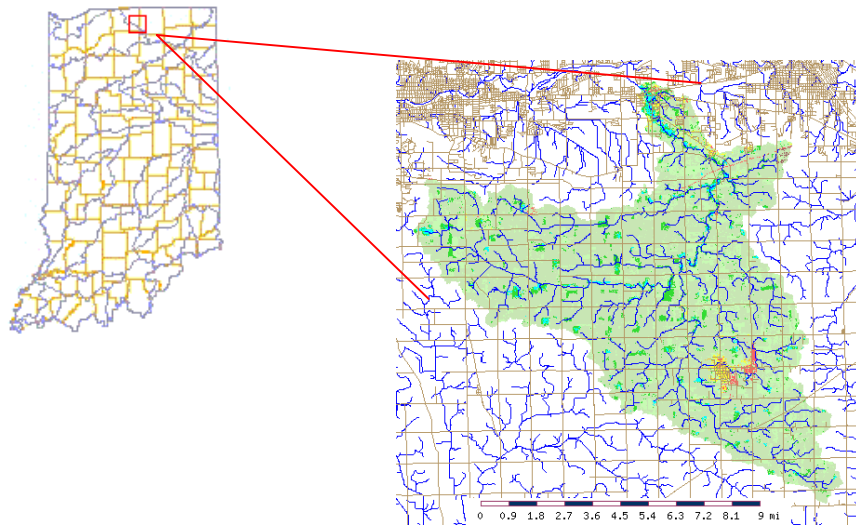


Baugo Creek Watershed Management

Plan—I Baugo Creek/Wisler Ditch Sub-watershed

St. Joseph and Elkhart Counties, Indiana



September 2004

Final Revised Draft

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DISTRIBUTION LIST

Copies of the Baugo Creek /Wisler Ditch were provided to the following people through direct distribution. In addition, copies of the document, minus the raw data field notes, have been posted on the MACOG website at www.macog.com and the St. Joseph River Basin Commission website at www.sjrbc.com.

Draft copies of the Baugo Creek/Wisler Ditch Watershed Management Plan were delivered to the Wakarusa Public Library and the Mishawaka Public Library-Bittersweet Branch for general public review.

Individual copies of the draft Watershed Management Plan were distributed to:

- The St. Joseph County Health Department—Paula Reinhold
- The Elkhart County Drainage Board—Lynn Loucks; Denny Lyons
- The St. Joseph County Drainage Board—John McNamara
- Ab Brown
- Hoosier Environmental Council—Rae Schnapp
- Dorothy O’Lena
- Elkhart County Health Department
- Town of Wakarusa—Randy Kruse
- Rita Kopala
- Pat Schultz
- Elkhart County Soil and Water Conservation District
- St. Joseph County Soil and Water Conservation District
- Keith E. Miller
- Wakarusa Chamber of Commerce
- Friends of the St. Joe River Association, Inc.
- Purdue University Cooperative Extension Service
- Greater Elkhart County Municipal Separate Storm Sewer System Program
- Indiana Department of Environmental Management
- Indiana Department of Natural Resources

Baugo Creek-Wisler Ditch Watershed Management Plan

EXECUTIVE SUMMARY

Mission of the Management Plan:

*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.*

In 2000, the Indiana Department of Environmental Management conducted a Basinwide water quality analysis of the Indiana portion of the St. Joseph River Basin. During that evaluation, I.D.E.M. recorded levels of *Escherichia coli* in Baugo Creek above the Indiana standard of 235 colonies/100 ml. *E. coli* is an indicator organism used to determine potential pollution associated with sewage or manure. The exceedance in Baugo Creek was the highest of any other sites sampled by IDEM in the St. Joseph River Basin and resulted in the Creek's continued inclusion on the 303d list of impaired waters and inclusion on the schedule for future development of a total maximum daily load (TMDL).

Baugo Creek is a watershed of 49,581 acres draining portions of both Elkhart and St. Joseph counties. It is primarily agriculture in landuse, with pockets of residential, commercial and industrial landuse. Baugo Creek is comprised of four subwatersheds, and discharges directly to the St. Joseph River north of Ferretti-Baugo County Park west of Ash Road (county line) and north of S.R. 933 (Lincolnway East).

To address the evidence of high *Escherichia coli* in the Baugo Creek Watershed, the Michiana Area Council of Governments (MACOG) obtained a Section #205j Clean Water Act Grant (two-year project) to develop a watershed management plan. The activities associated with development of the watershed management plan included compilation of historic water quality data, meetings with stakeholders to identify other water quality concerns in the watershed, completion of windshield stream-crossing surveys and development of a set of goals and tasks to improve the water quality.

In the final months of the grant those involved in the planning process came to a consensus that if a watershed management plan was to be developed, the activities should be scaled

back and the focus should be on one subwatershed of the entire Baugo Creek Watershed. The logical plan involved starting in the watershed at the headwaters of Baugo Creek—Baugo Creek-Wisler Ditch subwatershed.

Several other factors influenced this decision. Throughout the process there were two divided trains of thought regarding the sources of *E. coli* in the watershed—agricultural operations and the sewage treatment plant operated by the Town of Wakarusa. Through observations, and review of water quality analysis conducted in portions of the watershed, there was evidence of agricultural influence, either through direct access of livestock to waterbodies, discharges from barnyard runoff or other agricultural operations or through manure applications.

The Town of Wakarusa is also located in this subwatershed and as part of their combined sewer overflow stream characterization has also identified 99 illicit discharges to Werntz Ditch a sub-tributary of Baugo-Wisler. 24 of 45 flowing pipes had discharges above the water quality standard. In addition, Wakarusa's wastewater treatment plant (a series of five lagoons) discharges into Wisler Ditch-Baugo Creek and their combined sewer overflows discharge to Werntz Ditch. Based on all these factors, the planning group agreed to focus on the Baugo Creek-Wisler Ditch watershed.

A watershed management plan serves as the blueprint for future activities in a watershed, with the ultimate goal of improving impaired waters and restoring them to their designated uses. After presentation of information gathered during the stream-crossing surveys, along with historic water quality data, those involved in discussions related to the Baugo Creek-Wisler Ditch Watershed Management Plan agreed to pursue the following goals:

1. Reduce discharges of *E. coli* to Werntz Ditch from pipes identified during the Town of Wakarusa Stream Characterization
2. Reduce the potential contribution of *E. coli* entering the Baugo Creek-Wisler Ditch Subwatershed from those locations identified during the MACOG stream-crossing evaluation that contained physical evidence of potential contamination—evidence of manure or sewage in water; or continuous discharge pipes with unknown source
3. Reduce livestock access to waterbodies and potentially contaminated runoff from barnyards, pastures and milk parlors through the installation of best management practices

4. Reduce potential runoff of nutrients and contaminants, reduce erosion and stabilize waterway banks, reduce the amount of sediment, and manage increased stormwater from entering waterbodies within the entire watershed through the installation of riparian filter strips
5. Support the Town of Wakarusa's Combined Sewer Overflow Long Range Plan as it strives to reduce the contribution of *E. coli* into Wertz Ditch
6. Seek a producer within the Baugo Creek-Wisler Ditch Watershed that along with development of a good livestock management plan, will install practices including but not limited to fencing of livestock from waterways, alternative livestock watering, filter strips around potential sources of *E. coli*, and/or riparian buffer strips.
7. Develop a formal means to manage the Baugo Creek-Wisler Ditch Watershed Management Plan and insure achievement of identified water protection and improvement goals.

