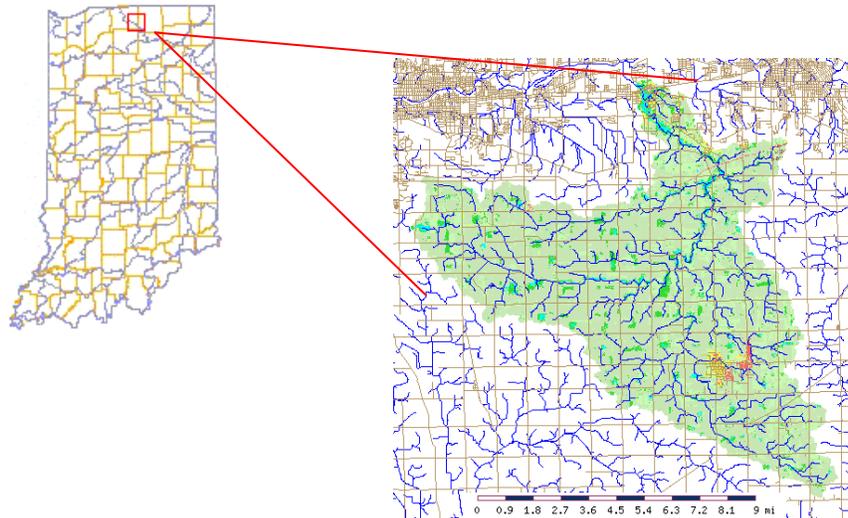


# Baugo Creek Watershed Management

## *Plan—I Baugo Creek/Wisler Ditch Sub-watershed*

St. Joseph and Elkhart Counties, Indiana



June 2004

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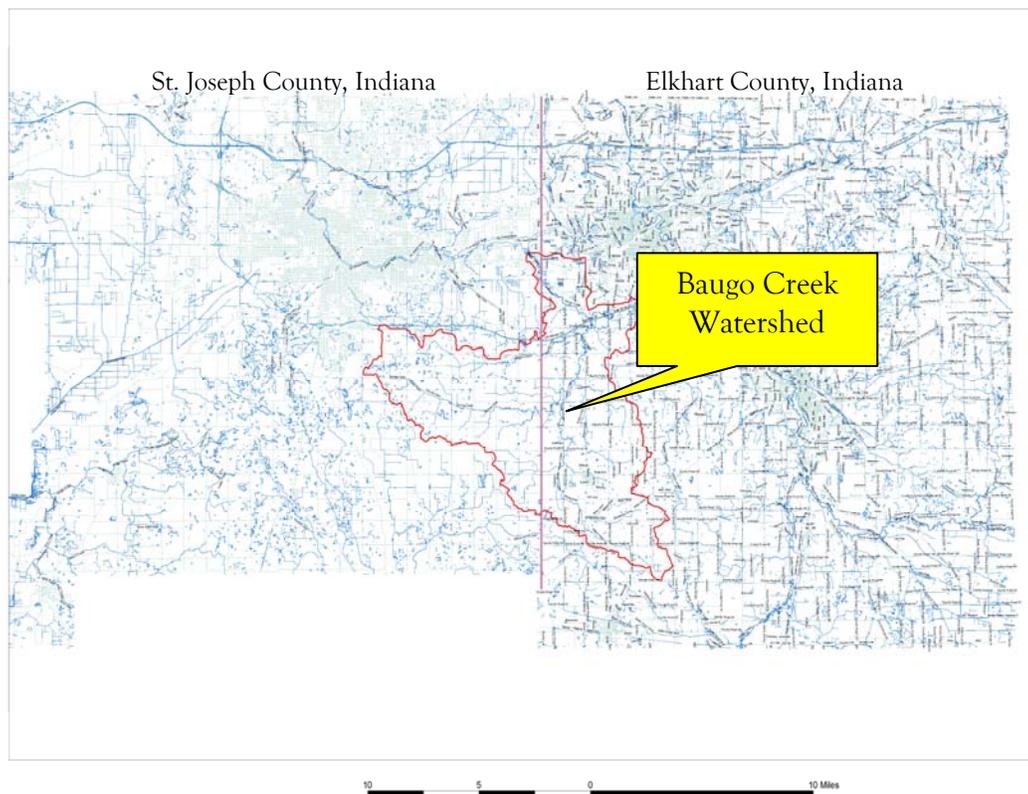
# Baugo Creek Watershed Management Plan

## Mission:

To improve the overall water quality in the Baugo Creek Watershed through reduction of *Escherichia coli*, with an ultimate goal of reducing the discharge of *E. coli* entering the St. Joseph River.

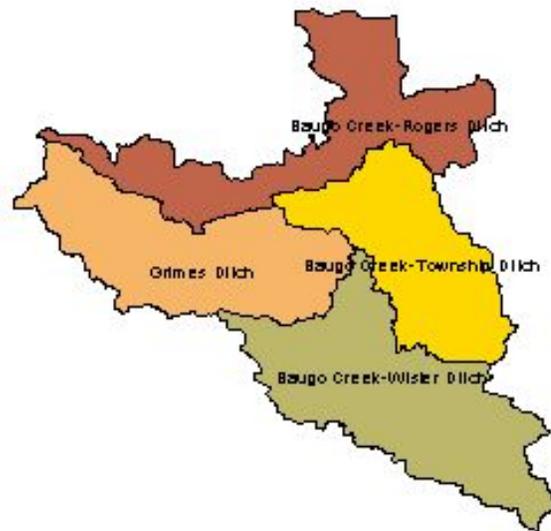
## INTRODUCTION

The Baugo Creek Watershed is in the St. Joseph River Basin—Lake Michigan Basin. North centrally located in Indiana, it encompasses 49,581 acres—57.7 percent in Elkhart County and 42.3 percent in St. Joseph County.



The entire watershed is composed of four sub-watersheds including:

Baugo Creek-Rogers Ditch (HUC: 04050001230040);  
Grimes Ditch (HUC: 0405000123020);  
Baugo Creek-Wisler Ditch (HUC: 04050001230010);  
Baugo Creek-Olive Township Ditch (HUC: 04050001230030).



In reviewing available water quality data, it is evident that Baugo Creek and its tributary system have had a history of water quality issues. As early as 1977, the MACOG 208 Water Quality final report indicated that “In addition, the following observations are made regarding water quality data ... Fecal coliform water quality violations in Baugo Creek The study further documented Baugo Creek’s historic contamination with bacteria, when it compared fecal coliform in the St. Joseph River and Baugo Creek. The report noted a wet weather sample in the St. Joseph River violating the fecal coliform standard with its recorded value of 500-600 per 100 ml, whereas a violation of 3000 per 100 ml was observed in Baugo Creek.

The St. Joseph River Basin Commission conducted a “snapshot” analysis of the St. Joseph River Basin in 1990. Baugo Creek and its major tributaries Grimes and Rogers ditches were included in the sampling regime. Bacterial evaluation was not conducted during this sampling scheme. Of the 20 sites evaluated for nitrates in 1990, Grimes at 9.6 mg/L, Rogers Ditch at 8.5 mg/L and Baugo Creek at 5.8 mg/L, ranked the highest detected levels. A surface water standard

for nitrates does not exist, although it is considered a contaminant. Reference to the 10-mg/L drinking water standard is often made. Nitrate contamination is associated with fertilizers as well as manure and domestic sewage.

Water quality concerns in the Baugo Creek Watershed have further been chronicled in the Indiana 305b Report, 1986-87, 1988-89 and 1994-95. Each report identifies specifically Baugo Creek as having coliform contamination.

