Office of Water Quality
Total Maximum Daily Load Program

DRAFT
Total Maximum Daily Load for
Escherichia coli (*E. coli*)
For the Middle Fork Wildcat Creek Watershed,
Clinton, Carroll, Tippecanoe, and Howard Counties

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Indiana Department of Environmental Management
Total Maximum Daily Load Program
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Total Maximum Daily Load (TMDL) for *Escherichia coli* (*E. coli*) in the Middle Fork Wildcat Creek Watershed, Clinton, Carroll, Tippecanoe and Howard Counties

Introduction

Section 303(d) of the Federal Clean Water Act and the United States Environmental Protection Agency's (USEPA's) Water Quality Planning and Management Regulations (Title 40 of the Code of Federal Regulations (CFR), Part 130) require states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not meeting Water Quality Standards (WQS). TMDLs provide states a basis for determining the pollutant reductions necessary from both point and nonpoint sources to restore and maintain the quality of their water resources. The purpose of this TMDL is to identify the sources and determine the allowable levels of *E. coli* bacteria that will result in the attainment of the applicable WQS in the Middle Fork Wildcat Creek Watershed in Clinton, Carroll, Tippecanoe and Howard Counties in Indiana.

Background

In 2002, the Middle Fork Wildcat Creek, Cripe Run, and Campbell's Run were listed on the 303(d) list as impaired for *E. coli*. In 2006 the Downstream and Upstream Tributaries of Wildcat Creek, Hog Run, Tributaries of Campbell's Run, Robertson Branch, Scofield Ditch, Whiteman Ditch, Harness Ditch, and Silverthorn Branch were listed on the 303(d) list for *E. coli*. Based on an intensive survey of the watershed in 2003 by IDEM, a reassessment of water quality condition was warranted. This reassessment was completed in January 2006, for the Upper Wildcat Creek Watershed. The reassessment for the *E. coli* impairment resulted in the addition of the following segments in the Upper Wildcat Creek Watershed to the 2006 303(d) List: (Table 1). All other impaired segments were unaffected by this reassessment. (Figure 1, Table 1).

Recently IDEM began using the high resolution National Hydrography Dataset (NHD) created by USGS. Previously IDEM could only view streams at medium resolution (1:100,000 scale). The high resolution streams are at the 1:24,000 scale, which allows for a more detailed view of the watershed. These high resolution waters have always been present; however, they have not been visible in electronic maps until now. A reassessment of the Middle Fork Wildcat Creek watershed was completed with regard to both medium and high resolution streams in this watershed.

This TMDL will address approximately 150 stream miles of the Middle Fork Wildcat Creek Watershed in Clinton, Tippecanoe, Carroll, and Howard Counties where recreational uses are impaired by elevated levels of *E. coli* during the recreational season. The Middle Fork Wildcat Creek Watershed is located in North Central Indiana (Figure 1). The twenty-two (22) impaired assessment units (Table 1) for this TMDL are all located in the Wildcat River Basin in hydrologic unit code (HUC) 05120107030. The description of the study area, its topography, and other particulars are as follows:

Table 1: Impaired Assessment Units in the Middle Fork Wildcat Creek Watershed

AUNAME_2010	AUID_2010	Impairment	Miles
WILDCAT CREEK, MIDDLE FORK	INB0721_01	*E. coli*	10.03
WILDCAT CREEK, MIDDLE FORK - UNNAMED TRIBUTARY	INB0721_T1012	*E. coli*	2.54
WHITEMAN DITCH	INB0721_T1013	*E. coli*	5.70
HARNESS DITCH	INB0721_T1014	*E. coli*	7.19
WILDCAT CREEK, MIDDLE FORK	INB0722_01	*E. coli*	7.97
WILDCAT CREEK, MIDDLE FORK - UNNAMED TRIBUTARY	INB0722_T1012	*E. coli*	1.43
MIDDLE FORK BRANCH - SCOFIELD DITCH	INB0722_T1013	*E. coli*	2.32
ROBINSON BRANCH	INB0722_T1014	*E. coli*	6.73
CAMPBELLS RUN	INB0723_01	*E. coli*	25.05
CAMPBELLS RUN	INB0723_02	*E. coli*	12.78
CRIPE RUN	INB0723_T1012	*E. coli*	11.23
WILDCAT CREEK, MIDDLE FORK	INB0724_01	*E. coli*	15.57
WILDCAT CREEK, MIDDLE FORK - UNNAMED TRIBUTARY	INB0724_02A	*E. coli*	0.31
WILDCAT CREEK, MIDDLE FORK - UNNAMED TRIBUTARY	INB0724_02B	*E. coli*	0.28
WILDCAT CREEK, MIDDLE FORK - UNNAMED TRIBUTARY	INB0724_T1002	*E. coli*	3.24
WILDCAT CREEK, MIDDLE FORK - UNNAMED TRIBUTARY	INB0724_T1003	*E. coli*	1.82
WILDCAT CREEK, MIDDLE FORK	INB0725_01	*E. coli*	5.03
WILDCAT CREEK, MIDDLE FORK	INB0725_02	*E. coli*	8.73
WILDCAT CREEK - UNNAMED TRIBUTARY	INB0725_T1012	*E. coli*	3.50
DUNK CREEK	INB0725_T1013	*E. coli*	7.29
HOG RUN	INB0725_T1014	*E. coli*	11.64