BAUGO CREEK WATERSHED MANAGEMENT PLAN

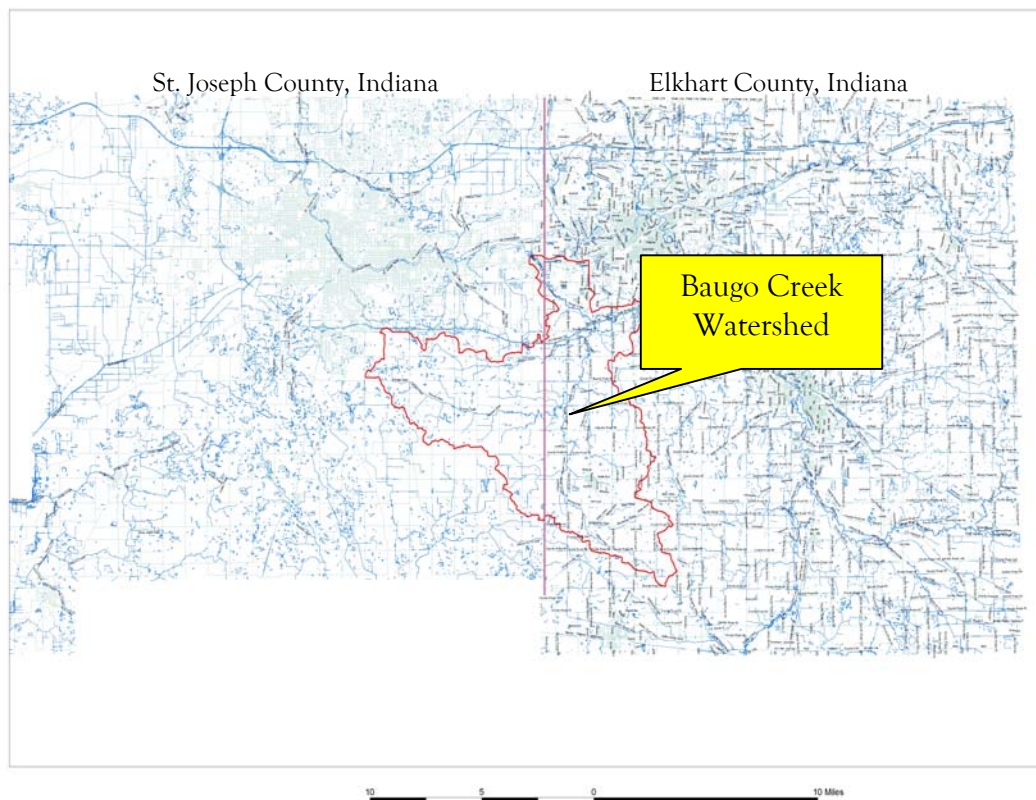
MISSION OF THE MANAGEMENT PLAN

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. However, 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 several reports related to 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.

BAUGO CREEK TASK FORCE

TASK FORCE DEVELOPMENT

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. Correspondence in the form of emails, along with ongoing distribution of the drafts of the document were provided to 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.

THE PLANNING PROCESS

It is safe to say, that in general, only a representative few people contributed suggestions to the overall goal development. As stated above, the MACOG staff utilized a number of ways to gain participation in the planning process. The initial list of individuals was built upon, each time a public meeting was held and new participants attended or contacted the MACOG staff with inquiries about the process.

Input and regular attendance at Baugo Creek Task Force or St. Joseph River W.I.S.E meetings included:

- Either the County Surveyor or Representatives of their staff or Drainage Boards from both St. Joseph and Elkhart Counties (Denny Lyons, Steve Sweisberger, Lynn Loucks, Blake Doriot, John McNamara, John Law);
- Representatives of both the St. Joseph and Elkhart County Health Departments (Dr. Janice Carson, Robert Watkins, Paula Reinhold, John Hulewicz)
- Staff Representative from the Elkhart County Soil and Water Conservation District (Nancy Brown)
- Staff Representative of the St. Joseph County Parks (Brooke Artley)
- Representative of the Wakarusa Wastewater Treatment Plant (Randy Hughes)
- Property owners along C.R. 1 in the Baugo Creek-Wisler Ditch Subwatershed (Richard Lechlitner, Ab Brown)
- Joint Steering Committee Members (Joe Foy, J.C. Sporleder, Mark Salee, Kevin Johnston).

There was no consistent attendance at any of the meetings. Several people came periodically to the planning meetings and had opportunity to comment.

Overall, the final goals and activities were developed based on

- Historic water quality data obtained from throughout the watershed
- Comments and suggestions obtained during the public planning meetings conducted during the second year of the grant period.

Preliminary goals were originally provided in September 2003 (Appendix E) to all those listed as the Baugo Creek Task Force as a springboard for discussion, and the development of the activities to achieve those goals. Although the Task Force agreed that there was evidence of *E. coli*,

in the Watershed, they were less agreeable on the potential sources, and failed to reach a consensus at this meeting on activities to complete the preliminary goals.

Furthermore, those attending the planning meetings did agree that installation of filter strips to reduce erosion, and filter out potential contaminants associated with runoff was a good idea. However, there was some caution by those participating, that soils in the watershed, coupled with steep banks had more of a contribution to erosion and sediment transport in the watershed than landuse issues. The group recommended that current activities by the Soil and Water Conservation Districts and the County Drainage Boards to encourage installation of such best management practices should continue but that a goal to require such installations was not attainable.

Following further fieldwork by the MACOG staff, as well as collection of additional historic water quality, the Task Force was once again gathered (January 2004) to review the data. Several suggestions were made at this meeting represented by

- The St. Joseph County Health Department
- Town of Wakarusa Wastewater Treatment Plant
- Producers representing several areas of the Watershed
- The Indiana Department of Environmental Management
- The St. Joseph County Parks

Those in attendance recommended that the original goals be revised to represent the following suggestions:

1. The Baugo Creek Watershed is too big to develop a plan for the entire watershed—focus on only one or two sub-watersheds, achieve small successes and follow-up with activities in the other sub-watersheds—logical choice would be the headwaters of the watershed (Baugo Creek-Wisler Ditch)
2. Seek assistance from the local health departments to complete additional water quality sampling in the designated sub-watershed to correlate specific sources of contamination with identified elevated levels of *E. coli*.
3. Support current activities of the Drainage Boards and Soil and Water Conservation Districts to encourage property owners to install filter strips.
4. Work with producers, the Farm Bureau and other related groups to encourage livestock and manure management best management practices in the watershed.

5. Work with the Town of Wakarusa and the County Health Department in identifying the sources of discharging pipes entering Werntz Ditch, and seek to eliminate these sources.

In keeping with the suggestions made at the January 2004 meeting, the MACOG staff narrowed development of the Plan to the sub-watershed of Baugo Creek-Wisler Ditch. The Town of Wakarusa is within this sub-watershed, livestock access to the waterways was observed in the sub-watershed as well as waterway corridors without filter strips and historical water quality data reviewed confirmed evidence of the exceedance of the *E. coli* water quality standard of 235 colonies/100ml.