The Indiana one-time standard for *Escherichia coli* is 235 colonies per 100 milliliters. The geometric mean standard is 125 colonies per 100 milliliters. *E. coli* is in the intestinal tract of warm-blooded animals and as such is an indicator organism for the presence of sewage or manure contamination. These standards are based on 327 IAC 2-1.5-8(e)(2) for fullbody contact recreational use during the recreation season, April 1 through October 31. The rule states:

*2. E. coli bacteria, using membrane filter (MF) count, shall not exceed one hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period nor exceed two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period*

The Indiana Department of Environmental Management (IDEM) conducted a St. Joseph River Basin-wide assessment in 2000. The Baugo Creek Watershed was included in the sampling scheme. The Baugo Creek geometric mean for *E. coli* was 1,919 colonies per 100 milliliters. As a result of this analysis, Baugo Creek has remained on Indiana's 303b list of impaired waters, and is scheduled for the eventual development of a Total Maximum Daily Load (TMDL) in the future. A TMDL represents the total maximum load of a substance that can be assimilated by the waterbody and still achieve the water quality standard.

During the 2000 assessment, IDEM also assessed the River Basin for other water quality parameters. Wisler Ditch, a tributary of Baugo Creek, showed significantly high levels of nitrates.

The 2002 Indiana Integrated Water Quality Monitoring and Assessment Report categorized Baugo Creek and its tributaries as "non-support" for Primary contact (recreation) and identified Pathogens as a "high" stressor. Baugo Creek and its tributaries was included in the

report *Final 2002 List of Impaired Waters Under Section 303d of the CWA*, published in the Indiana Register, Volume 27, Number 4, January 1, 2004 (pg. 1402). *E. coli* was listed as the impairment and a TMDL associated with this impairment is scheduled for development in 2010-2015.

*Appendix "B"* contains a chart of historic water quality data from the Baugo Creek Watershed.

To address the *E. coli* impairment in Baugo Creek, the Michiana Area Council of Governments obtained a Section 205j Clean Water Act grant. This Management Plan represents one element of that grant.

## THE BAUGO CREEK TASK FORCE

The Baugo Creek Task Force was organized to provide information about the Watershed, as well as guidance in development of the Plan. Through a series of several public meetings, the stakeholders were provided findings of the watershed stream-crossing evaluations, and were provided preliminary goals for discussion and further modification. In all, eight meetings were held. Correspondences in the form of emails, along with ongoing sharing of drafts of the document were shared with participants along with solicitation for feedback. Notices of Task Force meetings were sent to five newspapers, providing additional opportunity for input from interested citizens on the development of the Management Plan.

Finally, Plan development and identification of information related to water quality issues in the Baugo Creek Watershed were presented and discussed with the Steering Committee developed for the St. Joseph River W.I.S.E. (Watershed Initiative for a Safe Environment) Section 205j grant and the Elkhart County Commissioners Section 319 Grant Project.

Initial membership in the Task Force was developed through several sources representing different interests.

Indiana Act 1913, c. 165 allowed for the establishment of “ditch associations” and several of the tributaries within the Baugo Creek Watershed have such associations established to maintain the tributaries of Baugo Creek. The Michiana Area Council of Governments (MACOG) staff solicited membership in the Task Force through these associations, as well as through a broad solicitation announcement in local newspapers. Furthermore, participation in the Task Force was sought from the Baugo Community School Corporation and the Jimtown Historical Society, since both are in the Watershed. Participation from the County Drainage Boards in both Elkhart and St. Joseph counties, and the County Health departments in both counties was also requested.

Those solicited for inclusion in the group represented a number of stakeholder interests. First the ditch associations assess funds and hold the responsibility to maintain their own ditches. As such, they are the front-line in determining how a particular waterbody will be used and preserved or maintained.

The County Drainage Boards were invited to participate, since by authority of IC 36-9-27, they hold the responsibility to improve drainage in the county and maintain regulated drains within the county.

General citizenry were asked to participate, since they represent various stakeholder interests in the watershed—environmental, agricultural, historic preservation, industrial/commercial, etc. Similarly the Baugo Community School Corporation was invited to participate, since they hold property in the watershed, and also operate a wastewater disposal system discharging to Baugo Creek.

The County Health Departments were invited to participate; since Baugo Creek is listed on Indiana’s 303d impaired waters list for *E. coli* and local health departments have an authority to investigate potential surface water pollution.

APPENDIX “A” lists all those invited to participate in the Task Force or those expressing an interest in being included in the planning process.

## DESCRIBING THE WATERSHED

### **Physical Setting~**

The Baugo Creek Watershed is predominantly agricultural in landuse, with increasing transition to commercial and residential. The City of Elkhart is north of the Watershed and is serviced by municipal sewer, which discharges to the St. Joseph River. Sewer has been extended south, outside the City limits to portions of Baugo Township, which has served as a component to the accelerated landuse changes.

The Town of Wakarusa is in the southern portion of the Watershed, in Elkhart County. Wakarusa is patchworked with residential, commercial and industrial, as well as agricultural landuses. Wakarusa is serviced by municipal sewer, which consists of a lagoon treatment system (five lagoons in succession) discharging into Wisler Ditch, just south of the Wisler/Baugo Creek transition (West side of C.R. 1, ½ mile North of C.R. 40). The Town also has six permitted combined sewer overflows with consistent overflow only from one at the Remington Court lift station on Werntz Ditch, a tributary of Baugo Creek.

In St. Joseph County, the City of Mishawaka is located north of the watershed and a portion of the Town of Osceola is located in the watershed. The remaining portion of the watershed is unincorporated and serviced by on-site wastewater disposal systems. Landuse in the unincorporated areas is a combination of commercial, residential, industrial and agricultural

The mainstem of Baugo Creek begins on the Westside of C.R. 1,0.50 mile north of C.R. 40 in Elkhart County. It discharges into the St. Joseph River north of Ferretti-Baugo County Park at Baugo Bay. The Watershed consists of a number of tributaries that discharge into Baugo Creek, including:

Discharging from west to east—south to north:

- Wisler Ditch
- BillmanDitch
- Grimes Ditch
- Barkey Ditch
- Rogers Ditch

Discharging from east to west—south to north:

- Miller Ditch
- Doering Ditch
- Davidhiser Ditch
- Werntz Ditch
- Nunemaker to Olive Township Ditch

### Geology and climate-

Glacial lobes impacted the region from the northeast—Lake Erie and Saginaw Basins—and the northwest from the Lake Michigan Basin approximately 1 million years ago. Glacial activity has resulted in various geologic deposits as well as varying ranges of topography from level plains to steep slopes.

Specific climate information is not available for the Baugo Creek Watershed. However, regional climate can be classified as “temperate continental” (Water Resource Availability in the St. Joseph River Basin, Indiana). Annual temperatures average 49 degrees F, with annual precipitation averaging 35 inches.

### Endangered Species—

Indiana Department of Natural Resources and the U.S. Fish and Wildlife Service received a request from the MACOG staff to identify endangered species in the Watershed. The U.S. Fish and Wildlife Service has indicated that the federally endangered Indiana bat (*Myotis sodalist*) the federally threatened Bald Eagle (*Haliaeetus leucocephalus*) and the federal endangered candidate Eastern Massasauga (*Sistrurus catenatus catenatus*) are within the range of the Baugo Creek Watershed. However, they indicate that no surveys have been completed in this area to confirm their presence.

The Indiana Natural Heritage Data Center managed by the Indiana Department of Natural Resources lists several endangered, threatened and rare species and high quality natural communities in the Baugo Creek Watershed. They also caution that their information is based on individual observations and that no specific surveys have been conducted to confirm this data. These species include: Wet-Mesic Floodplain forest (*Forest-Floodplain Wet-Mesic*), Goose-foot corn-salad (*Valerianella chenopodiifolia*), the Great Blue Heron (*Ardea herodias*), Mesic Upland Forest (*Forest-Upland Mesic*), Herb-Robert (*Geranium Robertianum*) and Tall Millet-grass (*Milium Effusum*).

