and non-permitted livestock operations is a concern for water quality in the Swanfelt Ditch Watershed. Manure applied on fields from the permitted facilities, especially onto fields that have been conventionally tilled and have subsurface drain tiles create conditions for pathogens to run off into water and serving as a source of pollution. The Shuter livestock / crop operation practices complete no-till farming thus reducing the risk that pathogens will enter the receiving streams of the watershed when applying manure to the crop fields. However, the McCord livestock / crop operation was observed during the watershed windshield survey to practice conventional tillage on all of their cropped acreage in the watershed. Thus producing conditions for runoff of pathogens, sediment and nutrients into the receiving streams of the watershed.

The other small livestock operations noted during the watershed windshield survey were not determined to be sources of pollution for the watershed.

Urban Sources of Water Quality Problems

Urbanization can impact water quality. During the course of urbanization changes in land use from a vegetated, wetland or forested habitat can impact water quality. During the course of development water quality can be impacted from construction site runoff. And finally, when natural area land is developed, a new type of water quality impact is encountered through impervious surfaces, chemical usage and disposal by individuals or industries, and human or animal waste.

This planning project separated urban sources of pollutants into the following categories:

- **Pathogens**
  - *Septic Systems*
  - *Pets & Wildlife*
- **Toxic Substances**
  - *Lawn & Garden*
  - *Household Waste*
  - *Industrial*
- **Development**
  - *Construction Site Erosion*
  - *Impervious Surfaces*

Pathogens

Pathogens sources in the urban environment are from both human and animal sources. E. coli bacteria in the urban environment come from failed septic systems or direct discharges from homes with failed or non-existent septic systems. Not only is this a problem with urban homes not on sewer, but also from older homes in the rural area of the watershed that have failed septic systems or newer homes with improperly installed septic systems. Domestic pet and wildlife waste is a source of pathogens in the urban environment.

Septic Systems

According to Lisa Cory, Council President of the town of Frankton, every residence within the town of Frankton was served by municipal sewer. Therefore, septic systems are not a source of pollution within the town of Frankton. However, just outside of the corporate limits of the town of Frankton is the Alexander's Addition residential area that is not served by municipal sewer or water. All systems within this 100 home subdivision have septic systems that were installed approaching 30 years ago. Soil conditions in this area are heavy clay with high impermeability. Both Brandon Clidence of the Madison County Health Department and Patrick Manship, Madison County Surveyor informed the planning project that failed septic systems are occurring at a high rate within this subdivision. Brandon receives many complaints of failed systems with effluent bubbling to the surface or where systems have been connected to tiles leading to the Unnamed tributary to Pipe Creek #2. Many were installed improperly, have not received adequate maintenance and exist on lots that are too small to add an additional treatment field for septic tank effluent. Unnamed tributary to Pipe Creek #2 passes directly through this subdivision and is likely receiving E. coli from the failed septic systems and / or direct discharges from failed septic systems.

Pets and Wildlife

Domestic pets and wildlife waste have been documented to be a significant source of pathogens in certain watersheds. Wildlife, particularly waterfowl, feed and nest in colonies that tend to exist directly adjacent to water. During the course of their feeding, waterfowl trample vegetation as well as feed on it. By doing so, soil becomes bare and erosion may ensue. Domestic pet waste can be a significant source of pathogens particularly in dog parks, yards with higher numbers of pets, and areas where significant dog walking occur. There waste can be washed down storm drains or run off into receiving streams. During the course of the watershed windshield survey, and communicating with Lisa Cory of the town of Frankton, it was determined that no significant pet activity or wildlife concentration areas exist.

Toxic Substances

Lawn & Garden

Urban lawn and garden practices, particularly turf care can contribute significant sources of pesticides and nutrients to a watershed. Over application or mis-application is common by private homeowners who have not received training on the basics of fertilizers and yard chemicals. In addition, yard grass clippings, leaves, or chipped wood may contribute excessive nutrients and/or tie up available oxygen in streams if they are dumped in urban streams. During the course of the watershed windshield survey, it was determined that there was very limited use of lawn care products due to the presence of very few manicured lawns.

Also no dumping of yard or garden waste in relation to the Hulda-Miller legal drain or Pipe Creek was observed.

Household Waste

Most homes have products in garages, basements or in storage that could serve as a source of pollution. Items such as paint, solvents, fuel, used motor oil, gasoline, among others can accidentally spill or leak out of old containers and contaminate the ground water or runoff into receiving waters of the watershed. Without proper education, some homeowners may think that spreading these chemicals out over the ground might be an appropriate manner of disposal.

Industrial

Industrial sites can pose a significant source of pollution in urban areas. Within the town of Frankton, only a few small businesses exist. None of which are permitted dischargers. There are also no listings of superfund or brownfield sites within the town of Frankton or the Swanfelt Ditch Watershed.

Development

Construction Site Erosion

Per area of land, construction sites can contribute significant sources of sediment to receiving streams of the watershed. For every development that disturbs 1 acre or more of land, the developer is required by law to submit erosion and sediment control plans for approval to the Madison County SWCD. The plans outline how the developer will minimize off-site sedimentation. Typically, developers will utilize Best Management Practices to accomplish their goal. Practices such as straw bales, silt fence, retention areas and temporary seeding are common to aid in erosion and sediment control. At the time of publication of this document, the SWCD has only received one erosion and sediment control plan for a development to take place within the town of Frankton. No others have been received for any other area of the watershed. This indicates that not much development is taking place within the Swanfelt Ditch Watershed.

Impervious Surfaces

Impervious surfaces such as roads, parking lots, roofs and driveways increase the storm water runoff in an area when they are constructed. As the run off leaves the impervious surface, it usually takes with it any pollutants that may be present on the impervious surface. These pollutants range from automobile fluids, sediment and pathogens. The corporate limit of Frankton is the area within the Swanfelt Ditch Watershed that exhibits large areas of impervious surfaces. The town of Frankton is approximately 640 acres in area. Through out this area, the major form of land use is single family homes. Single family homes with yards are considered by this planning project as low density urban land use. For the sake of estimation, the planning project assumed that half of the low density urban areas are considered impervious. Using this estimation, it can be stated that approximately 320 acres of the town of Frankton is impervious. While surveying the town of Frankton, it was observed that only 5 storm drains existed within entire corporate limits. They exist in the immediate down town area. In addition, there is at least 50 feet of grass buffer adjacent to the Hulda-Miller legal drain that drains a large majority of Frankton. This low level of storm drains to receive impervious runoff and significant vegetative buffers to filter runoff into the legal drain indicates that impervious surfaces in the town of Frankton are not a major source of pollutants to the receiving streams of the watershed.

Table 5.5 shows the pollutant loading rates for the entire Swanfelt Ditch watershed. Contributing area acreage (Table 5.4) was compiled utilizing information gathered from both the town of Frankton and Madison County Council of Governments offices. The calculation of estimated current loads within the watershed was made using the calculation worksheets from IDEM's "Estimating Load Reductions For Agricultural and Urban BMPs" The estimates given in Table 5.5 give pollutant loads in the watershed using the unit of pounds per year. These numbers are estimates of each one of the pollutants shown as they exist prior to Best Management Practices being implemented anywhere in the watershed.

Table 5.4 Contributing Area Acreage for Swanfelt Ditch Watershed Land Use

	Sewered	Unsewered
Commercial	10	0
Industrial	5	0
Institutional	10	0
Transportation	53	209
Multi-Family	0	0
Residential	320	1060
Agriculture	0	7556
Vacant	0	0
Open Space	0	2041

Table 5.5 Estimated Pollutant Loads for Swanfelt Ditch Watershed

	Load before BMP (lbs/yr)
BOD	52,724
COD	527,588
TSS	1,887,958
LEAD	717
COPPER	181
ZINC	1,942
TDS	2,643,721
TN	26,437
TKN	13,900
DP	936
TP	2,668
CADMIUM	7

Summary – Sources of Water Quality Problems

The water quality assessment reports, watershed windshield survey, personal communication and limited monitoring data indicate that there are significant non point source pollutants that cause water quality impairments in the Swanfelt Ditch Watershed. Even though additional water quality monitoring will be beneficial to identifying pollutant sources that were not contained in any assessment reviewed or were not observed by our survey, the following conclusions can be made.

The Swanfelt Ditch Watershed is receiving pollutants from non point sources. Specifically, the pollutants are E. coli, sediment and nutrients. The Steering Committee has confirmed point sources of pollution to be E. coli from septic systems that have failed due to age, improper installation, and / or improper management. It is also determined that there are homes that have never had a functioning septic system and make direct discharge into subsurface tile drains. Failed systems either bubble sewage effluent to the ground surface or failed systems are connected to subsurface tile drains for relief. The limited data reviewed shows relatively low dissolved oxygen readings in both Pipe Creek and Swanfelt Ditch. The Madison County Surveyor communicated that his department has encountered problems with septic effluent in every tile that they have completed maintenance on throughout the Swanfelt Ditch Watershed. The Madison County Health Department Sanitarian commented that he had fielded numerous complaints regarding failing systems in the watershed and has also witnessed homes that had existed for a number of years without a septic system other than discharging to a subsurface drain tile.

In addition to E. coli, agricultural runoff is contributing sediment and nutrients to the receiving streams of the Swanfelt Ditch Watershed. Although the planning project relied heavily on the assessments of other water quality studies, the watershed windshield survey produced conclusions that can reasonably identify that adoption of conservation tillage and / or no-till crop production would produce measurable water quality benefits throughout the watershed. Additionally, it can also reasonably be concluded that the implementation of vegetative buffers throughout the watershed will also produce measurable water quality benefits in the watershed.

While not wide spread throughout the watershed, land application of manure and cattle with direct access to streams is contributing to E. coli, sediment and nutrients to the receiving streams of the watershed. It can also be reasonably determined that livestock exclusion from the streams and adoption of no-till cropping systems where manure is land applied will produce measurable water quality benefits in the watershed.

