VFC Index - Watershed (Plan)

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Watershed Management Plan

Buck Creek/Campbell Ditch

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Section 1. INTRODUCTION

1.1 **Purpose & Objectives:**

The following items represent the purposes and objectives for developing a watershed management plan:

- Improve water quality in Tipton County.
- Promote adoption of voluntary conservation.
- Provide a forum to identify and discuss watershed resources and concerns.
- Identify and seek funding to address concerns.

1.2 **Development Process:**

The Buck Creek watershed was selected for plan development through a prioritization process. This process is detailed in **Appendix #1 (Watershed Prioritization).** This watershed management plan (Plan) was developed by a stepwise process driven by local interests to reflect the water quality concerns of local stakeholders. A watershed team, or planning group, was assembled from members of the community and residents of the watershed in the early stages of the project. Once the team was assembled, the following events occurred in sequential order to develop the Plan. Quarterly watershed team meetings provided the forum to undertake the process.

- Introduction of project, background of watershed resources, group dynamics, and ground-rules for participation.
- Identification of water quality concerns important to local stakeholders via Nominal Group Technique.
- Assessment of water quality conditions in context of concerns identified above, which provided reference points for next steps. Incorporated information from many sources.
- Presentation of results of assessment and discussed sources/causes.
- Development of goals and solutions to concerns identified above via brainstorming and team consensus.
- Draft plan that incorporates all steps above.
- Implement plan; develop projects that address goals/solutions identified above.

1.3 **Planning Group Structure/Plan Development Partners:**

To ensure the Plan was developed in a manner reflective of the community's priorities, needs, and resources, the Planning Group, or watershed team, was assembled to provide input and direction to the Plan. The entire local public was invited to participate in the Plan development, with the intent of having broad representation of local interests reflected in the team composition. All planning decision-making was conducted at public meetings. Decisions were reached through group consensus with equal representation given to each participant. The principles of *Coordinated Resource Management* were discussed at the first public meeting and were adopted to guide the process.

The following groups and organizations provided representation to the watershed team and contributed to the Plan development:

- Tipton County Soil & Water Conservation District
- Tipton County Surveyors Office
- Tipton County Commissioners
- Tipton County Council
- Tipton Park Board
- Tipton Garden Club
- Tipton Utilities- Water Department
- Local Farmers
- USDA-NRCS
- Ray Brothers & Noble Canning Company
- Phil Overdorf Farms
- Tipton Economic Development Corporation
- Tipton County Health Department

1.4 **Vision & Mission Statements:**

The Watershed team developed the following Vision and Mission statements through team consensus to define the group's identity and purpose:

Vision Statement:

"The Buck Creek Watershed supports appropriate, healthy, aquatic communities, safe water quality, and sustains diverse human uses."

Mission Statement:

"Promote the wise use and stewardship of water resources in the Buck Creek Watershed."

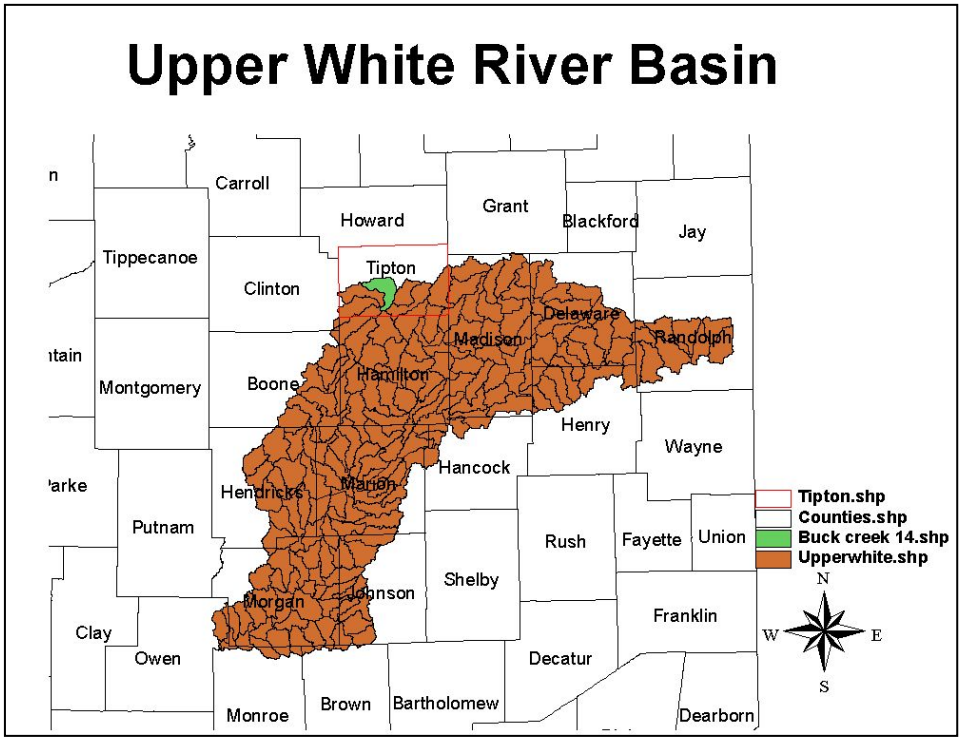
1.5 **Outreach Efforts:**

Membership for the watershed planning team and community involvement were solicited in a variety of ways. The goal of the outreach process was to promote awareness of the project to as many different sectors of the community as possible to encourage broad representation and participation. Outreach efforts included:

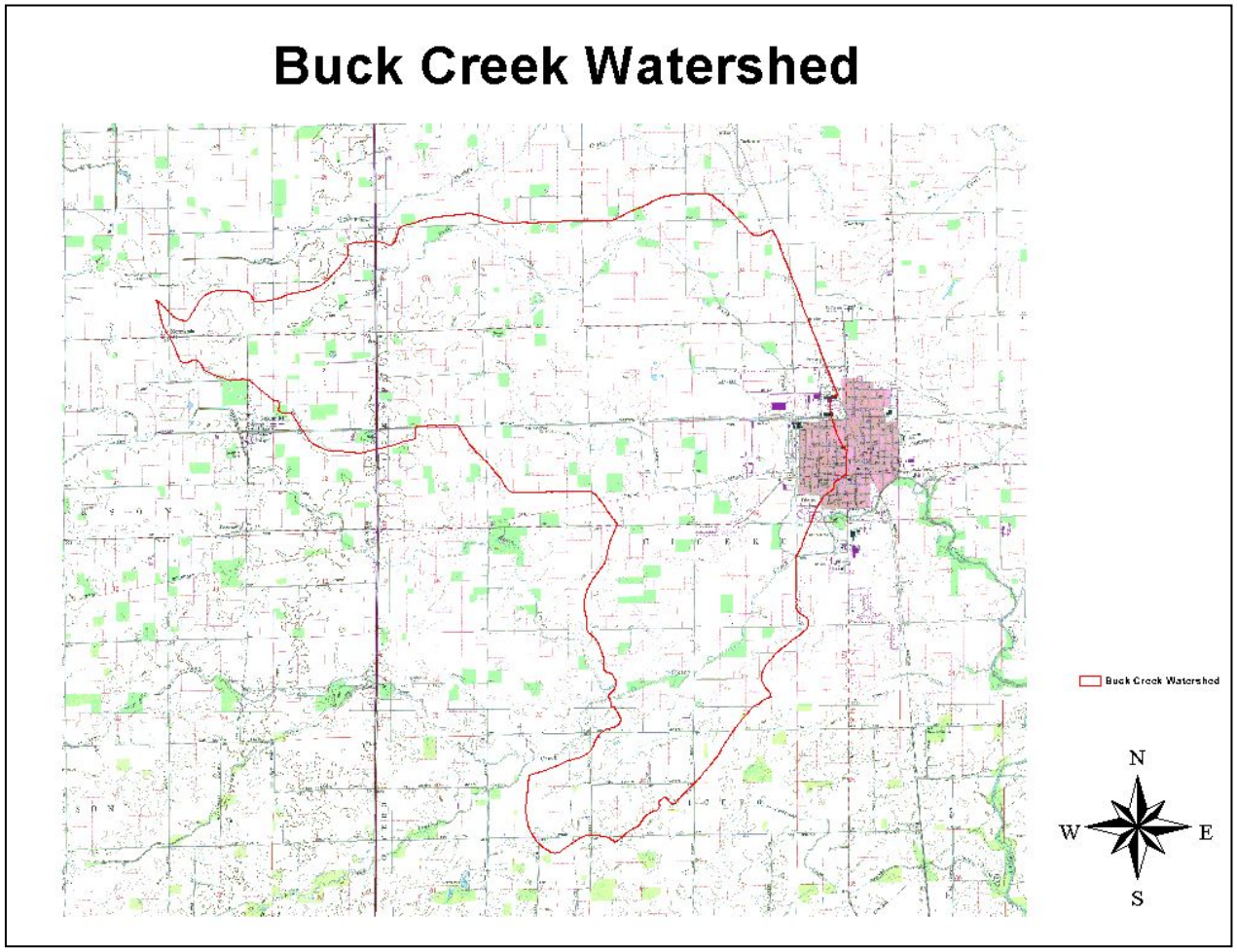
- Approximately 500 targeted mailings to watershed residents. Utilized County Surveyor drainage assessment records.
- Articles in the Soil & Water Conservation District newsletter and Tipton County Extension newsletter.
- Personal contacts and invitations to "key" individuals from SWCD Supervisors.
- Personal contacts and invitations to stream assessment site landowners.
- Repeated articles in two local newspapers.
- Educational program delivered to local High School Science Club.
- Presentations and project updates delivered at regular meetings of the *Upper White River Watershed Alliance*.
- Developed a brochure for distribution at local events.

Section 2. WATERSHED DESCRIPTION

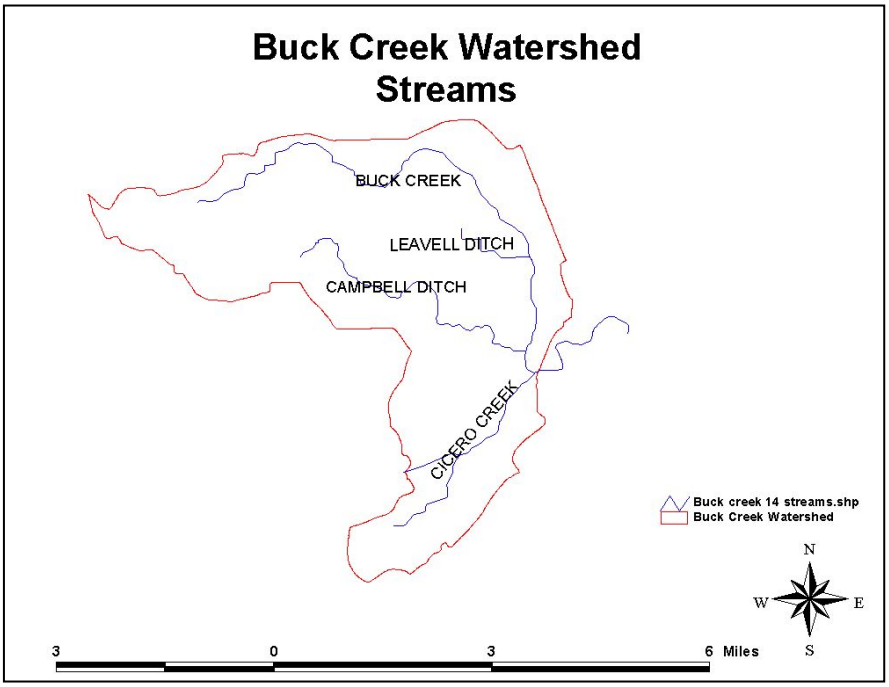
2.1 Regional Location: The Buck Creek/Campbell Ditch watershed drains approximately 11,867 acres and represents approximately 7.1 percent of the total land area of Tipton County (166,660 acres). The watershed is a headwaters of Cicero Creek, which is a contributor to the Upper White River Basin. The Hydrologic Unit Code (HUC) for this watershed is 05120201080040.



2.2 Watershed Location: The Buck Creek watershed is located in central Tipton County and encompasses the western portion of Tipton, the county's largest metropolitan area.



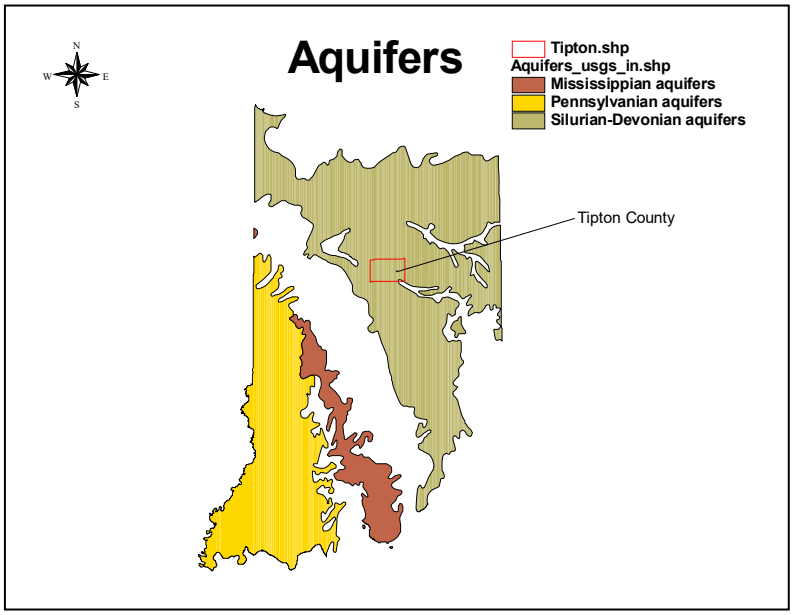
2.3 Waterways: Approximately 20 miles of perennial streams are located in the watershed, for which agricultural drainage is their primary human use. All of the streams in the watershed are classified as " county legal drains" and are maintained by local drainage boards. The drainage boards maintain a 75' right-of-way easement on both sides of all legal drains. Their primary function is to ensure adequate drainage.



2.4 Topography & Hydrology: Tipton County and the Buck Creek watershed lie on a depositional plain of low relief called the "Tipton Till Plain". Glaciation from the late Wisconsin glacial period is the chief

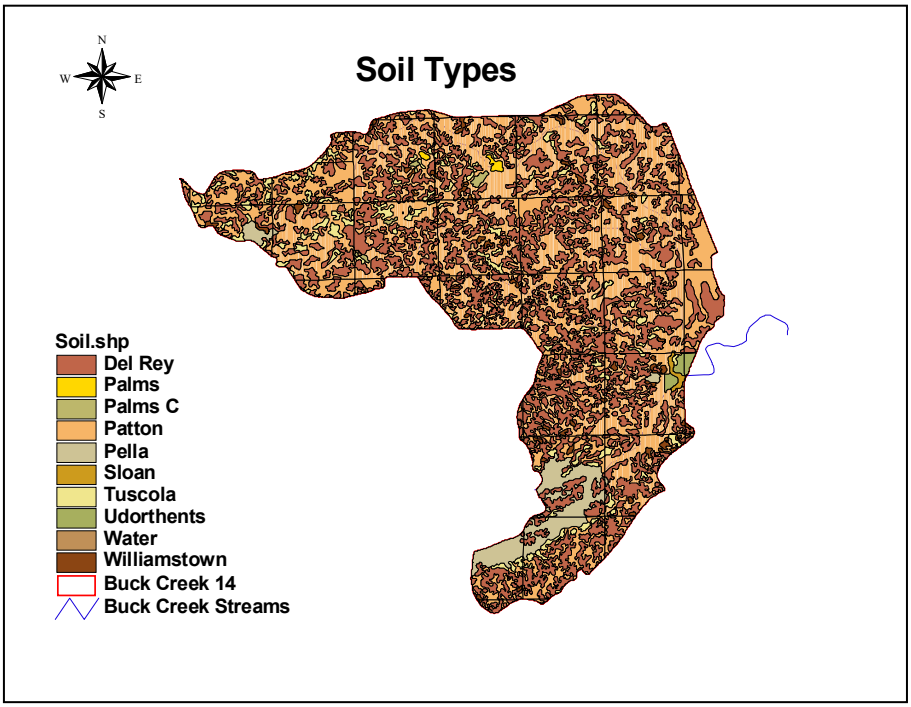
factor responsible for the landforms of the area. Relief in topography is strongest along breaks between the nearly level uplands and the bottomland along streams. Due to the low relief, natural drainage is poor throughout the area. Marshes and swamps were common before drainage systems of open ditches and sub-surface tiles were installed. In most areas, this drainage is essential to the production of crops. Source- *Tipton County Soil Survey*

2.5 Water Supply/Groundwater: Water supply for agricultural, industrial , and residential use is derived solely from well supplies. There are no surface drinking water intakes located in the watershed or Tipton County. Average depth to suitable drinking water source is approximately 75 feet. All public water supplies come from deep wells dug into sand and gravel formations underlying glacial till. The town of Tipton is served by a public drinking water supply from 7 large capacity wells located within the Tipton city limits. The Tipton Water Utility has initiated a well-head protection program and manages access to the source wells. Public water supplies are monitored according to state requirements and periodic adjustments to treatment and distribution are made as needed.
Source- *Tipton County Soil Survey and conversations with Tipton Water Utility.*



According to information from the *Indiana Geological Survey*, Tipton County, and the Mud Creek Headwaters watershed, are situated in the Silurian-Devonian Aquifer, comprised mostly of carbonate-rock aquifers. See map at right.

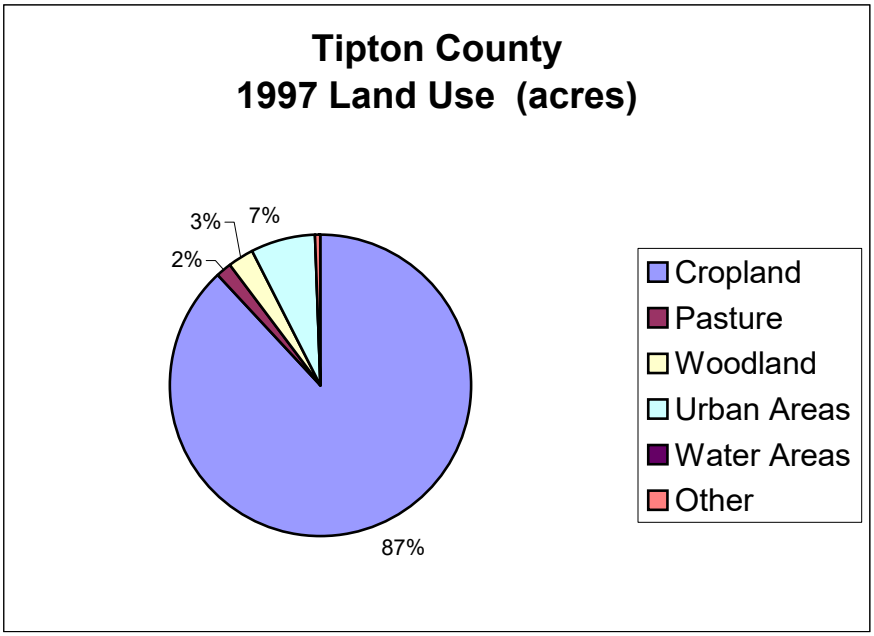
2.6 Soils: The *Patton-Del Rey-Crosby* association is the most prevalent soil formation in the Buck Creek watershed. This association is situated in depressional areas and on slight rises and low flats. The landscape is characterized by very little relief and many depressions. Slopes range from 0-2% percent. The association is characterized by the following traits:
Nearly level, poorly drained and somewhat poorly drained soils that formed in silty sediments, in silty and sandy sediments, or in a thin mantle of silty material and underlying loamy and clayey glacial till, on lake plains and till plains.
Patton soils- poorly drained in depressional areas with very dark gray silty clay loam surface and gray, mottled, firm subsoil.
Del Rey soils- somewhat poorly drained on low flats and till plains with a dark grayish/brow surface layer and brow and grayish brow, mottled, firm silty clay loam subsoil.
Crosby soils- somewhat poorly drained on slight rises and till plains with a dark grayish brown silt loam surface layer and a grayish brown, mottled, firm silty clay loam subsoil.
Source- *Tipton County Soil Survey*



2.7 Demographics- There are eight Census 2000 block groups that intersect the area of the Buck Creek watershed. These eight blocks account for a total of 58,101 acres, of which, 20% comprises the area of the Buck Creek watershed. According to this estimate, the total population for the Buck Creek watershed is approximately 1,550 people. Approximately 24.8% fall at or below poverty levels, approximately 46.5 percent have obtained a high school degree, and less than 4 percent have received a bachelor's degree. The area has little ethnic diversity vast majority of the population being white.

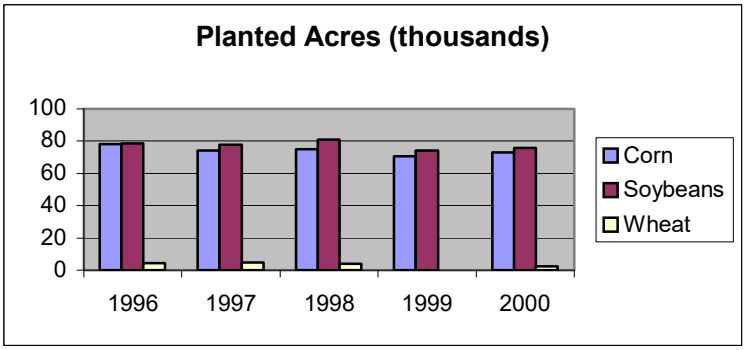
2.8 History: "Tipton county (and the Mud Creek Headwaters Watershed) was originally a hunting ground for the Miami, Delaware, and Potawatomi Indians. In 1826, the Indians ceded all of northwest Indiana, including the land that makes up Tipton County. The county was established by the legislature in 1844. It was one of the last counties in the state to be settled. The poorly drained, nearly level soils of the county could not be farmed until the wetness was reduced by ditches and tile. The county has been transformed from a swampy prairie and dense forest to one of the most productive agricultural counties in Indiana." Source- *Soil Survey of Tipton County, Indiana*

2.9 Landuse- Landuse in Tipton County and the Buck Creek watershed is dominated by row crop agriculture as depicted in the graph below. Land use conversion rates have remained relatively stable throughout the years, but there seems to be a recent trend in the expansion of residential areas around the city of Tipton .
Source- "Indiana Agricultural Statistics 1998-1999"

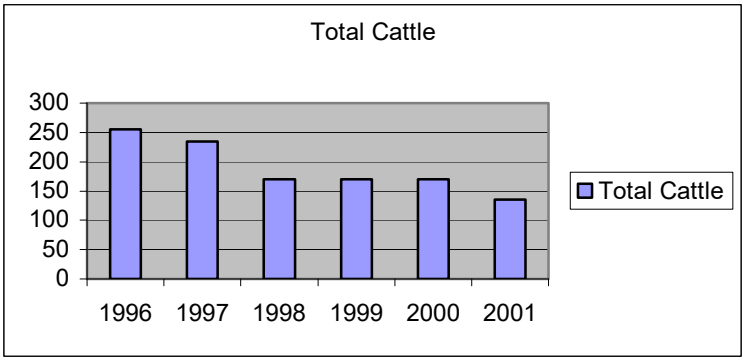


2.10 Agriculture- Row crop production of corn and soybeans is both the primary land use and main industry in the watershed and in Tipton County. Approximately 10,849 acres of row crops are present in the watershed, according to US Fish & Wildlife Service "GAP" data. The graph below illustrates grain production in Tipton County.

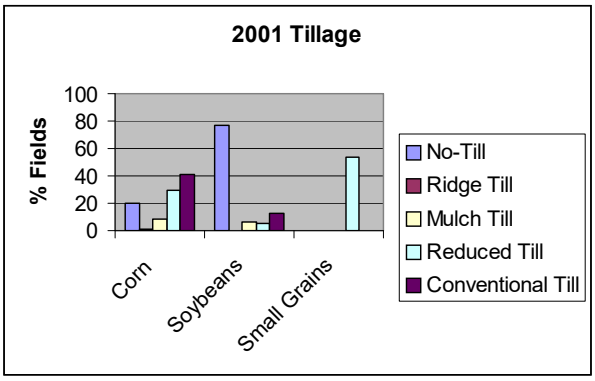
Source "Indiana Agricultural Statistics 1996 - 2000"

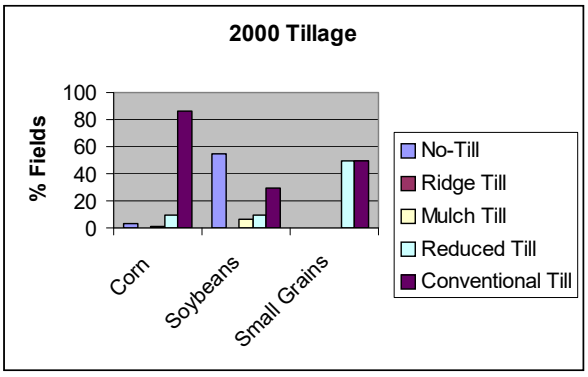


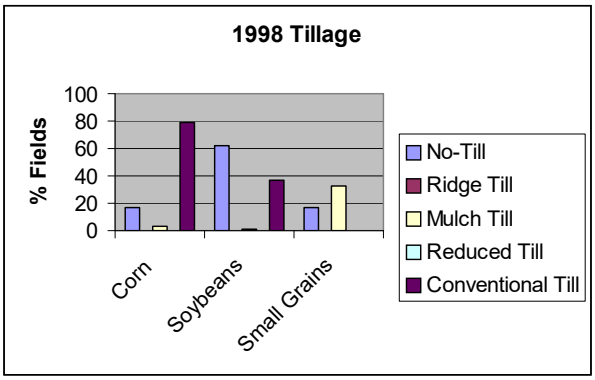
According from sources at USDA and Purdue University Cooperative Extension, livestock numbers in the County and the watershed have been steadily declining in recent years. This trend can be directly be seen in the graph below which depicts the number of cattle over a six year period.