Reed Canary Grass was the most observed vegetation along the waterways in the Baugo Creek Watershed. Common Nettles, Yarrow, and Thistle and Arrowhead were also identified.

### **Soils-**

Soil Surveys for Elkhart and St. Joseph counties were reviewed, along with observations made while conducting stream-crossing assessments. Soils in the northern region of the watershed are coarser in nature, representing the Oshtemo-Fox associations—well drained underlain with sands and gravelly sands. Whereas soils in the southern two-thirds of the Watershed represent Crosier-Brookston-Milford association—poorly drained and underlain with till plains and lake plains, and Riddles-Miami-Crosier association—fine textured, well to poorly drained underlain with till plains. Extensive field tiling has been installed in those parts of the Watershed where seasonal high watertables and ponding are soil characteristics. Tiling lowers the seasonal high watertable, allowing access to fields for cropping.

Primary crops in the watershed consist of corn and soybeans.

### **Landuse—**

As described above, landuse in the Watershed is primarily agricultural. Population centers include the Town of Wakarusa, and the southern portion of the City of Elkhart. A cluster of residential development is located in the Jimtown area in Baugo Township. It is within this area of the watershed—east of S.R. 19 and south of C.R. 24—that Hubbard Hill, a residential retirement home is also located.

Commercial development and light industrial development is also present in the southern portion of the Elkhart Area and on the eastern and southern perimeter of Wakarusa.

A portion of one of the largest railroad switching yards in the Midwest—the Norfolk Southern Elkhart Yard (Formerly the Robert Young Railyards)—is located in the watershed. This area has been designated as a U.S. Environmental Protection Area Superfund site.

Ferretti-Baugo Creek County Park is a 214-acre recreation area that is located adjacent to the discharge point of Baugo Creek into the St. Joseph River in Osceola. The Jimtown Historical Museum is located in the Baugo Township portion of the watershed, and efforts are underway to restore the property that surrounds the building and abuts Baugo Creek.

Three discharge permits (National Pollution Discharge Elimination System permits) have been issued by the Indiana Department of Environmental Management for facilities discharging to Baugo Creek and tributaries. They include the Town of Wakarusa, Jimtown Elementary and High School, and the Elkhart County Landfill (stormwater only).

The primary source of water for consumption, as well as commercial and industrial uses is groundwater. The upper portion of the Watershed is included in the U.S. Environmental Sole Source Aquifer designation for the St. Joseph Valley Aquifer system.

Two main transportation corridors dominate the watershed. S.R. 19 in Elkhart County, runs close to the eastern border of the watershed. This north/south roadway serves as the corridor between the City of Elkhart and the Wakarusa/Nappanee area. Over the past two years the roadway has been improved which included conversion of the gravel/soil shoulders to asphalt. Future plans for the corridor include development of a 4-lane facility the entire length of the corridor. Runoff from the improved roadway is still handled by existing roadside ditches with eventual discharge to various laterals of the Baugo Creek system or infiltration.

The U.S. 20 By-pass (“St. Joseph Valley Parkway/Dean Mock Expressway”) runs along the northerly portion of the watershed and bisects a portion of the Baugo Creek Watershed. The By-pass is four lanes with concrete shoulders. It begins on the west side of St. Joseph County and carries traffic through the watershed ending outside the watershed, just east of C.R. 17 in Elkhart County. Stormwater runoff from the U.S. 20 By-Pass is carried through roadside ditches encased by limestone riprap. Check dams within the ditches funnel stormwater/snow melt from the highway to various waterways along the By-Pass system, including a direct discharge to Baugo Creek in Elkhart County.

Historically there have been incidents of property loss and damage due to severe flooding within the watershed.

### **Maintenance and Reconstruction History-**

A “clearing and snagging” project along Baugo Creek was begun in 1987-88 which initiated Baugo Creek as a “regulated drain.” The project was conducted by the Indiana Department of Natural Resources (Project No. E6-030). The project began at the mouth of Baugo Creek and extended approximately 11.5 miles to C.R. 32 in Elkhart County.

A similar, more extensive project started in 1998 (Phase I). Tasks included removal of logjams, cabling logs to banks and removal of sediment deposits. The project was managed by a Joint Baugo Creek Drainage Board and took nearly five years to complete. As an extension of that project and to reduce sediment transport further down the stream, reducing overall maintenance on the waterway, four 300 feet by 2 feet sediment traps were installed. These traps are maintained by the Elkhart County Drainage Board.

In 2001 a petition was received for reconstruction of the Olive Township Ditch in one portion as part of the overall brushing project that was completed from S.R. 19 to Baugo Creek. The reconstruction project lasted from 2001-2002.

## BENCHMARKS

Two initial meetings were conducted at the beginning of the grant period to solicit concerns of the stakeholders in the Baugo Creek Watershed. The primary complaint among Watershed stakeholders is sedimentation resulting in periodic flooding. Residents talk of shallow ditches, covered drainage tiles and small-island deposits of sediment throughout the watershed and the transport of logs and other debris into the Baugo Bay area. Little concern was expressed that the *E. coli* levels were above State standards, since most people attending the meetings have the perception that no one swims or fishes in the Watershed, despite the Creek running right through a County Park.

A windshield survey was completed in the watershed. Evaluation points included stream-crossing inventories at locations where the road crossed any part of the waterway or the waterway ran along the road. Each site was visually evaluated for the following general categories of:

- Overall visual water quality – presences of water, color , sedimented, odor.
- Condition of streambanks – eroded, vegetated, presence of stream buffers.
- Condition of streambottom – imbedded gravel, silt and sediment, overgrown, logjams
- Surrounding land uses

An evaluation form was completed for each site and the location was GPSed (global positioning system). In all 144 sites were evaluated. Following the suggestion of the Baugo Creek Task Force participants, the MACOG staff did not complete assessments of every stream-crossing site in the watershed, but concentrated on completing those in the Baugo Creek-Wisler Ditch sub-watershed.

The following conditions were identified:

- Gray/black water color and odor was detected at 5 sites
- Banks were eroded and sloughing throughout watershed system
- Stream buffers between landuses and roads are rarely present
- Approximately 5 percent of sites are overgrown restricting flow
- Silt and sediment deposits present throughout watershed
- Logjams detected at six locations
- Discharge pipes present at approximately 30 percent sites—representing field tiles, suspicious discharges, sump drainage
- Crops are planted to bank top
- Animal access or impact to waterways at approximately 10 percent of sites evaluated

## WATER QUALITY DATA

Water quality sampling was not included as a part of this grant activity. Water quality sampling results obtained from Elkhart County as part of its Section 319 grant and the City of Elkhart as part of their Section #205j grant were shared among all three grant participants.

As stated previously, the Indiana water quality standard for *E. coli* is 235 colonies per 100 milliliters. *E. coli* is the indicator organism for potential contamination of surface water with either sewage or manure.

Elkhart County completed a Section #319 grant, which included *E. coli* analysis in the Baugo Creek Watershed. Analysis of water samples revealed levels of *E. coli* ranging from dry weather sampling of 800 colonies per 100 ml to wet weather sampling of 56,000 colonies per 100 ml.

The City of Elkhart conducted water quality analysis in the Baugo Creek watershed as part of a Section #205j grant. Sample results ranged from 520 colonies per 100 ml to 3,400 colonies per 100 ml.

The Town of Wakarusa conducted a stream characterization of the Wertz Ditch as part of their Combined Sewer Overflow permit strategy. During the evaluation of Wertz Ditch, 45 discharge pipes were sampled for *E.coli*, with results ranging from <1 colony per 100 ml to 14,100 colonies per 100 ml.