6. Identifying Critical Areas for Pollutant Sources

Taking into consideration the confirmed pollutant sources the Steering Committee discovered, the following critical areas were developed. The following critical areas are ranked according to the level of concern regarding the pollutants stated and the level of measurable effects on water quality that implementation measures will provide. The ranking determines the urgency of the water quality problems and order that implementations will be completed.

Critical Area #1
Agricultural Areas Directly Adjacent (within 120 feet) to Streams Lacking Buffers

Through the watershed windshield survey and analysis of aerial photography, the areas directly within the 120 foot corridor of the Swanfelt Ditch, McClure Ditch, and three areas of Pipe Creek lack adequate vegetative buffers. Planting wooded buffers on Pipe Creek and grass filter strips on McClure Ditch and the Swanfelt Ditch are important steps to reducing agricultural runoff from entering the streams. There are 8 miles within the Swanfelt Ditch Watershed on the streams mentioned in this paragraph that have insufficient buffers. These areas are very critical when considering a reduction of sediment, nutrients and chemicals. Surface runoff is trapped, filtered and utilized by the vegetation in the buffer and prevents the runoff from entering the stream. The critical area for the Swanfelt Ditch is the entire area north of county road 1000 north. The critical area for McClure Ditch is the entire area from the headwaters extending south to a line corresponding with county road 950 north. The first critical area for Pipe Creek is the field at the northeast corner of the intersection of the Pipe Creek bridge and State Road 128. The second is the field at the northwest corner of the Pipe Creek bridge and county road 700 west. The third is the field on the south side of Pipe Creek half way between the 700 west bridge and 700 north bridge. Figure 6.1 shows these critical areas.

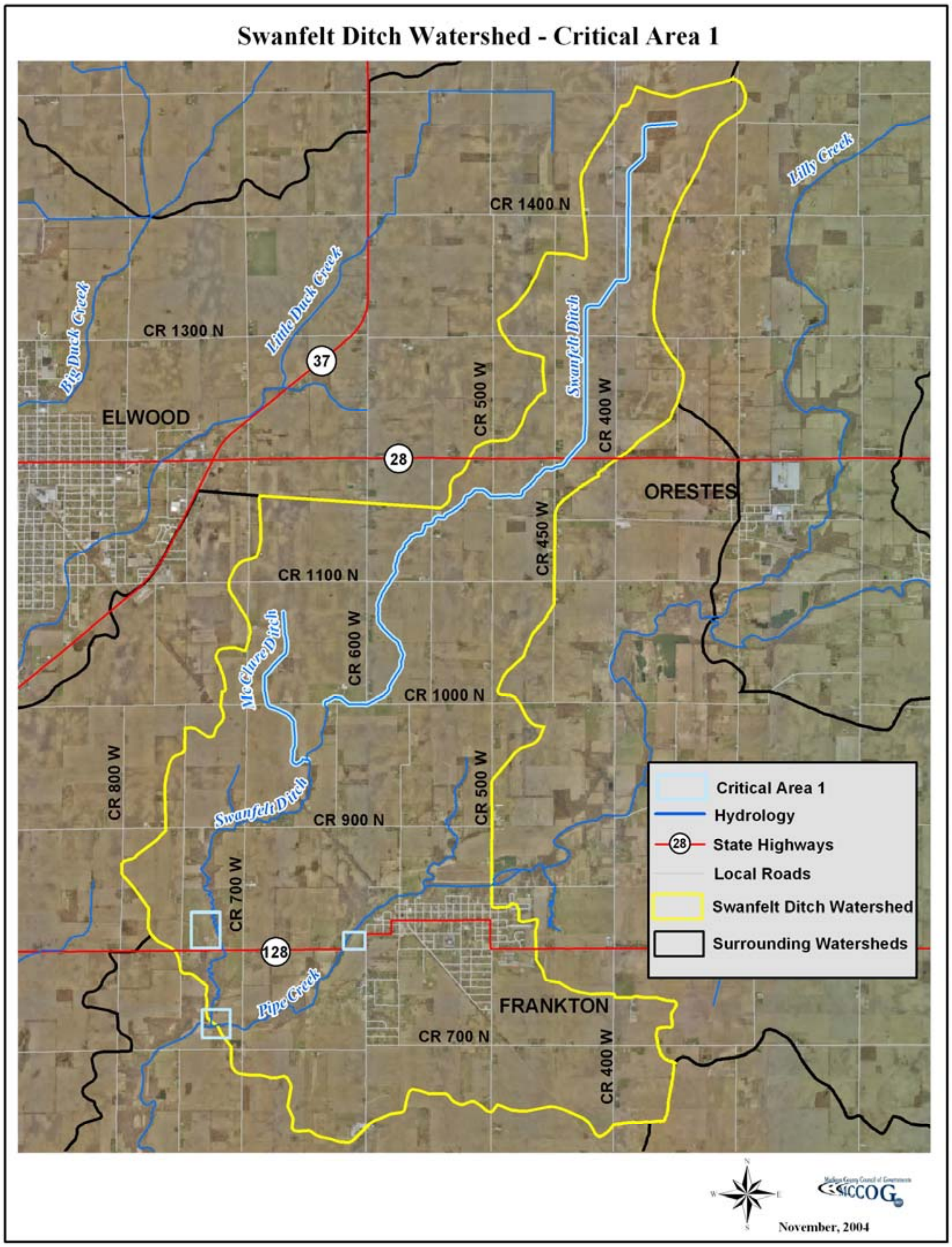


Figure 6.1 Critical Area #1

Critical Area #2
Gently to Moderately Sloping, Conventionally Tilled Crop Lands That Receive Land-Applied Manure

Through land use analysis, tillage transect data, and the watershed windshield survey, it was determined that inadequate levels of conservation tillage or no-till practices are occurring in one area of the Swanfelt Ditch Watershed that receives land-applied manure from two permitted livestock operations. Not only does this lend itself to erosion and loading of sediment, nutrients and chemicals to the watershed, it also contains a high probability that E. coli from manure will enter the receiving stream in the area. This area is approximately 320 acres in size and exists south of a line drawn by county road 700 north, between county road 600 west and 700 west, to the south line of the Swanfelt Ditch Watershed. This area contains soil types that are gently to moderately sloping, which is extreme to the majority of the other soil types and topography of the watershed. Based on the tillage transect, watershed windshield survey and communication with local stakeholders, it has been determined that no conservation tillage or no-till practices are used whatsoever in this area for any crop that is produced. This coupled with the fact that the area stated receives land-applied manure from two of the three permitted livestock facilities makes it a critical area for implementation of no-till cropping systems. Figure 6.2 shows this critical area.

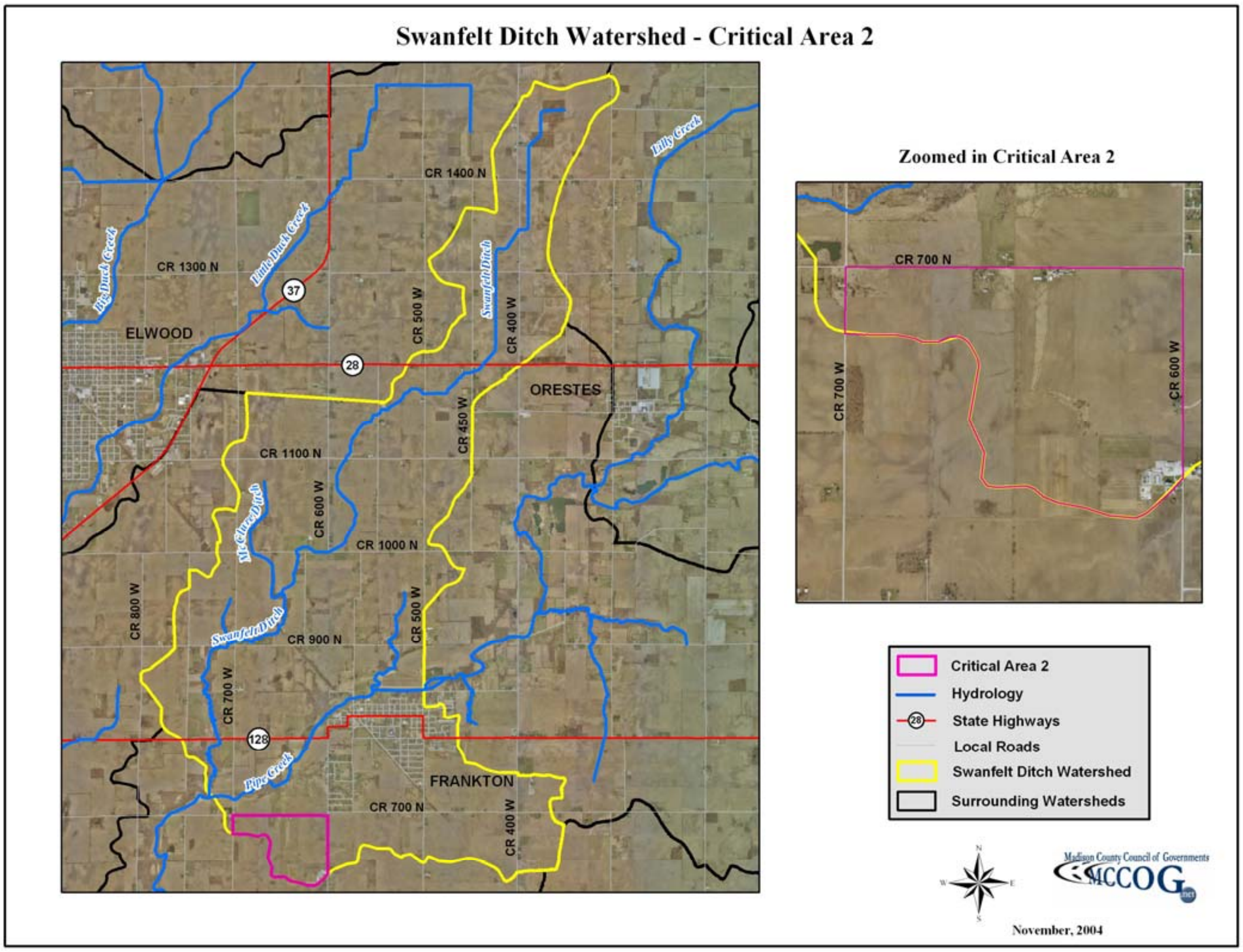


Figure 6.2 Critical Area #2

Critical Area #3

Gently to Moderately Sloping, Conventionally Tilled Crop Lands

Through land use analysis, tillage transect data, and the watershed windshield survey, it was determined that inadequate levels of conservation tillage or no-till practices are occurring in one area of the Swanfelt Ditch Watershed that has gently to moderately sloping topography. This type of terrain is conducive to erosion and surface runoff of nutrients, chemicals and sediment. The area is approximately 2,500 acres in size and exists as the entire section of the watershed between extending south from county road 1000 north all the way to Pipe Creek. Figure 6.3 shows this critical area.