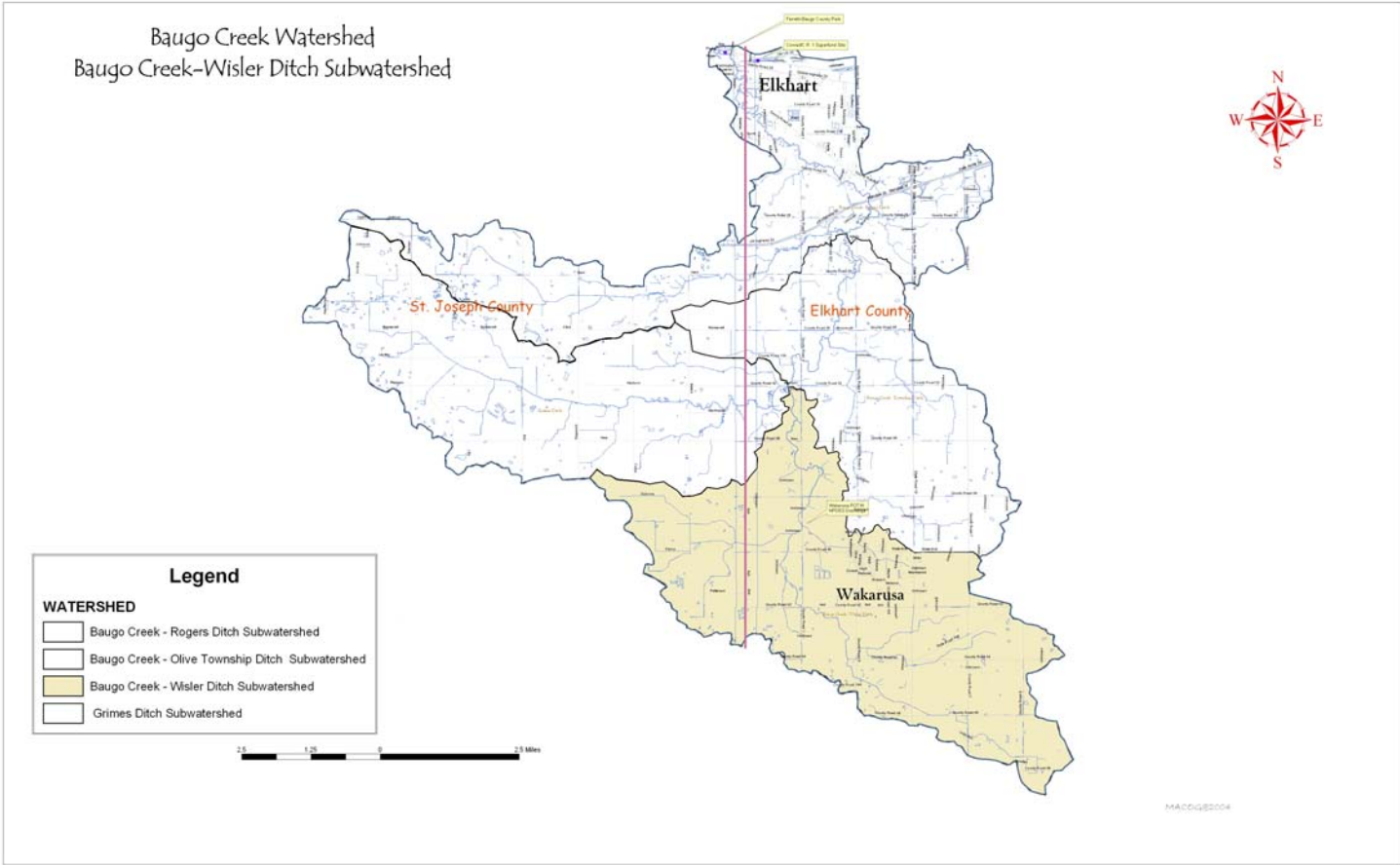


Figure 1. Baugo Creek-Wisler Ditch Subwatershed Cutout Map

The MACOG staff revised the goals to represent the suggestions and presented them to the larger group in March 2004 for discussion and development of activities to achieve the goals. The group made slight wording changes on the overall goals, and the MACOG developed the draft activities based on suggestions and discussion of the group.

A draft copy of the Plan was placed on both the MACOG website and the St. Joseph River Basin Commission website, and will continue to be present. In addition draft copies of the document were distributed to the Mishawaka Library–Bittersweet Branch and the Wakarusa Library with announcements in the local newspapers that the Plan could be reviewed and comments forwarded to the Michiana Area Council of Governments. Copies of the final draft were distributed to those attending one of two public meetings on June 22 (Mishawaka Library–Bittersweet Branch) and June 22 (Wakarusa Library). Suggested changes to the document were incorporated into the final document submitted to the Indiana Department of Environmental Management on June 30, 2004.