IDEM conducted an intensive survey of nineteen (19) sites in the Middle Fork Wildcat Creek watershed in 2003. All nineteen (19) sites were sampled five (5) times evenly spaced over a thirty (30) day period from July 1, 2003 to July 29, 2003. All twenty (20) violated the geometric mean. The geometric means ranged from 470.28 MPN (Most Probably Number)/100 mL at site 7 to 1725.66 MPN/100 mL at site 8 (Attachment A). One hundred (100%) percent of the sites sampled violate the geometric mean of 125 MPN (Most Probable Number)/100 mL. The single sample maximum of 235 MPN/ 100 mL is violated 93 % of the time.

Historic data collected by IDEM's Assessment Branch in 1998 indicate high levels of *E. coli* in the Middle Fork Wildcat Creek watershed. The one (1) site sampled in 1998 violated the geometric mean. The single samples ranged from 97 CFU (Colony Forming Units)/100 mL to 2,700 CFU/100 mL (Attachment B). Fixed station data in 2005 indicates an elevated level of *E. coli* with a single sample result of 1,100 MPN/100 mL (Attachment B).

Volunteers for Hoosier Riverwatch sampled Hog Run within the Middle Fork Wildcat Creek October 16, 2000. Data collected include chemical, biological, and habitat data (Attachment C).

The TMDL development schedule corresponds with IDEM's basin-rotation water quality monitoring schedule. To take advantage of all available resources for TMDL development, impaired waters are scheduled according to the basin-rotation schedule unless there is a significant reason to deviate from this schedule. Waterbodies could be scheduled based on the following:

1) Waterbodies may be given a high or low priority for TMDL development depending on the specific designated uses that are not being met, or in relation to the magnitude of the impairment.

2) TMDL development of waterbodies where other interested parties, such as local watershed groups, are working on alleviating the water quality problem may be delayed to give these other actions time to have a positive impact on the waterbody. If water quality standards still are not met, then the TMDL process will be initiated.

3) TMDLs that are required due to water quality violations relating to pollutant parameters where no EPA guidance are available, may be delayed to give EPA time to develop guidance.

This TMDL was scheduled based on the data available from the basin-rotation schedule, which represents the most accurate and current information available on water quality within waterbodies covered by this TMDL.

Numeric Targets

The impaired designated use for the waterbodies in the Middle Fork Wildcat Creek Watershed is for total body contact recreational use during the recreational season, April 1through October 31.

327 IAC 2-1-6(d) establishes the total body contact recreational use *E. coli* Water Quality Standard (WQS[1]) for all waters in the non-Great Lakes system as follows:

(3) For full body contact recreational uses, E. coli bacteria shall not exceed the following:
(A) 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.
(B) Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, except that in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters where the:
(i) E. coli exceedances are incidental and attributable solely to E. coli resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at IC 13-11-2-258; and
(ii) criterion in clause (A) is met.
However, a single sample shall be used for making beach notification and closure decisions.

[1] *E. coli* WQS = 125 cfu/100mL or 235 cfu/100mL; 1 cfu (colony forming units)= 1 mpn (most probable number)

If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in clause (B) must be met.

The sanitary wastewater *E. coli* effluent limits from point sources in the non-Great Lakes system during the recreational season, April 1through October 31, are also covered under 327 IAC 2-1-6(d).

For the Middle Fork Wildcat Creek Watershed during the recreational season (April 1 through October 31) the target level is set at the *E. coli* WQS of 125 per one hundred milliliters as a 30-day geometric mean based on not less than five samples equally spaced over a thirty day period.

Source Assessment

Watershed Characterization

The Middle Fork Wildcat Creek Watershed ranges over four counties; 74.48 % of the watershed is in Clinton County, 17.42 % is in Carroll County, 7.60 % is in Tippecanoe County, and 0.5 % is in Howard. The main stem of this watershed is the Wildcat Creek. The portion of the Wildcat within this TMDL watershed starts west of Russiaville and flows west to a point north of Dayton. The major tributaries flowing into the Middle Fork Wildcat Creek include; Robertson Branch, Campbell's Run, Cripple Run, and Hog Run (Figure 2).