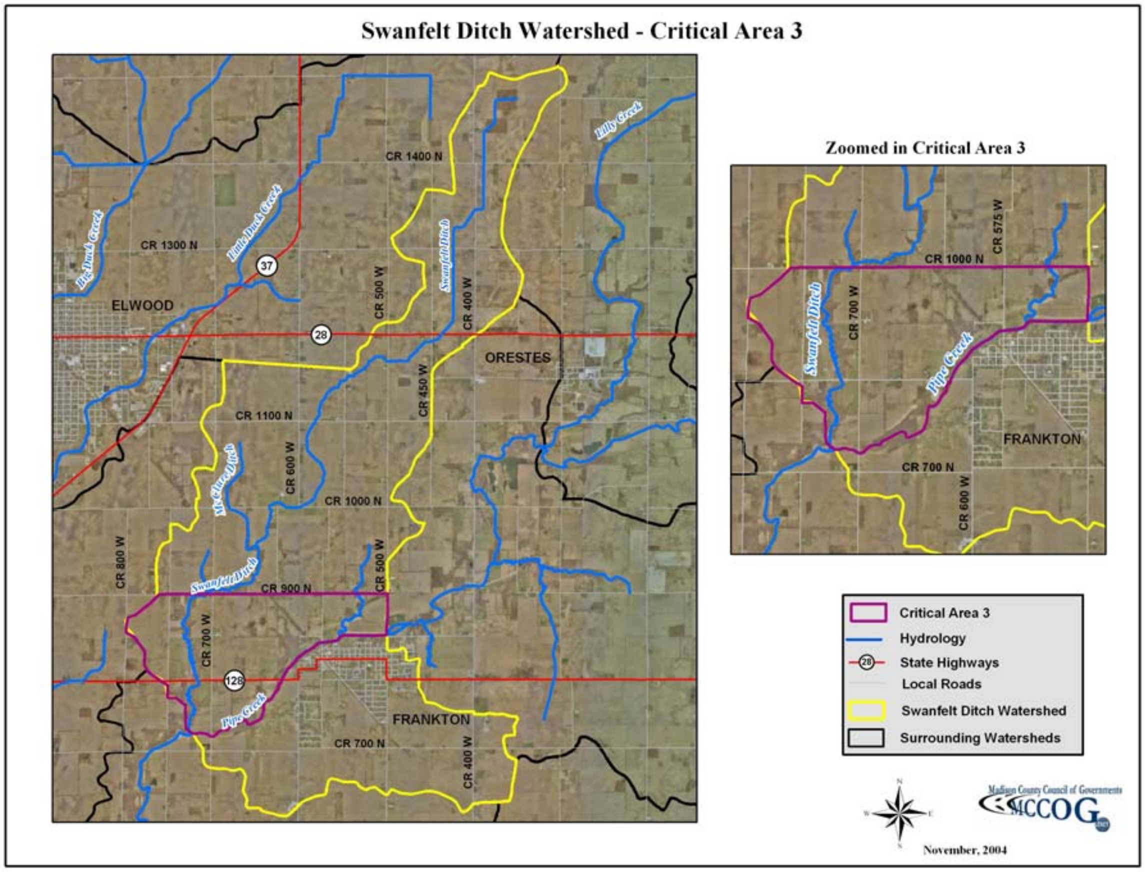


Figure 6.3 Critical Area #3

Critical Area #4
Critical Areas Where Livestock Directly Access Streams
There are two areas within the Swanfelt watershed where cattle are directly accessing the stream. Farmers provide access to streams for various reasons. Mostly for convenience of watering, and crossing over the water to graze additional pastures. The cattle operations vary in size, but total numbers with direct access to the streams average around 100 cows. This provides a direct contribution of *E. coli*, nutrients, and sediment to the streams. The first location where cattle have direct access to the stream is at the intersection of the Swanfelt Ditch and State Road 128 bridge. The cattle have direct access to the stream for approximately ½ mile. In addition to having access to the stream, the farmer has created a hay feeding and staging/holding area on 10-15% slope that slopes directly to the stream.

The second area exists half way between State Road 128 and 700 north on 600 west. The farm is located on the west side of the road. This pasture also holds approximately 100 animals. However, it does not exhibit muddy lots, over-grazing or feeding/staging areas directly adjacent to the stream. The cattle, however, do have direct access to approximately ½ mile of this unnamed tributary to Pipe Creek #2. Figure 6.4 shows these critical areas.

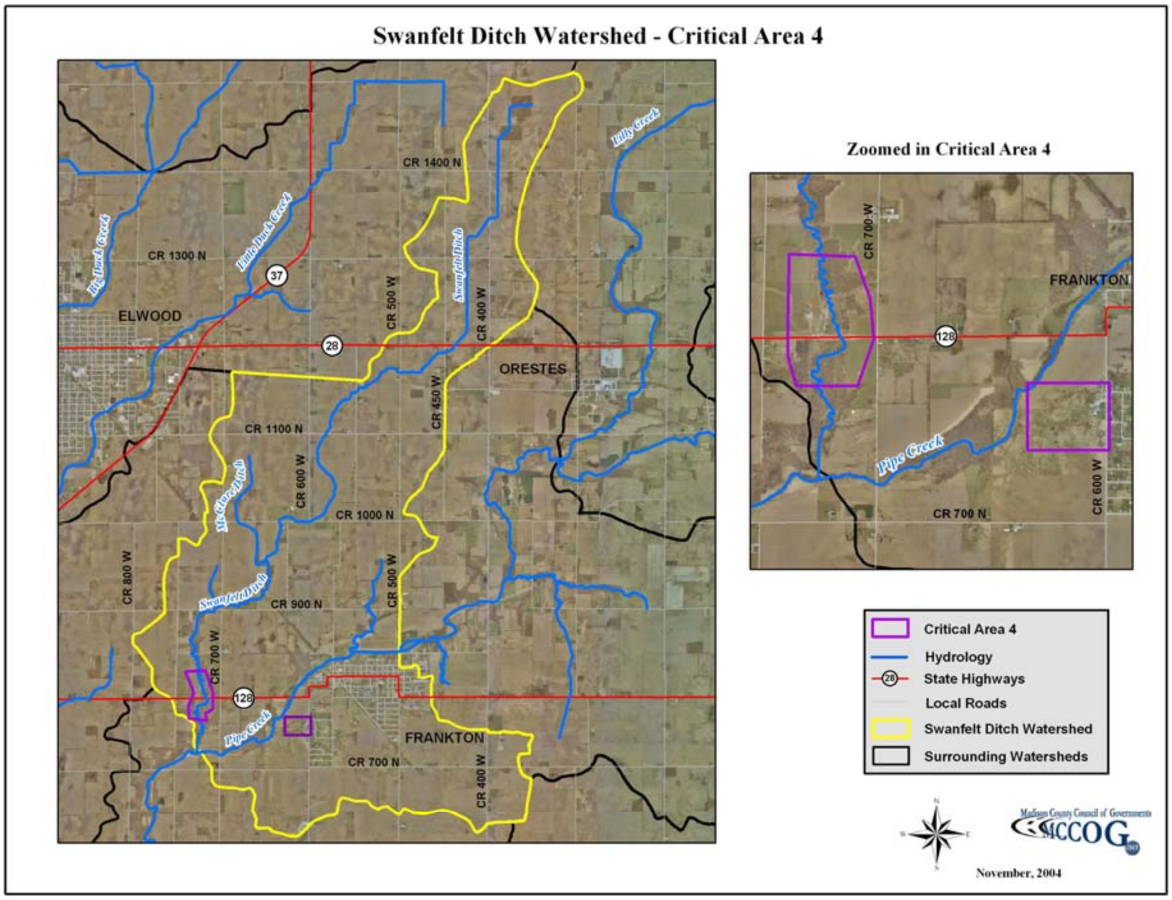


Figure 6.4 Critical Area #4

Critical Area #5
Alexander's Addition Sub-Division
The entire watershed, with the exception of the corporate limits of Frankton, utilizes septic systems for their individual onsite waste treatment. Through interviews with the local Department of Health, State Department of Health and the impairment status on the 303 (d) list for E. coli, it is evident that the watershed has a problem E. coli. Failed septic systems or direct discharges from non-existent septic systems contribute *E. coli*, increased nutrients to receiving streams in the watershed. Specifically, the County Health Department has mentioned that the unincorporated sub-division of Alexander's Addition has multiple issues regarding septic systems. The issues involve undersized lots, poor soil conditions for septic systems and existing directly adjacent to the unnamed tributary to Pipe Creek #2. This sub-division contains approximately 100 homes and occupies approximately 90 acres.