A request was made to the St. Joseph County Health Department to conduct *E. coli* analysis on Barkey Ditch based on visual evidence of contamination. Two samples conducted revealed dry weather levels of *E. coli* at 9,300 and 20,000 colonies per 100 ml.

*Appendix "B"* contains a chart of any historic water quality data from the Baugo Creek Watershed that the MACOG staff could locate.

## IDENTIFYING PROBLEM CAUSES AND STRESSORS

Based on visual observations (Appendix “C”), in addition to historic water quality analysis and that completed as part of the City of Elkhart Section 205j grant and the Elkhart County Commissioners’ Section 319 grant, the following problems and stressors were identified:

- **Presence of *E. coli* in the watershed at levels above Indiana Water Quality Standards.**

As stated above, the grant did not include any water quality sampling within its project. However, based on water quality assessments conducted by the Indiana Department of Environmental Management, the Elkhart and St. Joseph County Health Departments, the Town of Wakarusa, and the Elkhart County Commissioners, levels of *E. coli* ranged from less than one colony per 100 milliliters of water sampled to 56,000 colonies. The Indiana Water Quality Standard for *E. coli* is 235 colonies.

- **Illicit discharges**

Draining pipes, where the source is unknown, are referred to as “illicit discharges”. Observations during the stream crossing evaluations indicated the presence of various sized pipes with substances other than stormwater or groundwater discharging. As an example, at one site toilet paper was hanging from the end of the pipe. At another site, the discharge had a fabric-softener smell. At more than one site, the water prior to the discharge was of a different color and consistency compared to the discharge liquid and waterway after the discharge point.

The stream characterization conducted by the Town of Wakarusa identified 99 pipes of unknown origin, with 45 discharging liquid containing various levels of *E. coli*.

- **Inadequate manure management, livestock access to waterways, livestock presence or pastured near waterways**

Visual presence of manure or agricultural runoff funneled through field tiles were observed at four sites. Livestock were also observed pastured near waterways where no buffers were present to filter runoff or where no fencing existed allowing free access to the waterways.

- **Limited use of filter strips or buffers**

Of all the sites evaluated 54 had no filter strips or buffers to filter runoff or collect sediments, pesticides or fertilizers prior to the runoff entering the neighboring waterbodies.

- **Instability of banks**

Soils in the northern portion of the Watershed characteristically have higher potential for erosion and sloughing. Evidence of erosion is present even in locations surrounded by forested land.

In addition, in some areas the banks have steep slopes, which further reduces the stability of the overall waterway.



Erosion of banks associated with natural meander of Baugo Creek

- **Sediment transport through system; Sediment deposition and flow restriction**

One of the leading concerns citizens expressed about the Watershed was sediment coming through the system depositing and causing flow restrictions or depositing at the discharge of Baugo Creek into the St. Joseph River.



Baugo Creek at the Lincolnway East Bridge after a 2.5-inch rain

- **Increased water entering system**

As roads are improved—widened; pavement improvement—the potential for increased runoff is evident. Research has proven that increases in hard surfaces in the watershed, reduce water quality. As an example, observations along S.R. 19 where improvements have occurred, uncovered no improvements to the current roadside ditches that will carry the water eventually to Baugo Creek.

## IDENTIFYING SOURCES

It should be emphasized that the source information listed only represents those activities visible from the stream-crossing windshield survey, along with data associated with historic landuse information and information obtained from other studies.

### ELEVATED *Escherichia coli*:

- Illicit discharges
  - 24 of 45 discharging pipes identified during the Wakarusa Stream Characterization evaluation of Wertz Ditch had *E. coli* levels above the Indiana Water Quality Standard
  - Nearly 33 percent of sites evaluated had corrugated field tiling ; various sized PVC piping; metal corrugated piping all with unknown sources—some with suspicious discharges
- Combined sewer overflows
  - The Town of Wakarusa has identified at least one combined sewer overflow that consistently discharges during rain events (Remington Court)
- Registered Confined Feedlots
  - Two operations are within close proximity to identified high levels of *E.coli*
- Access or impact to waterways by livestock in 10 percent of locations evaluated.

### SOIL EROSION AND BANK INSTABILITY

- Farming operations—cropping—is conducted adjacent to banks. Visual evidence of crop rows right at bank top
- No filter strips
- Banks are not planted with deep-rooted vegetation—most observations include seasonal weeds, reed canary grass or no vegetation. Deep-rooted species were not observed.
- Access of farm animals to waterways
- Culvert sizing and placement
- Pipe outlets without riprap or other energy absorbing materials at discharge point
- Increased discharge of stormwater due to land conversion

## IDENTIFYING CRITICAL AREAS

After much discussion, the Baugo Creek Task Force decided in the final stages of review of a first draft of the Watershed Management Plan, that a Management Plan for the entire watershed was too much to consider with the remaining time and the resources available. Although water quality sampling conducted by various sources identified high levels of *E.coli*, the Task Force could not come to a consensus that the *E.coli* was associated with specific land uses in the vicinity of the sampling.

The Task Force concluded that the next step in the Management Plan process was to focus on one sub-watershed of Baugo Creek and agreed that future activities in the watershed should include conducting a more extensive water quality evaluation, narrowing down the potential sources of *E. coli* influence.

To that extent, Baugo Creek-Wisler Ditch Sub-Watershed was chosen. This portion of the watershed is the headwaters of the overall watershed. In preliminary evaluations and discussions with the stakeholders there are several stressors and impairments present:

- Illicit discharges. The Town of Wakarusa has identified 99 tiles or pipes that enter the Wertz Ditch which discharges to the Wisler Ditch. A one-time sampling identified 24 sites over the *E. coli* standard. In all 45 tiles were discharging at the time of the Wakarusa study ranging in *E. coli* levels of <1 to 14,100 colonies per 100 ml. Source of the pipes and continual discharges have not been identified to date.



Discharge pipe with unknown source to Wertz Ditch

- Identification of other illicit discharges in the Baugo-Wisler Ditch Watershed. 14 of 34 sites within the sub-watershed inventory had tiles noted. Once again it is important to note that the observations were made at stream-crossings and may not represent all discharges to the neighboring waterbodies.



Tile from sheep pasture area



Field tiling along newly constructed ditch

Historically, soil types and landuse dictate where some tiling may be installed specifically for lowering seasonal high water tables or discharges from sump-drains associated with building footing drains. Tiling in itself does not result in elevated levels of *E. coli*. However, it may serve as a conduit in areas where manure is applied or connections are made to onsite wastewater systems. Further water quality analysis, may link potential sources of *E. coli* with some of these discharges.

- Livestock access to the neighboring waterway, discharge of livestock operations wastes or livestock fenced to top of banks. There was at least one large livestock operation observed on the west side of Wakarusa where livestock had access to the waterway. Several smaller operations in the overall watershed were also observed. Three other operations observed had livestock fenced to the top of the bank, with no filter strips or buffers to control runoff.



Livestock prints in ditch going through pasture



Discharge pipe from barnyard area

Additionally, tiling in at least three locations in the sub-watershed were discharging material other than groundwater.

- Combined Sewer Overflows and illicit discharges. The Town of Wakarusa has six combined sewer overflows that discharge to Wertz Ditch eventually discharging to the Wisler Ditch. Only one consistently discharges, and the Town has currently submitted its Long Term Control Plan (June 2004) to the Indiana Department of Environmental Management.



Combined Sewer Overflow

- Bank erosion and lack of stream buffers. Erosion was observed at seventeen stream-crossing sites evaluated in the Wisler Ditch portion of the Watershed. Erosion in a portion of the watershed is a function of steep banks and soils in some portion of this watershed. As a result complete elimination of erosion may not be possible. Stabilization and decreased deterioration through buffering may reduce increased breakdown of banks, since actual rehabilitation or restoration is difficult.