Landuse information was assembled in 1992 using the Gap Analysis Program (GAP). In 1992, approximately 95.53% of the landuse in the Middle Fork Wildcat Creek Watershed was agriculture. The remaining landuse for the Middle Fork Wildcat Creek Watershed consisted of approximately 3.03% wetland, 1.11% forest, 0.05% water, and 0.28% urban (Figure 3 and 4). Based on observations from our most recent 2003 sampling and aerial photographs it appears there has not been a significant change in landuse. In the 1970's, 97.92% of the landuse was Agriculture, 1.49% of the watershed was Forest, 0.58% was Urban, and 0.01% was water.

Wildlife is a known source of *E. coli* impairments in waterbodies. Many animals spend time in or around waterbodies. Deer, geese, ducks, raccoons, turkeys, and other animals all create potential sources of *E. coli*. Wildlife contributes to the potential impact of contaminated runoff from animal habitats, such as urban park areas, forest, and cropland.

Failing septic tanks are known sources of *E. coli* impairment in waterbodies. There are four unsewered communities in the Lower Wildcat Creek watershed, Moran, Sedalia, Cambria, and Edna Mills (Figure 6). Conversations with staff from the Carroll, Clinton, Howard, and Tippecanoe County Health Departments indicate that septic system failure does occur. The Carroll County Health Department estimates that there are about 4000 households on septic systems. There is no septic system failure rate estimation available at this time; however, an average of 15 septic repairs take place per year. Repairs include the installation of a septic system connecting to a previously illicitly discharging system. These types of repairs are brought to the attention of the Carroll County Health Department when an older property is sold (Jones, Personal Communication, 2007). The Clinton County Health Department estimates that there are about 4700 households on septic systems. It is estimated that 45% are non-permitted systems. A majority of the non-permitted systems are illicitly discharging and contributing to the *E. coli* and nutrient impairments in the watershed. Clinton County is working with the Indiana Rural Community Assistance Program to help mitigate the problem along with seeking alternative solutions on their own (Yeary, Personal Communication, 2007). The Howard County Health Department has no specific information concerning the number of homes on septic systems or the failure rate of septic systems; however, a septic system permitting system is in place (Vest, Personal Communication, 2007).

The Tippecanoe County Health Department estimates that there are about 12000 households on septic systems and there is a 3-5% failure rate for permitted systems. An estimated 125 septic repairs take place per year. Repairs include connecting a septic system to a previously illicitly discharging structure. An estimated 200 new septic installations are built each year at new dwellings (Noles, Personal Communication, 2007).

National Pollutant Discharge Elimination System (NPDES) Permitted Dischargers

There is one (1) NPDES permitted facilities in the Middle Fork Wildcat Creek Watershed (Figure 5, Table 2). This permitted discharger has *E. coli* limits.

- The Rossville Municipal Sewer Treatment Plant had two violations in the past 5 years. There were no violations during the 2003 sampling period.

Storm Water General Permit Rule 13

There are no municipal separate storm sewer systems (MS4) communities in the Middle Fork Wildcat Creek Watershed.

Combined Sewer Overflows (CSO)

There is one (1) CSO community in the Middle Fork Wildcat Creek watershed, City of Rossville (IN0020907). The City of Rossville has two (2) CSO outfalls. These two CSO outfalls discharge to Silverthorn Ditch and Campbells Run. The LTCP was submitted August 21, 2001. The final LTCP was completed 7/16/2002 and is enforceable by permit. CSO outfalls are considered a source of *E. coli* to the Middle Fork Wildcat Creek watershed (Figure 5).

Concentrated Animal Feeding Operations

The removal and disposal of the manure, litter, or processed wastewater that is generated as the result of confined feeding operations falls under the regulations for confined feeding operations (CFOs) and concentrated animal feeding operations (CAFOs). The CFO and CAFO regulations (327 IAC 16, 327 IAC 15) require operations "not cause or contribute to an impairment of surface waters of the state. ". IDEM regulates these confined feeding operations under IC 13-18-10, the Confined Feeding Control Law. The rules at 327 IAC 16, which implement the statute regulating confined feeding operations, were effective on March 10, 2002. The rule at 327 IAC 15-15, which regulates concentrated animal feeding operations and complies with most federal CAFO regulations, became effective on March 24, 2004, with two exceptions. 327 IAC 15-15-11 and 327 IAC 15-15-12 became effective on December 28, 2006. Point Source rules can be found at 327 IAC 5-4-3 (effective 12/28/06) and 327 IAC 5-4-3.1 (effective 3/24/04). The difference between the two feeding operation is that Concentrated Animal Feeding operations fall under Federal regulation and Confined feeding operations fall under State regulations. Due to this difference CAFO loads fall under WLA and CFO loads fall under LA.