In addition, the rest of the rural residences of the watershed have problems with conventional septic systems. The soils are typically not conducive to long term operation of a conventional septic system. Also, the water table is typically high throughout the watershed. This scenario coupled with the high intensity of subsurface tile drains allows the ease with which rural residents may discharge their septic waste into an underground tile upon system failure.

The County Surveyor also commented on the frequency that they encounter septic waste within the tile when his department is repairing tiles. These are all great indicators that the entire watershed is a critical area for septic system reform. Figure 6.5 shows this critical area.

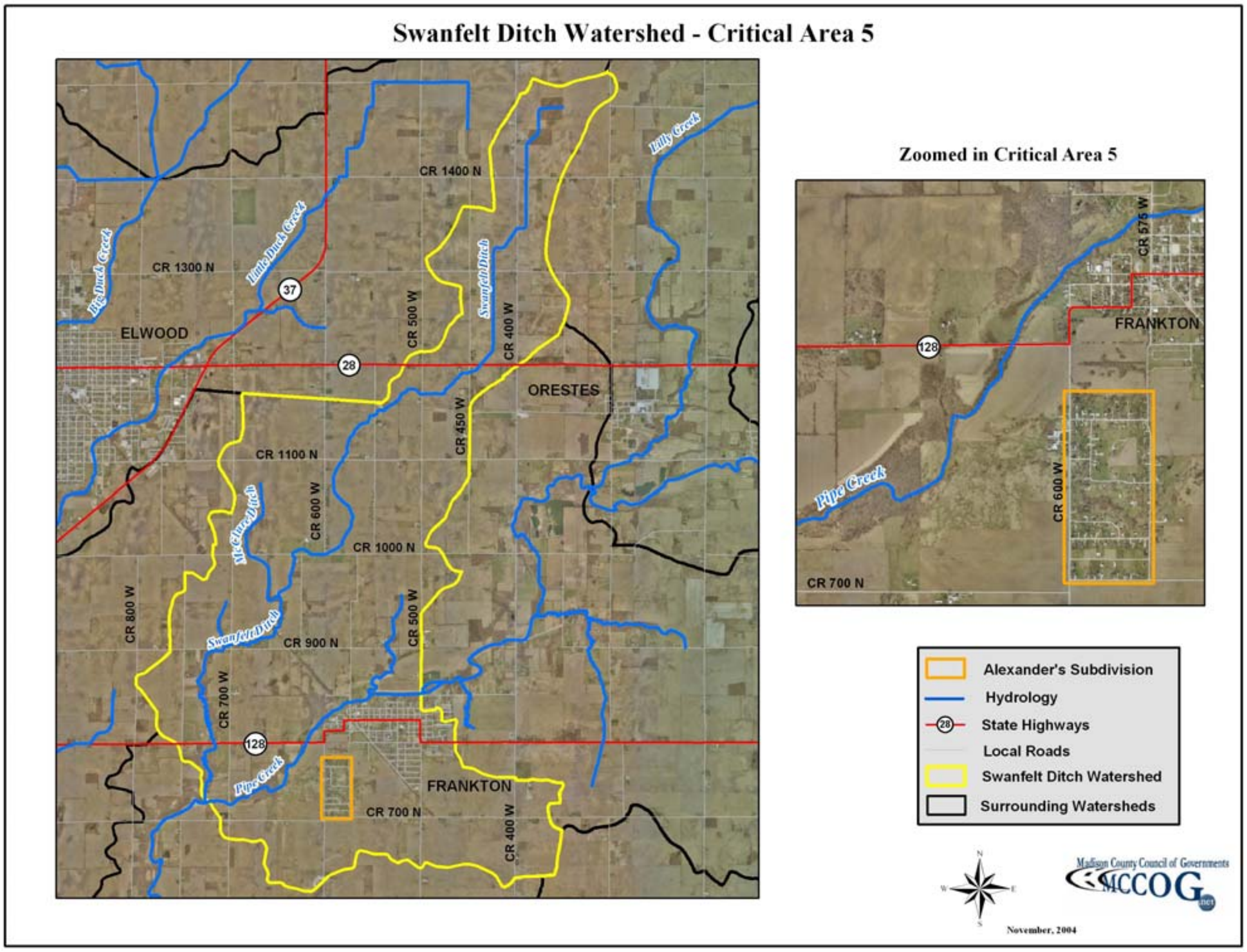


Figure 6.5 Critical Area #5

Critical Area #6
Flat to Gently Sloping, Conventionally Tilled Crop Lands with High Numbers of Subsurface Drainage Tiles

Through land use analysis, tillage transect data, and the watershed windshield survey, it can be determined that inadequate levels of conservation tillage or no-till practices are occurring in one area of the Swanfelt Ditch Watershed that has flat to gently sloping topography. This type of terrain is conducive to soil erosion by wind and surface runoff of nutrients, chemicals and sediment. In addition to potential erosion and surface runoff, this area is highly drained with subsurface drainage tile. High presence of subsurface drainage tiles allow the soils to drain such that conventional cropping may take place without crops perishing from standing water during wet times of year. The tiles also make it possible to complete spring and fall tillage, warm soils during spring, and permit earlier planting in spring and earlier harvesting during the fall. Two main types of tile are used; jointed clay tile and perforated plastic tile. These tiles come in a variety of sizes ranging from private tiles of 4” in diameter up to very large, subsurface legal drain tiles 36” in diameter. The perforations and joints in the tile allow the water to drain from the soil into a tile matrix that travels into open ditches and streams within the watershed. When water travels from the soil, it brings with it detached soil particles. The soil particles have chemicals and nutrients attached to them. This allows sediment, nutrients and chemicals to travel directly from the crop fields into the streams adjacent to the tiled areas. The soil types that exist within the southeastern side of the watershed (south and east of the corporate limits of Frankton) and the northern tier of the watershed (north of the line drawn by County Road 1000 north) warrant themselves to artificial, subsurface drainage. However, the farmer in the southeast area of the watershed exclusively uses no-till cropping systems. Thus, the area included in this critical area is approximately 3,800 acres in size.

Occasionally, these tiles break and provide open holes directly to the surface of the crop field. This allows direct importation of the detached sediment, chemicals and nutrients into the tile and consequently, directly into the streams of the watershed.

Coincidently, the areas that are tiled for crop production typically are the areas where conventional septic systems historically fail. By having close access to a subsurface tile matrix, rural residents often have made “midnight connections” to the tiles to provide trouble free elimination of human waste from their failed septic systems directly into the streams of the watershed. Figure 6.6 shows this critical area.

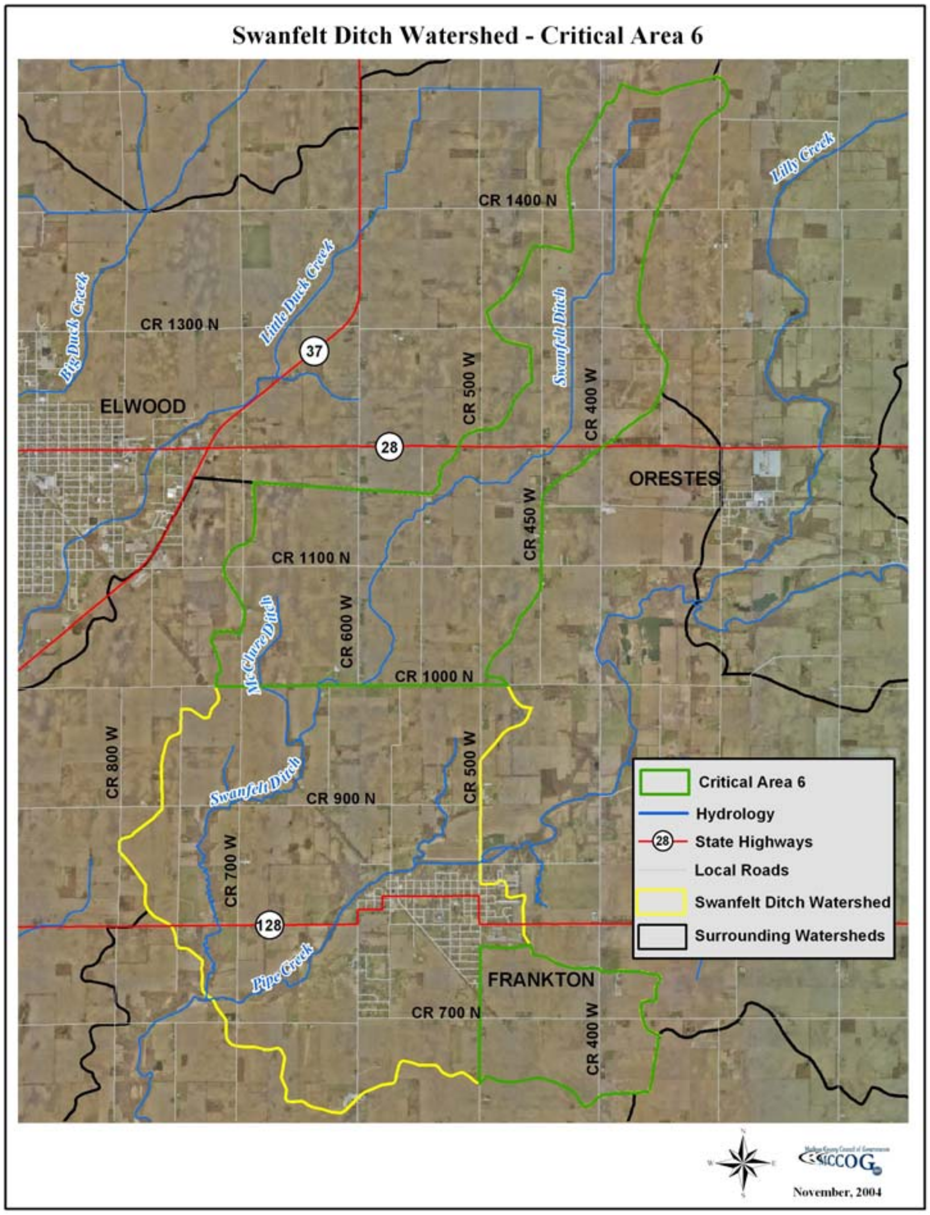


Figure 6.6 Critical Area #6

7. Setting Goals & Selecting Indicators

Goals
The Swanfelt Ditch Watershed Steering Committee has crafted the management goals below based on the following confirmed sources of pollution:

1. Agricultural Sources of Pollution
    a. Crop Production
        - Tillage Practices
        - Erosion and Sedimentation
        - Nutrients
        - Toxic Chemicals
        - Vegetative Buffers
    b. Livestock Production
        - Pasture Management
        - Pathogens

2. Urban Sources of Pollution
    a. Pathogens
        - Septic Systems

Goal 1.
Vegetative Buffers:
The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality in the watershed through installation of conservation buffers on all available streams through out the watershed utilizing cost share programs.