DESCRIBING THE WATERSHED

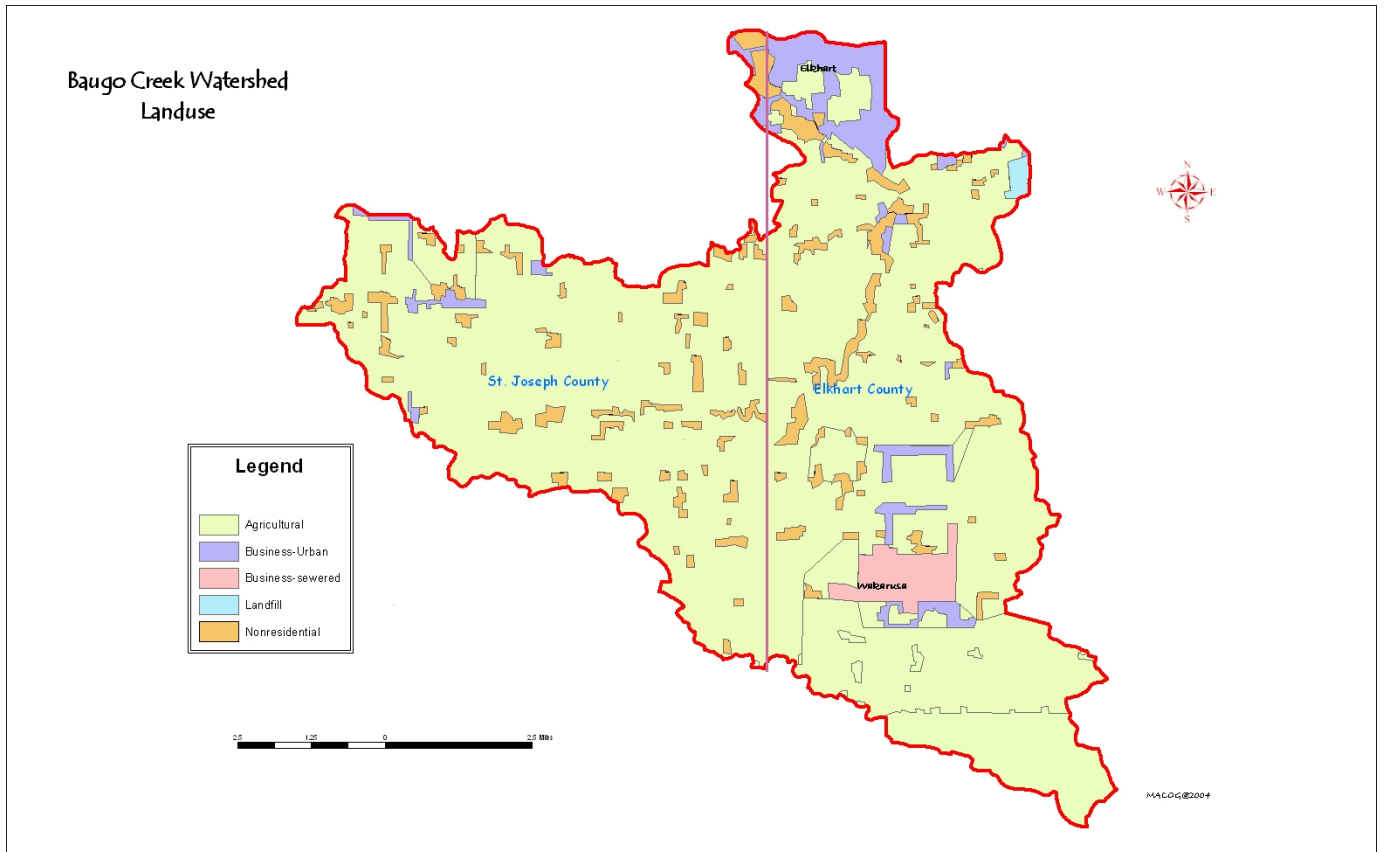
Physical Setting—

The Baugo Creek Watershed is predominantly agricultural in landuse, with increasing transition to commercial and residential. (Figure 1—landuse map) 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—original ponds constructed in 1968 with 2 ponds added in 1993) discharging into Wisler Ditch, just south of the Wisler/Baugo Creek transition (West side of C.R. 1, 0.5 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 Wertz 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

Figure 2—Baugo Creek Watershed Landuse Map



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
- Billman Ditch
- 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 sodalists*) 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.

LANDUSE—

As described above, landuse in the Watershed is primarily agricultural. (Figure 1). Primary crops in the watershed consist of corn and soybeans. The most recent evaluation of cropping practices was conducted in 2002 for both St. Joseph and Elkhart Counties. The table below identifies the percentage of operations currently utilizing each conservation tillage practice.

CROPPING CONDITIONS (PRACTICE PERCENTAGES) AS OF 2002

	Corn		Soybeans	
Tillage Practice	Elkhart County	St. Joseph County	Elkhart County	St. Joseph County
No-Till	18	12	39	41
Mulch-till	10	10	39	38
Reduced-till	18	27	13	13
Conventional	53	50	8	8

Reference: Natural Resource Conservation Services Indiana Website
www.in.nrcs.usda.gov

No-till farming is used on 11,699 acres of corn in Elkhart County and 7,877 acres in St. Joseph County. 16,932 acres of soybeans are in no-till farming in Elkhart County and 20,022 acres of soybeans are in no-till farming in St. Joseph County. 135,821 acres of farmland were treated with commercial fertilizer, lime and other conditioners in Elkhart County in 2002 whereas St. Joseph County had a total of 101,276 acres treated. Manure was used as a soil amenity on 33,122 acres of cropland in Elkhart County during compared to 7,324 acres in St. Joseph County.

The 2002 Census of Agricultural Statistics contains the following information related to livestock production for both counties. Of the 60,296 farms recorded in the State of Indiana in 2002, Elkhart County recorded 1,516, while St. Joseph County recorded 855. 11 percent of the State's dairy farms are in Elkhart County (308) with 34 in St. Joseph County.

Based on information from the Indiana Department of Environmental Management, the Baugo Creek Watershed has 16 registered confined feedlot operations, five of which are in the Baugo Creek-Wisler Ditch Sub-watershed.

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 (SEE Subwatershed Map). They include the Town of Wakarusa (Permit—IN0024775, Discharges to Wisler Ditch/Baugo Creek), Jimtown Elementary and High School (Permit—IN0022845, Discharges to Baugo Creek), 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. The Elkhart County Drainage Board maintains the sediment traps. They are located at:

- Northwest of Jimtown on C.R. 22/Baugo Creek
- East of C.R. 3/Baugo Creek
- West of C.R.1/Baugo Creek (at Brown Farm)
- Bridge at C.R. 130/Baugo Creek

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 informational meetings were conducted at the beginning of the grant period to solicit concerns of the stakeholders in the Baugo Creek Watershed and advise them about the grant activities. During these meetings, those in attendance learned of historic water quality problems associated with *E. coli* levels above the Indiana water quality standards. This also served as an opportunity for stakeholders to share other concerns in the watershed.

The primary complaint among Watershed stakeholders at the information meetings 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. (SEE: *Figure 3–Field Evaluation Points*) 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

Baugo Creek Watershed
Field Evaluation Points
2002-2004

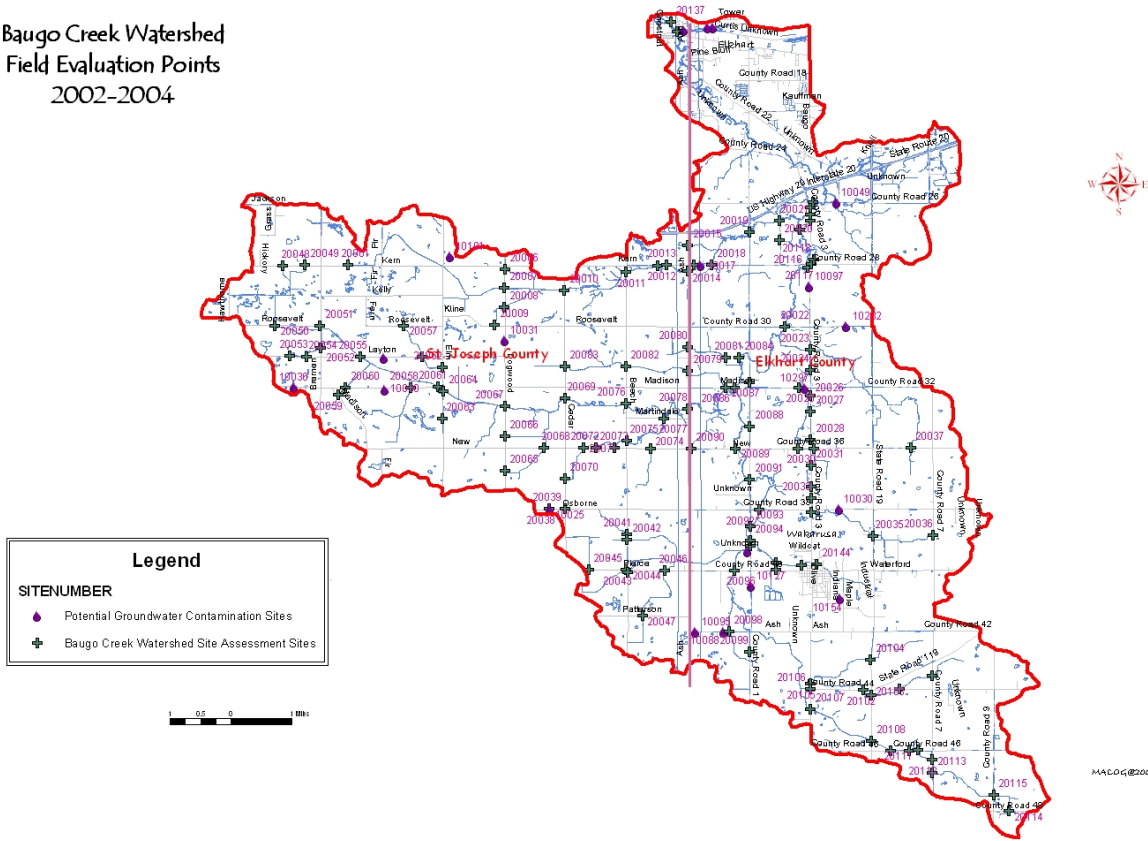


Figure 3—Baugo Creek Watershed-Field Evaluation Points

- 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

Observations related to the field evaluations are included in Appendix “C”.