Due to size, some confined feeding operations are defined as CAFOs. For purposes of discussion, it is important to remember that all CAFOs are confined feeding operations. The CAFO regulation, however, contains more stringent operational requirements and slightly different application requirements. There is one (1) CAFO in the Middle Fork Wildcat Creek watershed: Rose Acre Farms, Inc. Co. Line Egg Farm (ING802381).

Confined Feeding Operations

The animals raised in confined feeding operations produce manure that is stored in pits, lagoons, tanks and other storage devices. The manure is then applied to area fields as fertilizer. When stored and applied properly, this beneficial re-use of manure provides a natural source for crop nutrition. It also lessens the need for fuel and other natural resources that are used in the production of fertilizer. Confined feeding operations, however, can also pose environmental concerns, including the following:

- Manure can leak or spill from storage pits, lagoons, tanks, etc.
- Improper application of manure can contaminate surface or ground water.
- Manure over application can adversely impact soil productivity.

The locations of confined feeding operations in the Middle Fork Wildcat Creek Watershed are shown in Figure 6. There are thirty-six (36) CFOs in the Middle Fork Wildcat Creek watershed (Table 3).

There are many smaller livestock operations in the watershed. These operations, due to their small size, are not regulated under the CFO or CAFO regulations. These operations may still have an impact on the water quality and the *E. coli* impairment. No specific information on these small livestock operations is currently available for the Middle Fork Wildcat Creek Watershed; however, it is believed that these small livestock operations may be a source of the *E. coli* impairment.

Linkage Analysis and E. coli Load Duration Curves and Precipitation Graphs

The linkage between the *E. coli* concentrations in the Middle Fork Wildcat Creek Watershed and the potential sources of *E. coli* provides the basis for the development of this TMDL. The linkage is defined as the cause and effect relationship between the selected indicators and the sources. Analysis of this relationship allows for estimating the total assimilative capacity of the stream and any needed load reductions. Water quality duration curves were created for the sampling sites in the Middle Fork Wildcat Creek Watershed that were sampled by IDEM in 2003. A flow duration interval is described as a percentage. Zero (0) percent corresponds to the highest stream discharge (flood condition) and 100 percent corresponds to the lowest discharge (drought condition). Analysis of the data for the Middle Fork Wildcat Creek watershed indicates that a significant amount of the *E.* coli load enters the watershed through both wet (nonpoint) and dry (point) weather sources.

To investigate further the potential sources mentioned above, an *E. coli* load duration curve analysis, as outlined in an unpublished paper by Cleland (2002), was developed for each sampling site in the Middle Fork Wildcat Creek Watershed. The load duration curve analysis is a relatively new method utilized in TMDL development. The method considers how stream flow conditions relate to a variety of pollutant loadings and their sources (point and nonpoint).

In order to develop a load duration curve, continuous flow data is required. The USGS gage for the Wildcat Creek (gage 03335000) located near Lafayette, Indiana was used for the development of the *E. coli* load duration curve analysis for the Middle Fork Wildcat Creek Watershed TMDL. USGS gage 03335000 is located on the Wildcat Creek in Tippecanoe County.

The flow data is used to create flow duration curves, which display the cumulative frequency of distribution of the daily flow for the period of record. The flow duration curve relates flow values measured at the monitoring station to the percent of time that those values are met or exceeded. Flows are ranked from extremely low flows, which are exceeded nearly 100 percent of the time, to extremely high flows, which are rarely exceeded. Flow duration curves are then transformed into load duration curves by

multiplying the flow values along the curve by applicable water quality criteria values for *E. coli* and appropriate conversion factors. The load duration curves are conceptually similar to the flow duration curves in that the x-axis represents the flow recurrence interval and the y-axis represents the allowable load of the water quality parameter. The curve representing the allowable load of *E. coli* was calculated using the daily and geometric mean standards of 235 per 100 mL and 125 per 100 mL, respectively. The final step in the development of a load duration curve is to add the water quality pollutant data to the curves. Pollutant loads are estimated from the data as the product of the pollutant concentrations, instantaneous flows measured at the time of sample collection, and appropriate conversion factors. In order to identify the plotting position of each calculated load, the recurrence interval of each instantaneous flow measurement was defined. Water quality pollutant monitoring data are plotted on the same graph as the load duration curve that provides a graphical display of the water quality conditions in the waterbody. The pollutant monitoring data points that are above the target line exceed the water quality standards (WQS); those that fall below the target line meet the WQS (Mississippi DEQ, 2002).