Sloughing banks

- The Wakarusa Wastewater Treatment Facility. The discharge from the wastewater treatment plant is located at Wisler Ditch just prior to its entry into Baugo Creek. There is a perception among stakeholders that this is the major source of *E. coli* into the Baugo Creek Watershed is the wastewater treatment discharge. Discharges of algae, which dissipate within 50 feet of the discharge pipe adds to the perception. The treatment plant maintains sampling records, including *E. coli* discharge records., and currently operates under an National Pollution Discharge Elimination Permit (NPDES) under the jurisdiction of the Indiana Department of Environmental Management.

## SETTING GOALS AND SELECTING INDICATORS

### **1. Identify sources contributing to illicit discharge pipes noted in the Wakarusa Stream Characterization**

99 pipes of unknown sources that enter the Werntz Ditch and hold the potential to discharge to the Baugo-Wisler Watershed have been identified by the Town of Wakarusa during their stream characterization evaluation. All discharging pipes have been tested at least once and 24 sites have had levels of *E. coli* above the Indiana standard of 235 colonies per 100 ml.

#### ACTION ITEM:

- Focus investigation of discharging pipe sources
- Conduct *E. coli* sampling at those sites where source clearly indicates direct discharge of either manure or sewage
- Seek to gain voluntary elimination of those sources

GOAL: Seek to eliminate at least 5 sites each year for the next 5 years of those sites currently identified as contributing *E. coli* limits above the Indiana Standard.

Re-test other known pipes that may be discharging.

INDICATOR: Physical elimination of the 24 known sites over the next 5 years that are recorded to exceed current Indiana water quality standards of *E. coli*.

### **2. Analyze discharges entering waterways that have not been analyzed previously or during current inventory activities**

#### ACTION ITEM:

- Conduct water quality analysis on those discharging pipes identified during the MACOG inventory
- Divide the Baugo Creek-Wisler Ditch Watershed into smaller reaches, and conduct at least a wet and dry water quality analysis for *E. coli* in each reach, evaluating at least one reach each year for the next 3 years
- Narrow the scope of identifying potential sources, based on the level of *E. coli* identified within that reach
- Development of baseline *E. coli* data for this portion of the Watershed

GOAL: Elimination of potential sources of contamination entering the waterways from tiles or pipe discharges within this portion of the watershed

INDICATOR: Elimination of potential discharge sources within the reach of the watershed within five years.

Lowered levels of *E. coli* within this reach of the watershed.

### 3. Reduction of incidence of Combined Sewer Overflows by the Town of Wakarusa

ACTION ITEM:

- Annually review by the Baugo Creek Task Force the number of overflow events and the levels of *E. coli* that are discharging during these events.
- Evaluate reports completed by the Town of Wakarusa regarding the progress of meeting their Combined Sewer Overflow Long Range Plan

GOAL: Reduce the number of overflow events that occur from the remaining 5 Combined Sewer Overflows

INDICATOR: Elimination of Combined Sewer Overflow sources.  
Reduced number of overflow events from existing structures.

### 4. Reduce the introduction of livestock wastes into neighboring waterbodies

ACTION ITEM:

- Conduct information session within Watershed for Producers related to the proper storage, management and disposal of manure by the end of 2005.
- Maintain communication between the County Drainage Board Staff and the County Health Department staff to report incidence of agricultural runoff or intentional discharges
- Update producers of potential sources of technical and financial assistance in development of livestock management

GOAL: Reduce the discharge of manure and milk parlor wastes into the Baugo Creek-Wisler Ditch Watershed from intentional connection to field tiles or through improper application of these materials to fields resulting in runoff to neighboring waterbodies.

Eliminate illegal discharge pipes to neighboring waterways.

INDICATOR: Attendance by at least 10 percent of producers in the Watershed to the Information Session.

Reduced incidence of discharges to the Waterways as a result of improper application of agricultural wastes.

ACTION ITEM:

- Provide producers identified during the initial Watershed evaluation with information regarding options to control access of livestock entering waterways within the next six months.
- Identify other areas outside the stream-crossing viewing distance where livestock have access
- Make referrals when possible to the Soil and Water Conservation Districts for additional assistance with the distribution of technical and financial assistance for livestock controls—fencing, alternative watering operations, etc.

GOAL:

- Obtain a cooperative agreement with at least one producer each year to eliminate livestock from access to neighboring waterway
- Reduce the impacts of bank deterioration from livestock.

INDICATOR:

- Elimination of livestock from the waterway from at least one producer, through the use of fencing and buffering by the end of 2005.
- Elimination of livestock from waterways from at least one producer in subsequent years
- Inventory (database) of other producers in the Watershed who will need assistance in completing practices
- Records of referrals made to the Soil and Water Conservation Districts

**5. Seek producer to provide demonstration of practices that eliminate livestock from waterways, develop buffer strips and protect waterway banks.**

ACTION :

- Obtain funds to pay for a demonstration conservation and water protection project within the watershed
- Install best management practices related to restricting livestock from waterways, buffering areas holding livestock and installation of riparian buffers
- Conduct a field day upon completion of the project

GOAL : Bringing the practices to the watershed and allowing the producer an opportunity to share their experiences about the practices will serve as a forum to encourage others to use similar practices.

INDICATOR: Successfully obtaining funding either through a partnership of agencies or through grant opportunities and completing the project within the Baugo Creek-Wisler Ditch Watershed.

**6. Develop strategy that encourages landowners to install riparian filter strips.**

**ACTION:**

- Conduct meetings in the watershed on the economic and environmental benefits riparian buffers
- Conduct sign-up sessions within the watershed to make it convenient for landowners to participate in cost-share programs that focus on conservation practices

**GOAL:**

- Attendance of property owners to a workshop
- Sign up of at least one property owner per year into the cost-share programs that include installation of buffers

**INDICATOR:**

- Attendance of at 10 property owners in sub-watershed at workshop
- Completion of at least one project each year for the next five years

**7. Work with the St. Joseph and Elkhart County Surveyors to formalize a Baugo Creek Task Force as an Advisory Committee to the Drainage Boards and as an avenue of communication to the Private Ditch Associations.**

**ACTION:**

- Identify potential membership
- Invite members and conduct first meeting
- Elect Chairperson
- Identify overall role of the Task Force
- Prioritize stated Goals of Plan
- Conduct annual meeting, review goal achievement, Re-prioritize Goals as needed; Develop new goals as needed

**GOAL:** Develop a formal means of reviewing the Baugo Creek Watershed Management Plan and insuring that the goals identified in the Plan are met.

**INDICATOR:** Participation in organizational meeting by all invited members.

One potential stressor to the watershed has not been addressed in this Plan—increased stormwater runoff associated with increased development or landuse conversion in the overall watershed. Two factors may influence increased development in the watershed—extension of municipal water and sewer from Elkhart south, into the watershed

and the current evaluation of the Elkhart County Commissioners to develop a countywide sewer system.

Increased volume and accompanying velocity of water entering any system, increases the potential breakdown of banks and decreases water quality as a result of elevated water energy. Bank erosion surrounding drainage pipes without protective aprons are evident in several locations in the Watershed. Regulations related to stormwater management and erosion control—Phase II-MS4 (‘municipal separate stormwater sewer systems’), Indiana “Rule 5” and Indiana Rule “13”~ may aid in the control of the amount of runoff entering Baugo Creek and its tributaries. However, this issue should be evaluated in the future.