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*—The Indiana Department of Environmental Management has 16 registered facilities in the entire watershed
- Manure management
 - Manure application, barnyard runoff and direct discharges from livestock operations hold a potential for intermittent elevated contaminants
- 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 and increase in hard surfaces vs. infiltrative surfaces

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, or that those sites should be the target of initial implementation of practices to reduce the contribution of *E. coli*.

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 address some of the concerns of the stakeholder and agency participants in the planning process, the Baugo Creek-Wisler Ditch Sub-watershed was chosen as a starting point in the development of the management plan. The sub-watershed is the headwaters of the Baugo Creek Watershed, contains many of the elements observed throughout the watershed as mentioned below, and also contains the facility and discharge of the Town of Wakarusa Wastewater treatment facility.

- 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. The Town of Wakarusa has six combined sewer overflows that discharge to Werntz 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

A set of goals and indicators of success were developed to address the critical areas listed below. In addition, a goal dealing with development of an ad hoc committee or Task Force to oversee the completion of the goals has been included in the goals. No goal or indicator was developed related to the Wakarusa Wastewater Treatment Facility. Conflicting information related to the contribution of elevated *E. coli* to the Watershed by the Treatment facility will necessitate further evaluation by the Indiana Department of Environmental Management, the permitting agency of the facility.

Critical items include:

- Illicit discharges in Werntz Ditch (Goal # 1)
- Identification of other illicit discharges in the Baugo Creek-Wisler Ditch subwatershed (Goal #2)
- Livestock access to the neighboring waterway, discharge of livestock operations wastes or livestock fenced to top of banks(Goal #3, Goal #4, Goal #6)
- Bank erosion and lack of stream buffers. (Goal #4)
- Combined Sewer Overflows (Goal #5)
- The Wakarusa Wastewater Treatment Facility

GOALS

1. Reduce discharges of *E. coli* to Werntz Ditch from pipes identified during the Town of Wakarusa Stream Characterization

The Town of Wakarusa identified 99 pipes of unknown source during its Stream Characterization related to development of a Combined Sewer Overflow Strategy for the Town. Werntz Ditch flows through Wakarusa and discharges into Wisler Ditch as it becomes Baugo Creek.

All discharging pipes were sampled at the time of the initial evaluation by the contractor hired by the Town of Wakarusa. The results of the analysis and the location of the pipe is indicated in the tables included in Appendix . 45 pipes contained evidence of *E. coli* discharge with 24 sites exceeding the Indiana standard of 235 colonies per 100 ml.

ACTION ITEM:

- Evaluate sources of discharging pipes where *E. coli* standard was violated during initial investigation by the Town of Wakarusa

The initial sampling conducted by the Town of Wakarusa identified the discharge points and analyzed those pipes discharging to Werntz Ditch. Evaluation of the sources of the pipes was not conducted. In order to reduce the potential influence of *E. coli* entering the Werntz Ditch, it is important to identify the source of the pipe, and the possible source of the *E. coli*.

- Identify any new sites discharging into Werntz Ditch and conduct *E. coli* analysis of the discharge

Any new sites discovered during follow-up evaluations of Werntz Ditch will be included in the database developed by the Town of Wakarusa. Funds will be sought by the Baugo Creek Task Force to aid in evaluating the newly-identified sites discharging will be evaluated to determine new sources of *E. coli*.

Similar procedures listed above will be used to eliminate the sources.

- Seek to gain voluntary elimination of those sources through education of property owners of regulations related to illicit discharges

Upon investigation of potential sources of the identified discharges to Werntz Ditch, property owners would be approached with possible solutions to eliminate the source. Those solutions could include:

- If the source is domestic sewage - Connection to the Town of Wakarusa municipal treatment system if within the Town boundaries; Direct the Property owner to the Elkhart County Health Department for permitting and design information outside the town boundaries
 - If the source is agriculture related - Work with the Elkhart County Soil and Water Conservation District and the Elkhart County Agricultural Extension to provide technical assistance related to livestock and manure management.
- Seek enforcement assistance from the Elkhart County Health Department and the Elkhart County Drainage Board

The Elkhart County Health Department has the local authority to enforce regulations related to the proper handling and disposal of domestic sewage. If voluntary compliance is not met from property owners of confirmed sources of discharge, it would necessitate using the Health Department's authority to gain elimination of the source.

The Elkhart County Drainage Board holds the local authority to regulate discharges to regulated drains. Werntz Ditch is classified as a regulated drain and as such, the Drainage Board has the

authority to allow or deny discharges into it. For this reason, the Drainage Board can assist in the elimination of those pipes not approved for discharge into Wertz Ditch.

INDICATORS:

- Database that correlates known discharge pipes with source
- Reduction of the discharges exceeding the Indiana standard entering Wertz Ditch from known pipes. 24 pipes were identified with discharges that exceed the Indiana *E. coli* standard of 235 colonies per 100 ml.
- Identification of new sources and development of a new schedule to eliminate those sources in a fashion similar to the procedure listed above.

TIMEFRAME:

- Identify sources of pipes over two-year period
 - Begin process to eliminate sources as detected with elimination of all 24 discharges within 5 years
2. **Reduce the potential contribution of *E. coli* entering the Baugo Creek-Wisler Ditch Subwatershed from those locations identified during the MACOG stream-crossing evaluation that contained physical evidence of potential contamination—evidence of manure or sewage in water; or continuous discharge pipes with unknown source**

Limitations were placed on the MACOG staff by the Elkhart County Drainage Board to conduct only stream-crossing evaluations within the Baugo Creek Watershed or at sites where property owners gave permission to enter property. The attached maps and tables indicate where stream-crossing evaluations were conducted and what the visible condition of the waterway was at that location. Water quality sampling was not a part of the initial evaluation conducted by the MACOG staff.

In order to narrow the scope of potential sources of *E. coli* contamination in the Baugo Creek-Wisler Ditch Subwatershed, water quality samples will need to be conducted at strategic locations to determine whether the Indiana standard for *E. coli* is being exceeded. Sampling sites will be determined by physical observations recorded during the MACOG evaluation and landuses in the vicinity of the *E. coli* exceedances.

ACTION ITEM:

- Divide the Baugo Creek-Wisler Ditch subwatershed into smaller reaches and conduct water quality analysis within the subwatershed upstream and at the location where potential contamination was detected during the MACOG stream-crossing evaluation

Working with information gathered during the MACOG stream-crossing evaluation, and in consultation with the Elkhart County Health Department, develop an *E. coli* sampling strategy where no water quality information is available to confirm specific locations of *E. coli* contamination within the Baugo Creek-Wisler Ditch subwatershed.

- Identify potential sources of contamination based on results of water quality analysis.