Goal 2.
Agricultural:
The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality in the watershed through implementation of Best Management Practices and promoting conservation tillage practices and cost share programs.

Goal 3.
Septic Systems:
The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality in the watershed through thorough site surveys for proper septic system installation, heightened education regarding maintenance of septic systems and promotion of alternatives to septic systems.

Goal 4.
Education Goal:
The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality through heightened educational outreach to residents of the watershed involving pollution prevention techniques.

Table 7.1 Relationship of Goals to Indicators & Monitoring Progress
This table links goals, indicators and progress monitoring milestones that will help the planning group measure its progress.

Priority	**Goal**	**Indicators & Monitoring Progress**
1	**Vegetative Buffers:** The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality in the watershed through installation of conservation buffers on all available streams through out the watershed utilizing cost share programs. The Committee's goal is that 38 acres of vegetative buffers will be installed within the Swanfelt Ditch Watershed	**Indicators:** Maintain an educational booth at 4-H fair. (2005 & 2006) Research and create database / mailing list of farmers and landowners in watershed. (2005) Prepare and distribute cost share brochures on buffers to farmers and landowners in watershed. (2006) Conduct buffer workshop / tour as part of BMP tour. (2006) **Monitoring Progress:** Installation of a minimum 38 acres (8 miles, both sides of stream or ditch, 20 feet wide) of vegetative buffers. Lowered levels for E. coli, sediment, nutrients, & chemicals. Photographic documentation of implementation.
2	**Agricultural:** The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality in the watershed through implementation of Best Management Practices and promoting conservation tillage practices and cost share programs. The Committee's goal is that 1000 acres of conventional tillage be converted to no-till cropping systems.	**Indicators:** Maintain an educational booth at 4-H fair. (2005 & 2006) Conduct no-till workshop annually as part of BMP tour. Prepare educational materials on economic benefits of no-till crop production. (2005) Research and promote cost share programs for agricultural BMP's. (2005) **Monitoring Progress:** Conversion of 1000 acres minimum of conventional tillage to no-till cropping systems in watershed. Lowered levels for E. coli, sediment, nutrients, & chemicals. Photographic documentation of implementation.
3	**Septic Systems:** The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality in the watershed through thorough site surveys for proper septic system installation, heightened education regarding maintenance of septic systems and promotion of alternatives to septic systems. The Committee's goal is that 75% of failed septic systems are repaired, replaced or connected with sewer connection (municipal or regional septic district).	**Indicators:** Maintain an educational booth at 4-H fair. (2005 & 2006) Conduct an educational tour of alternative septic systems in the county as part of BMP tour. (2006) Attend new plat review committee meetings. (2005 & 2006) Distribute maintenance brochures to septic system owners. (2005) Research and initiate regional septic district discussions. (2005 & 2006) Research and prepare mailing list of septic system owners in watershed. (2005) **Monitoring Progress**: Reduce Septic System Failure and Discharge by 75%. See reduction of E. coli in watershed via water quality monitoring. Photographic documentation of implementation
4	**Education Goal:** The Swanfelt Ditch Watershed Management Steering Committee seeks to improve the water quality through heightened educational outreach to residents of the watershed involving pollution prevention techniques.	**Indicators:** Create & distribute quarterly newsletters & press releases. (2005 & 2006) Upgrade existing web site highlighting all water quality improvement projects. (2005) **Monitoring Progress**: Increased participation in quarterly meetings of steering committee, SWCD, and watershed sub-committees. Photographic documentation of implementation.

8. Implementation Measures

Selecting the Measures

The Steering Committee has selected the implementation measures shown in Table 10.1 to apply to the Swanfelt Watershed. These measures are combinations of practices, programs and processes arrived upon through brainstorming and consensus at Steering Committee meetings. These measures involve education and outreach, additional planning, implementation of on-the-land practices, and monitoring as recommended by technical personnel and stakeholders who participated in the development process. Table 8.1 shows an itemized task list organized by goal and linked to the partnerships that will be utilized to carry out the tasks at hand.

Information / Education Techniques Utilized

The Watershed Coordinator and Steering Committee will utilize active education and outreach programs to bring about public understanding and participation in the watershed project. A variety of activities such as direct mailing of educational newsletters, brochures, posting of press releases to local newspapers, use of website, field days and workshops will augment all of the measures selected to apply. For field days, workshops and tours, the Committee will utilize local and regional experts on the implementation measure at hand along with those local stakeholders who have already adopted the specific implementation measure. The Committee will also utilize existing partnerships with local, state and federal agencies, and forge new partnerships with other agencies and public stakeholders to better bring about positive water quality changes within the watershed. The Committee will tailor the message of each outreach / information piece to the specific message needed for successful acceptance of the implementation measure at hand.

Technical Standards for Implementation Measures

All measures that are implemented that correspond to a technical standard shall utilize the NRCS Field Office Technical Guide (FOTG) standard for that appropriate Best Management Practice. If a FOTG standard does not exist for the standard, the project will utilize scientific standards available from the manufacturer or contractor providing the service for that particular implementation measure.

Economic Social & Environmental Impacts

The implementation measures will be effective in their root aim to improve the water quality in the watershed. Completion of the implementation measures will enhance the environmental condition of the watershed and the environmental condition of the areas downstream from the watershed. When taking this into consideration, it is possible to see the effect that these measures may potentially have on the economic and social conditions throughout the watershed. It has been shown through other watershed projects throughout the country that economic conditions for particular segments of the population in a watershed improve as the water quality improves. If water quality improves, the water is in a condition that allows contact via recreation. This provides opportunities for recreation for new employees who relocate with businesses that have moved to the area. If quality of life is good, businesses, and people tend to locate in those areas. By current democratic governmental structure, this tends to bring economic and social prosperity and progress to an area. Ultimately, the Committee crafted the implementation measures with those aims in mind.

Implementation Measures & Subsequent Load Reductions

Through implementation, the Steering Committee wishes to make reductions in the loads of certain pollutants. Load calculations for these reductions may be found in Chapter 9 of this report.

The Committee wishes to reduce the sediment, nutrients, and chemicals coming from agricultural areas adjacent to streams in the watershed. The Committee wishes to do this through the installation of 38 acres (8 miles, each side of stream at 20 feet wide) of vegetated buffer strips during the next two years. By installing these practices, there will be an estimated load reduction of 7 tons/year of sediment, 14 lbs/year of phosphorous, and 27 lbs/year. During the implementation phase, the project will monitor total suspended solids, nutrients, chemicals, Biological Oxygen Demand (BOD), macroinvertebrates and Dissolved Oxygen (DO) to determine the actual load reduction occurring.

The Committee wishes to reduce the total suspended solids, nutrients, and chemicals coming from agricultural areas adjacent to streams in the watershed. The Committee wishes to make these reductions through increasing the acreage of no-till on conventional crop land by 1000 acres within the watershed. By implementing these Best Management Practices, there will be an estimated load reduction of sediment of 210 tons/year; phosphorous by 391 lbs/year; and Nitrogen by 780 lbs/year. During the implementation phase, the project will monitor total suspended solids, nutrients, chemicals, Biological Oxygen Demand (BOD), macroinvertebrates and Dissolved Oxygen (DO) to determine the actual load reduction occurring.

The Committee wishes to reduce the levels of E. coli, and nutrients in the agricultural areas by installing livestock exclusion fencing, livestock stream crossings, and livestock watering stations on 2 specific livestock feeding operations where approximately 200 cattle in total currently have direct access to the streams. The implementation of these practices will reduce the BOD by 3,211 lbs/ year, phosphorous load by 410 lbs/year and nitrogen load by 2,408 lbs/year. Undoubtedly, removal of cattle from the streams and providing a setback from the streams will reduce E. coli, sediment and other nutrients in the water. During the implementation phase, the project will monitor total suspended solids, nutrients, chemicals, Biological Oxygen Demand (BOD), macroinvertebrates, E. coli and Dissolved Oxygen (DO) to determine the actual load reduction occurring.

The Committee wishes to reduce the levels of E. coli and nutrients in the entire watershed by educating the public on the proper maintenance of conventional septic systems and also defining for the public what an acceptable septic system really is. Results of this program will be identified by reduced E. coli levels via the implementation phase monitoring program.

The Committee wishes to reduce all levels of nonpoint source pollutants and improve the aesthetics of the watershed through a targeted outreach and education program in the entire watershed. This outreach and education program would take place during the next 2 year implementation phase. The watershed project will measure success of this program by the levels of public participation in programs offered and achievement of milestones listed in Table 8.1. Concentrated educational efforts may further improve water quality when implemented with the adoption of the best management practices mentioned above.