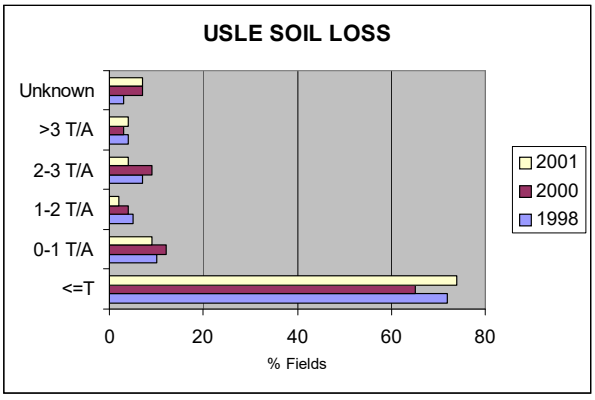


2.11 Tillage Systems: According to information from the Purdue University *Indiana T by 2000 Watershed Soil Loss Transects* data, conventional tillage systems are still the most widely used throughout the watershed, although more *minimum till* systems appear to be becoming incorporated into local farming methods. The following graphs display information from the Purdue University *Indiana T by 2000 Watershed Soil Loss Transects* collected for the Cicero Creek 11-digit HUC watershed, of which the Buck Creek watershed is a subset.









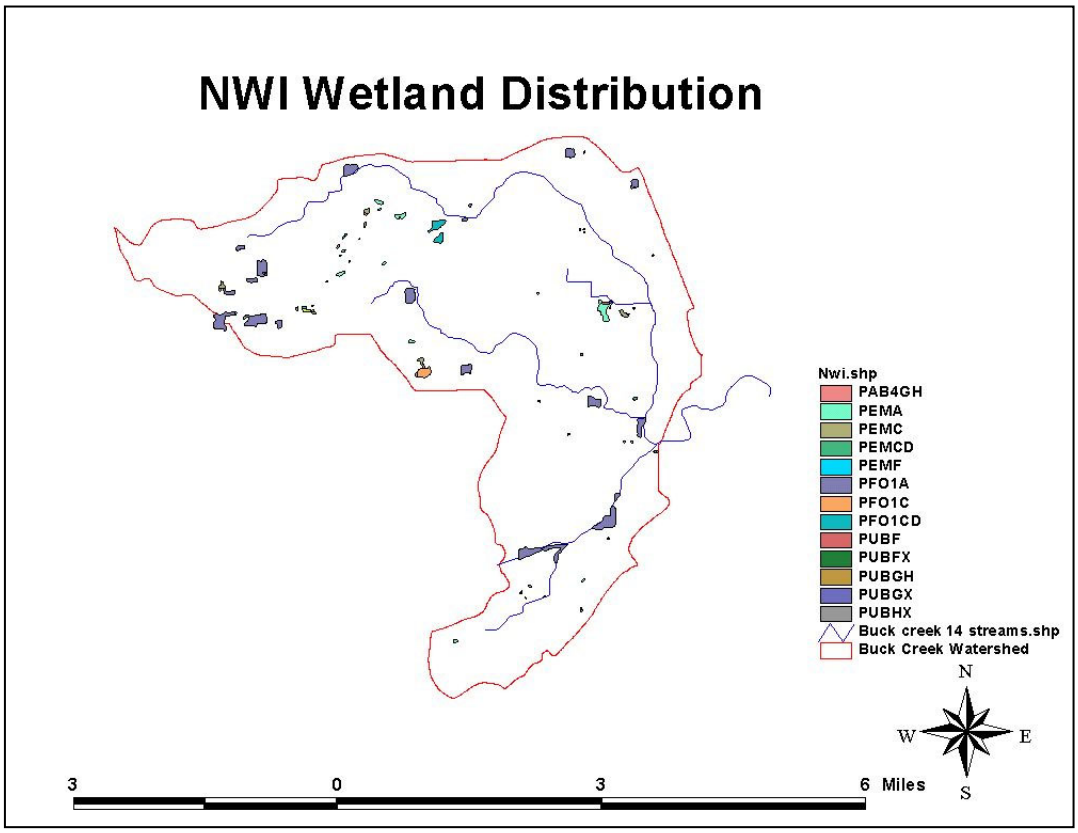
Due to the flat topography of the area and sparse distribution of Highly Erodible Land (HEL), soil loss rates are not extreme. Soil loss rates are most often expressed using the Universal Soil Loss Equation (USLE) which considers several factors. USLE formula A = R * K * LS * C * P. Where:

A = Predicted Average Annual Soil Loss (Tons/Acre/Year)
R = Rainfall Runoff Erosivity Factor
K = Soil Erodibility Factor
LS = Length-Slope Factor

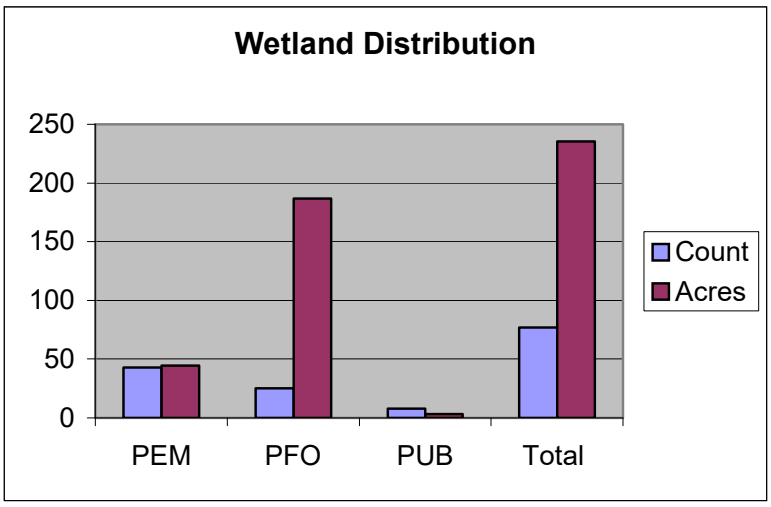
C = Cover-Management Factor
P = Support Practice Factor

Soil Loss Tolerance (T), expressed in tons/acre/year, is an important criteria when we begin our management to control soil loss. "T" - Soil Loss Tolerance - is the maximum amount of soil loss, in tons/acre/year , that a given soil type can tolerate and still permit a high leva1 of crop production to be sustained economical1y and indefinitely.

2.12 Wetland Mapping: According to the US Fish & Wildlife Service "National Wetland Inventory" maps, wetlands are distributed throughout the watershed as represented below.
According to the National Wetland Inventory map information, approximately 77 wetland polygons are identified in the Buck Creek watershed totaling approximately 235 acres.



Four major types of wetlands are represented in the watershed.



Palustrine Emergent (PEM),

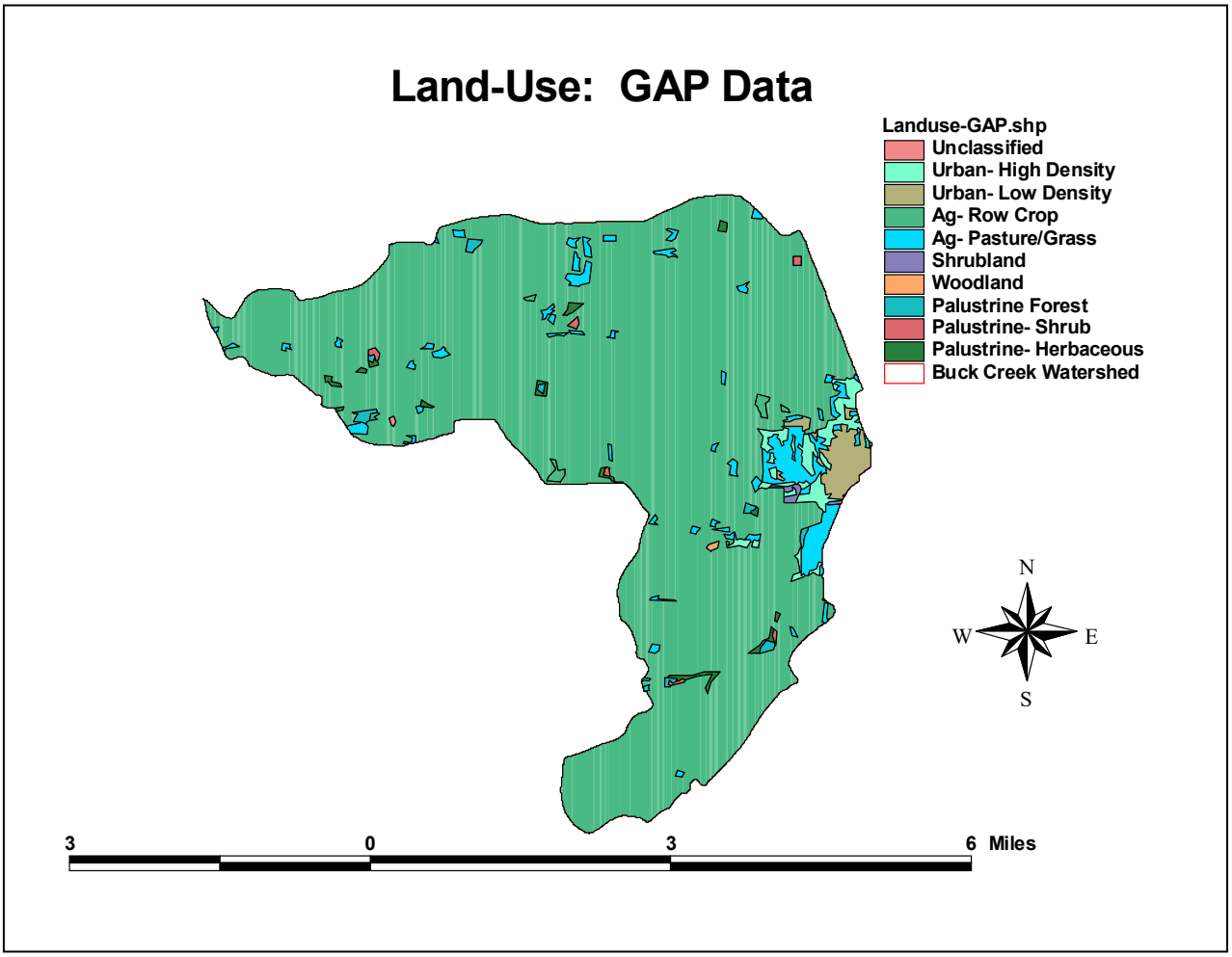
Palustrine Forested (PFO),

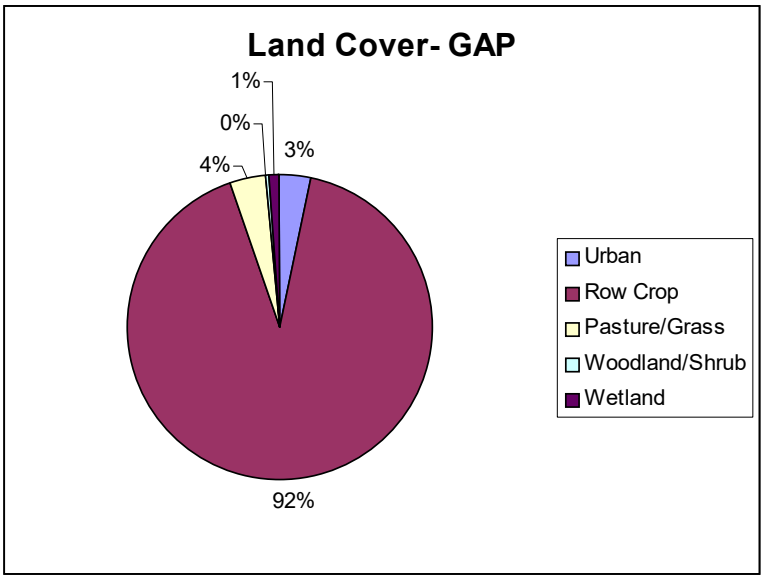
Palustrine Unconsolidated Bottom (PUB).

Their distribution is represented at left.

2.13 GAP Data- The US Fish & Wildlife Service has compiled land cover information known as the "GAP" data. GAP is the acronym used to refer to the Gap Analysis Program of USGS. It could also refer to the fact that GAP is a geographic approach to planning.

The graphics below depict the major land-cover forms and their distribution, as mapped in the watershed.





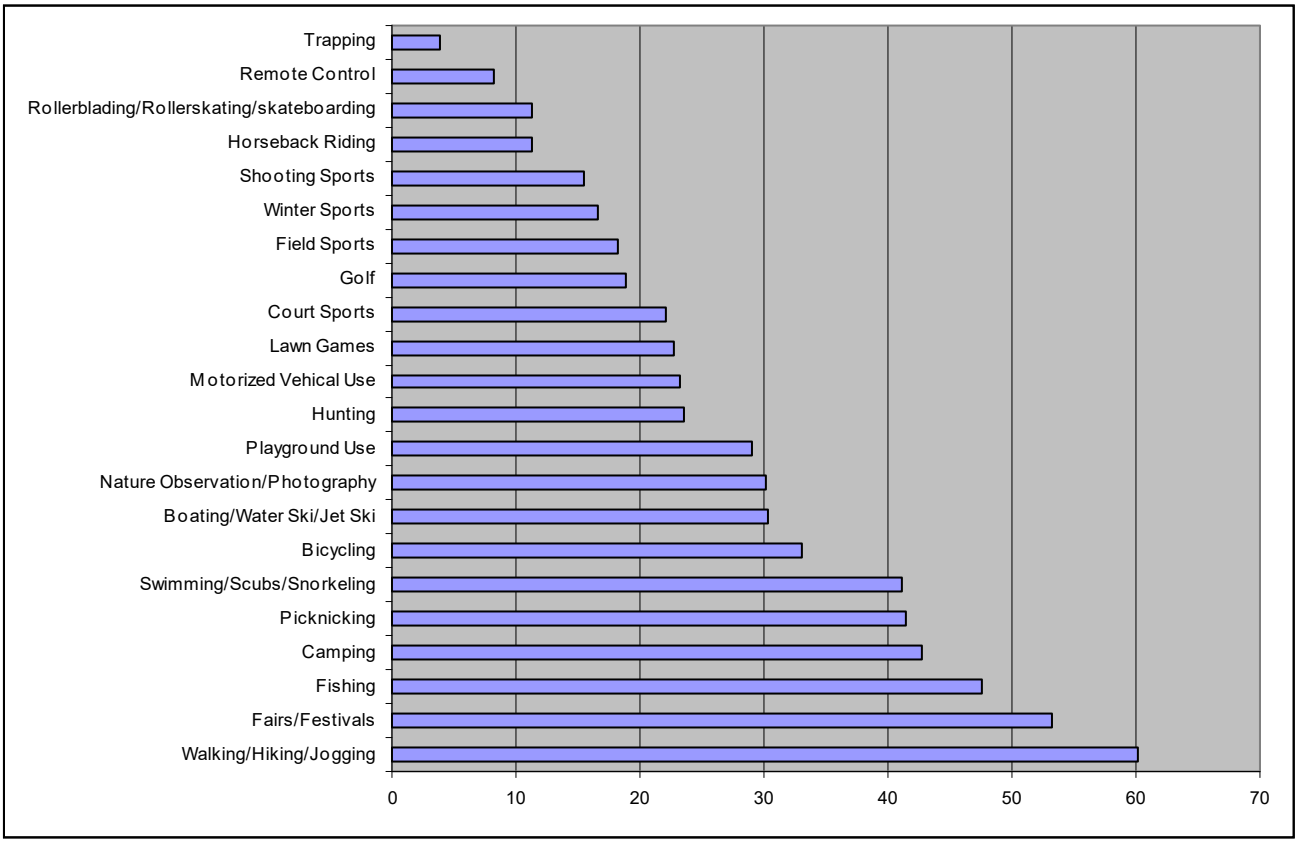
2.14 Recreation- Outdoor recreational opportunities directly within the Buck Creek watershed are limited. There are no publicly accessible forests, wilderness areas, lakes, or reservoirs in the watershed. Canoeing and limited fishing of Cicero Creek is possible in some areas.

According to information from the Indiana Department of Natural Resources *Statewide Comprehensive Outdoor Recreation Plan* (SCORP 2000), The Buck Creek watershed falls into the management unit Region 5, which is composed of Tipton, Howard, Fulton, Cass, Miami, and Wabash counties. SCORP 2000 identifies the following recreational lands available to the public in Region 5:

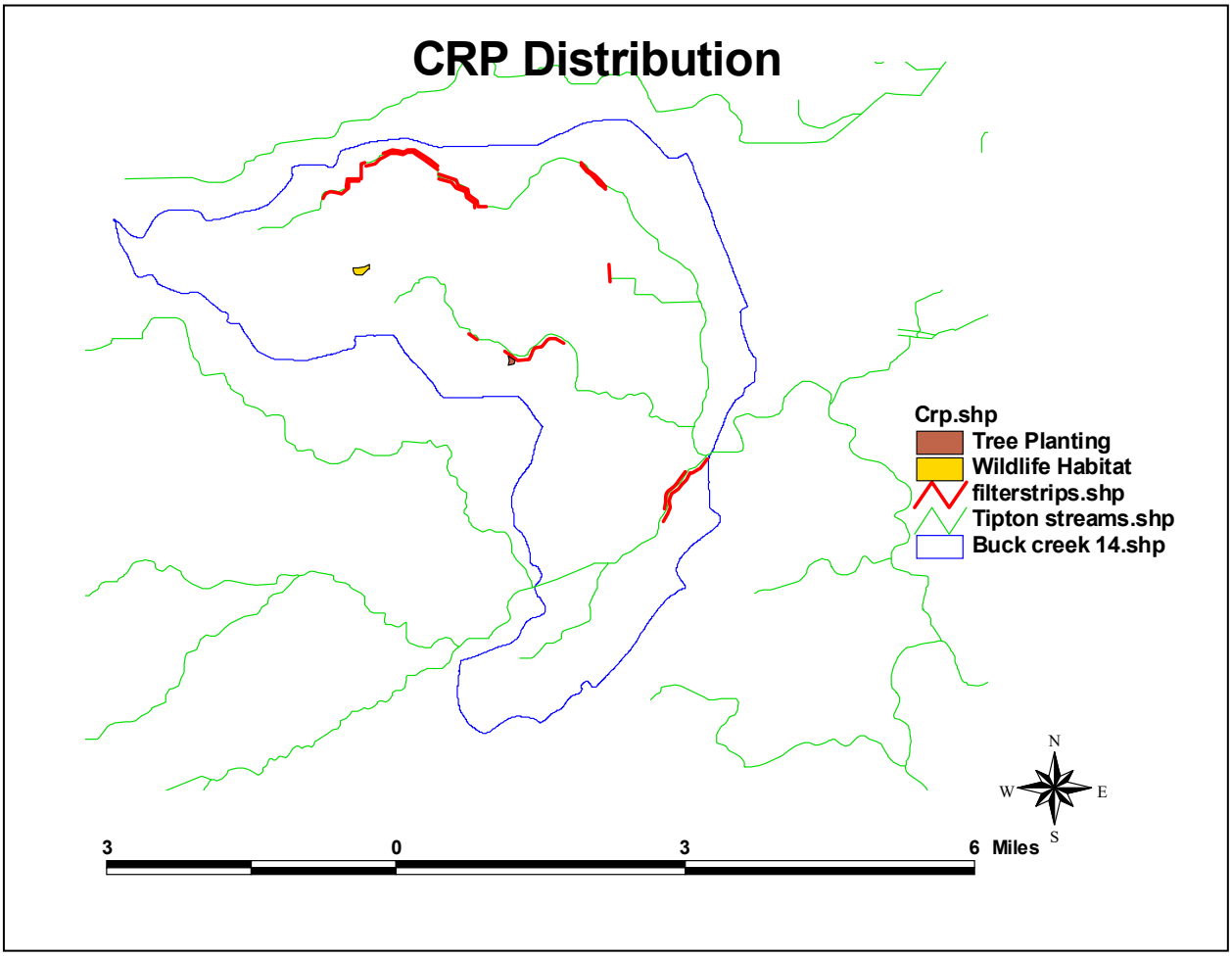
	# Sites	# Acres
Federal Recreational Lands	4	3,485
State Recreational Lands	24	16,797
County Recreational Lands	6	595
Municipal Recreational Lands	92	1,447
Township Recreational Lands	2	13
Other Public Lands	9	33
Commercial Recreational Lands	21	1,059
Private Recreational Lands	29	2,605
TOTAL	187	26,033

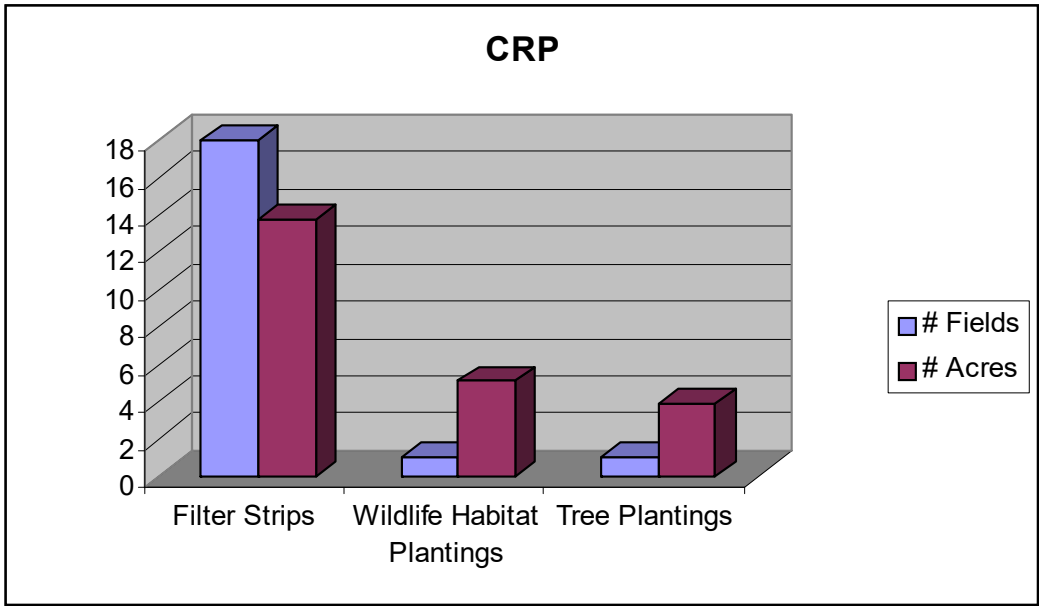
SCORP also provided the following information concerning outdoor recreational activities in Region 5:

"What outdoor recreation activity (ies) did you participate in regularly last year?"



2.15 Existing Conservation Practices: According to information from the local Natural Resource Conservation Service and Farm Service Agency offices, conservation practices in the watershed consist predominantly of Conservation Reserve Program (CRP) filter strips along ditches and waterways. Approximately 6.6 miles of CRP filter strips currently exist along the banks of approximately 20 miles of perennial streams (40 miles of banks). The following graph depicts the breakdown of existing CRP practices, and their distribution, as mapped in the watershed.





In this area, filter strips appear to be the most commonly recognized form of conservation practice. Local NRCS staff estimate that the most common width of filter strips in the watershed is approximately 30 feet.

Three 100 foot reference steambank sections in the watershed were chosen to represent typical conditions of areas without filter strips. The sites were chosen in cooperation with the County Surveyor and a representative from the local Natural Resource Conservation Service office. Load reductions for sediment, phosphorus, and nitrogen were calculated by using the IDEM tool "*Estimating Load Reductions for Agricultural and Urban BMP's*" and averaging the results from the three representative sites. Assuming 30 foot wide filter strip installation along both banks, the estimated average annual load reduction per 100 linear feet of filter strip installation are:

Sediment-	4.6 tons per year
Phosphorus-	7 lbs. Per year
Nitrogen-	14.3 lbs. Per year

2.16 Threatened/Endangered Listed Species: According to information from the Indiana Department of Natural Resources, Heritage Trust Database, there are historical listings of a state endangered plant, Slough Sedge *(Carex atheroides)*, and a state threatened species, Lieberg's Witchgrass *(Panicum leibergii)* in the Cicero Creek watershed area.

Slough Sedge

Lieberg's Witchgrass

2.17 Pesticides: Pesticides are applied by farmers to limit crop loss from insect predation and weed competition. According to estimates from the Purdue University Extension publication- *A Guide for Watershed Partnerships*, approximately 1% of the pesticides applied end up in our waterways. Using the following matrix taken from the *Guide,* pesticide loading for the Buck Creek Watershed were estimated as presented below.