Correlating landuse information, field evaluations and water quality analysis and through communication with property owners, determine potential sources of contamination. Include information in existing database.

- Coordinate with property owners of confirmed sources of contamination on methods to eliminate sources and improve water quality in specified reach of the subwatershed.

Once the sources of contamination are determined, work with property owners to voluntarily eliminate sources.

- Provide technical assistance and possible financial assistance for the installation of practices that eliminate *E. coli* entering neighboring waterways

Correlate technical assistance needs with the appropriate agency or agencies. If the source of the *E. coli* contribution is domestic sewage, extend assistance from the Elkhart County Health Department to determine onsite wastewater disposal sizing and requirements. If the source of the *E. coli* contamination is agricultural, extend assistance from the Elkhart County Soil and Water Conservation District and the Elkhart County Purdue Extension Service.

INDICATORS:

- Baseline *E. coli* data for reaches of the Baugo Creek-Wisler Ditch subwatershed where potential contamination exists but has not been previously confirmed with water quality analysis.
- Correlation of sources in reaches of the Baugo Creek-Wisler Ditch subwatershed where the Indiana standard for *E. coli* has been exceeded.
- Coordination with property owners through the provision of technical assistance and possible financial assistance, if available, to eliminate the identified sources of contamination
- Progressive reduction of the number of exceedances of the Indiana Standard for in the sampled reaches of the Baugo Creek-Wisler Ditch subwatershed

Timeframe:

- It should take no longer than six months to develop the sampling strategy

- Complete first round of water quality analysis within one year
- Within five year period, correlate all potential sources of contamination with water quality analysis
- Within one year of correlating source with confirmed contamination, begin developing means of eliminating sources
- Eliminate at least 10 percent of sources each year for the next 5 years

3. Reduce livestock access to waterbodies and potentially contaminated runoff from barnyards, pastures and milk parlors through the installation of best management practices

Evidence of livestock access to waterways, potential runoff entering waterways due to lack of buffers between the barnyard or pasture area and the waterway and direct discharge of animal wastes were observed during the MACOG stream-crossing inventory. Although water quality analysis was not conducted as part of the inventory process, visible impairments to the structure of the waterway as well as quality of the water were observed.

The achievement of this goal coincides with Goal #2.

ACTION ITEMS:

- Provide information to property owners identified during the MACOG inventories with information related to the economic and environmental benefits of livestock management

Conduct public information meetings in the subwatershed to provide producers information related to the economic and environmental benefits of buffers, proper livestock management and waste utilization plans.

- Seek producers to voluntarily participate in programs that include technical assistance and cost-share opportunities to install fencing, buffer strips and alternative watering sources

Conduct sign-up sessions within the watershed to make it convenient for landowners to receive technical assistance and participate in Farm Bill cost-share programs when available.

INDICATOR:

- Coordination with all relevant agencies (Elkhart County Soil and Water Conservation District, Natural Resources Conservation Service, Elkhart County Farm Bureau and Elkhart County Purdue Agricultural Extension) in the development of an information session within the Baugo Creek-Wisler Ditch subwatershed that focuses on the benefits of livestock and manure management, including technical assistance in the development of livestock and manure management plans.
- Attendance by identified producers in the Subwatershed at the above-mentioned information session

- Signed contracts by producers to participate in appropriate cost-share programs or in obtaining technical assistance to install best management practices to serve to filter out or prevent the introduction of those contaminants that result in exceeding the *E. coli* standard.

Timeframe:

- At least once every two years, conduct an information session, focusing on specific best management practices or technical assistance programs for producers. Determine the focus of the information meeting based on most observed livestock management issues in the watershed and feedback from producers on topics that will most aid them in managing their operations in a manner that reduces impacts to water quality.
- Gain at least one producer each year for the next five years, to sign a contract participate in programs that support installation of best management practice for the purpose of reducing barnyard runoff, managing manure, fencing livestock or providing alternative watering sources for livestock, which serve to reduce contributions of *E. coli* to the neighboring waterways.

4. Reduce potential runoff of nutrients and contaminants, reduce erosion and stabilize waterway banks, reduce the amount of sediment, and manage increased stormwater from entering waterbodies within the entire watershed through the installation of riparian filter strips

Whereas stakeholders within the Baugo Creek Watershed expressed concerns that ditches were clogged and sediment and debris transport through the system was a concern, they also acknowledged that steep slopes in some of the waterbodies prevented the use of practices that would traditionally aid in the reduction of bank erosion and sediment transport.

During the MACOG stream-crossing survey, sloughing banks, sediment deposits and evidence of erosion along banks were standard observations. Installation of vegetated filter strips along banktops serves the purpose of filtering out nutrients and sediments from runoff, but also aids stability to the banktop.

This goal coincides with Goals #2 and #3.

ACTION ITEM:

- Include information on the environmental benefits of riparian buffer strips in the information sessions identified as part of Goals #2 and #3.
- Conduct sign-up sessions within the watershed to make it convenient for landowners to participate in cost-share programs

Numerous Farm Bill opportunities exist for producers to participate in programs that assist in the development of filter strips along waterways. Increasing the opportunities for sign-up in these programs will increase involvement in these program.

- Support the Elkhart County Drainage Board's practice of providing filter strip information to producers when they evaluate a waterway for potential maintenance

No one has the authority to require installation of buffer strips along riparian corridors. However, the Elkhart County Drainage Board distributes an information packet related to the benefits of filter strips, whenever they are requested by a property owner to evaluate a portion of any waterbody for potential maintenance work. This practice should continue.

- Support local ordinances under development by the Elkhart County MS4 Committee that strive to manage stormwater onsite and reduce increased volume and velocity of runoff from entering waterbodies throughout the county.

As part of the Phase II Municipal Separate Storm Sewer requirements, local designated jurisdictions will be required to develop ordinances that control stormwater management onsite rather than designing additional direct discharges to neighboring waterbodies. Research has proven that runoff discharged to a waterbody that does not have the capacity for the added volume and velocity, serves to break down banks and instigate sediment transport down stream, in addition to encouraging downstream flooding. Controlling stormwater onsite, will prevent accelerated deterioration of the water system and serve to reduce potential erosion and sediment transport.

INDICATOR:

- Coordination with all relevant agencies (Elkhart County Soil and Water Conservation District, Natural Resources Conservation Service, Elkhart County Farm Bureau and Elkhart County Purdue Agricultural Extension) in the development of an information session within the Baugo Creek-Wisler Ditch subwatershed that focuses on the benefits of buffer strips and proper nutrient and manure applications.
- Attendance by identified producers in the Subwatershed at the above-mentioned information session
- Signed contracts by producers to participate in appropriate cost-share programs or in obtaining technical assistance to install best management practices to serve to filter out or prevent the introduction of those contaminants that result in exceeding the *E. coli* standard.

Timeframe:

- Conduct an information session within one year of organization of the Baugo Creek Task Force, focusing on specific best management practices or technical assistance

programs for producers at least once every two years. Determine the focus of the information meeting based on most observed livestock management issues in the watershed and feedback from producers on topics that will most aid them in managing their operations in a manner that reduces impacts to water quality.