Table 8.1 Itemized Implementation Task List by Goal

Goal	Task	Partnerships
All Goals	2005 – Initiate implementation project	SWCD / steering committee
All Goals	2005 – Hire Watershed Coordinator	SWCD / steering committee
Education	2005 – 2007 Present 4 educational programs to civic groups, etc.	SWCD / steering committee
Education	2005 – 2007 Maintain educational booth at Madison County 4-H Fair	SWCD / steering committee
Education	2005 – Further develop mailing lists for Swanfelt Ditch Watershed	SWCD / town of Frankton
Agriculture	2006 – Conduct watershed BMP tour	SWCD / steering committee
Education	2006 – Convert 1 acre impervious surface adjacent to Hulda Miller legal drain to pervious surface as demonstration project	SWCD / Frankton Elem. School / steering committee
	Prepare educational materials on economic benefits of no-till crop production.	
Education	2006 – Cost Share on 5 Rain Barrels as demonstration project for water conservation / runoff prevention	SWCD / 5 landowners
Septic System	2005 –Mail septic system repair & maintenance brochures to septic system owner mailing list	SWCD / steering committee / MC Health Department
Septic System	2005 – 2007 Participate in plat review process for new home site development to ensure appropriate site planning for septic system installation	SWCD / MC Planning Department
Education	2005 – 2007 Further develop world wide web to highlight all educational and implementation projects as part of Swanfelt Ditch Watershed Management Plan	SWCD / steering committee
Septic System	2005 – 2007 Initiate discussion regarding the development of a regional waste district or north Madison County septic district	SWCD, towns of Frankton, Elwood, Alexandria, Orestes Summitville, Madison County Health Department
Vegetative Buffer	2006 – Conduct vegetative filter strip marketing, enrollment and installation project	SWCD / steering committee / USDA NRCS & FSA
Agriculture	2006 – Install 2 livestock exclusion projects in the watershed	SWCD / USDA NRCS
Education	2005 – 2007 Develop and distribute quarterly newsletters to watershed mailing list and post on web site	SWCD / steering committee
Education	2005 – 2007 Develop and distribute quarterly press releases to local newspapers and post to web site	SWCD / local news paper reporters / steering committee
Agriculture	2006 – Distribute Farm*A*Syst Water Quality Self Assessment Packets to farm operators in watershed	SWCD/ Purdue Farm*A*Syst coordinator / watershed farm operators
All Goals	2005 – 2007 Initiate and conduct water quality monitoring program & Quality Assurance Project Plan (QAPP)	SWCD / monitoring contractor / steering committee

9. Calculating Load Reductions

Load reductions were calculated using the Revised Universal Soil Loss Equation (RUSLE). RUSLE is a conservation planning tool that estimates annual average soil loss. It is a mathematical calculation that considers climate, soil, topography, and land use. RUSLE is used by federal, state and local governments to predict and evaluate the effects of soil erosion. This is valuable information for planning groups such as the Swanfelt Ditch Watershed Steering Committee and other natural resources planning groups. The information used to calculate the reductions is based on watershed soil conditions that were obtained from the Madison County United States Department of Agriculture – Natural Resources Conservation Service - District Conservationist, Mike Hughes.

With regards to the conversion of 1000 acres of agricultural production from conventional tillage to no-till the following load reduction calculations can be made. All of the load reduction calculations shown below were made using the IDEM "Estimating Load Reductions for Agricultural and Urban BMP's" worksheets, Revision 10-1-03, as part of the Region V load reduction model.

Table 9.1
Load Reduction Calculation Factors for Agricultural Field Practices

RUSLE	Before Treatment	After Treatment
Rainfall-Runoff Erosivity Factor (R)	145	145
Soil Erodibility Factor (K)	0.26	0.26
Length-Slope Factor (LS)	0.14	0.14
Cover Management Factor (C<=1.0)	0.13	0.03
Support Practice Factor (P<=1.0)	1.0	1.0
Predicted Average Soil Loss (ton/acre/year)	0.69	0.16
Contributing Area (Acres)	1000	1000
Gross Soil Texture: Silt(silt, silty, clay loam and silt loam		

Estimated Load Reductions from Agricultural Field Practices

Sediment Load Reduction (ton/year)	210
Phosphorus Load Reduction (lb/year)	391
Nitrogen Load Reduction (lb/year)	780

With regards to the installation of 38 acres of vegetated filters strips in the critical area, the following load reduction calculations are made.

Table 9.2
Load Reduction Calculation Factors for Filter Strip Practices

RUSLE	Before Treatment	After Treatment
Rainfall-Runoff Erosivity Factor (R)	145	145
Soil Erodibility Factor (K)	0.26	0.26
Length-Slope Factor (LS)	0.14	0.14
Cover Management Factor (C<=1.0)	0.13	0.03
Support Practice Factor (P<=1.0)	1.0	1.0
Predicted Average Soil Loss (ton/acre/year)	0.69	0.16
Contributing Area (Acres)	38	38
Gross Soil Texture: Silt(silt, silty, clay loam and silt loam		

Estimated Load Reductions from Filter Strips

Sediment Load Reduction (ton/year)	14
Phosphorus Load Reduction (lb/year)	28
Nitrogen Load Reduction (lb/year)	54

The following load reduction calculation is estimated to occur by excluding 200 – 1000 pound slaughter animals from access to streams listed in the critical areas section.

Table 9.3
Estimated Load Reduction from Two Livestock Exclusion Projects

Pollutants	Before Treatment	After Treatment
Biochemical Oxygen Demand (lb/year)	3211	0
Phosphorus Load (lb/year)	482	72
Nitrogen Load (lb/year)	2408	0

10. Implementing the Measures

This management plan may only succeed through the implementation phase and beyond with the continued support and involvement of all who have helped to develop it thus far and with those whose hands hold the implementation key to success, the residents and stakeholders of the Swanfelt Ditch Watershed. In addition, new relationships must be fostered with funding entities and groups who are not yet aware that the project exists. Tables 7.1, 8.1 & 10.1 and outline the programs and processes that the Steering Committee has developed to ensure that the goals of the management plan are met. Table 10.1 specifically links the goal, objective, critical areas, time frame of completion resources and estimated costs.

The entire implementation phase will be completed using community involvement, voluntary sign-up, stakeholder input and decision making. The stakeholders will provide input based on community feed back. The Madison County SWCD will hold final approval of all activities and contractual agreements. The homeowner, landowner or business who installs any Best Management Practice will sign an agreement that they will operate and maintain the new practice for a period of ten years.

Table 10.1 Action Register of Implementation Measures

Goal Category	Objective	Where	Task	Start	End	Responsibility	Resources	Milestones	Products	Estimated Cost
Vegetative Buffers	Install 16 miles (8 miles each side of stream) of vegetated buffer strips adjacent to streams in the watershed	Critical Area #1	Hire a contracted technician, contact landowners / operators, develop cost share program and education program	2005	2007	MC SWCD	USDA - NRCS, IDNR	Track reduced pollutant levels and acreages enrolled in the CRP	Minimum of 38 acres of vegetated buffers adjacent to streams in the watershed	$12,000
Agricultural	Increase no-till and conservation tillage by 1000 acres in the watershed	Critical Area #'s 6,3,&2	Contact landowners / operators, develop cost share program and education program	2005	2007	MC SWCD	USDA - NRCS	Track reduced pollutant levels and acreages converted to conservation tillage / no-till	Minimum of 1000 acres converted to conservation tillage / no - till	$15,000
Agricultural	Exclude cattle from having direct access to two stream locations in the watershed	Critical Area #4	Contact landowners / operators, develop cost share program and education program	2005	2007	MC SWCD	USDA - NRCS, IDNR	Track reduced pollutant levels and completion of individual projects	Minimum of 200 cattle excluded from direct, uninterrupted access to streams	$15,000

Goal Category	Objective	Where	Task	Start	End	Responsibility	Resources	Milestones	Products	Estimated Cost
Septic Systems	Address Septic System Failures; Education; Encourage Enforcement of Existing Regulatory Ordinances	Critical Area # 5	Contact landowners / residents, foster partnership with County officials/ health department develop education program	2005	2007	MC SWCD	USDA - NRCS, IDNR, County Health Department	Track reduced pollutant levels and septic systems repaired & maintained	Regional Septic District Formed	$5,000
Education	Target all residents of watershed with conservation education programs	All areas of watershed	Develop education program materials, direct mail brochures, post newsletters, post press releases, continue development of existing website	2005	2007	MC SWCD	USDA - NRCS, IDNR, Town of Frankton, County Health Department, Steering Committee, Purdue Extension	Track reduced pollutant levels and completion of education projects	Increased stewardship ethic in watershed, increased quality of life, behavioral modification for pollution prevention	$12,000

Total Estimated Implementation Costs for BMP's and Educational Activities (not including administration, personnel, etc.) $59,000

Implementation Costs & Potential Funding Sources
At the time of publication of this watershed management plan, the Madison County SWCD has submitted the following funding request to the IDEM so as to continue with the implementation phase.

Type of Grant:	***EPA Clean Water Section 319, Nonpoint Source***
Administered by:	United States Environmental Protection Agency Indiana Department of Environmental Management

Total Grant Project Request = $97,400
Estimated Budget

Personnel = $45,800
- Watershed Coordinator - $38,800
- Contracted Technician - $7,000

Outreach and Education = $18,000
- Workshop / Field Day / Newsletters / Brochures, etc.

Water Quality Monitoring = $20,000
- Baseline water quality parameters (Physical, Biological, Chemical)

Best Management Practices = $33,600
- Cost-Share for Practices, Vegetated Buffers, etc.

Total EPA Section 319 Grant =	**$97,400**
Section 319 Funds Requested =	$73,050
Matching Funds (Cash or In-kind Services) =	$24,350

Cash & In-Kind Sources for Section 319 Grant

Madison County SWCD Cash — $10,000
182 W. 300 N. Suite D.
Anderson, IN 46012
765-644-4249 Ext. 3

Town of Frankton Cash — $5,000
P.O. Box 286
Frankton, IN 46044
Telephone: 765-754-7285
Funding Subject to Town Council Approval

In Kind Match from Local Community Stakeholders — $5,000

Other Potential Funding Sources
In the event that the grant request listed above proves insufficient or other needs in the watershed are assessed that require funding mechanisms to correct, the following organizations have historically funded community development projects that improve the quality of life within Madison County.