Crop Type	Crop Acres in Watershed	X	Pesticide Type	Fraction of acres treated in the state (2000 figures)*	X	Average Rate of application (lbs per acre) (2000 figures)*	=	Estimated amount of pesticide applied (lbs)
Corn	5,175	X	Atrazine	.80		1.41		4,719.6
			Metolachlor	.41		1.5		3,182.6
			Acetochlor	.26		2.01		2,704.5
			Primisulfuron	.8		.02		82.8
			Cyanazine	--		--		
			Insecticides:					
			Tefluthrin	.13	X	.10	=	67.3
			Chlorpyrifos	.08		1.04		430.5
Soybeans	5,374	X	Glycophosphate	.71		.97		3,701
			Chlorimuronethyl	.19		.01		10.2
			2,4,D	.14		.46		346
			Imazethapyr	.09		.04		193.5
			Paraquat	--		--		
Total Pesticide Applied in Watershed (lbs)								**15,438**
Approximate Amount of Herbicides Transported to Waterways								**154 lbs**

*Source- 2000-2001 Indiana Agricultural Statistics

2.18 Nutrients:

Available nutrients in the watershed have both positive and negative effects on watershed health and productivity. While they are essential inputs to crop production, yard and recreational area functionality, and even aquatic environment viability, too many nutrients in our waterways can lead to poor water quality and degraded aquatic health. The two primary nutrients of relevance to watershed management are nitrogen and phosphorus. Nitrogen, which degrades into nitrate, has been linked to health concerns from ground water contamination. Phosphorus is highly mobile when attached to soil particles and is readily washed into streams during erosion causing events. Common sources of these nutrients include: crop fertilizer, yard/golf course fertilizers, manure, and human waste.

The following tables, based on matrices in the *Guide for Watershed Partnerships,* estimate available nutrients in the watershed based on fertilizer sales and livestock manure. It is important to note that this information does not include nutrients available from other sources, such as septic system discharge, Combined Sewer Overflow events, and residential fertilizer sales.

Nutrients From Fertilizer

Fraction of County in Watershed	x Total Nutrients (tons)*		x 2,000 lbs/ton	Nutrients in Watershed (lbs)	
7.1%	Nitrogen	P_2O_5		Nitrogen	P_2O_5
.071	3000	3220	X 2,000	426,000	457,240

* Source- Office of Indiana State Chemist. *Indiana Fertilizer Tonnage Reports*: January 1- December 31, 2001

Nutrients from Manure

Livestock	# Head*	x Avg. Manure Produced	= Amount Manure Produced	Fraction Nutrients in lb. Manure		Lbs. N in Manure	Lbs. P in Manure
				Nitrogen	Phosphorus		
Beef Cattle	135	75 lb/day	10,125	.008	.0065	81	65.8
Dairy Cattle	--	115 lb/day		.0045	.002		
Hogs	4,034	11.7 lb/day	47,197	.0045	.004	212.4	188.8

* Source- "Indiana Agricultural Statistics 200-2001"

Section 3. PROBLEM IDENTIFICATION

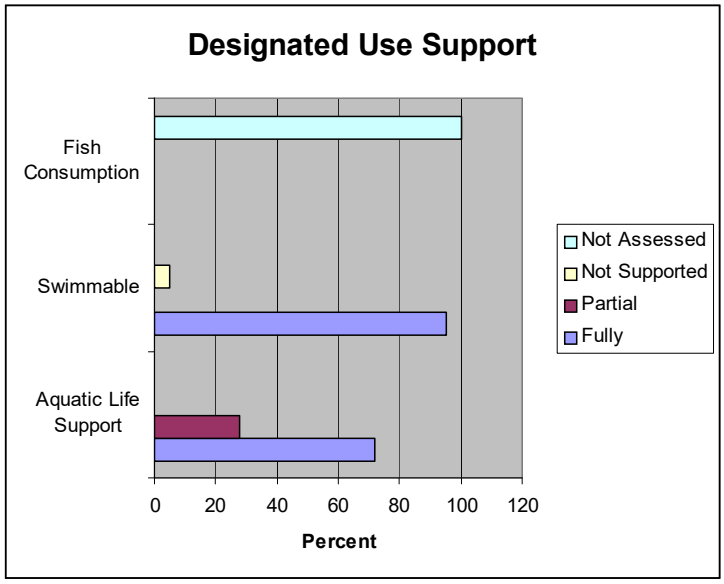
3.1 Nominal Group Technique: At the second watershed team meeting, the participants identified what they perceived to be the greatest threats to water quality in the watershed. The team accomplished this by using the Nominal Group technique, in which the first step is to brainstorm all potential water quality threats, then to rank them in terms of highest priority. The results of this process are indicated on **Appendix #2**. The top five were chosen to be addressed in the watershed management plan. They are listed as follows with their primary pollutants of concern:

#1: Combined Sewer Overflows (CSO's)	*bacteria/pathogens, nutrients*
#2. Malfunctioning Septic Systems	*bacteria/pathogens, nutrients*
#3. Streambank Erosion	*sediment, nutrients*
#4. Agricultural Chemical Runoff	*sediment, nutrients, pesticides*
#5. Industrial/Municipal Discharges	*organic/inorganic chemicals, nutrients, bacteria/pathogens*

Section 4. SUPPORTING INFORMATION

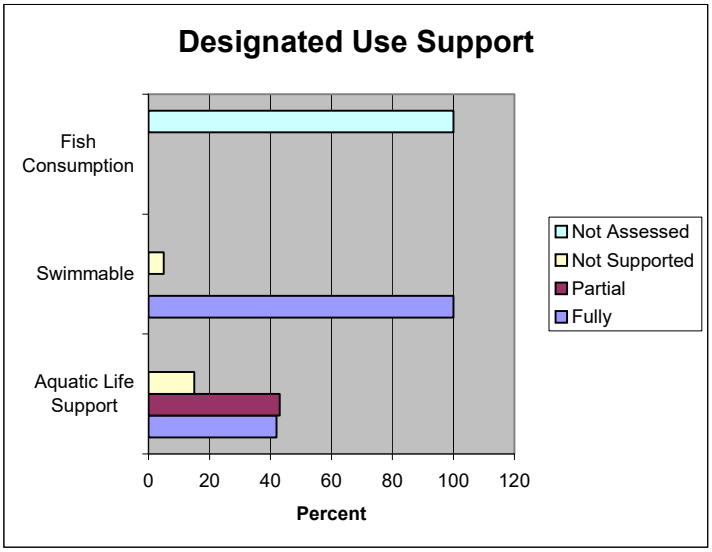
Supporting information from a wide variety of sources was then gathered to provide a reference point to frame further action. This information is summarized below.

4.1 **305(b)-** The 1998 305(b) Indiana Water Quality Report provided the following information concerning Overall Use Support:



Cicero Creek Basin (Waterbody ID: IN05120201080), of which the Buck watershed is a sub-unit.

Non-attainment causes for the basin are listed as "Pathogens" and the source is designated as "Unknown".



West Fork White River (Cicero Creek to Indianapolis) (Waterbody ID IN05120201090), which is immediately downstream of the Buck Creek/Cicero Creek watershed.

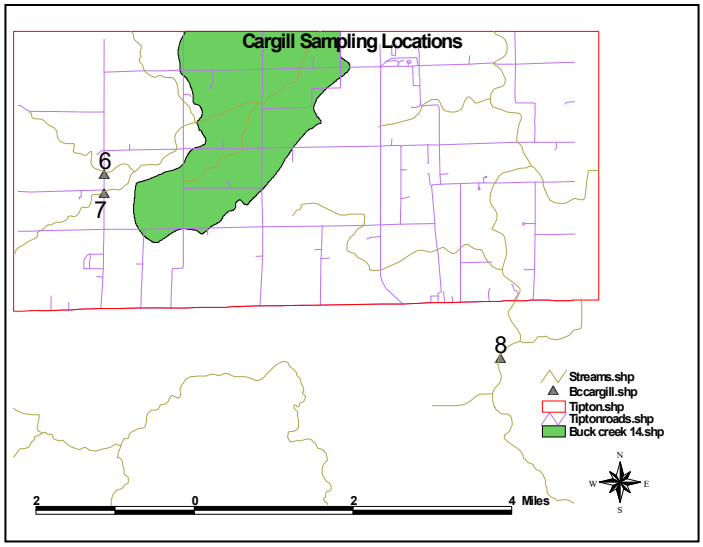
Non-attainment causes are listed as:
PCB,s
Metals
Total Metals

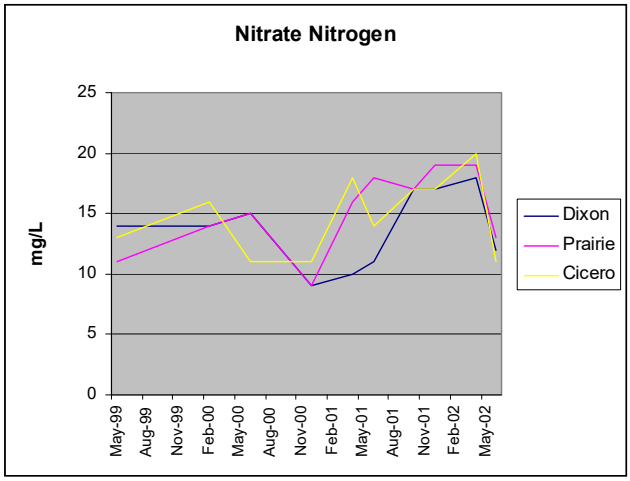
Source of impairments is designated as "Unknown".

4.2 **303(d) List**- The 2002 303(d) list of Impaired Waterbodies (draft) does not list any of the waterbodies in the Buck Creek watershed as "impaired". However, The West Fork of the White River, of which the Buck Creek watershed is a headwaters, is listed as "impaired" for the following parameters in downstream counties: E. Coli, Cyanide, Impaired Biotic Communities, PCB's, and Mercury. Additionally, Morse Reservoir, which is located immediately downstream on Cicero Creek in Hamilton County, is listed as impaired for a Fish Consumption Advisory for Mercury.

Section 303(d) of the federal Clean Water Act requires the development of Total Maximum Daily Loads (TMDL's) for all waters that a state has identified as being impaired. These TMDL's must be established at levels necessary to attain and maintain the applicable water quality standards. Source- IDEM TMDL Program Strategy

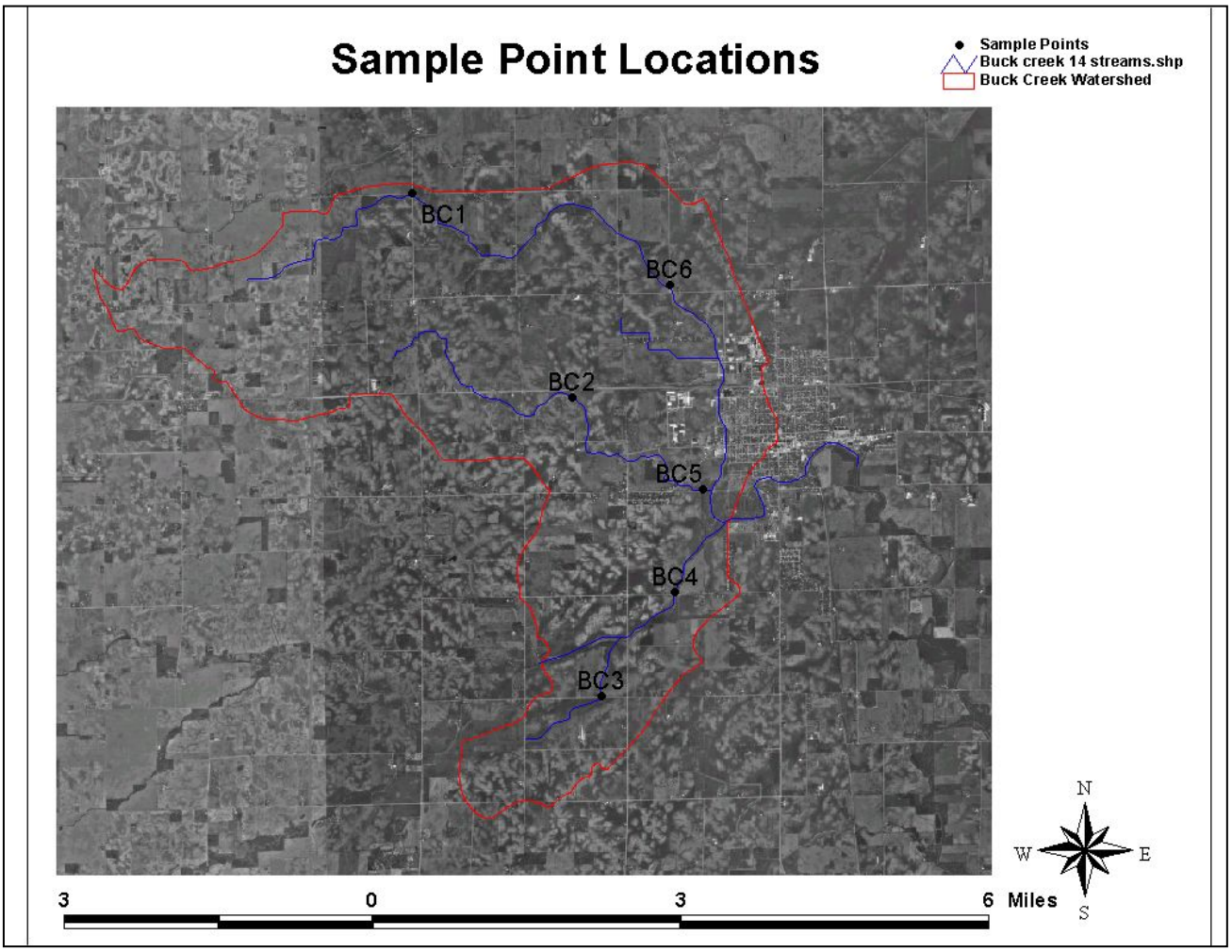
4.3 **Cargill Data**: The Tipton County Soil & Water Conservation District has been conducting a surface water quality monitoring project in cooperation with the Cargill seed company. No QA/QC was provided with the data, so accuracy may be questionable. Although no sample points are located within the Buck Creek watershed, two sample points just upstream on Dixon and Prairie Creeks, and one sample point downstream on Cicero Creek, give some indication of water quality conditions in the area. Results for the different parameters sampled are similar for each waterbody. Level fluctuations seem to appear at the same time for each point and are most likely related to local weather events. The following graphics depict the location of relevant sample points and concentrations of Nitrate Nitrogen. Complete data from these sample points are included as **Appendix #3**.

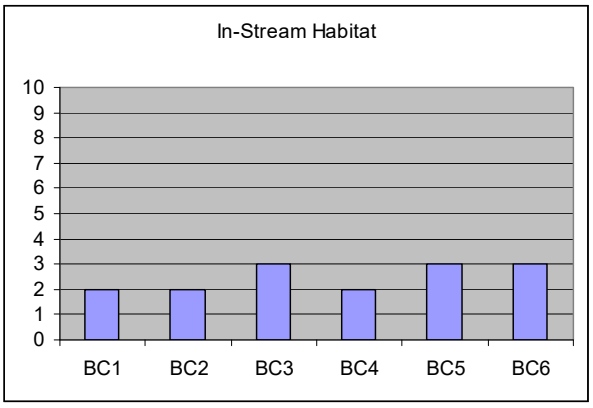


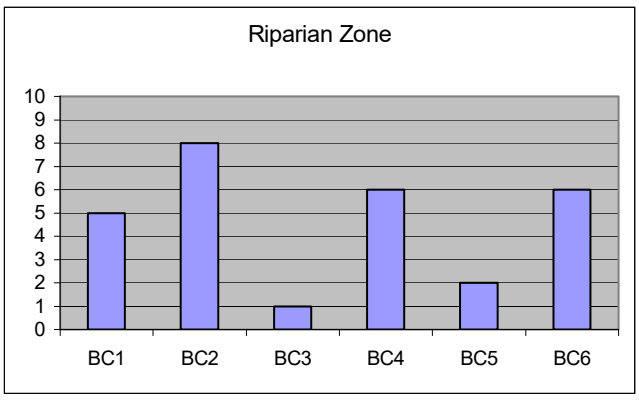


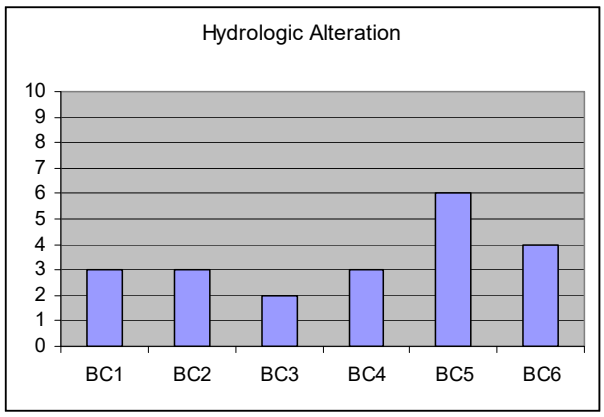
4.4 **Stream Visual Assessment Data-** The USDA *Stream Visual Assessment Protocol* was used to assess the ecological health of the watershed. Six sample sites were chosen to represent the watershed. The sample sites were chosen based on the following criteria: size of stream, location in watershed, drainage area land-use, and landowner participation. The USDA procedure evaluated only on the physical characteristics of the sample area. The landowner was present at the time of the evaluation at most sites to provide background information and a historical perspective of the subject reach.

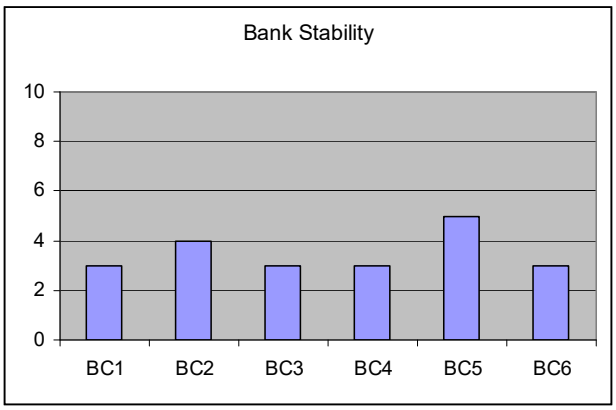
The procedure evaluated approximately 12 parameters by ranking them on a scale of 1 to 10 (10 being the highest). Each parameter is scored according to guidelines specified in the procedure. Complete results of individual sites are attached as **Appendix #4** and can also be viewed in GIS form in **Appendix #5**. Key results are summarized as follows:

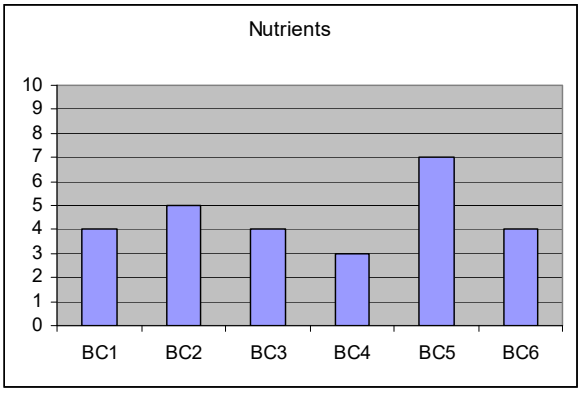


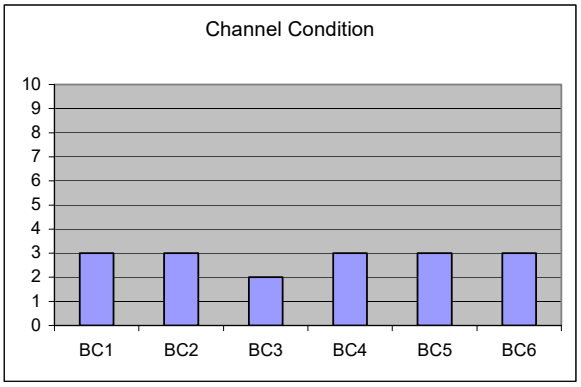


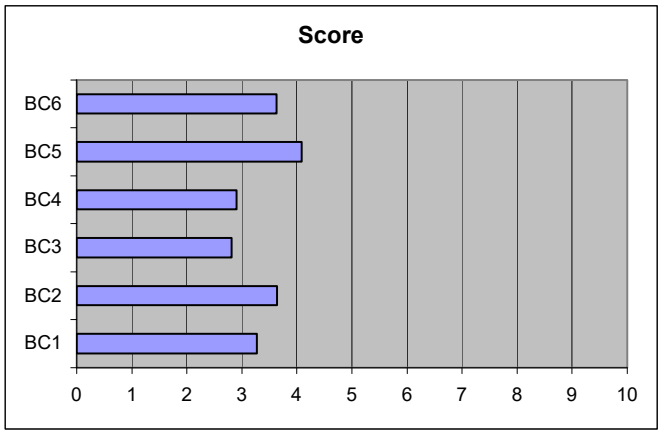



Hydrologic Alteration
10
9
8
7
6
5
4
3
2
1
0
BC1
BC2
BC3
BC4
BC5
BC6


Bank Stability
10
8
6
4
2
0
BC1
BC2
BC3
BC4
BC5
BC6


Nutrients
10
9
8
7
6
5
4
3
2
1
0
BC1
BC2
BC3
BC4
BC5
BC6


Channel Condition
10
9
8
7
6
5
4
3
2
1
0
BC1
BC2
BC3
BC4
BC5
BC6


Score
BC6
BC5
BC4
BC3
BC2
BC1
0
1
2
3
4
5
6
7
8
9
10

ID#	Channel Width	Reach Length	Substrate	Drainage Area (acres)	Channel Condition
BC1	20	120	silt	1553	3
BC2	18	108	silt	828	3
BC3	25	150	silt	3375	2
BC4	20	120	silt	2120	3
BC5	45	270	silt, sand	1770	3
BC6	20	120	silt	3088	3

ID#	Bank Stability	Water Appearance	Nutrients	Fish Barriers	In-Stream Habitat
BC1	3	7	4	5	2
BC2	4	6	5	5	2
BC3	3	6	4	5	3
BC4	3	3	3	5	2
BC5	5	7	7	5	3
BC6	3	5	4	5	3

ID#	Canopy Cover	Invertebrate Habitat	Land Use	Riparian Zone	Hydrologic Alteration
BC1	1	2	Reduced Till	5	3
BC2	1	2	Reduced Till	8	3
BC3	1	3	Conventional Till	1	2
BC4	1	2	Conventional Till	6	3
BC5	1	3	Reduced Till	2	6
BC6	3	3	Forest	6	4

ID#	Pools	Filter Strips?	Score	Rank
BC1	1	Yes	3.27	Poor
BC2	1	Yes	3.64	Poor
BC3	1	No	2.81	Poor
BC4	1	Yes	2.9	Poor
BC5	3	No	4.09	Poor
BC6	3	No	3.63	Poor

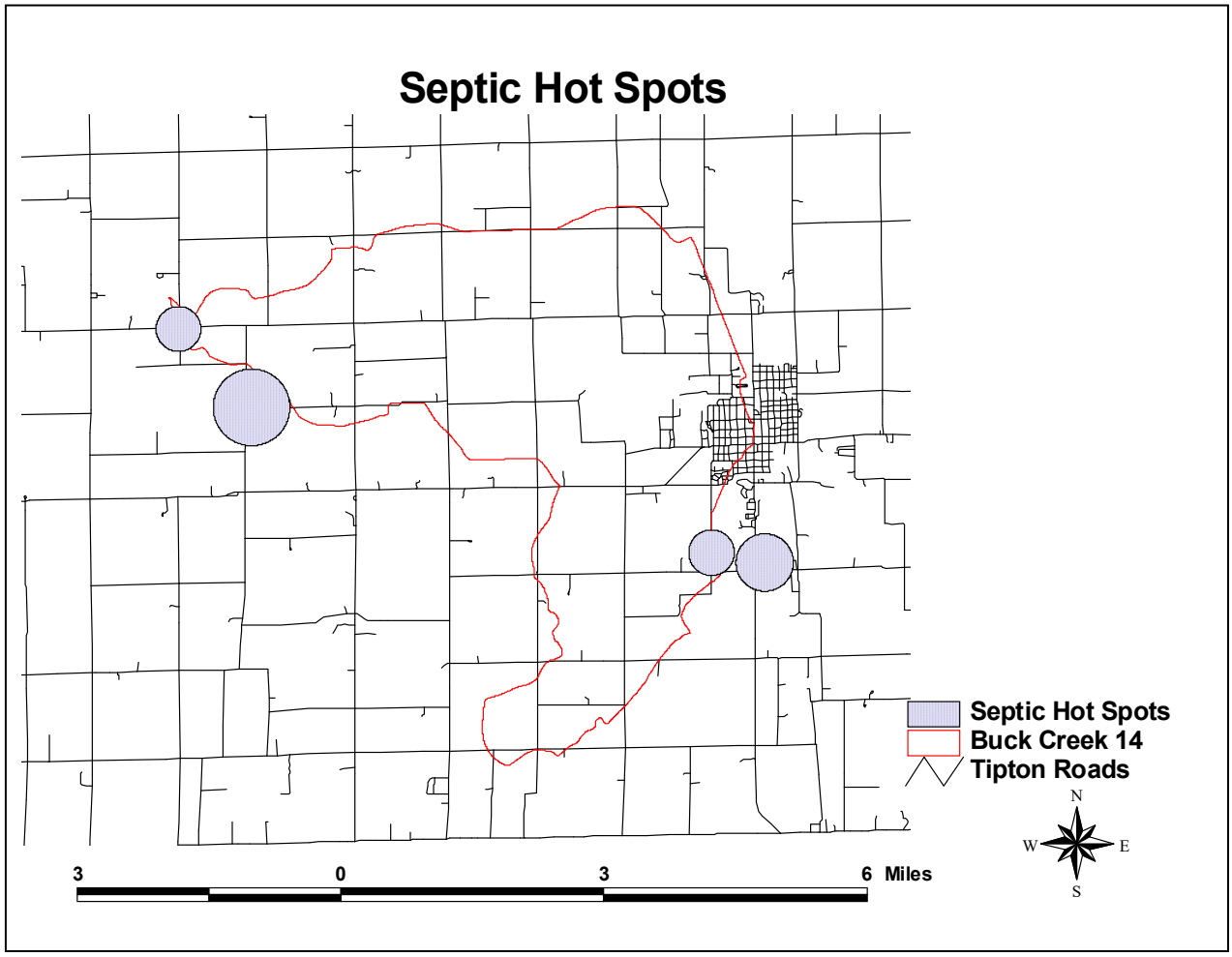
Causes of low scoring conditions common to most sites include:

- Steep banks
- Homogenous channel configuration and substrate
- Isolation from floodplain
- Lack of vegetated riparian zone
- Full exposure to sunlight
- Sediment contribution

It is important to note that the scoring guidelines reference an “ideal” stream reach. This “ideal reach” (score of 10) may not be possible to attain due to limitations such as geology, topography, landscape, flow, and most importantly, human uses. The streams evaluated in this watershed are maintained as drainage ditches and the scores therefore reflect this background condition.