- Gaining a signed contract from at least one producer each year for the next five years to participate in programs that support installation of best management practice for the purpose of reducing barnyard runoff, managing manure, fencing livestock or providing alternative watering sources for livestock, which serve to reduce contributions of *E. coli* to the neighboring waterways
- Distribution of filter strip materials by the Elkhart County Drainage staff is ongoing
- Development of the Phase II MS4 Stormwater Management in compliance with Indiana and Federal guidelines is ongoing.

5. Support the Town of Wakarusa's Combined Sewer Overflow Long Range Plan as it strives to reduce the contribution of *E. coli* into Wertz Ditch

The Town of Wakarusa submitted its Combined Sewer Overflow Long Range Plan to the Indiana Department of Environmental Management in June 2004. The Town anticipates reduction of stormwater contribution to the combined system over the next ten years.

ACTION ITEM:

- The Baugo Creek Task Force will annually review the overflow events and the levels of *E.coli* that are discharging during these events

Monitoring the number of discharge events that occur each year, in addition to the level of *E. coli* during each event will determine the significance of the contribution of *E. coli* to the overall exceedance of the Indiana Standard.

- Evaluate reports completed by the Town of Wakarusa regarding the progress of meeting their Combined Sewer Overflow Long Range Plan

Through continued discussion with the Town of Wakarusa determine what other efforts can be taken to aid the Town of Wakarusa in successfully accomplishing their long range plan and reducing the number of overflows entering Wertz Ditch

INDICATORS:

- Reports from the Town of Wakarusa, that activities addressed in their Long Range Plan are being achieved and are serving to reduce the number of incidence of overflows from their combined sewer system.

Timeframe:

- The Town of Wakarusa anticipates completion of their Long Range Control Plan in 10 years.

6. **Seek a producer within the Baugo Creek-Wisler Ditch Watershed that along with development of a good livestock management plan, will install practices including but not limited to fencing of livestock from waterways, alternative livestock watering, filter strips around potential sources of *E. coli*, and/or riparian buffer strips.**

Bringing examples of best management practices into the Subwatershed where they are visible and appropriate to the location, provides greater opportunity for those in the watershed to experience the success of the applications. Getting voluntary cooperation from a producer or producers that can further communicate to others the positives of installation of best management practices will aid in improving water quality in the Baugo Creek-Wisler Ditch subwatershed.

The goal of the field day is to make it convenient for the producer to obtain information about best management practices, see the practices in use under typical conditions in the watershed, and identify ways they can also use these practices to improve water quality.

ACTION ITEM:

- Identify producers willing to participate in a voluntary manner to install practices within the Baugo Creek-Wisler Ditch subwatershed, that focus on conditions listed above

At least one producer in the watershed will be sought to participate in the development of a livestock management plan, and the installation of several best management practices that serve to restrict livestock from waterways, reduce runoff from barnyards and/or pastures and/or cropped fields

- Seek cost-share funding, grants and in-kind to aid in the technical assistance and installation of best management practices

As an incentive to get voluntary cooperation to develop a demonstration of installed best management practices, seek the assistance of all appropriate agencies to obtain funding either through the Farm Bill programs, grants or local funding to help pay for various best management practices

- Install appropriate best management practices

Upon receipt of partial or full funding for best management practices, install practices.

- Conduct a field day upon completion of project to demonstrate techniques and solutions

To encourage other producers in the subwatershed to voluntarily install appropriate best management practices to improve, conserve and protect the water quality, a field day will be hosted that focuses on the value of the best management practices, the costs associated with the practices and the alternatives.

INDICATORS:

- Obtain a formal contract between the voluntary producer (producers) to participate in installation of best management practices
- Identify and obtain funding for the approved best management practices
- Installation of the best management practices
- Completion of the field day to demonstrate practices

Timeframe:

- Within one year of formal adoption of the Baugo Creek-Wisler Ditch Management Plan, actively seek cooperation from producers within the watershed to participate in the installation of best management practices
- Within 1 year of identifying voluntary producers, work to identify funding sources and obtain funds
- Within 1 year of obtaining funding, complete practices and conduct the workshop, demonstration day

7. Develop a formal means to manage the Baugo Creek-Wisler Ditch Watershed Management Plan and insure achievement of identified water protection and improvement goals.

ACTION ITEM:

- 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 in the Baugo Creek Watershed

The membership of the Baugo Creek Task force will include those agencies and stakeholders that participated in the planning process of the Watershed Management Plan. Membership shall have technical expertise in water quality issues in the watershed or have general knowledge of concerns in the watershed.

- Conduct first meeting, elect chairperson and identify overall role of the Task Force.

Input from the membership is critical to the success of an organization. Defining the structure of the group, what the role will be and supporting leadership within the group, will aid in the overall goals of the Watershed Plan being achieved.

INDICATORS:

- Active participation in the Task Force by invited membership.

Timeframe:

- The first Task Force meeting should be held within the first six months of the final Plan approval
- The Task Force shall be ongoing, meeting as needed, but at least once each year.

As indicated in the “Planning Process” narrative, there is concern by stakeholders that the discharge from the Wakarusa Wastewater Treatment facility contributes to the elevated *E. coli* levels. None of the available information would indicate that this is a major contributor. However, further discussion with the Town of Wakarusa, the Indiana Department of Environmental Management and the organized Baugo Creek Task Force should be conducted to determine what the potential impact is or to determine the best way to dispel this concern.

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

CHOOSING MEASURES TO APPLY

1. **Reduce discharges of *E. coli* to Werntz Ditch from pipes identified during the Town of Wakarusa Stream Characterization**
 - 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 5 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. **Reduce the potential contribution of *E. coli* entering the Baugo Creek-Wisler Ditch Subwatershed from those locations identified during the MACOG stream-crossing evaluation that contained physical evidence of potential contamination—evidence of manure or sewage in water; or continuous discharge pipes with unknown source.**
 - The Baugo Creek Task Force, along with the staff of the Michiana Area Council of Governments shall explore funding to aid the Health Department in conducting a more detailed water quality analysis in the Baugo Creek-Wisler Ditch Subwatershed;
 - Where appropriate, solicit the assistance of volunteers to obtain baseline data, using the Hoosier RiverWatch Program volunteers;
 - Notify property owners of correlating landuse/water quality information;
 - Provide technical assistance and potential financial assistance, seeking voluntary correction of *E. coli* contributions to Subwatershed.

TIMEFRAME: Immediately–November 2009

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. Reduce livestock access to waterbodies and potentially contaminated runoff from barnyards, pastures and milk parlors through the installation of best management practices.

- Provide direct distribution of information to producers where potential sources of contamination have been observed
- Conduct information sessions regarding technical and financial assistance for the installation of best management practices related to the reduction of livestock access and potentially contaminated runoff to neighboring waterbodies
- Seek assistance from Soil and Water Conservation Districts, Natural Resource Conservation Service, Purdue University Extension, and Farm Bureau to seek voluntary participation by producers to reduce potential sources of contamination associated with agricultural operations and installation of best management practices by conducting Farm-Bill cost-share program sign-up opportunities within the watershed

TIMEFRAME: Immediately–November 2009

WITH NO ACTION: Livestock access to waterways, and contaminated runoff entering waterways was observed during the MACOG stream-crossing survey. If the sources of *E. coli* are not eliminated by the installation of best management practices, the overall water quality of the watershed cannot be expected to improve. Making the information available to the producers in the watershed, and utilization of the many local, state and federal funding programs available for

the installation of agricultural best management practices aids in the reduction of identified stressors to the Subwatershed.