The goals and action item table is located in Appendix “D”

## CHOOSING MEASURES TO APPLY

1. **With the assistance of the Elkhart County Drainage Board, the County Health Department and other appropriate agencies or individuals, identify the sources of discharge pipes to Werntz Ditch.**
  - Work with source and the Town of Wakarusa to connect to the municipal sewer system if source is domestic sewage
  - Work with the source and the Elkhart County Soil and Water Conservation District and the Purdue Extension Service to develop a manure management plan and install best management practices if the source is agricultural

TIMEFRAME: Begin process in January 2005—Complete within three years

**WITH NO ACTION:** Current records indicate the discharge of *E. coli* into the Werntz Ditch from several pipes with unknown sources. If sources are not identified, and the discharges eliminated, the discharge of *E. coli* at limits above the State standard will continue. Since this Ditch runs through residential properties, the potential for human contact with the contaminated water is evident.

2. **Explore funding for St. Joseph and Elkhart County Health Departments to develop a sampling scheme to more narrowly identify potential sources of *E. coli*.**

The Health Departments have the local authority to conduct water quality evaluations and work to eliminate discharge of potential pollutants.

Staff of the Michiana Area Council of Governments will seek potential grant funding to further the evaluation effort. Where appropriate, solicit the assistance of volunteers to obtain baseline data, using the Hoosier RiverWatch Program volunteers.

TIMEFRAME: Immediately—Ongoing

**WITH NO ACTION:** Stakeholders involved in the planning process, believe other sources of contamination exist beyond those visible from the stream-crossing locations used in the watershed evaluation. Neither health department has the manpower or funds to conduct a more thorough

evaluation to identify other sources. Without additional funding, no further evaluations can be conducted, and other sources of contamination will continue. With continued discharges, the level of *E. coli* would not be reduced.

**3. Identify other sources of *E. coli* contamination within the Baugo Creek-Wisler Ditch sub-watershed**

Upon identification of potential sources, the Health Departments will seek compliance where local or State public health or Environmental Health rules have been violated. The Indiana Department of Environmental Management will also be involved should violations be associated with facilities holding permits.

The Task Force will solicit the assistance of the Soil and Water Conservation Districts, the Natural Resource Conservation Services and the Agricultural Extension Services in providing technical and financial assistance for the installation of agricultural practices that will eliminate the introduction of *E. coli* into the neighboring waterways.

TIMEFRAME: Immediately—Ongoing

**WITH NO ACTION:** Until the sources of *E. coli* are identified and eliminated in the watershed, water quality standards will continue to be exceeded, preventing the Baugo Creek Watershed meeting the “swimmable/fishable” use. Observations have proved that people do enter the waterways. Baugo Creek flows through Ferrettie-Baugo Park which increases the potential of human exposure to potentially contaminated water.

**4. Support the Town of Wakarusa’s effort to pursue their 10-year Combined Sewer Overflow Long Range Plan.**

The Task Force shall review the Long Range Plan upon organization and determine what actions the Task Force can take to support the completion of the goals outlined in the Plan. It should be noted that the Task Force would have no authority to require completion of the goals,

but needs to be up-to-date on the Plan, since combined sewer overflows are a source of *E. coli* in the Watershed.

**TIMEFRAME:** Upon organization of the Task Force, determine what role the Task Force can play in the process. Annually review the report of the Town of Wakarusa to determine the progress of the Plan ~ Ongoing.

**WITH NO ACTION:** The Town of Wakarusa will still have to meet the goals set forth in their Combined Sewer Overflow Long Range Plan. The Task Force would merely review the progress to determine that efforts are on track to reduce the influence of this source of *E. coli* entering the watershed.

#### **5. Reduce the introduction of livestock wastes into neighboring waterbodies**

Through a cooperative effort between the local Soil and Water Conservation Districts, the Natural Resource Conservation Service, the Drainage Boards, the Health Departments, the Michiana Area Council of Governments, and other appropriate agencies and organizations provide information on the management of livestock wastes and milk parlor wastes, including potential sources of financial and technical assistance.

**TIMEFRAME:** Staff shall send information to those operations that were identified during the original watershed evaluation immediately. Ongoing distribution of information through mini-workshops and information brochures and bulletins will occur when new information and funding programs become available. ~ Ongoing.

**WITH NO ACTION:** Improving water quality without legal action takes education of all stakeholders. New information on rules, best management practices and potential funding sources is ever-changing. In order for more people to participate in changes they need good information. Without that information, in a convenient format, changes won't take place and potential sources of *E. coli* will continue.

- Livestock in waterways, pastures at the banktop without buffers, and direct discharges from agricultural operations were identified during the MACOG evaluation. Communication already exists whenever illicit discharges are discovered by various county agencies. This communication should continue for further investigation, and elimination of all identified discharges not identified as groundwater.

**TIMEFRAME:**

- Eliminate at least one identified illicit discharge each year for the next five years.
- Obtain contracts with at least one participant per year to be involved in various cost-share conservation programs.~ 5 years.

**WITH NO ACTION:** Improvement to water quality in a watershed is a responsibility of all stakeholders. Elevated levels of *E. coli* will continue if all sources are not eliminated over time. Voluntary action will reduce the necessity for forced action should a Total Maximum Daily Load be mandated for Baugo Creek in the future.

**6. Develop Field Day demonstration within watershed to demonstrate bank stabilization techniques, animal fencing methods, filter/buffer strips and alternative livestock watering methods.**

- A producer in the Baugo Creek-Wisler Ditch Watershed will be invited to cooperate in the installation of conservation and water quality practices to improve the watershed should funding become available.

TIMEFRAME: Immediately

- The stakeholders and all applicable agencies and organizations will seek grants or cost-share opportunities to financially encourage a producer to incorporate practices that will eliminate livestock from the waterways, ultimately reducing the *E. coli* load.

TIMEFRAME: Immediately–Complete in 5 years

- In cooperation with the Producer, and the Task Force Develop a Field Day to highlight the established practices

TIMEFRAME: Installation by 2006; Field day upon completion of installation

**WITH NO ACTION:** Stakeholders voiced the opinion at the planning meetings, that it is often difficult to convince producers to try new practices. Seeing conservation and water protection practices working in your own watershed, often help instigate others to take action. Without providing funding as an initial incentive to install the best management practices, completing the projects, and allowing others to see the results, there is less chance that producers will agree to installation of filter strips, alternate watering sources, or even fencing their livestock.

## 7. Develop strategy that encourages landowners to install riparian filter strips

Review current materials distributed to property owners related to riparian filter strips to insure such materials adequately laud the benefits of using such practices and also provide information on potential funding sources.

TIMEFRAME: Ongoing

**WITH NO ACTION:** Several different options currently exist to assist producers with the installation of filter strips that improve water quality and stabilize banks. Yet, stakeholders indicated that few people in the watershed have taken advantage of these options. Without determining the shortfalls of the materials currently being distributed, there will continue to be a lack of participation in these programs.

As stated above, at least a third of all sites evaluated in the whole watershed have no buffering—cropping is to the banktop, lawns are mowed to the edge, livestock are fenced to the bank edge. Evidence of erosion existed throughout the watershed, which in turn adds to the sediment transport in the watershed.

Using the *Channel Erosion Equation* from the document, "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual", the MACOG staff calculated that at one site where erosion was evident for at least 100 feet on one side, results in an annual contribution of 3 tons of sediment contributed to the overall watershed.

$$\text{Length x Height x Lateral Recession Rate x Soil weight} \\ 100 \text{ ft. x 4 ft. x 0.2 ft. x .0375} = \mathbf{3 \text{ tons of sediment}}$$

Patches of erosion in the watershed as small as this picture are seen throughout the watershed and contribute a cumulative amount of sediment.

$$15 \text{ ft. x 2 ft. x 0.5 ft. x .04} = \mathbf{0.6 \text{ tons of sediment}}$$



Erosion and bank sloughing along Wertz Ditch

**Multiply these two examples by numerous reaches throughout the watershed and it is safe to say that hundreds of tons of sediment regularly move through the system, increasing after high-energy storm events occur.**

Sediment transport, resulting in flow restrictions, was the number one concern of stakeholders. Installation of riparian filter strips will aid in stabilizing banks, and reducing the amount of soil moving through the system from sloughing banks.