4.5 **Septic Info. (Health Dept.)** According to information provided by the Tipton County Health Department, failing or malfunctioning residential septic systems are widely distributed throughout the watershed.

The figure below depicts geographic areas with a high concentration of malfunctioning systems. (Source- Nolan Pyke, Tipton County Sanitarian) The main causes of system failure include: systems greater than 30-40 years old, heavy clay soils with low permeability, lack of adequate outlets for perimeter drainage systems, and illegal bypass or "straight pipe" systems. Priority areas are located in and around established residential communities and small developed areas that do not have access to sanitary sewer systems. Improperly treated waste from failing and/or malfunctioning septic systems can lead to pollution of both surface and groundwater. Bacteria and nutrients are the primary pollutants from failed septic systems.



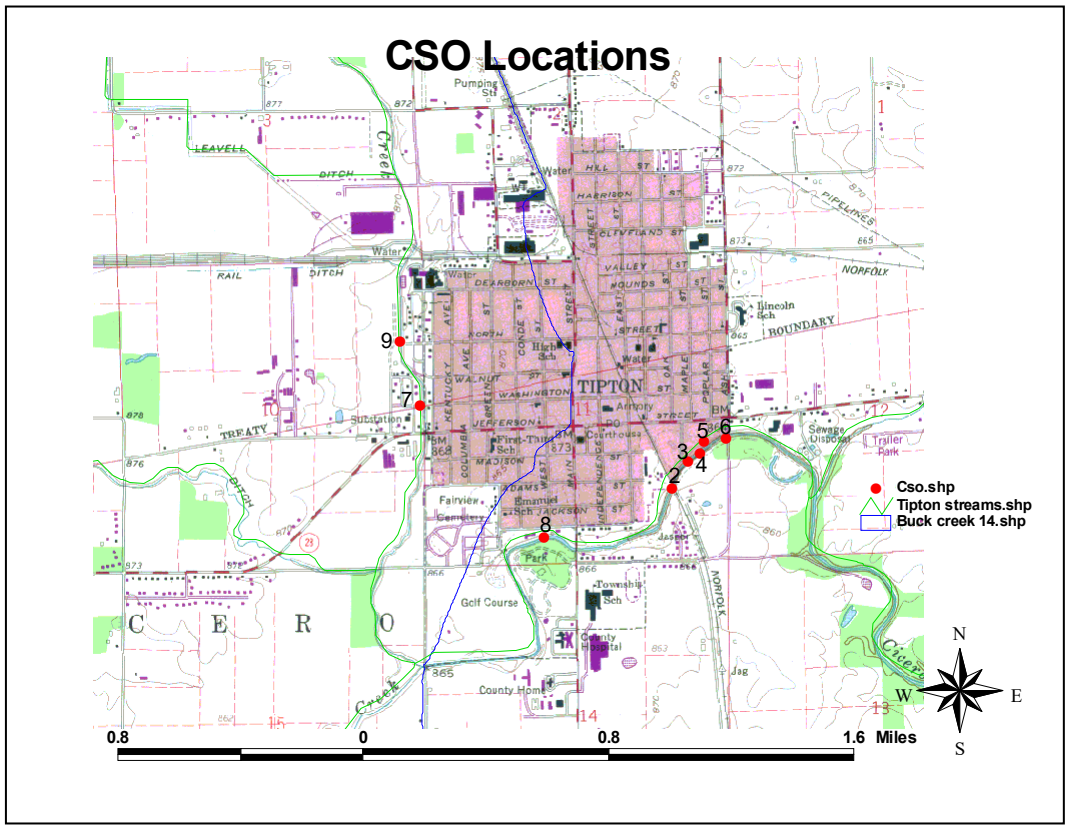
4.6 **Combined Sewer Overflows (CSO's)**: Combined Sewer Overflows contribute a variety of pollutants to waterways. The most common water quality concerns associated with CSO's include: bacteria/pathogens, nutrients, dissolved oxygen, and BOD. "The State of Indiana required the City of Tipton to develop and submit a Combined Sewer Overflow Long term Control Plan as a condition of NPDES permit IN 00 32964. Under the CSO control programs of the United States Environmental Protection Agency (USEPA) and the Indiana Department of Environmental Management (IDEM), municipalities, with their Publicly Owned Treatment Works (POTW's), are required to address CSOs through an evolving series of regulations. The EPA and IDEM have developed the CSO control program over time as outlined in the following documents:

- 1989 National CSO Policy, EPA
- 1991 Indiana CSO Strategy, IDEM
- National CSO Control Policy, EPA, 1994
- State of Indiana CSO Strategy, IDEM, 1996
- SEA 431 Adopted by Indiana State Legislature March 2000

Combined sewer systems convey both sanitary wastewater and stormwater through the same main in the collection system to a wastewater treatment facility. During heavy rainfall events, the flow in the combined sewer system exceeds the capacity of this conveyance system. To prevent overloading the sewer system, overflow points, or, combined sewer overflows (CSO's) have been constructed in the combined system that allow the flow to discharge into the receiving stream.

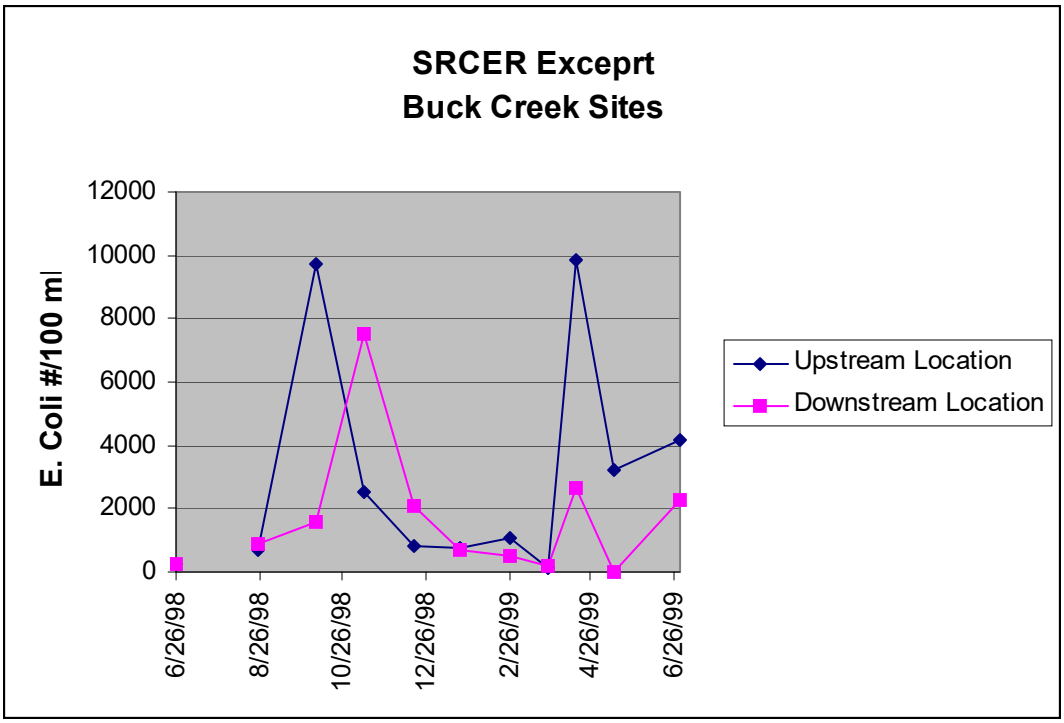
The City of Tipton is currently served with approximately 23 miles of sewers, most of which are combined sewers, although separate sanitary and storm sewers exist in some areas. The Tipton sewer system currently contains eight CSO's. Five CSO's, 002-005 and 008, are direct overflows to the receiving stream, while three CSO's, 006, 007, and 009, are storm sewers which contain several cross-connections with the combined sewers. Six of the CSO's discharge to Cicero Creek and two discharge to Buck Creek." Source- Combined Sewer Overflow Long Term Control Plan. City of Tipton. April 2002. HNTB

The graphic at right depicts the location of all CSO's in the City of Tipton in relation to the Buck Creek watershed boundary. Two CSO discharge locations are located in the Buck Creek watershed.



"According to dry-weather sampling data collected by the City of Tipton for the *Stream Reach Characterization and Evaluation Report* (SRCER) to establish baseline water quality in the receiving streams, it appeared that Buck Creek and Cicero Creek rarely met water quality standards for *E. Coli* even upstream of all CSO's. Additionally, the data from the SRCER indicated that the CSO's have a minimal impact on wet weather water quality in the two streams for the sampling parameters of temperature, pH, Dissolved Oxygen, CBOD, TSS, phosphorous, and ammonia. However, it appears that *E. Coli* levels in the streams are impacted by the CSO's, storm sewers, and other runoff sources." Source- Combined Sewer Overflow Long Term Control Plan. City of Tipton. April 2002. HNTB

The following graph depicts the levels of *E. Coli* bacteria sampled at locations upstream of all CSO outfalls and downstream of CSO outfalls on Buck Creek. The water quality standard for *E. Coli* is 235 colonies per milliliter. Notice that the levels above the CSO discharge points are typically higher. This indicates *E. coli* contamination from other sources upstream.



Source- City of Tipton, SRCER Stream Monitoring Data Summary

4.7 **Streambank Erosion:**

Streambank erosion in the watershed is a commonly recognized concern among local landowners and land-users. Streambank erosion is most commonly associated with sediment and nutrient pollution of waterways. The most prevalent cause of bank erosion in this area is the steep, nearly vertical banks associated with drainage maintenance. In recent years, the local drainage board has recognized the problem and now requires the installation of a minimum of a 2:1 slope on all banks undergoing drainage reconstruction

Three 100 foot reference steambank sections in the watershed were chosen to represent typical conditions. The sites were chosen in cooperation with the County Surveyor and a representative from the local Natural Resource Conservation Service office. Load reductions for sediment, phosphorus, and nitrogen were calculated by using the IDEM tool "*Estimating Load Reductions for Agricultural and Urban BMP's*" and averaging the results from the three representative sites. Assuming bank stabilization treatment along both banks, the estimated average annual load reduction per 100 linear feet of treatment are:

Sediment-	5 tons per year
Phosphorus-	5 lbs. Per year
Nitrogen-	9.6 lbs. Per year

The above estimates reflect treatment on average bank conditions. Much greater load reductions can be expected for treatment projects that target severely eroding areas, such as in meanders, turns or bends, near large inlets or other areas of concentrated velocity.

4.8 **IDEM Water Quality Information:**

4.8.1 IDEM (1998). *A Preliminary Appraisal of the Biological Integrity of Indiana Streams in the West Fork of the White River watershed using Fish Tissue Contamination Assessment.* James Stahl. IDEM Office of Water Management. Biological Studies Section. 32/03/005/1997

> "Results of the monitoring currently place 482 stream miles and 1,630 lake acres under specific fish consumption advisories. Trend analysis for four biennially monitored sites on the main stem of the West Fork White River show

a general decline of PCB's and organochlorine pesticides. In addition to the observed continued downward trend in organochlorine pesticides, and total PCB concentrations in fish tissue, lead concentrations also appear to be on a downward trend. Mercury concentrations in fish tissue do not appear, however, to be exhibiting a downward trend. Levels are staying about the same in the West Fork White River and may be higher than the statewide average. Concentrations of polycyclic aromatic hydrocarbons in fish tissue do not appear to be a concern at this time."

4.8.2 IDEM (1998) *West Fork White River Basin 1996 Statistical Analysis*. Carl Christensen. IDEM Office of Water Management. Surveys Section. 32/02/003/1998

"This report summarizes the data collected in 1996 in the West Fork White River Basin through the use of statistical analysis. From the analysis of over 5900 water chemistry observations, it was concluded that:

- Urban areas often increased alkalinity, dissolved solids, hardness, total phosphorous, and sulfate.
- Agricultural areas had inconsistent impacts on the water chemistry. Some stations in agricultural drainage areas had high concentrations of total phosphorous, TKN, TOC, hardness, dissolved solids, and alkalinity.
- Strip mine drainage typically increased dissolved solids, hardness, and sulfates while reducing alkalinity for tributary streams.
- TOC, TKN, and total phosphorus were highest in the spring due to runoff of accumulated arganic materials and fertilizer runoff. Hardness, chloride, and sulfate were highest in the winter months due to low flow conditions concentrating the minerals and sulfates, and the application of road salt.
- Parameters which were chronic outliers for a given station almost always had either been classified as high or upper background for that parameter."

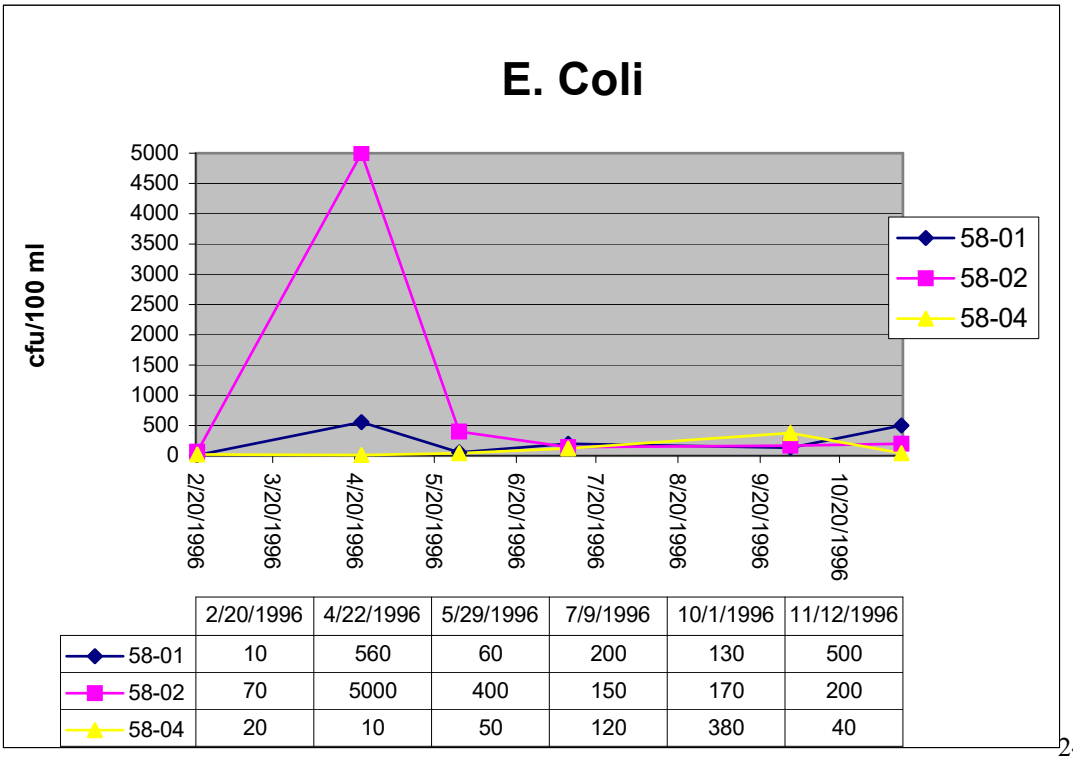
4.8.3 IDEM (1997) *West Fork White River and Patoka River Basins General Aquatic Life and Recreational Use Water Quality Assessments for the 305(b) Report.* Beckman, T. & McFall, L. IDEM Office of Water Management. Assessment Branch. 32/02/014/1997

Site #58-01. Cicero Creek at County Road 300 South.
Recreation- Supportive
Aquatic Life- Supportive

Site #58-02. Cicero Creek at East 266th Street.
Recreation- Supportive
Aquatic Life- Supportive

Site #58-04. Cicero Creek at State Road 38.
Recreation- Non-Supportive
Aquatic Life- Supportive

The graphic at right depicts levels of E. coli bacteria collected by the study at the sample points listed above in the Cicero Creek basin.



	2/20/1996	4/22/1996	5/29/1996	7/9/1996	10/1/1996	11/12/1996
58-01	10	560	60	200	130	500
58-02	70	5000	400	150	170	200
58-04	20	10	50	120	380	40

4.8.4 IDEM (1998) *1996 Synoptic Sampling Surveys in the West Fork of the White River Basin*. Mark Holdeman, Sam Gibson, James McFall, Timothy Beckman, Derek Eisman, Veronica Erwin. IDEM Office of Water Management, Surveys Section. 32/02/001/1998.

In 1996, the IDEM Surveys Section conducted synoptic water quality sampling surveys in the West Fork of the White River and Patoka River watersheds.

"One of the main objectives of these surveys was to describe the environmental quality of the surface water resources in these basins and to identify what parts of the watersheds are impacted and exhibit signs of existing or emerging problems. Sampling sites for this project were selected in such a way as to give an overall even spatial distribution coverage. Then, each site was evaluated as to its upstream land use. Sites were sampled six times over the year to give seasonal coverage. Basic water quality parameters were chosen to characterize the sites. Flow measurements were made at the selected sites and data from the USGS gauging station sites were collected in order to help with the chemical data interpretation."

"The average long term discharge for the West Fork White River as measured at the USGS gauging station at Newberry is 4,847 cubic feet per second, or approximately 5.7 billion cubic yards of discharge in an average year." (USGS 1995, Water Data Report IN95-1) The average daily contribution for each of the 12 gauging stations shows a remarkably close correlation to the drainage area. Calculation of the ratio of average daily flow (cfs) to drainage area (square miles) shows an almost one to one relationship, or one sqaure miles of drainage equates to one cubic foot per second flow for all of the sites spaced throughout the basin."

The table below depicts water chemistry data collected at sites in or immediately adjacent to the Buck Creek watershed.

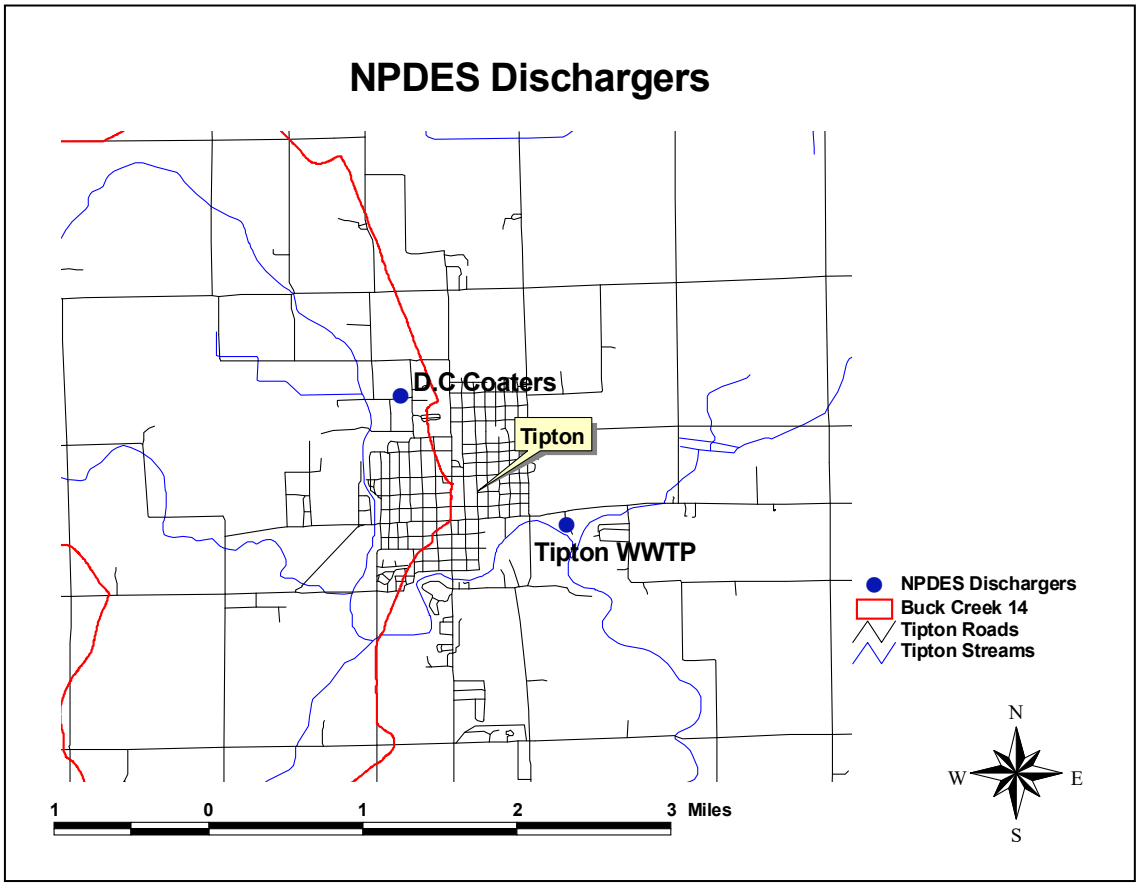
SITE	DATE	ALK	HARD	CHL	SULF	TKN	TOT PHOS	TOC	TS	TSS	TDS
58-01	2/20/96	220	300	43	55	0.13	0.08	2.4	420	4	380
	4/22/96	130	280	46	45	2.7	0.28	6	630	220	360
	5/29/96	140	270	33	39	1	0.11	4	480	57	390
	7/9/96	170	280	42	47	0.6	0.11	3.2	440	13	330
	10/1/96	190	230	45	56	0.59	0.09	5.8	360	4	310
	11/12/96	220	330	45	60	0.66	0.09	3.8	440	9	420
58-02	2/20/96	210	370	62	66	0.08	0.1	3	460	5	430
	4/22/96	150	270	49	47	2.7	0.2	5.3	530	110	330
	5/29/96	150	280	35	40	1.5	0.1	3	500	70	420
	7/9/96	190	300	54	52	0.71	0.09	3.2	410	6	360
	10/1/96	200	260	63	53	0.59	0.28	5.5	440	4	390
	11/12/96	210	280	43	47	0.4	0.1	3.3	390	4	370
58-04	2/20/96	150	230	50	29	1.6	0.06	4.6	330	4	260
	4/22/96	150	240	53	51	1.6	0.04	3.9	370	6	330
	5/29/96	130	230	34	39	1.2	0.09	4	430	4	340
	7/9/96	130	230	36	43	0.77	0.1	3.1	390	7	310
	10/1/96	150	220	38	38	1.1	0.12	3.6	350	26	270
	11/12/96	140	190	40	37	0.96	0.05	3.8	280	6	260
		All results expressed in MG/L									
	Site 58-01 is located on Cicero Creek at County Road 300 South.										
	Site 58-02 is located on Cicero Creek at East 266th Street.										
	Site 58-4 is is located on Cicero Creek at State Road 38.										