Madison County Community Foundation
33 West 10th Street, Suite 600
P.O. Box 1056 Anderson, IN 46015-1056
Telephone: 765-644-0002
Email: info@madisonccf.org

Madison County Council of Governments
Madison County Government Center
Room 100
16 E. 9th St.
Anderson, IN 46016
Telephone: 765-641-9482
www.mccog.net

Corporation for Economic Development – Anderson / Madison County
205 W. 11th St.
Anderson, IN 46016
Telephone: 765-642-0266

Legal Responsibilities During Implementation Phase

The Madison County Soil & Water Conservation District will assume the legal responsibility of carrying out the planned activities within the watershed. The Madison County SWCD will also assume the responsibility of monitoring and reporting the requirements of any grant proposal requirements that may be undertaken. At the drafting of this plan, the installation of cost share practices, BMP's, and taking part in suggested water quality improvement practices, and maintaining those practices shall be the expressed responsibility of the landowner / resident / operator who agrees to participate. There is potential that easements, permits, etc. may be required to carry out the responsibilities of the watershed management plan. If required, the Madison County SWCD will take the necessary actions to obtain said required documents. All water quality projects proposed by the Madison County SWCD are completely and without reservation voluntary.

11. Monitoring the Indicators

The Swanfelt Watershed Planning Project has conducted its planning without a structured water quality monitoring program. However, it is the intent of the project to begin a monitoring program during the implementation phase of the project.

There are various indicators that tell us how water quality is responding. The following outlines the monitoring program that will be carried out during the implementation phase

Water Quality Monitoring

We plan to have approximately six sampling points in the Swanfelt Watershed. We plan to make approximately 4 sampling events per year – 3 seasonal and 1 rain event. Sampling sites will be determined with the assistance of the Steering Committee, Madison County SWCD, and the contractor who is contracted to perform the monitoring program. We plan on monitoring the following approximate parameters at each of the sampling sites:

> Biological: macroinvertebrates and fish, along with habitat assessment (bank evaluation and water habitat type)
>
> Chemical: ammonium-N, nitrate (nitrate+nitrate)-N, orthophosphate, total suspended solids, *E. coli*, pH, and *in situ* determination of temperature, dissolved oxygen, total biochemical oxygen demand (BOD), chemical oxygen demand (COD), Atrazine and Diazanon, hydrocarbons.

The Madison Count SWCD will select the contractor who will perform the monitoring program. The Contractor will be responsible for developing the QAPP for the monitoring program. The contractor will also be responsible for calculating the pollutant load reductions as the project progresses.

Ultimately the monitoring program will establish the “before and after” scenario with regards to baseline water quality data as it relates to water quality after improvement implementation projects are completed.

Monitoring will be completed for a period of 3 years. At that time, the SWCD and Steering Committee will evaluate the needs of the monitoring program and adjust future monitoring plans accordingly.

Measurement of Success

Measures of success will be three fold; 1) by implementing Best Management Practices (BMP’s), we will reduce nonpoint source pollution coming from the targeted critical areas outlined in this watershed management plan; 2) we will implement education and outreach to bring about behavioral changes that will directly lead to reduced nonpoint source pollution in the targeted critical areas in the watershed; 3) we will conduct water quality monitoring to ascertain the success of our efforts in the watershed through both education and installation of BMP practices.

As outlined in Table 7.1, we will rely heavily on photographic documentation as a measurement tool. We will also geo-locate all BMP projects that are installed as part of this management plan. Project success will definitely be measured by completion of newsletters, press releases, BMP tour, outreach activities, etc. The SWCD will perform follow-up interviews / surveys with the homeowners and landowners who participate in the implementation phase to ascertain their heightened level of awareness and action through our education efforts.

Water quality and habitat monitoring, coupled with installation of BMPs, and participation in education and outreach will determine the success of the project during the implementation phase. All of these measurements will be reported through quarterly reports and final reports to project stakeholders.

12. Evaluating & Adapting the Plan

Project Responsibilities

The Madison County Soil & Water Conservation District will maintain the sole responsibility of evaluating and revising the plan to match current political, environmental, and social factors. The Swanfelt Watershed Management Plan is to serve as a living document that will best serve the public and environment by being updated periodically. This plan shall be evaluated and updated if necessary at the end of the first two year implementation phase. (2007) At that time, as the planning partners become more familiar with the water quality needs of the watershed, they will be able to refine the management plan. Even though the responsibility exists with the Madison County SWCD, all decisions will be made with the assistance of the public stakeholders and technical personnel that have assisted with the plan thus far, and those who will inevitably gain interest as the project progresses.

Project Contact

To obtain a copy of this Swanfelt Watershed Management Plan or any associated documents, please contact:

Madison County Soil & Water Conservation District
Watershed Coordinator
182 W. 300 N.
Anderson, IN 46012
Phone: 765-644-4249 Ext. 3
Fax: 765-640-9029
Website: http://www.madisonswcd.org/

Plan Distribution

The Madison County SWCD will make the Swanfelt Watershed Management Plan available to as many people or interested groups may wish to view it. The SWCD will have copies of the plan available at all Madison County Public Libraries and on the World Wide Web. Copies of the plan on the www.madisonswcd.org web site will be made available in both Adobe pdf and Microsoft Word formats for ease of access. The SWCD will also provide copies of the plan upon request.

Future TMDL Projects

As mentioned earlier in this management plan, there will be TMDL projects occurring as this management plan is implemented. The watershed coordinator will serve as the primary contact for IDEM and independent contractors who are working on TMDL projects that involve the Swanfelt Ditch Watershed. The coordinator will serve as a liaison and active participant in the IDEM and contractors quest for information and outreach that are necessary for the successful completion of their TMDL development.

Appendices

Table A.1 Results of Windshield Survey by Project Coordinator and Steering Committee in Swanfelt Watershed

Site	Stream	Location	Date	Weather	Land Use	Site Comments
1	Swanfelt Ditch	400W & 0.75 miles n. of 1400N	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, no till soybeans	Farmed directly up to bank of stream
2	Swanfelt Ditch	400W & 0.4 miles n. of 1400N	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	Farmed directly up to bank of stream
3	Swanfelt Ditch	400W & 0.75 miles n. of 1400N in center of woods, headwater area	4-23-03	Sunny, mild, normal rainfall	Wooded	Woods on all sides of area where Swanfelt Ditch begins
4	Swanfelt Ditch	400W & 0.4 miles n. of 1400N	4-23-03	Sunny, mild, normal rainfall	Wooded	Woods on all sides of area where Swanfelt Ditch begins
5	Swanfelt Ditch	1400N & intersection of Swanfelt Ditch	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	Farmed directly up to bank of stream, lots of algae growth in stream, field tile outlets visible
6	Swanfelt Ditch	400W 0.25 miles s. of 1300N	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	Farmed directly up to bank of stream, lots of algae growth in stream
7	Swanfelt Ditch	400W between 1300N & 1400N at bridge	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	Farmed directly up to bank of stream, lots of algae growth in stream, field tile outlets visible
8	Field not adjacent to stream	SE corner of intersection of 1300N & 400W	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, no till soybeans	Flat, subsurface tiled field
9	Field not adjacent to stream	NW corner of intersection of 1300N & 400W	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	Flat, subsurface tiled field
10	Swanfelt Ditch	Intersection of 1300N and Swanfelt Ditch	4-23-03	Sunny, mild, normal rainfall	1 corner no-tilled, other 3 tilled	Scum on water surface, lots of algae, increased sediment – mucky bottom
11	Field not adjacent to stream	500 W 0.2 mile north of 1200N	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled fields	Flat, subsurface tiled fields on either side of road
12	Swanfelt Ditch	Field south of SR 28 & east of Swanfelt Ditch	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, no till soybeans	Flat, subsurface tiled field, tile outlets visible, excessive algae in stream
13	Swanfelt Ditch	South of SR 28 on west side of 450W south of Swanfelt	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	Flat, subsurface tiled field, tile outlets visible, excessive algae in stream
14	Swanfelt Ditch	SW corner of 1200N and 450W	4-23-03	Sunny, mild, normal rainfall	Rural residence	Possible lawn fertilizers and chemicals used up to bank of stream, horses grazed up to bank of stream
15	Field not adjacent to stream	450W 0.5 mile south of 1200N on either side of road	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	Flat, subsurface tiled fields on either side of road
16	Field not	NE corner of	4-23-03	Sunny, mild,	Conventional	Flat, subsurface tiled field