**8. Work with the St. Joseph and Elkhart County Surveyors to formalize a Baugo Creek Task Force as an Advisory Committee to the Drainage Boards and as an avenue of communication to the Private Ditch Associations.**

The Baugo Creek Task Force would serve to insure that goals and actions identified would be reviewed, prioritized and achieved. The Task Force would also be the forum for communication among all stakeholders within the Larger Watershed and shall meet at least once each year to review goals, and at other times as requested. Membership should include:

- County Surveyor or member of the Drainage Board from Elkhart and St. Joseph Counties
- Health Officer or designated Environmental Health Staff person from Elkhart and St. Joseph Counties
- Town Manager or Wastewater Treatment Operator from the Town of Wakarusa
- Soil and Water Conservation District or Natural Resource Conservation Service Representative from St. Joseph and Elkhart Counties
- County Planning Representative from Elkhart and St. Joseph Counties
- County Engineer or Representative from Elkhart and St. Joseph Counties
- St. Joseph River Basin Commission
- City of Elkhart Representative
- Member representing the Agricultural Community
- Member representing the Business/Commercial Community
- St. Joseph County Parks Representative
- Representative from the Environmental Community

The Michiana Area Council of Governments/St. Joseph River Basin Commission staff will initially serve to notify members of the initial meeting. The overall administration of the Task Force will be determined at the initial meeting.

TIMEFRAME: Develop by September 2004 ~ Ongoing.

**WITH NO ACTION:** Since the Baugo Creek Watershed Management Plan was developed under a grant, by the Michiana Area Council of Governments, along with the input of stakeholders, it is important to formalize an advisory group that will carry the Plan to achievement of the goals. If the Baugo Creek Task Force is not established, no one agency or group will hold the responsibility to insure that the goals and action items will be completed.

If the goals and action items are not achieved, particularly those associated with reduced *E. coli* in the Baugo Creek Watershed, the planned Total Maximum Daily Load strategy scheduled for 2010-2015 would proceed, and could result in mandated activities to achieve water quality standards.

## Implementing the Measures

The implementation table including those agencies or individuals responsible for the action items is included as Table 1 ~ Appendix “D”.

Once established, the Baugo Creek Task Force will set priorities on the identified goals. Since the original stakeholders identified a need to complete additional water quality analysis in the sub-watershed, focusing on those areas that have the greatest influence of *E. coli* in the watershed will take top priority.

Additional water quality sampling and the manpower costs associated with the sampling scheme will be a key factor in the progress of the Baugo Creek Watershed Management Plan. It is estimated that at today’s standard, the average cost of a *E. coli* analysis is approximately \$25.00. The Baugo Creek Task Force will determine the sampling scheme accompanied by the potential number of water samples needed for analysis, once it organizes, and seek a funding mechanism that complements the process. Funding for this activity could come from several sources:

- Indiana Department of Environmental Management—Clean Water Act grants programs—Section #319
- Indiana Department of Natural Resources—Lake and River Enhancement Program
- Local Agency budgeted funds for water quality assessment
- Hoosier RiverWatch Voluntary Monitoring

Based on these results, the next step will be the installation of the appropriate best management practices.

The costs associated with installation of best management practices is dependent on the practice used and the size of the project. Practices associated with critical areas identified in the sub-watershed include alternative watering facilities for livestock, filter strips between waterways and livestock operations, alternative or expanded manure management facilities, elimination of direct discharges of livestock wastes or septic system overflows.

Milestones associated with completion of goals is listed in the “Choosing Measures to Apply” section of this document, within the “Timeframe” section of each goal.

A ten-year schedule is planned for the Town of Wakarusa Combined Sewer Overflow Long-Term Plan. Costs associated with replacing sewer lines as road construction occurs, and developing a method to take the remaining CSOs out of service and still accommodate the stormwater, in addition to identifying funds to complete the project all add up to the need for a period of longer than 5 years to complete the strategy.

Best management practices related to agricultural measures would qualify for a number of cost-share funding under programs associated with the Farm Bill—Conservation Reserve Program, Environmental Quality Incentive Program, etc.—with each situation needing to be evaluated by the Natural Resource Conservation Service to determine eligibility of the specific producer or operation.

Funds for best management practices and information/education projects could be sought from:

- Natural Resource Conservation Services Farm Bill Programs
- Indiana Department of Environmental Management-Clean Water Act ~ Section #319 grant Program
- Indiana Soil and Water Conservation District Programs with funding from the Indiana State Budget
- Local Foundations
- Local agency partnerships
- Local and state trade groups—Farm Bureau, Pork Producers, Indiana Cities and Towns Association, etc.
- Local ditch maintenance funds
- Great Lakes Soil Erosion Grants Program
- Great Lakes Aquatic Habitat Fund

## MONITORING INDICATORS

Water quality monitoring within the Baugo Creek Watershed will take on two phases:

### Escherichia coli:

- I. First, monitoring to identify specific contributing sources of *E. coli*. Direct discharges will be monitored based for *E. coli* contributions. All discharges exceeding the 235 colonies per 100 milliliters sampled will be included in a database and source identification.

The Task Force will evaluate the sources and develop a plan, prioritizing those sites where corrective action in the form of elimination of the discharge or installation of best management practices will serve to reduce the *E. coli* influence.

- II. Upon identification of sources and planned elimination of the sources, follow-up *E. coli* monitoring will be conducted throughout the sub-watershed to insure the activities conducted and practices installed serve to reduce the *E. coli* levels, meeting Indiana Water Quality standards.

Based on meetings conducted with the Stakeholders, the final recommendation was that funding for the local Health Departments be sought to conduct the necessary water quality analysis. However, there was some discussion that volunteers might be used to complete baseline data. If this is used, volunteers would need to be trained and equipment purchased. The process would then include follow-up evaluation by the Health Departments of those sites where *E. coli* levels registered above the 235-colony limit.

### Sediment loading:

Reducing sediment loading in the watershed was based on concerns of the Stakeholders rather than actual water quality sampling results. Therefore, no baseline information currently exists.

Once sites specific sites are identified for corrective action—streambank restoration projects, filter strip installation, etc.—before and after load calculations will be conducted. It is

important to reiterate, that based on bank slopes, and soil types, some natural contribution of sediment into the watershed, will continue.

However, the Baugo Creek Task Force will base success of best management practice installation, on evaluation that the practice installed will serve the addressed purpose—stabilize banks, reduce erosion, establish buffers, and will be in place upon inspection of the site for the next 5 years. Evaluation would be conducted by those agencies or individuals identified by the Task Force.

## EVALUATION AND ADAPTING THE PLAN

The overall Baugo Creek Management Plan was developed based on feedback and discussion conducted at 8 meetings, in addition to individual discussions with stakeholders in the Watershed.

On June 22, and June 24, 2004 public meetings were held at the Mishawaka Public Library–Bittersweet Branch and the Wakarusa Public Library, respectively, for final comments and overall acceptance of the Baugo Creek Management Plan. Those in attendance acknowledged that water quality stressors in the Baugo Creek Watershed exist, and that actions must be taken to reduce those impacts.

As set forth in the Plan, the Baugo Creek Task Force will annually, evaluate the achievement of the identified goals, prioritize activities, and include new goals if necessary. Additional meetings, as needed to evaluate the progress of the goals can be called by the Task Force as needed.