4.8.5 IDEM. (1998). *A study of Pesticide Concentrations in the Whitewater River and White River Basins*. Sean K. Grady IDEM. Office of Water Management. Surveys Section. 032/02/011/1998

> "In 1997, the Surveys Section of the Assessment Branch (IDEM) conducted a Pesticide Monitoring Project that sampled surface water for 15 consecutive weeks during the summer and once in late fall. Over 120 pesticides were analyzed in each sample. Benchmark pesticide data was collected during the study, and loadings associated with the Whitewater River and the White River basins were calculated. Atrazine was the most commonly detected herbicide in the surface waters of these river basins. Metolachlor and Acetochlor were the second and third most commonly detected herbicides respectively. During the course of the project, these river basins experienced very heavy rains.
>
> During this study, on average, surface waters in the Whitewater River and White River basins had elevated levels above the Maximum Contaminant Level (MCL) for Drinking Water (3ug/L) two months out of the year. Of the entire pesticide load based on the dates sampled and data collected in the White River Basin, the East Fork contributed approximately 75% of the pesticide load, and the West Fork contributed approximately 25%.
>
> Findings of this study indicate that loadings of herbicides entering surface water of East Fork White River and Whitewater River basins in 1997 were well above 1 percent of the estimated total herbicide applied. Peak runoff for Atrazine was estimated at 11%, for Metolachlor at 6% and for Acetachlor at 7%. This indicates that these watersheds are impaired by agricultural chemicals from non-point source runoff."

4.9 **National Pollutant Discharge Elimination System (NPDES) Dischargers:**

According to information from US Environmental Protection Agency's *Envirofacts* website, only two permitted surface water discharge facility are located within the Buck Creek watershed. The City of Tipton Municipal Wastewater Treatment Plant is located just downstream of the Buck Creek watershed on Cicero Creek, and DC Coaters located on the northwest side of Tipton. Discharges from NPDES sources may contain a variety of organic chemicals, inorganic chemicals, pathogens, or nutrients, dependant upon the particular waste stream. The following graphics depict the locations of the facilities and relevant discharge information.



Facility Name: D.C Coaters, Inc.		**NPDES #:** INP000106
Permit Issue Date: 8/27/1998		**Permit Expiration Date:** 7/31/2003
List of Permitted Discharges		
PIPE NUMBER	*PIPE DESCRIPTION*	*PARAMETER DESCRIPTION*
001	Zinc Phosphating & Painting	Ph
001	Zinc Phosphating & Painting	Cyanide, Total (As Cn)
001	Zinc Phosphating & Painting	Nickel Total Recoverable
001	Zinc Phosphating & Painting	Silver Total Recoverable
001	Zinc Phosphating & Painting	Zinc Total Recoverable
001	Zinc Phosphating & Painting	Cadmium Total Recoverable
001	Zinc Phosphating & Painting	Lead Total Recoverable
001	Zinc Phosphating & Painting	Chromium Total Recoverable
001	Zinc Phosphating & Painting	Copper Total Recoverable
001	Zinc Phosphating & Painting	Flow, in conduit or thru treatment plant
001	Zinc Phosphating & Painting	Organics, Total Toxic (TTO)

Facility Name: Tipton Municipal WWTP		**NPDES #:** IN0021474
Permit Issue Date: 7/3/1997		**Permit Expiration Date:** 6/30/2002
List of Permitted Discharges		
PIPE NUMBER	*PIPE DESCRIPTION*	*PARAMETER DESCRIPTION*
001	Municipal STP	Oxygen, Dissolved (DO)
001	Municipal STP	Ph
001	Municipal STP	Solids, Total Suspended
001	Municipal STP	Oil & Grease Freon Extra-Grav meth
001	Municipal STP	Nitrogen, Ammonia Total (as N)
001	Municipal STP	Phosphorus, Total (as P)
001	Municipal STP	E. Coli, MTEC-MF
001	Municipal STP	Flow, Wastewater bypassing treatment plant
001	Municipal STP	Flow, in conduit or thru treatment plant
001	Municipal STP	BOD, Carbonaceous 05 day, 20C
001	Municipal STP	Bypass of treatment
001	Municipal STP	Phosphorus, Total Percent Removal
001	Municipal STP	Flow, total
001	Municipal STP	LC50 Statre 48 hr ACU *Ceroidaphnia*
001	Municipal STP	LC 50 Statre 96 hr ACU *Ceroidaphnia*
001	Municipal STP	LC 50 Statre 7 day CHR *Ceroidaphnia*
001	Municipal STP	Noel Statre 7 day CHR *Pimephales*

4.10 **Pollutant Loads:**

4.10.1 *Agricultural Lands:* NRCS staff indicate that the most prevalent row crop farming method is conventionally tilled corn followed by reduced tilled soybeans. Using the IDEM tool "*Estimating Load Reductions for Agricultural and Urban BMP's*", the approximately 10,849 acres of row crops farmed in this method in the watershed can be expected to lose approximately 0.46 tons of sediment per year per acre, or contribute approximately **4,990 tons of sediment** every year to receiving waterways. If farming methods were changed to no-till corn followed by no-till soybeans, the annual soil loss rate would be reduced to a mere 0.12 tons per year, and result in approximately 3,689 tons of soil saved every year, a reduction of erosion by 74%. Additionally, approximately 2,3281 pounds of phosphorus and approximately 4,645 pounds of nitrogen would be prevented from entering waterways.

According to the information examined in Section 2.18, available nutrients in the watershed from agricultural sources are as follows:

	Nitrogen (lbs)	Phosphorus (lbs)
From Fertilizer	426,000	457,240
From Manure	293.4	254.6
TOTAL	**426,293.4**	**457,494.6**

4.10.2 *Urban/Residential Lands*: According to land-use data from the Tipton County Assessor's Office, the following table depicts the amount of potentially "impervious surface" present in the watershed. Large areas of impervious surface can contribute to water quality problems including: heavy metals, nutrients, oil & grease, salts, and increased flow rates in receiving waters.

Home-Sites	Towns	Industrial/Commercial	Roads	Total % Watershed Area
292 acres	330 acres	341 acres	250 acres	10%

Using the IDEM *"Urban Runoff BMP Pollutant Load Reduction Worksheet"*, the following tables estimate potential pollutant loading , and potential for pollutant load reduction if "Vegetated Filter Strips" were employed as a "Best Management Practice" (BMP) in the contributing areas. Contributing areas were based on land-use information provided by the Tipton County Assessor's Office.

Contributing/drainage area in acres:

	Sewered	Unsewered
Commercial	341	0
Industrial	0	0
Institutional	0	0
Transportation	0	250
Multi-Family	0	0
Residential	330	318
Agriculture	0	9836
Vacant	0	0
Open Space	0	381

	Pre-BMP Loading (lbs/yr)		Post-BMP Loading (lbs/yr)		Load Reduction (lbs/yr)
BOD	76,903		38,067		38,836
COD	680,250		408,150		272,100
TSS	2,398,350		647,555		1,750,796
LEAD	880		484		396
COPPER	218		U		U
ZINC	2,151		860		1,290
TDS	3,038,676		U		U
TN	35,734		21,441		14,294
TKN	15,786		U		U
DP	1,186		U		U
TP	2,933		1,606		1,327
CADMIUM	9		U		U

Section 5. GOALS & SOLUTIONS

At public meetings held on June 20, 2002, and August 27, 2002, the watershed team developed long term goals and identified potential solutions through a brainstorming and consensus process. The following results reflect the team's direction with respect to the five priority water quality issues identified earlier. Recommendations and Action Items are listed in order of priority.

5.1 #1 Combined Sewer Overflows (CSO's)

Group discussion on this topic centered on the enormous scope of eliminating CSO discharges, which was determined by the group to be the ultimate goal. Many participants expressed doubt that this would be possible because of the high cost associated with infrastructure modifications.

GOAL: "Eliminate combined sewer overflow discharges."

Rational: Evidence of *E. coli* pollution from Combined Sewer Overflow sources is documented in Section 4.6. This goal supports the USEPA and IDEM requirements to address CSO discharges.

The group decided that due to the size and scope of the problem, and since the City of Tipton is actively addressing the problem as required by state and federal law, the best solution for addressing CSO discharges in the watershed is to support the recommendations of the City's *Combined Sewer Overflow Long Term Control Plan (LTCP)*.

Recommendation: Implement the City of Tipton's *Combined Sewer Overflow Long Term Control Plan.*

The *LTCP* was prepared by HNTB in April 2002 and is currently in draft form. The *LTCP* evaluated the following alternatives:

- Alternative #1- Wastewater Treatment Plant Improvements
- Alternative #2- Diversion of Flow from CSO 8 to the 18" Interceptor
- Alternative #3- Combined Sewer System (CSS) Modifications
- Alternative #4- Elimination of all CSOs from the sewer system by sewer separation.

After evaluation of the cost of these alternatives as well as their expected performance, the *LTCP* recommended that Alternatives #1 through #3 be implemented. These alternatives are expected to cost approximately $18,340,000. Implementation of the alternatives, issuance of any required permits, post construction monitoring, evaluation, and revision are scheduled through the year 2022.

No further action on this topic is proposed by the watershed team at this time.

5.2 #2 Septic Systems

During the planning group discussion and decision-making process, there seemed to be two schools of though dominating the discussion on the topic of septic systems; one for locally based regulatory empowerment to require the clean-up of failing systems, and the other to wait for state or federal requirements and financial assistance. Consensus was not reached as to which approach would be the local preference.

There was consensus among the group that resources must be focused on identifying and eliminating the most seriously malfunctioning systems, particularly the "straight pipe systems". However, the group was not compelled to state a clear, quantifiable goal due to the potential for political and financial ramifications resulting from the enormous cost and burdens on individual homeowners for system repair or replacement. After lengthy discussion, the clearest goal offered by the group was the following:

GOAL: "Identify the most seriously failing septic systems and repair or eliminate."

Rational: This goal supports information presented in Section 4.5 which indicates that local sources are aware of significant potential of failed septic systems and associated bacterial and nutrient contamination of surface water and shallow ground water due mostly to the age of existing systems and limiting factors of un-suitable soils and high water tables. However, due to the complexity of identifying true sources of pollution from failed septic systems, the goal reflects the consensus that more specific information must be obtained before jumping to corrective measures.

Alternatives discussed by Group:

1. Conduct an inventory of homes on septic systems greater than 30-40 years old. Locate and target areas of the greatest concentration of these homes. *Potential funding source*: Tipton County Foundation, Section 205(j) (IDEM).
2. Explore the creation of a *Regional Septic District*, through the Indiana State Department of Health, in these areas.
3. Create a package plant or cluster systems, to serve these areas. Treat only effluent; use existing septic tanks to settle solids. *Potential funding source*: Indiana State Revolving Fund Loan Program (IDEM).
4. Develop a locally based cost share program to assist homeowners with repair or replacement of failing systems in these areas. Create a low interest loan program that ties the loan to the property in the form of a lien. *Potential funding sources*: Indiana State Revolving Fund Loan Program (IDEM), local tax revenue or assessments.

Two recommendations were discussed that were supported by group consensus:

Recommendation #1: Develop an incentive based demonstration of new technology that focuses on systems with problem soils and high water tables.

Action Item: Locate and target residential, commercial, or institutional sites in the watershed with systems that have failed due to problem soils and/or insufficient drainage of high water tables. *Target Date*: 1/1/05. *Technical Assistance*: Tipton County Health Department, Tipton County Soil & Water Conservation District. *Estimated Cost*: $5,000

Action Item: Determine the best available on-site technology suitable for correcting the failed system. Potential technology includes: re-circulating sand filters, mound systems, drip-irrigation systems, perimeter sub-surface drainage, constructed wetland systems, etc. *Target Date*: 1/1/06. *Technical Assistance*: Tipton County Health Department, Tipton County Soil & Water Conservation District. *Estimated Cost:* $5,000.

Action Item: Acquire a grant or low interest loan funding to subsidize the replacement of the failed systems with the most suitable technology. *Potential Funding Sources*: Indiana State Revolving Fund Loan Program (IDEM), Section 319 Grant (IDEM), Tipton County Foundation Grant, Section 104(b)(3) Grant (IDEM), Water Quality Cooperative Agreements (USEPA). *Target Date*: 1/1/07

Action Item: Hire engineers to design the replacement systems and contractors to install the new on-site technology. Secure any required state or local permits (eg. NPDES, Section 404/401, Groundwater discharge permit, local septic permit, etc.) *Target Date*: 1/1/08. *Estimated Cost*: $60,000.

Action Item: Conduct post installation inspection and monitoring of the systems to determine effectiveness of the new technology. Utilize dye test and E. coli/nutrient monitoring. *Technical Assistance:* Tipton County Health Department, Tipton County Soil & Water Conservation District, private consultants. Target Date: 1/1/09. *Estimated Cost:* $5,000.

Action Item: Conduct outreach program in the watershed and county to publicize the results. *Technical Assistance*: Tipton County Health Department, Tipton County Soil & Water Conservation District, Tipton County Commissioners, Purdue Cooperative Extension Service, Rural Community Assistance Program. *Target Date*: 1/1/10. *Estimated Cost*: $7,000.

Action Item: Develop a locally based cost share program to assist and encourage homeowners with the repair or replacement of failing systems utilizing the demonstrated new technology in priority areas. Create a low interest loan program that ties the loan to the property in the form of a lien. *Potential funding sources*: Indiana State Revolving Fund (IDEM), local tax revenue or assessments, Tipton County Foundation, Environmental Fund for Indiana, Water Quality Cooperative Agreements (USEPA) *Technical Assistance*: Tipton County Commissioners, Tipton County Council, Rural Community Assistance Program, *Target Date*: 1/1/11. *Estimated Cost*: $200,000.

Recommendation #2: Develop an educational program on the affects of improper septic systems, diagnosing potentially failing systems, and how to repair or replace failing systems.

Action Item: Develop a multi-media marketing approach targeted toward the residents of the watershed and the county. Materials will focus on: highlighting the water quality and environmental affects of failed septic systems, threats to human health from failed septic systems, how to determine if your system is operating correctly, who to contact for assistance, and methods for correcting problems. Marketing materials include:

- Informational bulletins
- Billboard advertising
- Press releases and feature articles; case studies.
- Display for use at city & county events.
- *Powerpoint* or slide show presentation for use by local officials during presentations to civic clubs, schools, public hearings, meetings, or events.

Technical Assistance: Tipton County Health Department, Tipton County Commissioners, Tipton County Soil & Water Conservation District, Purdue Cooperative Extension Service, Rural Community Assistance Program, private consultants and/or marketing firms. *Target Date*: 1/1/05. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships. *Estimated Cost*: $75,000.

5.3 #3 Streambank Erosion

Group discussion for this topic centered on the agreement that areas of critical bank erosion must be identified and ranked as part of comprehensive inventory, then take steps to repair the most severe sites. There was also consensus that filter strips and buffers need to be established wherever possible. The group also agreed that a demonstration of new or alternative methods for controlling bank erosion be established to promote education and awareness.

GOAL 1- "Identify areas in the watershed most prone to severe bank erosion and install appropriate conservation practices along approximately two miles of banks."

Rational: Information collected in Section 4.4 indicates that the "Bank Stability" criteria evaluated as a part of the *Stream Visual Assessment Protocol* study scored below average for the majority of sites observed, however, the study did not provide an exhaustive inventory of all potentially erosive sites. Funding constraints warrant limitation of corrective measures to only the most severely eroding sites.

GOAL 2- "Establish filter strips and buffers along approximately 50% of stream-banks, totaling approximately 20 miles of buffers."

Rational: Information in Section 2.14 indicates that approximately 16% of banks are currently enrolled in the Conservation reserve Program filter strip program. Information in Section 4.10.1 indicates that approximately 4,990 tons of sediment are annually contributed to the streams in the watershed. The Planning Group firmly believes that installation of filter strips will be the most practical measure to reduce this sediment load and reduce pressure on eroding banks.

GOAL 3- "Develop a demonstration project to illustrate new or alternates methods of controlling bank erosion to promote education and public awareness."

Rational: Traditional "hard armor" approaches to bank stabilization may be cost prohibitive in many situations. The Planning Group felt it important to evaluate other alternatives that may be more cost effective and to showcase the benefits of bank stabilization practices to the public to facilitate implementation of Goal #1.

Alternatives discussed by Group:

1. All new ditch re-construction have minimum of 2:1 slopes. *(Currently implemented by Drainage Board).*
2. Identify and classify most severe areas of bank erosion in the watershed.
3. Restore and/or rehabilitate critical areas.
4. Demonstration of new methods of erosion control.
5. Informational/educational program.
6. Establish filter strips & buffers.
7. Extend CRP contracts to allow for additional buffer footage.
8. County enforce 75' drainage easement (no crops).
9. Establish local cost share incentive to match CRP payments for filter strips.

Recommendation #1: Establish the Buck Creek Watershed as a local priority area for NRCS EQIP funding.

Action Item: Submit the following statement to local NRCS personnel for inclusion on EQIP local ranking criteria for Water Quality resource concern: "Are the acres for contract located within the Buck Creek 14 digit HUC area, for which a Watershed Management Plan has been developed?"

Recommendation #2: Conduct a comprehensive inventory of streambank erosion in the watershed and classify according to severity.

Action Item: Develop list of areas with potential bank erosion. Develop method for classification of severity of erosion. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service. *Target Date:* 1/1/04. *Estimated Cost:* $2,500

Action Item: Apply for funding to conduct comprehensive inventory of the watershed using the severity classification tool. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Tipton County Commissioners. *Target Date:* 6/1/04. *Potential Funding Sources*: Tipton County Foundation, Section 205(j) (IDEM), Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships, Lake & River Enhancement (IDNR), Water Quality Special Research Grants (CSREES).

Action Item: Conduct on-land inventory of stream-banks in watershed. Classify eroding banks according to the severity classification tool. Calculate pollution loading rates at each site according to the IDEM "BMP Load Estimating Workbook". Map erosive sites using GPS. *Technical Assistance:* Tipton County Surveyor, Tipton County Soil & Water Conservation District, Tipton County Commissioners, private consultants. *Target Date*: 6/1/06. *Estimated Cost*: $75,000.

Recommendation #3: Repair, restore, or rehabilitate approximately two miles of the most severely eroding banks, according to results of inventory. Results in load reduction of approximately 528 tons of sediment per year, 528 pounds of Phosphorus per year, and 1,013 pounds of Nitrogen per year.

Action Item: Design appropriate bank erosion practices for each of the priority sites identified through the inventory process. Secure any require federal, state, or local permits (eg. Section 404/401, IDNR Construction in a Floodway permit, Drainage Board permit, etc.) *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, private consultants and/or engineers. *Target Date:* 1/1/07. *Estimated Cost:* $30,000.

Action Item: Install bank erosion practices at priority sites. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, private contractors. *Target Date:* 1/1/08. *Estimated Cost:* $500,000. *Potential Funding Sources:* Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships, Drainage Board ditch assessment revenues, Lake & River Enhancement (IDNR).

Recommendation #4: Establish filter strips and buffers along approximately 20 miles of stream-banks. Results in load reductions of approximately 4,857.6 tons of sediment per year, 7,392 pounds of Phosphorus per year, and 15,100.8 pounds of Nitrogen per year.

Action Item: Conduct an inventory of existing filter strips and buffers present along banks, including CRP areas and private buffers. Inventory includes length, width, and location of existing buffers. Map current buffers using GPS. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, private consultants. *Target Date:* 1/1/05. *Estimated Cost:* $15,000.

Action Item: Develop a cost share assistance program to subsidize buffer establishment. Utilize existing programs such as CRP, EQIP, Encourage the development of a local match program, using ditch assessment funds or local grants, to further subsidize landowner portion. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service. *Target Date:* 1/1/06

Action Item: Develop a marketing program to publicize cost share assistance program, and benefits of buffers. Target landowners with no existing buffers. Marketing materials include:

- Informational bulletins and targeted mailings.
- Billboard advertising.
- Press releases and feature articles; case studies.
- Display for use at city & county events.
- Organized luncheons or breakfasts.
- Phone calls and/or personal visits to candidates.
- Informational flyer or statement to include with Drainage Board correspondence, eg. Assessment invoices.

Technical Assistance: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, Purdue Cooperative Extension Service, private contractors. *Target Date:* 6/1/06. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships, Lake & River Enhancement (IDNR). *Estimated Cost*: $15,000.

Action Item: Establish approximately 20 miles of filter strips or buffers along perennial streams. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, private contractors. *Target Date:* 1/1/10. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, CRP (NRCS), EQIP (NRCS), local ditch assessments revenues, corporate sponsorships, Lake & River Enhancement (IDNR). *Estimated Cost*: $150,000.

Recommendation #5: Establish a demonstration project featuring alternative methods to control bank erosion and enhance aquatic habitat.

Action Item: Select a site accessible to the public to feature demonstration of a variety of bank erosion and aquatic enhancement techniques. Target practices to the site requirements. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Tipton Parks Department, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, private contractors. *Target Date:* 1/1/03.

Action Item: Apply for funding to develop demonstration site. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Tipton County Commissioners, Tipton Parks Department. *Target Date:* 6/1/03. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships, Lake & River Enhancement (IDNR).

Action Item: Secure any required federal, state or local permits (eg. Section 404/401, IDNR Construction in a Floodway permit, Drainage Board permit, etc.) Install practices at site. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Tipton County Commissioners, Tipton Parks Department, private contractors. *Target Date:* 6/1/05. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships. *Estimated Cost*: $110,000.

Action Item: Conduct education program concurrently with practice installation. Target local residents, Regional Drainage Board members and County Surveyors. Encourage local participation in project implementation. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Tipton County Commissioners, Tipton Parks Department, private consultants. *Target Date:* 6/1/05. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships. *Estimated Cost*: $30,000.

5.4 #4. Agricultural/Residential Chemical Runoff

For this topic, the group agreed that the most direct way to minimize agricultural chemical runoff to waterways is to establish filter strips/buffers along waterways. The group also decided to expand the scope of the topic to include runoff from residential sources as well. Education on the proper use of chemicals, labeling requirements, and the hazards of improper use was also agreed upon. The group recommended targeting these efforts to youth and suggested the introduction of school programs/curriculum

Goal #1- "Establish filter strips and buffers along approximately 50% of stream-banks, totaling approximately 20 miles of buffers."

Rational: Information in Section 2.14 indicates that approximately 16% of banks are currently enrolled in the Conservation reserve Program filter strip program. Information in Section 4.10.1 indicates that approximately 4,990 tons of sediment are annually contributed to the streams in the watershed. The Planning Group firmly believes that installation of filter strips will be the most practical measure to reduce this sediment load.

Goal #2- "Educate local residents on the proper use of chemicals, labeling requirements, and the hazards of improper use."

Rational: Although no direct evidence indicates significant water quality problems associated with improper use of pesticides or fertilizer application, the Planning Group believes that prevention of future problems begins with solid educational efforts.

Alternatives discussed by Group:

1. On-land assessment.
2. Education.
3. Personal contacts.

4. New or modified rules or laws
5. Compliance/enforcement activities.
6. Incentives.

Recommendation #1: Establish the Buck Creek Watershed as a local priority area for NRCS EQIP funding.

Action Item: Submit the following statement to local NRCS personnel for inclusion on EQIP local ranking criteria for Water Quality resource concern: "Are the acres for contract located within the Buck Creek 14 digit HUC area, for which a Watershed Management Plan has been developed?"

Recommendation #2: Establish filter strips and buffers along approximately 20 miles of stream-banks. Results in load reductions of approximately 4,857.6 tons of sediment per year, 7,392 pounds of Phosphorus per year, and 15,100.8 pounds of Nitrogen per year.

Action Item: Conduct an inventory of existing filter strips and buffers present along banks, including CRP areas and private buffers. Inventory includes length, width, and location of existing buffers. Map current buffers using GPS. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, private consultants. *Target Date:* 1/1/05. *Estimated Cost:* $15,000.

Action Item: Develop a cost share assistance program to subsidize buffer establishment. Utilize existing programs such as CRP, EQIP, Develop a local match program, using ditch assessment funds or local grants, to further subsidize establishment costs. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service. *Target Date:* 1/1/06

Action Item: Develop a marketing program to publicize cost share assistance program, and benefits of buffers. Target landowners with no existing buffers. Marketing materials include:

- Informational bulletins and targeted mailings.
- Billboard advertising.
- Press releases and feature articles; case studies.
- Display for use at city & county events.
- Organized luncheons or breakfasts.
- Phone calls and/or personal visits to candidates.
- Informational flyer or statement to include with Drainage Board correspondence, eg. Assessment invoices.

Technical Assistance: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, Purdue Cooperative Extension Service, private contractors. *Target Date:* 6/1/06. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships. *Estimated Cost*: $15,000.

Action Item: Establish approximately 20 miles of filter strips or buffers along perennial streams. *Technical Assistance*: Tipton County Surveyor, Tipton County Soil & Water Conservation District, Indiana Department of Natural Resources-Division of Soil Conservation, USDA-Natural Resources Conservation Service, private contractors. *Target Date:* 1/1/10. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, CRP (NRCS), EQIP (NRCS), local ditch assessments revenues, corporate sponsorships, Lake & River Enhancement (IDNR), Watershed Protection and Flood Prevention Program, PL 566, NRCS). *Estimated Cost*: $150,000.

Recommendation #3: Develop an educational program on the proper use of chemicals, labeling requirements, and the hazards of improper use.

Action Item: Develop a multi-media marketing approach targeted toward the residents of the watershed and the county. Materials will focus on: compliance with pesticide labeling requirements, storage & disposal of chemicals and containers, potential threats to human health and the environment, proper use. Marketing materials include:

- Informational bulletins.
- Press releases and feature articles; case studies.
- Display for use at city & county events.
- *Powerpoint* or slide show presentation for use by local officials during presentations to civic clubs, schools, public hearings, meetings, or events.