4. Reduce potential runoff of nutrients and contaminants, reduce erosion and stabilize waterway banks, reduce the amount of sediment, and manage increased stormwater from entering waterbodies within the entire watershed through the installation of riparian filter strips

- Conduct information sessions regarding technical and financial assistance for the installation of best management practices related to reduction of erosion, stabilization of waterway banks, and management of stormwater runoff
- Seek assistance from Soil and Water Conservation Districts, Natural Resource Conservation Service, Purdue University Extension, and Farm Bureau to seek voluntary participation by producers to reduce potential sources of contamination associated with agricultural operations and installation of best management practices by conducting Farm-Bill cost-share program sign-up opportunities within the watershed
- Partner with the Greater Elkhart County Municipal Separate Stormwater System Committee where applicable in the development of strategies to manage stormwater onsite, install appropriate best management practices and reduce the discharge of runoff into neighboring waterbodies.

TIMEFRAME: Immediately–November 2009

WITH NO ACTION: Riparian filter strips serve a number of purposes including filtering potentially contaminated runoff, stabilizing waterway banks and providing vital habitat along waterbody corridors. Erosion and instability of banks will continue to contribute sediment to the watershed, requiring continued maintenance of the ditches and streams in the subwatershed.

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.

Length x Height x Lateral Recession Rate x Soil weight

$$100 \text{ ft.} \times 4 \text{ ft.} \times 0.2 \text{ ft.} \times .0375 = \mathbf{3 \text{ tons of sediment}}$$

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



Erosion and bank sloughing along Werntz Ditch

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

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.

Rain, manure and other nutrients result in contaminated runoff entering neighboring waterbodies and elevating *E. coli*, nitrates and phosphorous attached to eroded soil particles. Historic water quality data comparing wet and dry *E. coli* levels in the Baugo Creek Watershed, indicated elevated levels during rain events. Buffers help to filter out the contaminants, and slow the runoff from entering neighboring waterbodies, thereby reducing the contribution of contaminants.

5. Support the Town of Wakarusa’s Combined Sewer Overflow Long Range Plan as it strives to reduce the contribution of *E. coli* into Werntz Ditch

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-dated on the Plan, since combined sewer overflows are a source of *E. coli* in the Watershed.

TIMEFRAME: Upon organization of the Task Force~20014

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.

6. Seek a producer within the Baugo Creek-Wisler Ditch Watershed that along with development of a good livestock management plan, will install practices including but not limited to fencing of livestock from waterways, alternative livestock watering, filter strips around potential sources of *E. coli*, and riparian buffer strips.

- Notify producers in the subwatershed of economic and environmental benefits of filter strips
- Identify producer within the subwatershed to install practices that aid in managing livestock, preventing erosion, and reducing entry of contaminants to neighboring waterways
- Seek sources of funding in aid in the installation of practices
- Conduct field day to showcase best management practices within the watershed

TIMEFRAME: 2004-2007

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. Providing examples of best management practices that work in the watershed, will aid in more producers considering use of these practices. Without this example, fewer or no producers will be willing to change.

7. Develop a formal means to manage the Baugo Creek-Wisler Ditch Watershed Management Plan and insure achievement of identified water protection and improvement goals

Working with the St. Joseph and Elkhart County Surveyors to formalize the 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 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 development and completion of goals is listed in Appendix F of this document. (SEE: Baugo Creek Watershed—Milestones).

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 Task Force/stakeholder meetings and 8 St. Joseph River Watershed Steering Committee meetings, in addition to individual discussions with stakeholders in the Watershed.

In addition, 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 draft Baugo Creek-Wisler Ditch Watershed 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 and improve the water quality.

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.

When the original goals were presented to the St. Joseph River W.I.S.E. Steering Committee, the group suggested that the St. Joseph River Basin Commission serve as the “keeper” of the Management Plan. Any changes recommended by formalized Baugo Creek Task Force, whether it be prioritizing the goals, identifying new goals or recordkeeping of completed goals would be forwarded to the St. Joseph River Basin Commission, and the document would be edited.

The Basin Commission has served in a similar capacity for the Juday Creek Watershed Management Plan since 1995. The Indiana General Assembly approved development of the Basin Commission in 1988 with the following purposes:

- *Provide a forum for discussion, study, and evaluation of water resource issues of common concern in the Basin;*
- *Facilitate and foster cooperative planning and coordinated management of the Basin’s water and related and resources;*
- *Develop positions on major water source issues and serve as an advocate of the Basin’s interests;*
- *Make recommendations on matters related to It’s functions and objectives, to political subdivisions in the Basin, and to other public and private agencies;*
- *Develop plans to improve water quality in the Basin.*

With these legislated purposes, the St. Joseph River Basin Commission would be a logical established organization to maintain the document.

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 (where feasible) 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. The Watershed Management Plan and the Baugo Creek Task Force will also serve as a means to improve communication related to water quality issues in the Baugo Creek Watershed, which will also aid in improved water quality.

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.

REFERENCES

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- “Final 2002 List of Impaired Waters Under Section 303d of the CWA”, Indiana Register. Volume 27, Number 4, January 1, 2004 (Page 1402).
- Indiana Watershed Planning Guide.* Indiana Department of Environmental Management. August 2003
- Michiana Area Council of Governments Section 208 Water Quality Management Plan.* Michiana Area Council of Governments. South Bend, Indiana, May 1978.
- Pollutant Controlled Calculation and Documentation for Section #319 Watersheds Training Manual.* Michigan Department of Environmental Quality. Lansing, MI. June 1999.
- St. Joseph River Basin Commission Nonpoint Source Pollution Study.* Environmental Health Laboratories, South Bend, IN. June 1990.
- Soil Survey of Elkhart County,* U.S. Department of Agriculture, Natural Resource Conservation Service, October 2001.
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- Watershed Action Guide for Indiana.* Indiana Department of Environmental Management, et. al. November 1998.

APPENDICES

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Appendix A

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Appendix “B”

Compilation of Historic Water Quality Data and Endangered Species Records

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	56000.00
4DWN	C.R. 3/Baugo Cr.	Lawson/Fisher	Oct. 16, 2001	Wet	28000.00
4UP	C.R.28/Baugo Cr.	Lawson/Fisher	Feb. 20, 2002	Wet	3700.00
4DWN	C.R. 3/Baugo Cr.	Lawson/Fisher	Feb. 20, 2002	Wet	4900.00
	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	2300.00
	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	900.00
	U.S.33/Baugo Cr.	W.I.S.E.	August 20, 2002	Wet	3200.00
	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	700.00
	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	2800.00
	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	750.00
	U.S.33/Baugo Cr.	W.I.S.E.	March 20, 2003	Dry	212.00

**Additional records not generated by computer, or obtained from other agencies as hard copies are available upon request or can be reviewed within the complete hard copies.

Appendix “C”
Stream-Crossing Inventory Information

- Table of Global Positioning Data
- Table of Field Observations
- Raw Data Field Observation Sheets

Appendix “D”
Goals and Action Item Table

Appendix “E”

Press Releases, Meeting Announcements and Attendance Sheets, Articles, Other Public Information Materials

**Copies of these materials available upon request—Included in hard copy file document

Appendix “F”
Watershed Management Plan Milestones

Appendix “G”
Baugo Creek Watershed Map with Hydrology