- In its approved Workplan for 2004-2005, the St. Joseph River Basin Commission approved a work element which states

**“Continue to participate in forums such as the Juday Creek Task Force, Steering Committee of the LaGrange County Soil and Water Conservation District Livestock Management grant, and the Friends of the St. Joe Steering Committee. Serve in a liaison capacity on the Baugo Creek Watershed Task Force.”**

In this role, the staff will notify participants of the initial meeting of the Task Force. The Task Force will determine who will take on the notification responsibility at its initial meeting. The designated Chairperson of the Task Force will determine the agenda and activities of the Task Force in consultation with its members. The annual meetings conducted by the Task Force would be announced in local newspapers, and open to the public.

## CONCLUSION

The *Baugo Creek Watershed Management Plan—Part I Baugo Creek-Wisler Ditch* represents the contributions of many individuals concerned about the future of Baugo Creek and its tributaries. Focusing on the reduction of E. coli and the transport of sediment through the watershed and entering the St. Joseph River, the success of the Plan will depend on a cooperative effort of many people. Recognizing the stressors in the Watershed, and taking actions to systematically reduce those stressors will eventually improve water quality, and also reduce the need for maintenance of the waterbodies, through the reduction of bank deterioration and sediment transport in the Watershed.

As progress occurs in the Baugo Creek-Wisler Ditch Sub-watershed, the Task Force should consider seeking funding for additional planning in the remaining sub-watersheds of Baugo Creek.

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## Appendix “A”

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## Appendix “B”

COMPILATION OF HISTORIC WATER QUALITY DATA

***ECHERISCHIA COLI* VALUES IN BAUGO CREEK—HISTORIC DATA**

Sample I.D.	Location of Sample	Taken by	Date of Collection	Wet or Dry Sample	Results (Reported in CFU/100 ml)
ECHD#4	C.R.30/Baugo Creek	Elkhart Co. Health Department	May 26, 1993		3050
	C.R.30/Baugo Creek	Elkhart Co. Health Department	June 23, 1993		2600
	C.R.30/Baugo Creek	Elkhart Co. Health Department	July 28, 1993		730
	C.R.30/Baugo Creek	Elkhart Co. Health Department	September 15, 1993		Too numerous to count
ECHD#3	C.R.1;1/8 mi.No.C.R.32	Elkhart Co. Health Department	May 26, 1993		2200
	C.R.1;1/8 mi.No.C.R.32	Elkhart Co. Health Department	June 23, 1993		1955
	C.R.1;1/8 mi.No.C.R.32	Elkhart Co. Health Department	July 28, 1993		4825
	C.R.1;1/8 mi.No.C.R.32	Elkhart Co. Health Department	September 15, 2003		Too numerous to count
	C.R.1/btwn C.R.22 and C.R. 24	Water Watchers	Oct. 5, 1999	Dry	6200
LMJ230-0005	C.R.1/No. C.R.24	IDEM	Sept.26,2000		2419.20
		IDEM	Oct. 4, 2000		2419.20
		IDEM	Oct. 11, 2000		1413.60
		IDEM	Oct. 17, 2000		1299.65
		IDEM	Oct. 24, 2000		2419.20
LMJ230-0004	Old U.S. Hwy 33 (Lincoln Way)	IDEM	Sept. 27, 2000		200.00
	Old U.S. Hwy 33 (Lincoln Way)	IDEM	October 4, 2000		1000.00
	Old U.S. Hwy 33 (Lincoln Way)	IDEM	October 12, 2000		80.00
	Old U.S. Hwy 33 (Lincoln Way)	IDEM	October 19, 2000		<10
	Old U.S. Hwy 33 (Lincoln Way)	IDEM	October 26, 2000		140.00
4UP	C.R. 28/Baugo Cr.	Lawson/Fisher	Oct. 10, 2001	Dry	2500.00
4 DWN	C.R. 3/Baugo Cr.	Lawson/Fisher	Oct. 10, 2001	Dry	800.00
4UP	C.R.28/Baugo Cr.	Lawson/Fisher	Dec. 5, 2001	Dry	1000.00
4DWN	C.R. 3/Baugo Cr.	Lawson/Fisher	Dec. 5, 2001	Dry	1550.00
4UP	C.R.28/Baugo Cr.	Lawson/Fisher	Oct. 16, 2001	Wet	<b>56000.00</b>

4DWN	C.R. 3/Baugo Cr.	Lawson/Fisher	Oct. 16, 2001	Wet	<b>28000.00</b>
4UP	C.R.28/Baugo Cr.	Lawson/Fisher	Feb. 20, 2002	Wet	<b>3700.00</b>
4DWN	C.R. 3/Baugo Cr.	Lawson/Fisher	Feb. 20, 2002	Wet	<b>4900.00</b>
	U.S.33/Baugo Cr.	W.I.S.E.	July 18, 2002	Dry	460.00
	U.S.33/Baugo Cr.	W.I.S.E.	July 25, 2002	Dry	212.00
	U.S.33/Baugo Cr.	W.I.S.E.	July 30, 2002	Wet	<b>2300.00</b>
	U.S.33/Baugo Cr.	W.I.S.E.	August 8, 2002	Dry	500.00
	U.S.33/Baugo Cr.	W.I.S.E.	August 14, 2002	Wet	<b>900.00</b>
	U.S.33/Baugo Cr.	W.I.S.E.	August 20, 2002	Wet	<b>3200.00</b>
	U.S.33/Baugo Cr.	W.I.S.E.	August 29, 2002	Dry	550.00
	U.S.33/Baugo Cr.	W.I.S.E.	Sept. 5, 2002	Dry	300.00
	U.S.33/Baugo Cr.	W.I.S.E.	Sept. 12, 2002	Dry	260.00
	U.S.33/Baugo Cr.	W.I.S.E.	Sept. 19, 2002	Dry	246.00
	U.S.33/Baugo Cr.	W.I.S.E.	Sept. 26, 2002	Dry	585.00
	U.S.33/Baugo Cr.	W.I.S.E.	Oct. 3, 2002	Dry	380.00
	U.S.33/Baugo Cr.	W.I.S.E.	Oct. 10, 2002	Dry	360.00
	U.S.33/Baugo Cr.	W.I.S.E.	October 17, 2002	Dry	240.00
	U.S.33/Baugo Cr.	W.I.S.E.	Oct. 24, 2002	Dry	310.00
	U.S.33/Baugo Cr.	W.I.S.E.	Oct. 31, 2002	Dry	590.00
	U.S.33/Baugo Cr.	W.I.S.E.	Nov. 6, 2002	Wet	<b>700.00</b>
	U.S.33/Baugo Cr.	W.I.S.E.	Nov. 14, 2002	Dry	240.00
	U.S.33/Baugo Cr.	W.I.S.E.	Nov. 21, 2002	Dry	230.00
	U.S.33/Baugo Cr.	W.I.S.E.	Dec. 5, 2002		No Sample
	U.S.33/Baugo Cr.	W.I.S.E.	Dec. 19, 2002	Wet	<b>2800.00</b>
	U.S.33/Baugo Cr.	W.I.S.E.	Jan. 16, 2003	Dry	71.00
	U.S.33/Baugo Cr.	W.I.S.E.	March 6, 2003	Dry	28.00
	U.S.33/Baugo Cr.	W.I.S.E.	March 13, 2003	Wet	<b>750.00</b>
	U.S.33/Baugo Cr.	W.I.S.E.	March 20, 2003	Dry	212.00

## Appendix “C”

## STREAM-CROSSING INVENTORY TABLE

## Appendix “D”

## GOALS AND ACTION ITEMS TABLE

## Appendix “E”

MEETING ANNOUNCEMENTS AND ATTENDANCE SHEETS

## Appendix “F”

## MAPS