Technical Assistance: Tipton County Health Department, Tipton County Commissioners, Tipton County Soil & Water Conservation District, Purdue Cooperative Extension Service, Rural Community Assistance Program, Indiana Office of the State Chemist, private consultants and/or marketing firms. *Target Date*: 1/1/05. *Potential Funding Sources*: Tipton County Foundation, Environmental Fund for Indiana, Section 319 Grant (IDEM), IPALCO Golden Eagle Grants, corporate sponsorships, Pesticide Environmental Stewardship Grants (USEPA). *Estimated Cost*: $25,000.

Action Item: Develop Progressive Planning for approximately 100 acres of farmland in the watershed. Progressive Planning includes comprehensive plans for pest management and nutrient management. *Target Date*: 1/1/05. *Technical Assistance*: USDA Natural Resource Conservation Service.

Action Item: Encourage the development of "Home*A*Syst" and "Farm*A*Syst" planning through the Purdue Cooperative Extension Service. *Target Date*: 1/1/05 *Technical Assistance*: Purdue Cooperative Extension Service (http://www.ecn.purdue.edu/SafeWater/farmasyst)

5.5 #5. Industrial Discharges

The group agreed that discharges from permitted facilities in the watershed are most likely not posing a serious threat to water quality if they are in compliance with permit conditions, because there a so few located in the watershed. Consensus for this topic was to focus efforts on the identification of operations that discharge without a permit or have a high potential for spills or accidents.

Goal #1- "Reduce or eliminate un-permitted discharges and potential for spills and/or accidents."

Rational: Although no direct evidence indicates significant water quality problems associated with un-permitted discharges, the Planning Group believes that prevention of future problems begins with solid educational efforts.

Alternatives discussed by Group:

- Inventory of illegal point sources or high risk areas.
- Education on compliance with existing regulations.

Recommendation #1: Establish a voluntary audit program for operations with surface water discharges.

Action Item: Encourage the development of "Home*A*Syst" and "Farm*A*Syst" planning through the Purdue Cooperative Extension Service. *Target Date*: 1/1/05 *Technical Assistance*: Purdue Cooperative Extension Service (http://www.ecn.purdue.edu/SafeWater/farmasyst)

Action Item: Encourage the development of voluntary environmental audits and compliance assistance for operations that discharge to surface waters. *Technical Assistance:* IDEM- Office of Pollution Prevention and Technical Assistance. (http://www.in.gov/idem/oppta) *Target Date:* 1/1/05

Section 6. MEASURING PROGRESS

6.1 **#1: Combined Sewer Overflows (CSO's):** Progress toward eliminating the combined sewer overflows in the watershed will be measured by attainment of the alternatives recommended in the City of Tipton's *Combined Sewer Overflow Long Term Control Plan*. Since no state of federal guidance or requirements concerning *LTCP* implementation have been issued at this time, the actual schedule for implementation of recommended alternatives has not been set. Continued dialogue with representatives from the City of Tipton is recommended to monitor *LTCP* progress. Milestones for charting success include the timely accomplishment of alternatives recommended in the LTCP.

6.2 **#2. Septic Systems:** Progress toward meeting the goals for failing septic systems will be measured against the following milestones, in order of importance:

1. Development and installation of the demonstration project and numbers of people reached through educational component.
2. Development of a locally based cost share assistance program and the numbers of participants.
3. Numbers of people targeted and reached through educational and marketing efforts.

6.3 **#3. Streambank Erosion:** Progress toward meeting the goals for controlling streambank erosion will be measured against the following milestones, in order of importance:

1. Establishment of a successful demonstration site and calculated amounts of load reductions of sediment, nitrogen and phosphorus, and number of participants and/or number of people reached through educational component.
2. Establishment of approximately 20 miles of filter strips/buffers adjacent to stream-banks, and calculated amounts of load reductions of sediment, nitrogen and phosphorus.
3. Completion of the inventory and targeting of critical areas for repair.
4. Installation of stabilization measures. Load reductions for sediment, nitrogen, and phosphorus will be calculated.

6.4 **#4. Agricultural/Residential Chemical Runoff:** Progress toward meeting the goals for agricultural/residential chemical runoff will be measured against the following milestones, in order of importance:

1. Establishment of approximately 20 miles of filter strips/buffers adjacent to stream-banks, and calculated amounts of load reductions of sediment, nitrogen and phosphorus.
2. Number of people reached through marketing efforts.
3. Completion of NRCS Progressive Planning on approximately 100 acres of farmland in the watershed.
4. Number of participants completing the Home*A*Syst and Farm*A*Syst program.

6.5 **#5. Industrial Discharges:** Progress toward meeting the goals for agricultural/residential chemical runoff will be measured against the following milestones, in order of importance:

1. Number of participants completing the Home*A*Syst and Farm*A*Syst program.
2. Number of participants participating in the voluntary audit program through IDEM Office of Pollution Prevention and Technical Assistance.

Section 7. FUNDING SOURCES

The table below depicts potential funding sources and contact information for recommended projects.

SOURCE	CONTACT INFO.
Section 319	IDEM. (317) 232-0019 www.ai.org/idem/owm
Section 205(j)	IDEM. (317) 232-0019 www.ai.org/idem/owm
Tipton County Foundation	
IPALCO Golden Eagle Grants	(317) 736-8994 www.ipalco.com/aboutipalco/news/03-30-99.html
Section 104(b)(3)	IDEM. (317) 232-0019 www.ai.org/idem/owm
Environmental Quality Incentives Program (EQIP)	NRCS. (317) 290-3200 www.in.nrcs.usda.gov
Conservation Reserve Program (CRP)	NRCS. (317) 290-3200 www.in.nrcs.usda.gov
Lake & River Enhancement (LARE)	(317) 233-3870 www.state.in.us/dnr/soilcons
State Revolving Fund (SRF)	IDEM. (317) 232-0019 www.ai.org/idem/owm
Water Quality Special Research Grants	Cooperative State Research Education & Extension Service (CSREES). USDA. (202) 401-5971
Chemical Emergency Preparedness & Prevention Technical Assistance Grants	USEPA- (202) 260-0030 www.epa.gov/ceppo
Pesticide Environmental Stewardship Grants	USEPA. (703) 308-7035 www.pesp.org
Watershed Protection & Flood Prevention Program	USDA, NRCS (202) 720-3534 www.ftw.nrcs.usda.gov/programs.html
Watershed Assistance Grants	USEPA (202) 260-4538 www.epa.gov/owow/wag.html
Water Quality Cooperative Agreements	USEPA (202) 260-9545 www.epa.gov/owm/wm042000.htm

Section 8. ADMINISTRATIVE

8.1 **Plan Evolution/Progress Reports**- The Tipton County Soil & Water Conservation District will be the primary record-keeper and responsible entity for the watershed management plan. The document will be reviewed biennially by the SWCD to determine if established goals are being met according to the specified schedule and to make any adjustments or updates based on new information. The results of the biennial evaluation will be made available to stakeholders in the watershed via SWCD Board meetings, newsletters, direct mailings, and/or articles in local press.

8.2 **Contact Information-** If you have any questions regarding the intent or content of this plan, please contact:

Randy Jones, Project Coordinator
317/933-4169
rcjones@franklinisp.net

or

Tipton County Soil & Water Conservation District
765/ 675-2316

8.3 **Distribution List-** Hard copies and electronic versions, as well as the GIS information, of this watershed management plan will be available at:

Tipton County Soil & Water Conservation District
243 Ash Street, Suite B.
Tipton, IN 46072.
765/ 675-2316

Hard copies will be provided to the following:

Tipton County Commissioners
Tipton County Health Department
Tipton County Surveyor's Office
Tipton Economic Development Council

8.4 **Calendar of Events:**

This watershed management plan was developed according to events summarized in the table below:

DATE	EVENT	OUTCOME
7/01	Developed topographic & aerial watershed maps.	Used for prioritization and informational purposes.
7/31/01	Watershed Prioritization Committee Meeting	Selected 4 14-digit watersheds for plan development.
8/23/01	"Kick-Off" event at Cargill luncheon	Introduced project to local citizens. Developed informational flyer.
10/01	Supplemental SWCD Newsletter	Distributed informational newsletter/meeting invitation announcing project to approx. 500 watershed residents.
10/3/01	Science Club presentation	Conducted workshop at local high school to explain project.
11/13/01	Public meeting	Held first meeting to introduce project to public, provide watershed resource overview, group ground rules, and process.
12/01	Identified key watershed group participants	Invited to participate through personal contacts from SWCD supervisors and target mailings.
1/02	Identified potential assessment collection sites.	Located sites with SWCD staff for assessment data collection.
2/13/02	Public Meeting	Conducted meeting to identify and prioritize local concerns via Nominal Group Technique procedures and discuss assessment procedure.
2-4/02	Developed GIS based mapping and data collection system.	Includes spatial coverages for watershed resources.
3-5/02	Conducted *Stream Visual Assessment Procedure*	Met with landowners on-site; collected and compiled data utilizing GPS/GIS.
4-7/02	Researched existing water quality & resource data.	Gathered & summarized data from existing local, state, & federal sources.
6/02	City Utilities, County Health Dept. meetings	Met with local personnel to collect resource data.
6/20/02	Public Meeting	Presented results of assessment and identified goals, solutions, and tasks through consensus process.
6/02	Began drafting Watershed Management Plan	
8/1/02	Public Meeting	Held meeting to refine goals & solutions; re-scheduled due to poor attendance.
8/27/02	Public Meeting	Refined goals, solutions and action items through group consensus. Invited by personal contact.
9-10/02	Continued updating/revising Management Plan	
11/1/02	Estimated load reductions	Met on-site w/ local personnel to estimate load reductions from recommended practices.
11/02	Submit Draft Watershed Management Plan to SWCD for comments	
12/02	Submit draft plan to IDEM for comment.	
4/03	Revise plan based on IDEM comment	
5/03	Submit Final Draft	

8.5 **Appendices:**

1. 14 digit HUC Prioritization Process Results
2. Issues Prioritization- Nominal Group Technique Results
3. Cargill Water Quality Sampling Project Data
4. Stream Visual Assessment Site Data
5. GIS Portable File

Appendix #1

Watershed Prioritization Meeting
Summary

When: July 31, 2001

Where: Tipton County Foundation Center

Participants:

George Tebbe-	SWCD Supervisor
Kurt Fettig-	SWCD Supervisor
Judy Baird-	SWCD Staff
Gail Peas-	IDNR
Luther Cline-	Tipton County Surveyor
Nolan Pyke-	Tipton County Health Department
Keith Shoettmer-	Citizen at Large
Mark Raver-	First National Bank

Facilitator: Randy Jones

Purpose:

Choose four 14-digit watersheds in Tipton County in which to conduct comprehensive watershed management planning.

Criteria:

Two watersheds must lie in the Wildcat Creek 8-digit watershed, and two watersheds must lie in the Upper White River 8-digit watershed.

Method:

Systematically discuss the 29 14-digit watersheds that are fully or partly contained within Tipton County and include or exclude based on resource issues identified by the participants. The method relied heavily on knowledge of local issues and resources by the participants. The list of resource issues or criteria was not prior conceived or limited to allow maximum flexibility and creativity by the participants.

Results:

1. Cicero Creek- Bacon Prairie Creek/Buscher Ditch *(Upper White River)*
   HUC#: 05120201080060
2. Cicero Creek- Buck Creek/Campbell Ditch *(Upper White River)*
   HUC#: 05120201080040
3. Turkey Creek- Askren/Round Prairie Ditch *(Wildcat Creek)*
   HUC#: 05120107010060
4. Mud Creek Headwaters *(Wildcat Creek)*
   HUC#: 05120107010030

14-Digit Name	Included	Reason
Bear Creek- West Fork Bear Creek	No	Small size, small portion within county
Cicero Creek- Bacon Prairie Cr/Buscher Dt	**YES**	Size, canning factory, heterogeneous topography, Town of Hobbs
Cicero Creek- Buck Creek-Campbell Dt	**YES**	Industrial park, housing developments, Buck Creek fish kills, poultry, size
Cicero Cr- Dixon Cr- Crum Dt	No	Few livestock operations, homogenous topography
Cicero Cr- Tobin Dt	No	Small size, small portion within county
Cicero Cr- Weasel Dt	No	Small size, small portion within county
Cox Dt- Chrity/Kingin Dt	No	No towns, few livestock
Duck Cr- Lamberson Dt	No	Small size, small portion within county
Duck Cr- Little Duck Cr	No	Small size, small portion within county
Duck Cr- Polywog Cr	No	More diverse issues in Bacon Prairie Creek, TOUGH DECISION
Duck Cr- Todd Dt	No	Small size, small portion within county
Kilmore Cr- Shanty Cr	No	Small size, small portion within county
Kilmore Cr- Stump Dt	No	Small size, small portion within county
Kokomo Cr- Headwaters	No	Larger portion of watershed out of county, **Good potential for Wildcat Group**
Kokomo Cr- Lower	No	Small size, small portion within county
Little Cicero Cr- Bennett Dt-Taylor Cr	No	Small size, small portion within county
Little Cicero Cr- Teter Br	No	Small size, small portion within county
Little Wildcat Cr- East & West Forks	No	No towns, few livestock
Little Wildcat Cr- Lower	No	Small size, small portion within county
Middle Fork Dt	No	Small size, small portion within county
Mud Cr- Headwater	**YES**	Recent drainage reconstruction, Sharpsville, livestock, HEADWATER
Mud Cr- North Cr	No	No towns
Prairie Cr- Rearce/McKinzie Dt	No	Small size, small portion within county
Sugar Cr- Mallot Dt	No	Not in Wildcat or Upper White river
Swamp Cr	No	Small size, small portion within county
Turkey Cr- Askren/Round Prairie Dt	**YES**	Windfall, livestock, recent drainage maintenance in upper, wooded corridor in lower reach, streambank erosion.
Turkey Cr- Headwaters	No	No towns, few livestock
Wildcat Cr- Honey Cr	No	Small size, small portion within county
Wildcat Cr- Mud Cr-Irwin Cr	No	No towns, most of main stem out of county

NOTE: Bolded watersheds had good merits and passed the initial cut. Discussion focused mainly on subtle differences between these nine watersheds.

Appendix #2

NOMINAL GROUP TALLY SHEET

SOURCE: "A Guide to Watershed Partnerships"

TASK: Identify and rank perceived threats to water quality in the upper Cicero Creek Watershed (Buck Creek and Bacon Prairie Creek sub-watersheds).

Statement	Ranks Assigned	Total Points	Final Ranking
CSO's	5,5,5,5,4,4,4,2	34	1st
Improper septic systems.	4,2,5,2,3,5,5,5	31	2nd
Streambank erosion	3,4,3,5,2,1,2,2,4	26	3rd
Chemicals- surface Ag. runoff	4,2,2,1,4,3,5,2	23	4th
Industrial waste- overflow, NPDES discharges	4,3,3,4,4	18	5th
Spills- accidental, intentional	4,2,3,3,3,2	17	6th
Lack of stormwater retention	1,3,1,1,5,2,1	14	7th
Beaver Dams	5,3	8	8th
Well head protection	3,2,1	6	9th
Livestock runoff	1,1	2	10th
Lack of agency communication	1,1	2	10th
Water resources security	0	0	-
Right-of-way easements	0	0	-

Ranks equal 1-10; 10 being the highest score.

Cargill Water Quality Monitoring Project

Creek Name & No.	Ph Level	Temp.	N2	Un-Ionized Ammonia	Dissolved Oxygen	Free/Total Chlorine	Nitrate Nitrogen	No3	Phosphate	Phosphorous
#6 Dixon										
5-16-99	8.9	80°F	.05 mg/l	27%	20 mg/l	1/0 mg/l	14 mg/l	61.6 mg/l	.26 mg/l	.087 mg/l
2-27-00	7.6	47.5°F	.2 mg/l	1.17%	34 mg/l	.1/.1 mg/l	14 mg/l	61.6 mg/l	.24 mg/l	.08 mg/l
6-24-00	8.4	73°F	.2 mg/l	---	19 mg/l	0/0 mg/l	15 mg/l	54 mg/l	.25 mg/l	.08 mg/l
12-11-00	8.3	34°F	0 mg/l	---	40 mg/l	0/.1 mg/l	9 mg/l	39.6 mg/l	0 mg/l	0 mg/l
4-19-01	8.4	58.1°F	0 mg/l	10%	16 mg/l	0/.1 mg/l	10 mg/l	44 mg/l	0 mg/l	0 mg/l
6-14-01	7.9	86.1°F	0 mg/l	---	19 mg/l	0/0 mg/l	11 mg/l	48.4 mg/l	0 mg/l	0 mg/l
10-10-01	8.0	57°F	0 mg/l	---	8 mg/l	0/0 mg/l	17 mg/l	68 mg/l	0 mg/l	0 mg/l
12-20-01	6.8	61°F	0 mg/l	---	8 mg/l	0/0 mg/l	17 mg/l	75 mg/l	.76 mg/l	.25 mg/l
4-2-02	7.2	57.6°F	---	0 mg/l	11 mg/l	0/0 mg/l	18 mg/l	79.2 mg/l	.1 mg/l	.03 mg/l
6-21-02	7.7	76ºF	0 mg/l	0 mg/l	5 mg/l	0/0 mg/l	12 mg/l	53 mg/l	.06 mg/l	.02 mg/l
#7 Prairie										
5-16-99	8.5	80°F	.05 mg/l	20%	14 mg/L	0 mg/L	11 mg/L	48.4 mg/L	.14 mg/L	.0467 mg/L
2-27-00	7.6	47.5°F	.2 mg/l	1.17%	34 mg/l	.1/.1 mg/l	14 mg/l	61.6 mg/l	.24 mg/l	.08 mg/l
6-24-00	8.4	73°F	.2 mg/l	---	19 mg/l	0/0 mg/l	15 mg/l	54 mg/l	.25 mg/l	.08 mg/l
12-11-00	8.3	34°F	0 mg/l	---	40 mg/l	0/.1 mg/l	9 mg/l	39.6 mg/l	0 mg/l	0 mg/l
4-19-01	8.1	59.2°F	0 mg/l	0%	32 mg/L	0/.1 mg/l	16 mg/l	70.4 mg/l	0 mg/l	0 mg/l
6-14-01	8.1	80°F	0 mg/l	---	17 mg/l	0/0 mg/l	18 mg/l	79.2 mg/l	0 mg/l	0 mg/l
10-10-01	8.0	57°F	0 mg/l	---	8 mg/l	0/0 mg/l	17 mg/l	68 mg/l	0 mg/l	0 mg/l
12-20-01	6.9	63°F	0 mg/l	---	5 mg/l	0/0 mg/l	19 mg/l	84 mg/l	.32 mg/l	.11 mg/l
4-2-02	7.4	58.1°F		0 mg/l	7 mg/l	0/0 mg/l	19 mg/l	83.6 mg/l	.1 mg/l	.03 mg/l
6-21-02	7.5	76ºF	.4 mg/l	.008 mg/l	4 mg/l	0/0 mg/l	13 mg/l	57 mg/l	.94 mg/l	.31 mg/l
#8 Cicero										
5-16-99	8.4	80°F	0 mg/L	14%	20 mg/L	0/0 mg/l	13 mg/l	57.2 mg/l	.36 mg/l	.12 mg/l
2-27-00	7.5	48.9°F	.2 mg/l	1.2%	17 mg/l	0/0 mg/l	16 mg/l	70.4 mg/l	.1 mg/l	.033 mg/l
6-24-00	8.3	75°F	0 mg/l	---	19 mg/l	0/0 mg/l	11 mg/l	46 mg/l	.14 mg/l	.04 mg/l
12-11-00	8.2	34°F	0 mg/l	---	20 mg/l	.4/.2 mg/l	11 mg/l	48.4 mg/l	0 mg/l	0 mg/l
4-19-01	8.1	57°F	0 mg/l	0%	32 mg/l	.1/.1 mg/l	18 mg/l	79.2 mg/l	0 mg/l	0 mg/l
6-14-01	8.0	77.7°F	0 mg/l	---	3 mg/l	0/0 mg/l	14 mg/l	61.6 mg/l	0 mg/l	0 mg/l
10-10-01	7.8	57°F	0 mg/l	---	7 mg/l	0/0 mg/l	17 mg/l	68 mg/l	.1 mg/l	.033 mg/l
12-20-01	6.9	63°F`	0 mg/l	---	8 mg/l	0/0 mg/l	17 mg/l	75 mg/l	.4 mg/l	.13 mg/l
4-2-02	7.4	58.1°F	---	0 mg/l	9 mg/l	0/0 mg/l	20 mg/l	88 mg/l	.14 mg/l	.046 mg/l
6-21-02	7.3	76ºF	.1 mg/l	.0013 mg/l	4 mg/l	0/0 mg/l	11 mg/l	48 mg/l	.18 mg/l	.06 mg/l

Stream Visual Assessment Protocol Worksheet

www.wcc.nrcs.usda.gov/water/quality/frame/wqam/Guidance_Documents/guidance_documents.html

OWNERS NAME: David Gunkel		**DATE:** 3/27/02
EVALUATORS NAME: Randy Jones		**HUC:** 05120201080040
STREAM NAME: Buck Creek		**Sample ID#:** BC1
REACH LOCATION: SW corner of CR 500 W & CR 100 N		
ECOREGION:	**DRAINAGE AREA:** 1,553 acres	**GRADIENT:** <1%
REFERENCE SITE: None		
LAND USE WITHIN DRAINAGE AREA (%)		
ROW CROP: 87%	*HAYLAND:* 1%	*PASTURE:*
FOREST: 7%	*RESIDENTIAL:* 4%	*CFO's:*
CRP: 1%	*INDUSTRIAL:*	*OTHER:*
WEATHER TODAY: Sunny, cold, recent snow on ground.		
WEATHER PAST 2-5 DAYS: Cold, ice, snow, wet.		
ACTIVE CHANNEL WIDTH: 20'		
DOMINANT SUBSTRATE:		
BOULDER:	*GRAVEL:*	*SAND:*
SILT: **X**	*MUD:*	

PARAMETER	SCORE	PARAMETER	SCORE
Channel Condition:	3	Hydrologic Alteration:	3
Riparian Zone:	5	Bank Stability:	3
Water Appearance:	7	Nutrient Enrichment:	4
Barriers to Fish Movement:	5	In-stream Fish Cover:	2
Pools:	1	Invertebrate Habitat:	2
Canopy Cover:	1	Manure Presence:	N/A
Salinity:	N/A	Riffle Embeddedness:	N/A

OVERALL SCORE (Total divided by number scored):	**3.27**

EXCELLENT	>9.0	
GOOD	7.5 – 8.9	
FAIR	6.1 – 7.4	
POOR	<6.0	**X**

SUSPECTED CAUSES OF OBSERVED PROBLEMS:

1. Channelization of watercourse.
2. Steep channel banks w/ remnant spoil piles; no access to floodplain.
3. Lack of structure in substrate, banks, & bottom; homogenous configuration.
4. Full exposure to sunlight warms water temp.; decreases fish community & encourages algal blooms.

RECOMMENDATIONS:

1. Introduce structure to channel at strategic locations.
2. Create riffle/pool complexes.
3. Plant trees/shrubs along bank to provide shade to waterway.
4. Restore access to portion of floodplain area by lowering banks and/or removing spoil piles.
5. Install practices to reduce input of sediment and nutrients to stream.
6. Stabilize eroding banks.

***NOTE:** Not all recommendations may be appropriate for waterway; contingent upon intended waterway uses.

Site Photographs

Stream Visual Assessment Protocol Worksheet

www.wcc.nrcs.usda.gov/water/quality/frame/wqam/Guidance_Documents/guidance_documents.html

OWNERS NAME: Maxine Dovenberger		**DATE:** 3/27/02
EVALUATORS NAME: Randy Jones		**HUC:** 05120201080040
STREAM NAME: Campbell Ditch		**Sample ID#:** BC2
REACH LOCATION: West side of CR 350 W south of Campbell Ditch.		
ECOREGION:	**DRAINAGE AREA:** 2,120 acres	**GRADIENT:** <1%
REFERENCE SITE: None		
LAND USE WITHIN DRAINAGE AREA (%)		
ROW CROP: 80%	*HAYLAND:*	*PASTURE:*
FOREST:	*RESIDENTIAL:* 15%	*CFO's:*
CRP:	*INDUSTRIAL:* 3%	*OTHER:* 2%
WEATHER TODAY: Sunny w/ recent snow on ground.		
WEATHER PAST 2-5 DAYS: Cold, snow, ice, wet.		
ACTIVE CHANNEL WIDTH: 20'		
DOMINANT SUBSTRATE:		
BOULDER:	*GRAVEL:*	*SAND:*
SILT: **x**	*MUD:*	

PARAMETER	SCORE	PARAMETER	SCORE
Channel Condition:	3	Hydrologic Alteration:	3
Riparian Zone:	6	Bank Stability:	3
Water Appearance:	3	Nutrient Enrichment:	3
Barriers to Fish Movement:	5	In-stream Fish Cover:	2
Pools:	1	Invertebrate Habitat:	2
Canopy Cover:	1	Manure Presence:	N/A
Salinity:	N/A	Riffle Embeddedness:	N/A

OVERALL SCORE (Total divided by number scored):	**2.90**

EXCELLENT	>9.0	
GOOD	7.5 – 8.9	
FAIR	6.1 – 7.4	
POOR	<6.0	**X**

SUSPECTED CAUSES OF OBSERVED PROBLEMS:

5. Channelization of watercourse.
6. Steep channel banks w/ remnant spoil piles; no access to floodplain.
7. Lack of structure in substrate, banks, & bottom; homogenous configuration.
8. Full exposure to sunlight warms water temp.; decreases fish community & encourages algal blooms.