	adjacent to stream	1100N & 500W		normal rainfall	agriculture, no till soybeans	
17	Swanfelt Ditch	Intersection of Swanfelt and 500W between 1100N & 1200N	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, no till soybeans	Flat, subsurface tiled field, tile outlets visible, excessive algae in stream
18	Swanfelt Ditch	Intersection of Swanfelt and 550 W between 1100N & 1200N	4-23-03	Sunny, mild, normal rainfall	Hayfield, electrical substation on east, row crops with filter strips on west side	Steep banks on west side, small fish visible in stream, greater than 100 feet grass buffers
19	Swanfelt Ditch	North side of 1100N bridge intersection with Swanfelt	4-23-03	Sunny, mild, normal rainfall	Converted to buffer strips and tree planting	Nice grass buffers planted with tree seedlings, no erosion present
20	Swanfelt Ditch	South side of 1100N bridge intersection with Swanfelt	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, no till soybeans	No buffers present, surface runoff present
21	McClure Ditch	Intersection of McClure Ditch with 1000N just East of 700 West	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture, tilled field	No buffers present, surface runoff present
22	Swanfelt Ditch	Intersection of Swanfelt Ditch on 1000N just West of 625W	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture	North side hay, and buffers, south side has solid tree cover with vegetated filter strip, no potential for surface runoff
23	Swanfelt Ditch	Fields on either side of Swanfelt approx. ½ mile North of 1000N between 575W & 600W	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture	No buffers present, surface runoff present, need buffers
24	Swanfelt Ditch	Fields at intersection of 1000N & 575 W	4-23-03	Sunny, mild, normal rainfall	Conventional agriculture	SW side in hay, all other sides in conventional row crop production, NE side planted no-till soybeans
25	Unnamed Trib to Pipe Creek	Intersection of 500W & 900N	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture	NW side conventionally tilled on HEL field, erosion present, SE side is same as NW, NE is farmstead, and SW is wooded riparian buffer to unnamed trip to Pipe Creek. Stream appears to have nice gravel bottom and very little sedimentation problems
26	Unnamed Trib to Pipe Creek	Intersection of Trib at 900N between 500W & 575W	6-16-03	Sunny, mild, normal rainfall	Wooded Riparian buffer	Slow flow stream but good wooded cover. Stream looks clear with good gravel bottom
27	Unnamed Trib to Pipe Creek	Intersection of 575W & 900N	6-16-03	Sunny, mild, normal rainfall	Residences on 2 corners, other two corners are conventional agriculture	Erodible crop fields need conservation tillage during corn rotation. Appears to be no-tilled during soybean rotation
28	Unnamed Trib to Pipe	900N just east of 575W	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture	Crops along road appear to drown out each year along road, HEL around that area to

	Creek					north. Possible wetland vegetation could be used to filter crop runoff?
29	Unnamed Trib to Pipe Creek	Intersection of 900N & 500W	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture on W side of 500W, and around two residences on E side of 500W	No-till soybeans present, but need conservation tillage implemented during corn phase of rotation.
30	Pipe Creek	Intersection of 850N & 500W at Pipe Creek bridge	6-16-03	Sunny, mild, normal rainfall	3 sides natural areas (two with residences) 1 side with conventional agriculture	100 foot filter strip present on NW side of bridge. All other sides contain at least 25 feet or greater of solid riparian cover over pipe creek.
31	Swanfelt Ditch	¼ mile north of 900N on 575W	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture	Needs no-till or conservation tillage on corn phase of rotation, appears to have no-till soybeans during soybean rotation.
32	Swanfelt Ditch	¼ mile east of 625E on 900N	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture	Need no till or conservation tillage, surface runoff present, wind erosion possible
33	Swanfelt Ditch	Intersection of 625W & 900N	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture & 1 small farmstead	Over stocked horse pasture on NW corner. Conventional tilled fields all other corners, need conservation tillage or no-till corn in rotation.
34	Swanfelt Ditch	¼ mile N of 900N on 700W	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture	Need conservation tillage or no-till in corn phase of rotation. W side of road slopes markedly towards McClure Ditch that is un-buffered.
35	McClure Ditch	½ mile N of 900N on 700W 1/8 mile W of road	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture	Marked slope towards McClure Ditch. At this point McClure Ditch converts from open, un-buffered ditch to ditch with 10 feet or more of solid riparian, wooded vegetation
36	Swanfelt Ditch	Intersection of Swanfelt Ditch with 700W just north of 900N	6-16-03	Sunny, mild, normal rainfall	Residences & 1 small farmstead	Small goat farm in low area NE of bridge. Doesn't appear to be runoff present. Wooded vegetation covers stream completely, stream bottom swift with visible gravel bottom
37	Swanfelt Ditch	Just E of intersection of 700W & 900N	6-16-03	Sunny, mild, normal rainfall	Small farm stead residences on N and S side of road Cattle pasture on N	Cattle pasture surrounds Swanfelt, only a few cattle present, pasture appears in good shape, no over grazing or erosion present
38	Pipe Creek	Intersection of Pipe Creek Bridge & 575W	6-16-03	Sunny, mild, normal rainfall	Grass fields on N side of creek, town residences on S side of creek	Good solid wooded vegetative cover on Pipe Creek, Frankton waste treatment plant on NW side
39	Pipe Creek	¼ mile south of 900N on 575 W	6-16-03	Sunny, mild, normal rainfall	Residences along W side of road, conventional agriculture	Need conservation tillage or no-till in corn rotation. Land prone to surface runoff and erosion, somewhat HEL

					everywhere else	
40	Unnamed Trib to Pipe Creek	Intersection of Unnamed Trib to Pipe Creek on 600 W, ½ mile between 700N & 800N	6-16-03	Sunny, mild, normal rainfall	Cattle pasture on W side of road residences on E side of road	E. side grass yards and sparse mature trees, residences with documented septic problems, W side has cattle pasture with significant cattle access to the stream. Pasture is not overgrazed, however.
41	Unnamed Trib to Pipe Creek	Intersection of Unnamed Trib to Pipe Creek on 700N approx ½ mile W of 600W	6-16-03	Sunny, mild, normal rainfall	Pasture & conventional agriculture	Headwaters of Unnamed Trib needs buffer from conventionally tilled crop field on S side of road. Definitely in need of conservation tillage or no-till within the corn rotation.
42	Hulda Miller Legal Drain	Intersection of 500W & SR 128	4-21-03	Sunny, mild, normal rainfall	Commercial shops on NE & SW corner, grass lot on NW, school on SE corner	Gas station, grocery store and ice cream shop dominate NE the intersection. All runoff from all 4 corners goes to opening of Hulda Miller Legal Drain. Grass Vegetation surrounds the drain inlet area. Significant impervious surface area present.
43	Hulda Miller Legal Drain	NW Corner of Frankton Jr./Sr. High School parking lot	4-21-03	Sunny, mild, normal rainfall	Residential, school zone	Wooded, mature trees surround residences. School maintains very large impervious surface drains to Hulda Miller Legal Drain.
44	Hulda Miller Legal Drain	100 block of Sigler Street in Downtown Frankton	4-21-03	Sunny, mild, normal rainfall	Residential, mixed commercial, churches, offices	Interspersed grass lots with parking lots. Only 5 storm drains on Sigler Street.
45	Hulda Miller Legal Drain	4 city blocks W of E intersection of SR 128 and Sigler Street	4-21-03	Sunny, mild, normal rainfall	Residential, one small industry and one church	All water flows across vegetated yards to opening for Hulda Miller Legal Drain
46	Pipe Creek	3 city blocks east of 575W on South bank of Pipe Creek	4-21-03	Sunny, mild, normal rainfall	Mixed residential, Town of Frankton storage area	Town of Frankton stores electrical transformers close to flooded area. Lisa Corey commented that they were going to move the storage out of the flood zone.
47	Hulda Miller Legal Drain	S 100 block of Washington St. in downtown Frankton	4-21-03	Sunny, mild, normal rainfall	Residential, mixed commercial, offices	Interspersed gravel lots, impervious surfaces with open drain to Hulda Miller present at intersection.
48	Pipe Creek	Intersection of Pipe Creek on SR 128 W of 600W approx. ¼ mile	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture	Cattle pasture on NW corner, fenced up to top of bank with narrow mature wooded riparian cover on N side of bridge. Conventional crops on other three corners, however two large filter strips present in addition to wooded riparian buffer. Need grass strip on NE corner of bridge.
49	Pipe Creek	Intersection of Pipe Creek bridge with 700W ¼ mile N	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture and natural area.	NW side needs filter strip, runoff into pipe creek significant despite small wooded riparian buffer.

		of 700N				However all other corners of bridge contain significant wooded buffer.
50	Swanfelt Ditch	Intersection of Swanfelt Ditch with SR 128 approx ¼ mile W of 700W	6-16-03	Sunny, mild, normal rainfall	Conventional agriculture, farmsteads	Wooded area buffering steep hills was bulldozed, grass seeded, fence erected, and converted to cattle pasture. Large numbers of cattle have direct access to stream, Hay feeding on steep slope between house and stream. All crop ground, however, was converted to hay and / or pasture.

Table A.2 Meeting Date Summary of the Swanfelt Ditch Watershed Planning Project

Meeting Date	**Activities**
August 22, 2002	Introduction - Background
September 17, 2002	Ground rules development / water quality discussions
October 8, 2002	Mission & vision statement development / water quality discussions
November 9, 2002	Watershed selection meeting / water quality discussions
December 5, 2002	Preparation for public kick off meeting
January 14, 2002	Public kick off meeting
February 11, 2003	Introduction for new Steering Committee members / water quality concerns
March 18, 2003	Water quality concerns / discussions with stakeholder experts (health department, NRCS, farmers, town of Frankton representatives)
April 15, 2003	Water quality concerns / discussions with stakeholder experts (health department, NRCS, farmers, town of Frankton representatives) / issue prioritization
June 17, 2003	Water quality concerns / discussions with stakeholder experts (health department, NRCS, farmers, town of Frankton representatives)
July 15, 2003	Goal development / discussion of watershed windshield survey / issue prioritization
August 19, 2003	Implementation brainstorming
November 18, 2003	Implementation brainstorming / water quality discussions
December 16, 2003	Implementation brainstorming / water quality discussions / funding and future project activities

Table A.3 Acronyms and Corresponding Definitions

Acronym	**Definition**
BOD	Biochemical Oxygen Demand
BMP	Best Management Practice
CSO	Combined Sewer Overflow
EPA	Environmental Protection Agency
FCA	Fish Consumption Advisory
HUC	Hydrologic Unit Code
IDEM	Indiana Department of Environmental Management
IDNR	Indiana Department of Natural Resources
ISDH	Indiana State Department of Health
MCCOG	Madison County Council of Governments
NPS	Nonpoint Source Pollution
NRCS	Natural Resources Conservation Service
NAWQA	National Water Quality Assessment program
SWCD	Soil & Water Conservation District
USDA	United States Department of Agriculture
WRAS	Watershed Restoration Action Strategy