RECOMMENDATIONS:

7. Introduce structure to channel at strategic locations.
8. Create riffle/pool complexes.
9. Plant trees/shrubs along banks to provide shade to waterway.
10. Restore access to portion of floodplain area by lowering banks and/or removing spoil piles.
11. Install practices to reduce input of sediment and nutrients to streams.
12. Stabilize eroding banks.

***NOTE:** Not all recommendations may be appropriate for waterway; contingent upon intended waterway uses.

Site Photographs

Stream Visual Assessment Protocol Worksheet

www.wcc.nrcs.usda.gov/water/quality/frame/wqam/Guidance_Documents/guidance_documents.html

OWNERS NAME: Phillip Overdorf		**DATE:** 3/27/02
EVALUATORS NAME: Randy Jones		**HUC:** 05120201080040
STREAM NAME: Garhart Drain		**Sample ID#:** BC3
REACH LOCATION: CR 400 S ¼ mile west of CR 300 W; south side.		
ECOREGION:	**DRAINAGE AREA:** 828 acres	**GRADIENT:** <1%
REFERENCE SITE: None		
LAND USE WITHIN DRAINAGE AREA (%)		
ROW CROP: 93%	*HAYLAND:*	*PASTURE:*
FOREST:	*RESIDENTIAL:* 2%	*CFO's:* 5%
CRP:	*INDUSTRIAL:*	*OTHER:*
WEATHER TODAY: Sunny, recent snow on ground.		
WEATHER PAST 2-5 DAYS: Cold, snow, ice, wet.		
ACTIVE CHANNEL WIDTH: 18'		
DOMINANT SUBSTRATE:		
BOULDER:	*GRAVEL:*	*SAND:*
SILT: **X**	*MUD:*	

PARAMETER	SCORE	PARAMETER	SCORE
Channel Condition:	3	Hydrologic Alteration:	3
Riparian Zone:	8	Bank Stability:	4
Water Appearance:	6	Nutrient Enrichment:	5
Barriers to Fish Movement:	5	In-stream Fish Cover:	2
Pools:	1	Invertebrate Habitat:	2
Canopy Cover:	1	Manure Presence:	N/A
Salinity:	N/A	Riffle Embeddedness:	N/A

OVERALL SCORE (Total divided by number scored):	**3.64**

EXCELLENT	>9.0	
GOOD	7.5 – 8.9	
FAIR	6.1 – 7.4	
POOR	<6.0	**X**

SUSPECTED CAUSES OF OBSERVED PROBLEMS:

9. Channelization of watercourse.
10. Steep channel banks w/ remnant spoil piles; no access to floodplain.
11. Lack of structure in substrate, banks, & bottom; homogenous configuration.
12. Full exposure to sunlight warms water temp.; decreases fish community & encourages algal blooms.

RECOMMENDATIONS:

13. Introduce structure to channel at strategic locations.
14. Create riffle/pool complexes.
15. Plant trees/shrubs along banks to provide shade to waterway.
16. Restore access to portion of floodplain area by lowering banks and/or removing spoil piles.
17. Plant grass strips adjacent to channel to reduce sediment and nutrient input to stream.
18. Stabilize eroding banks.

***NOTE:** Not all recommendations may be appropriate for waterway; contingent upon intended waterway uses.

Site Photographs

Stream Visual Assessment Protocol Worksheet

www.wcc.nrcs.usda.gov/water/quality/frame/wqam/Guidance_Documents/guidance_documents.html

OWNERS NAME: Walter Schulenburg		**DATE:** 4/10/02
EVALUATORS NAME: Randy Jones		**HUC:** 05120201080040
STREAM NAME: Cicero Creek		**Sample ID#:** BC4
REACH LOCATION: CR 300 S @ Cicero Creek; NW side		
ECOREGION:	**DRAINAGE AREA:** 1,770 acres*	**GRADIENT:** 1%
REFERENCE SITE: None		
LAND USE WITHIN DRAINAGE AREA (%)		
ROW CROP: 89%	*HAYLAND:*	*PASTURE:*
FOREST: 5%	*RESIDENTIAL:* 3%	*CFO's:* 2%
CRP: 1%	*INDUSTRIAL:*	*OTHER:*
WEATHER TODAY:		
WEATHER PAST 2-5 DAYS:		
ACTIVE CHANNEL WIDTH: 45'		
DOMINANT SUBSTRATE:		
BOULDER:	*GRAVEL:*	*SAND:* **X**
SILT: **X**	*MUD:*	

*** within the Buck Creek 14 digit HUC**

PARAMETER	SCORE	PARAMETER	SCORE
Channel Condition:	3	Hydrologic Alteration:	6
Riparian Zone:	2	Bank Stability:	5
Water Appearance:	7	Nutrient Enrichment:	7
Barriers to Fish Movement:	5	In-stream Fish Cover:	3
Pools:	3	Invertebrate Habitat:	3
Canopy Cover:	1	Manure Presence:	0
Salinity:	0	Riffle Embededness:	0

OVERALL SCORE (Total divided by number scored):	**4.09**

EXCELLENT	>9.0	
GOOD	7.5 – 8.9	
FAIR	6.1 – 7.4	
POOR	<6.0	**X**

Note: Gabion baskets installed on approx. 150' of west bank.

SUSPECTED CAUSES OF OBSERVED PROBLEMS:

13. Channelization of watercourse.
14. Steep channel banks w/ remnant spoil piles; no access to floodplain.
15. Lack of structure in substrate, banks, & bottom; homogenous configuration.
16. Full exposure to sunlight warms water temp.; decreases fish community & encourages algal blooms.

RECOMMENDATIONS:

19. Introduce structure to channel at strategic locations.
20. Create riffle/pool complexes.
21. Plant trees/shrubs along banks to provide shade to waterway.
22. Restore access to portion of floodplain area by lowering banks and/or removing spoil piles.
23. Install practices to reduce sediment and nutrient inputs to stream.

***NOTE:** Not all recommendations may be appropriate for waterway; contingent upon intended waterway uses.

Site Photographs

Stream Visual Assessment Protocol Worksheet

www.wcc.nrcs.usda.gov/water/quality/frame/wqam/Guidance_Documents/guidance_documents.html

OWNERS NAME: Tipton County, c/o Steve Raver- City Park Board		**DATE:** 5/15/02
EVALUATORS NAME: Randy Jones		**HUC:** 05120201080040
STREAM NAME: Campbell Ditch		**Sample ID#:** BC5
REACH LOCATION: South side of CR 200 S just west of CR 200 W.		
ECOREGION: ---	**DRAINAGE AREA:** 3,088 acres	**GRADIENT:** 1%
REFERENCE SITE: None		
LAND USE WITHIN DRAINAGE AREA (%)		
ROW CROP: 91%	*HAYLAND:* 1%	*PASTURE:*
FOREST: 2%	*RESIDENTIAL:* 5%	*CFO's:*
CRP: 1%	*INDUSTRIAL:*	*OTHER:*
WEATHER TODAY: Sunny, warm		
WEATHER PAST 2-5 DAYS: Rainy		
ACTIVE CHANNEL WIDTH: 20'		
DOMINANT SUBSTRATE:		
BOULDER:	*GRAVEL:*	*SAND:*
SILT: **X**	*MUD:*	

PARAMETER	SCORE	PARAMETER	SCORE
Channel Condition:	3	Hydrologic Alteration:	4
Riparian Zone:	6	Bank Stability:	3
Water Appearance:	5	Nutrient Enrichment:	4
Barriers to Fish Movement:	5	In-stream Fish Cover:	3
Pools:	3	Invertebrate Habitat:	3
Canopy Cover:	3	Manure Presence:	N/A
Salinity:	N/A	Riffle Embeddedness:	N/A

OVERALL SCORE (Total divided by number scored):	**3.63**

EXCELLENT	>9.0	
GOOD	7.5 – 8.9	
FAIR	6.1 – 7.4	
POOR	<6.0	**X**

SUSPECTED CAUSES OF OBSERVED PROBLEMS:

17. Channelization of watercourse.
18. Steep channel banks w/ remnant spoil piles; no access to floodplain.
19. Lack of structure in substrate, banks, & bottom; homogenous configuration.
20. Exposure to sunlight warms water temp.; decreases fish community & encourage algal blooms.
21. Possible runoff of pollutants from adjacent roadway.

RECOMMENDATIONS:

24. Introduce structure to channel at strategic locations.
25. Create riffle/pool complexes.
26. Install practices to reduce inputs of sediment and nutrients to stream.
27. Restore access to portion of floodplain area by lowering banks and/or removing spoil piles.
28. Stabilize eroding banks.

***NOTE:** Not all recommendations may be appropriate for waterway; contingent upon intended waterway uses.

Site Photographs

Stream Visual Assessment Protocol Worksheet

www.wcc.nrcs.usda.gov/water/quality/frame/wqam/Guidance_Documents/guidance_documents.html

OWNERS NAME: Geneva Grishaw (Contact: Richard- son)		**DATE:** 3/27/02
EVALUATORS NAME: Randy Jones		**HUC:** 05120201080040
STREAM NAME: Buck Creek		**Sample ID#:** BC6
REACH LOCATION: NW corner of Division & 250 W.		
ECOREGION:	**DRAINAGE AREA:** 3,375 acres	**GRADIENT:** <1%
REFERENCE SITE: None		
LAND USE WITHIN DRAINAGE AREA (%)		
ROW CROP: 93%	*HAYLAND:* 1%	*PASTURE:*
FOREST: 2%	*RESIDENTIAL:* 3%	*CFO's:*
CRP: 1%	*INDUSTRIAL:*	*OTHER:*
WEATHER TODAY: Sunny, recent snow on ground.		
WEATHER PAST 2-5 DAYS: Cold, snow, ice, wet.		
ACTIVE CHANNEL WIDTH: 25'		
DOMINANT SUBSTRATE:		
BOULDER:	*GRAVEL:*	*SAND:*
SILT: **X**	*MUD:*	

PARAMETER	SCORE	PARAMETER	SCORE
Channel Condition:	2	Hydrologic Alteration:	2
Riparian Zone:	1	Bank Stability:	3
Water Appearance:	6	Nutrient Enrichment:	4
Barriers to Fish Movement:	5	In-stream Fish Cover:	3
Pools:	1	Invertebrate Habitat:	3
Canopy Cover:	1	Manure Presence:	N/A
Salinity:	N/A	Riffle Embeddedness:	N/A

OVERALL SCORE (Total divided by number scored):	**2.81**

EXCELLENT	>9.0	
GOOD	7.5 – 8.9	
FAIR	6.1 – 7.4	
POOR	<6.0	**X**

SUSPECTED CAUSES OF OBSERVED PROBLEMS:

22. Channelization of watercourse.
23. Steep channel banks w/ remnant spoil piles; no access to floodplain.
24. Lack of structure in substrate, banks, & bottom; homogenous configuration.
25. Full exposure to sunlight warms water temp.; decreases fish community & encourages algal blooms.

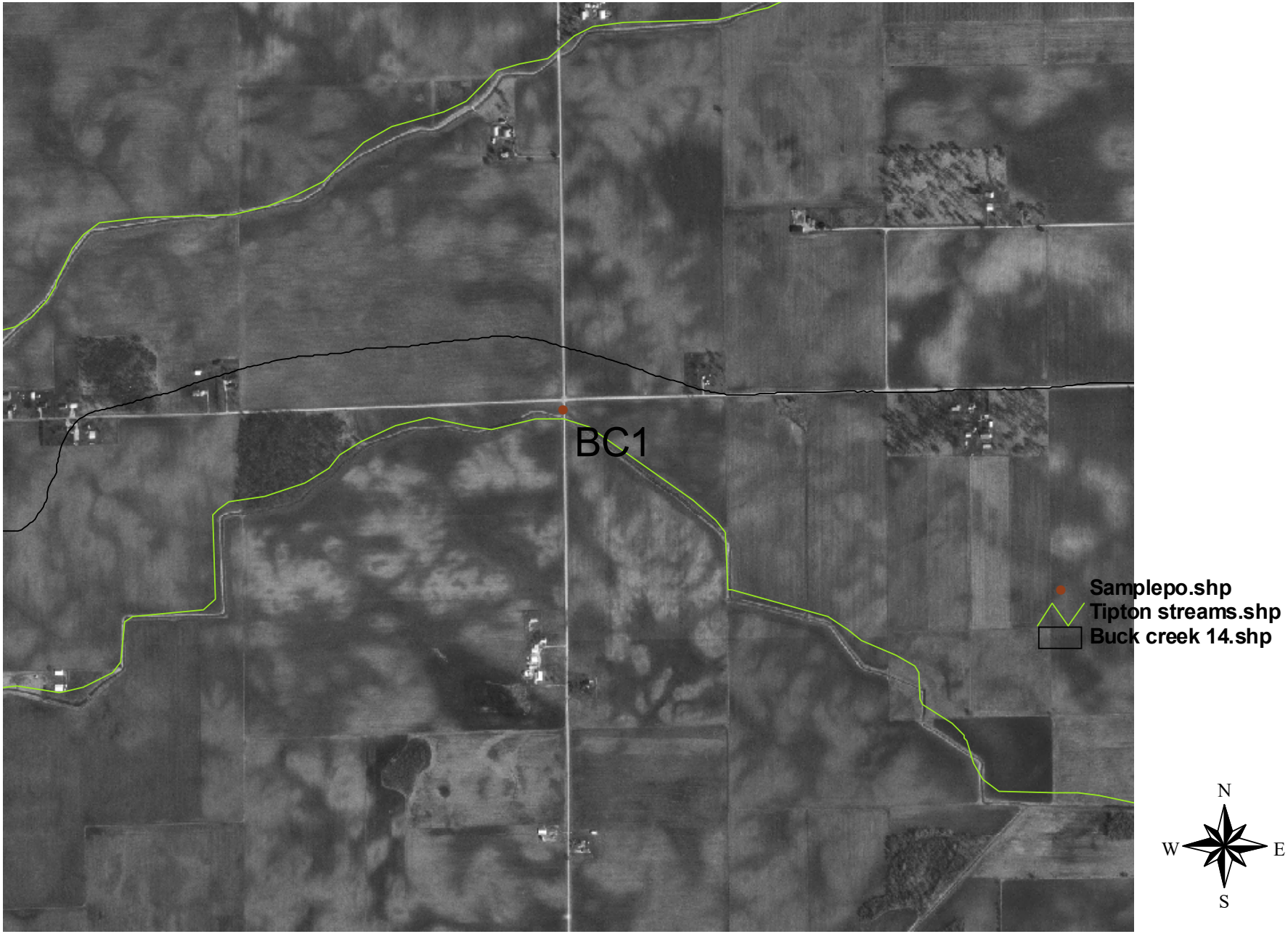
RECOMMENDATIONS:

29. Introduce structure to channel at strategic locations.
30. Create riffle/pool complexes.
31. Plant trees/shrubs along banks to provide shade to waterway.
32. Restore access to portion of floodplain area by lowering banks and/or removing spoil piles.
33. Plant grass strips adjacent to channel to reduce sediment and nutrient inputs to stream.
34. Stabilize eroding banks.

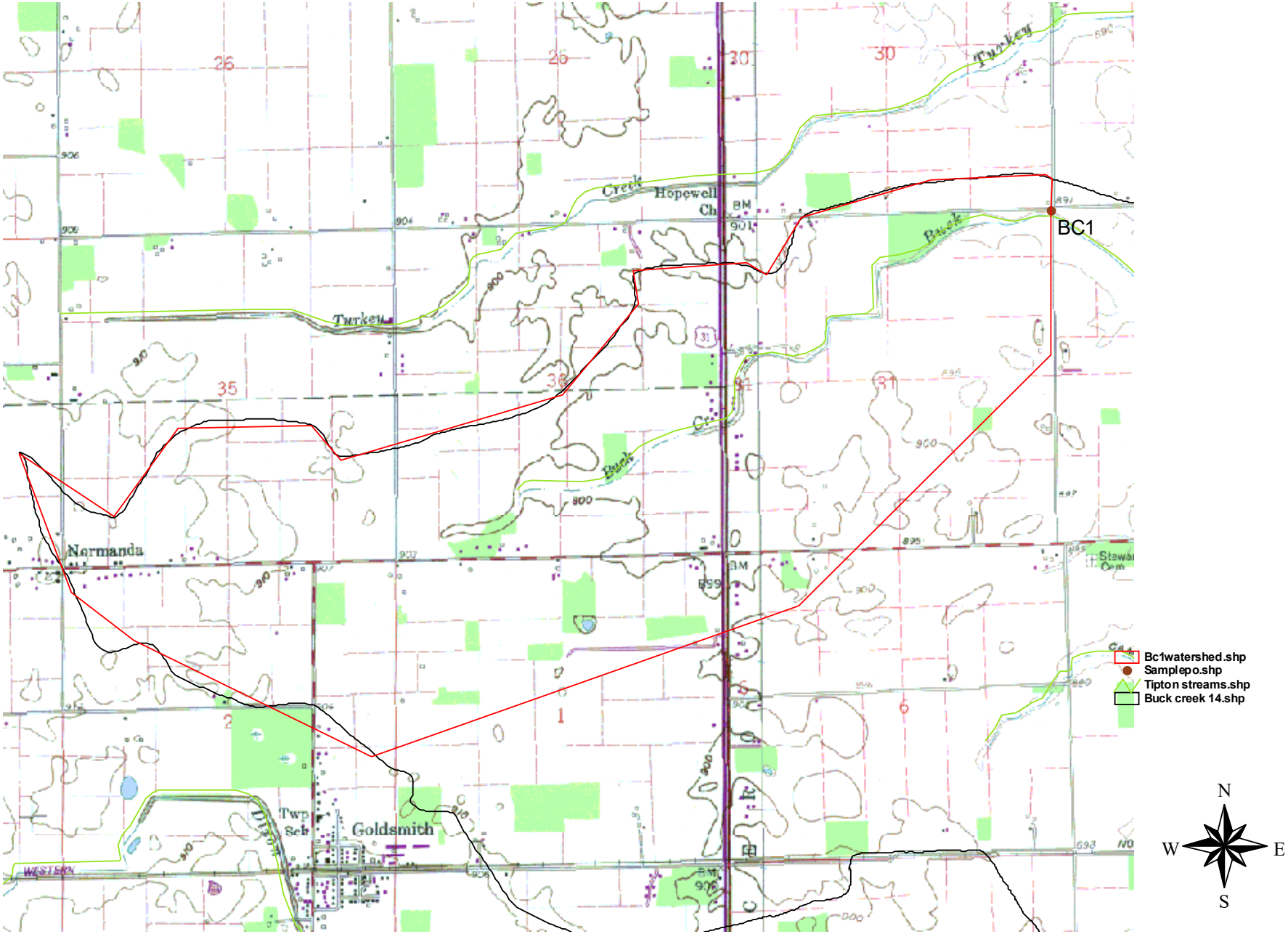
***NOTE:** Not all recommendations may be appropriate for waterway; contingent upon intended waterway uses.

Site Photographs

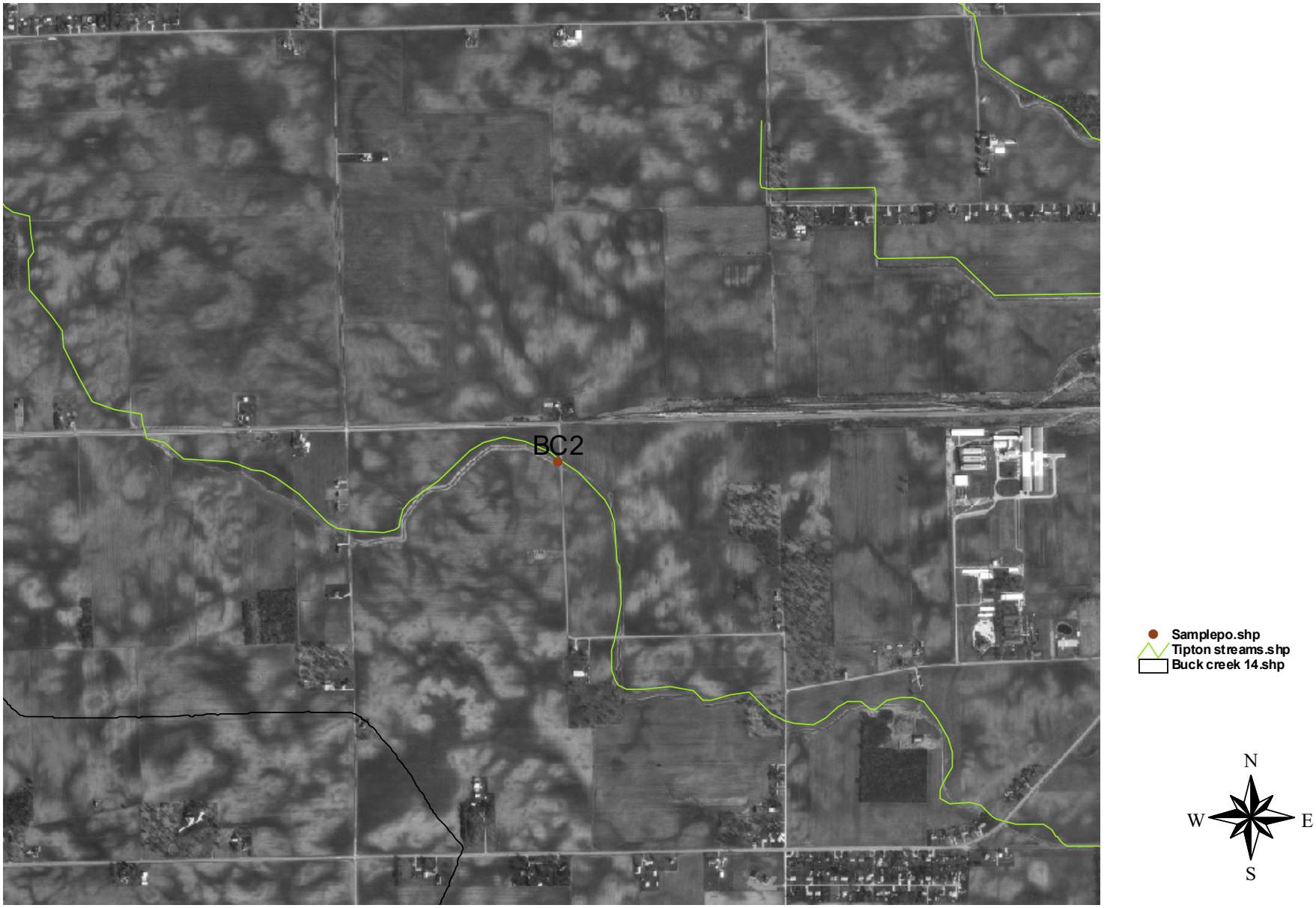
Site BC 1 Aerial Map



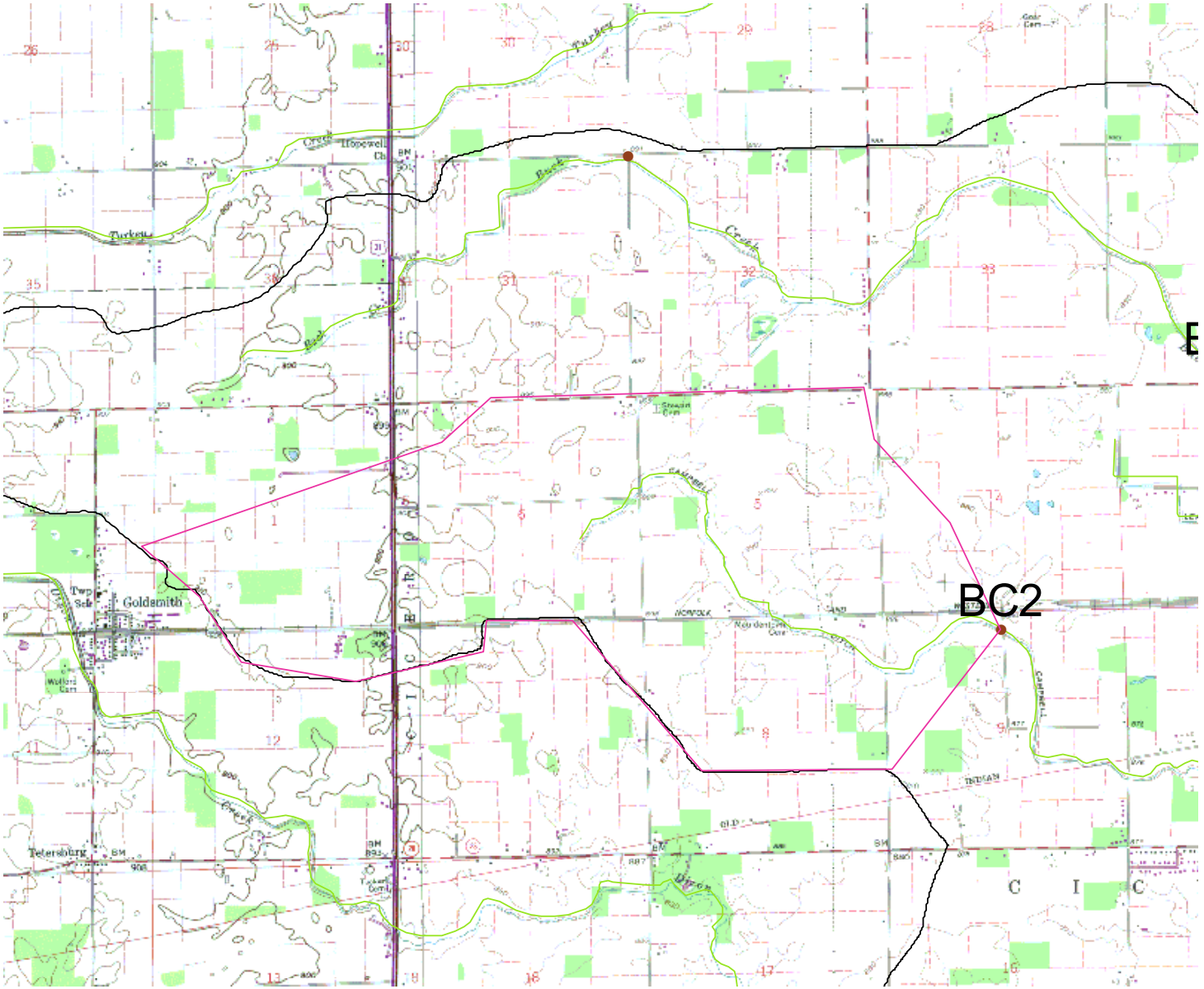
Site BC 1 Drainage Area



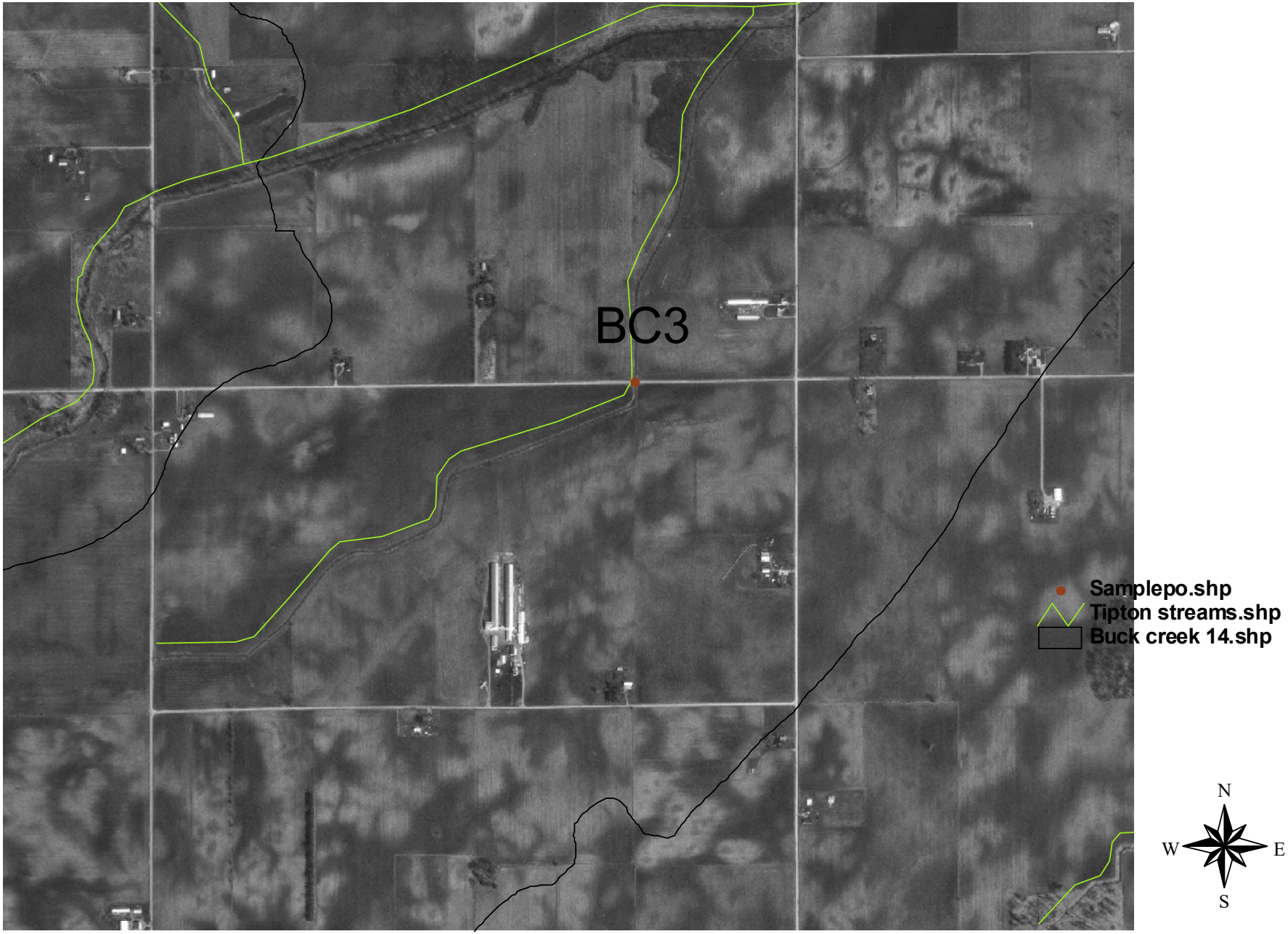
Site BC 2 Aerial Map



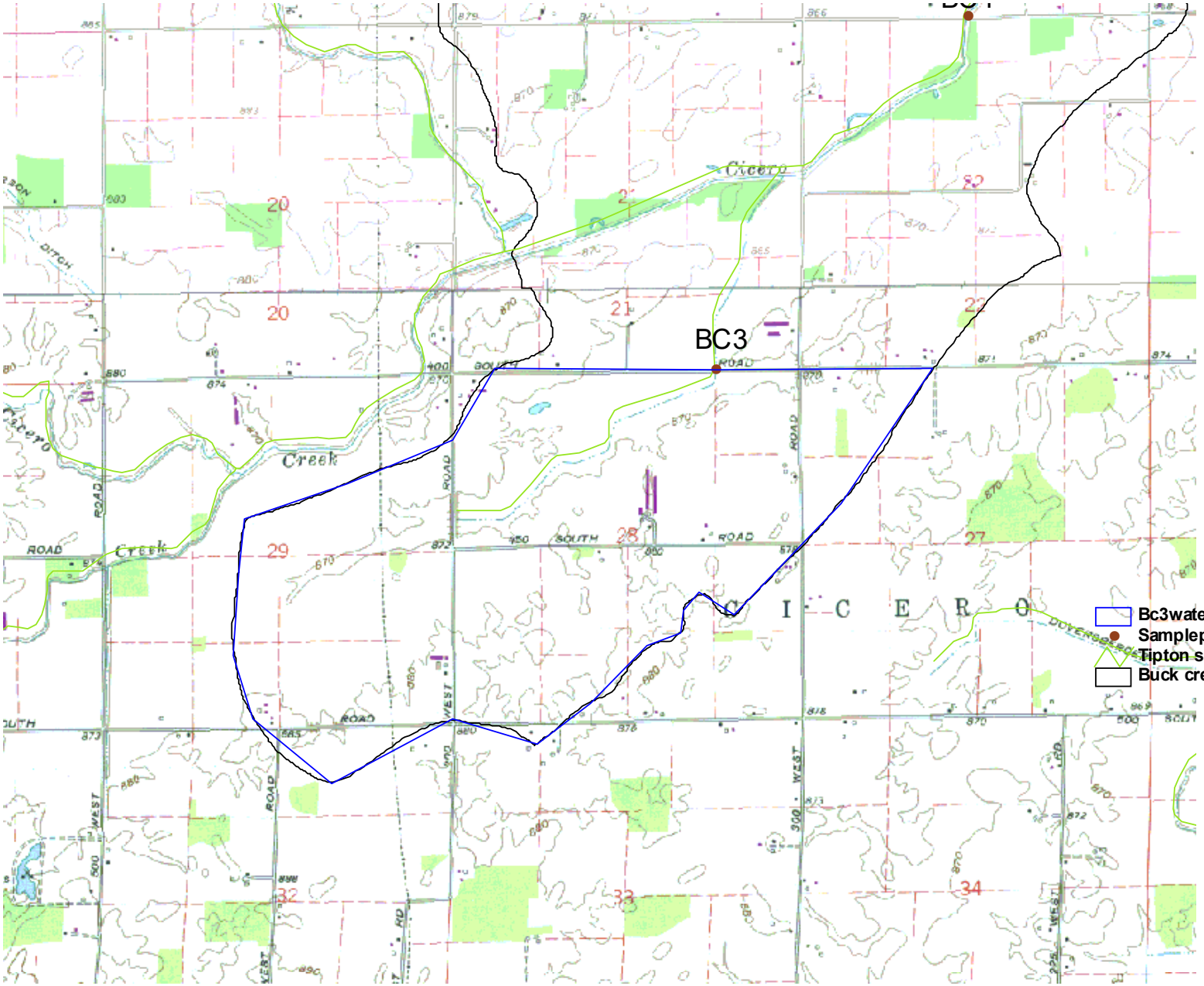
Site BC 2 Drainage Area



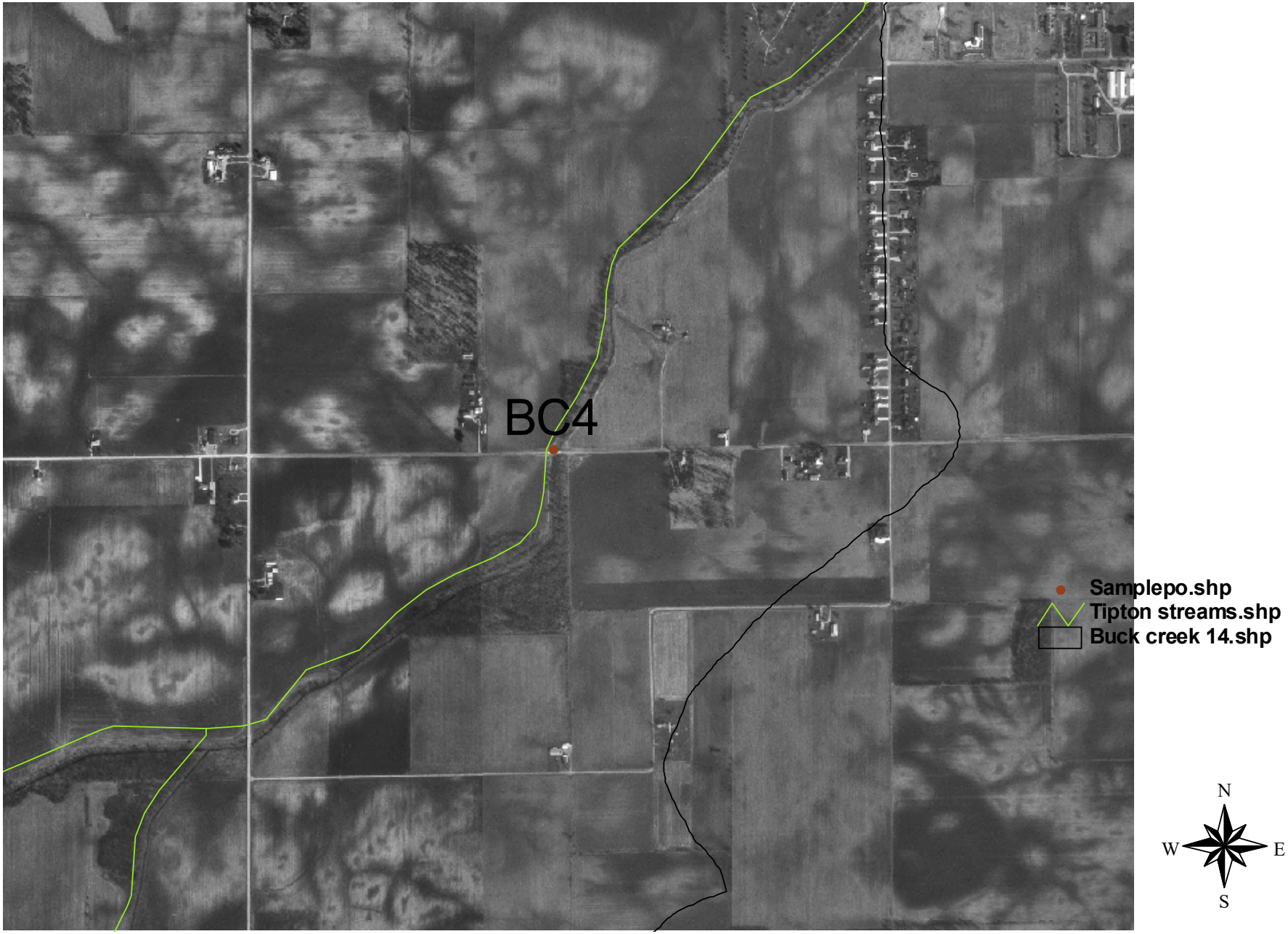
Site BC 3 Aerial Map



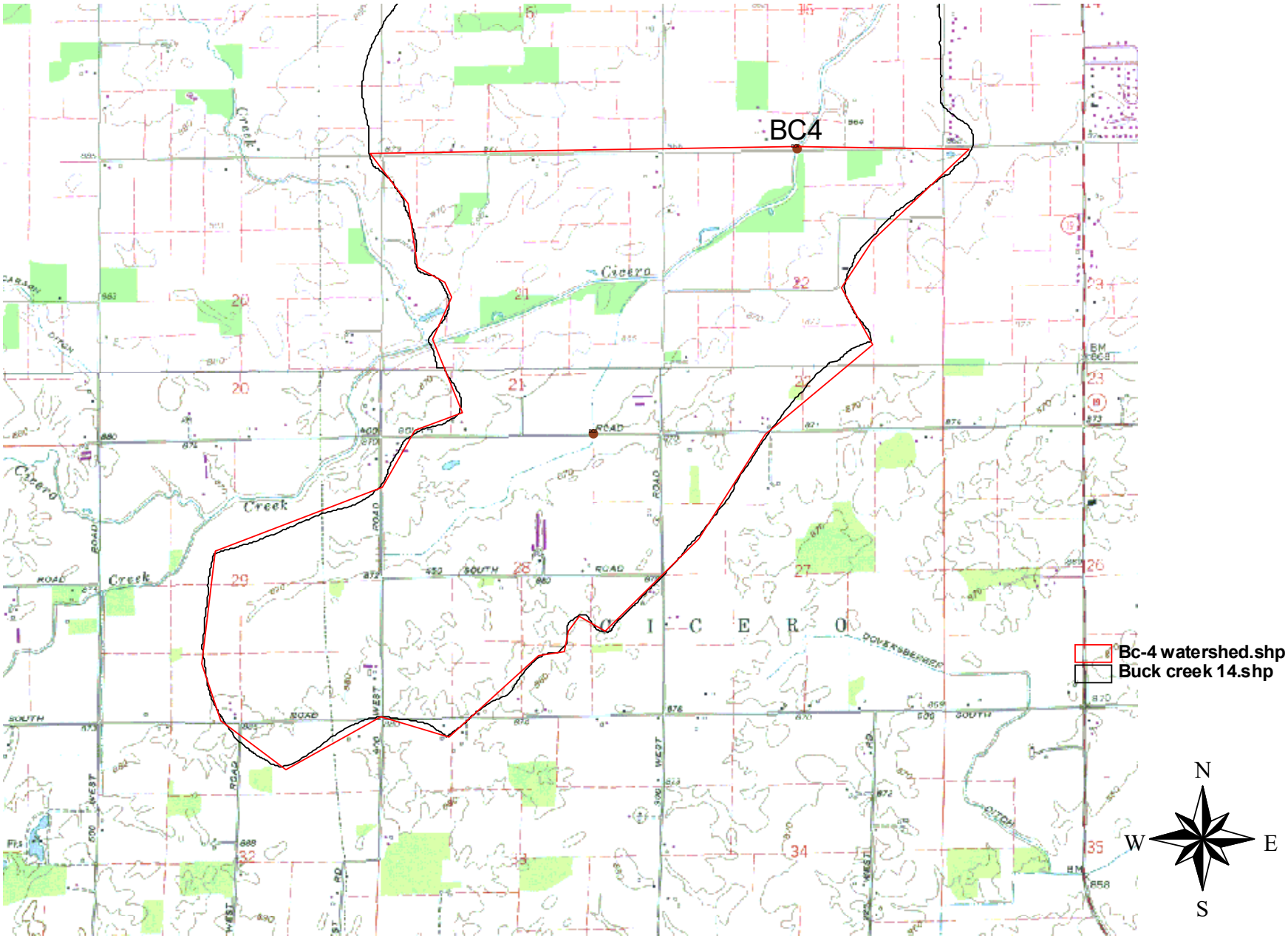
Site BC 3 Drainage Area



Site BC 4 Aerial Map

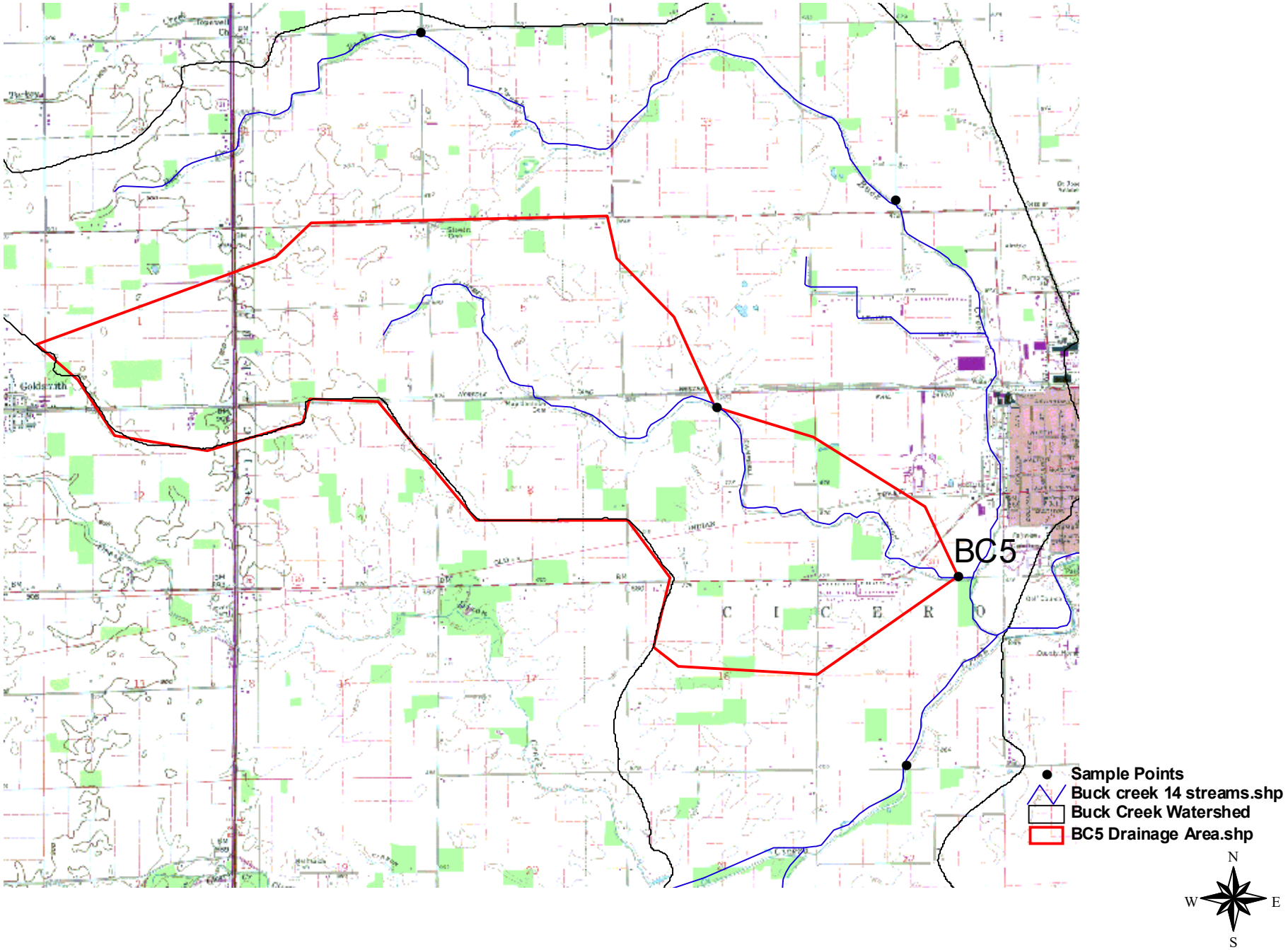


Site BC 4 Drainage Area

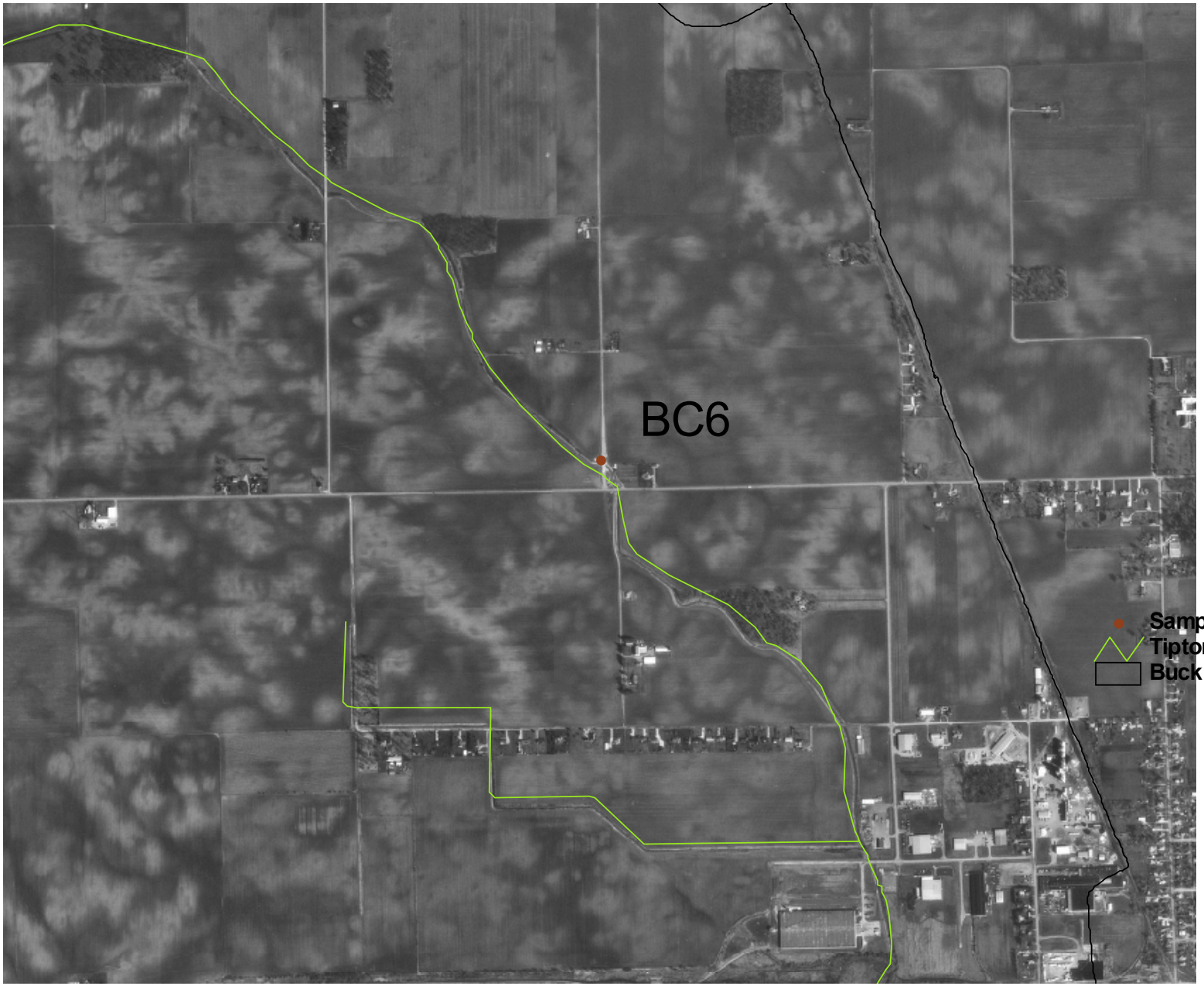


BC 5 Aerial Map

Sample Point BC5 Drainage Area



Site BC 6 Aerial Map



Site BC 6 Drainage Area