Load duration curves were created for all the sampling sites in the Middle Fork Wildcat Creek watershed. However, sampling sites 1, 10, 17, and 19 provide the best description of the sources of *E. coli* to the Middle Fork Wildcat Creek watershed and will be discussed in this TMDL (Figure 4, Attachment D). Site 1 (WAW030-0040) is located on the headwaters of Middle Fork Wildcat Creek off County Road 800 East. Site 10 (WAW030-0034) is located on Campbell's Run at County Road 300 West. Site 12 (WAW030-0011) is located on Silverthorn Ditch at CR 480 West. Site 20 (WAW030-0026) is located on the mainstem West Fork Wildcat Creek at State Road 26. These sampling sites were intensively sampled for *E. coli* in July 2003. The data indicate that the largest exceedances of the *E. coli* WQS are prevalent during wet weather events (noted by diamonds above the curve on the far left side of the figure in Attachment D). Dry weather contributions are also a source of *E. coli* to the Lower Wildcat Creek watershed (noted by the diamonds above the curve on right side of the figure in Attachment D).

To further investigate sources of pollution *E. coli* counts in Most Probable Number (MPN)/100 mL have been plotted on precipitation graphs (Attachment D). Elevated levels of *E. coli* during rain events indicate a nonpoint source of pollution exists. The precipitation data was collected from a weather station in Frankfort and managed by the Indiana State Climate Office at Purdue University.

Site 1(WAW030-0040) is located off of Country Road 800 E and represents sources coming from the headwaters of Middle Fork Wildcat Creek. The geometric mean value for Site 1 is 1377.33 MPN/100mL. The load duration curve shows exceedances of the single sample maximum during all flow regimes, indicating that *E. coli* is entering the stream from both point and nonpoint sources. An *E. coli* concentration of 2420 MPN/100mL was recorded on July 1, 2006, after a relatively dry period. Between June 24, 2003 and July 1, 2003 (the day of the sample) there was only 0.38 inches of rain indicating point source contributions, while violations during high flow events indicate nonpoint source contributions. The precipitation graph also indicates that *E. coli* contributions are present during both wet and dry events.

Site 10 (WAW030-0034) is located off of Country Road 300 W and represents sources coming from Campbell's Run and tributaries feeding into Campbell's Run. The geometric mean value for Site 10 is 1360.75 MPN/100mL. Exceedances occur during all flow regimes indicating that *E. coli* enters the stream through both point and nonpoint sources. Exceedances during high flows indicate nonpoint source contributions of *E. coli* while exceedances during lower flows indicate point source *E. coli* contributions. The precipitation graph also indicates that *E. coli* contributions are present during both wet and dry events.

Site 17 (WAW0320-0023) is located off of Country Road 100 S and represents sources coming from Hog Run. The geometric mean value for Site 18 is 1561.71 MPN/100mL. Exceedances occur during all flow regimes indicating that *E. coli* enters the stream through both point and nonpoint sources. Exceedances during high flows indicate nonpoint source contributions of *E. coli* while exceedances during lower flows indicate point source *E. coli* contributions. The precipitation graph also indicates that *E. coli* contributions are present during both wet and dry events.

Site 19 (WAW030-0026) is located off of State Road 26 and represents sources coming from Middle Fork Wildcat Creek. The geometric mean value for Site 20 is 775.24 MPN/100mL. Exceedances occur during high flow events indicating that contributions of *E. coli* are primarily from nonpoint sources. The precipitation graph indicates that during dry periods, *E. coli* contributions are minimal, indicating that there are few point sources of *E. coli* in this area and more nonpoint contributions.

While there are point source contributions, compliance with the numeric *E. coli* WQS in the Middle Fork Wildcat Creek Watershed most critically depends on controlling nonpoint sources using best management plans (BMPs). If the *E. coli* inputs can be controlled, then total body contact recreational use in Middle Fork Wildcat Creek Watershed will be protected.

TMDL Development

The TMDL represents the maximum loading that can be assimilated by the waterbody while still achieving the Waters Quality Standard (WQS). As indicated in the Numeric Targets section of this document, the target for this *E. coli* TMDL is 125 per one hundred milliliters as a geometric mean based on not less than five samples equally spaced over a thirty-day period from April 1 through October 31. Concurrent with the selection of a numeric concentration endpoint, TMDL development also defines the critical conditions that will be used when defining allowable levels. Many TMDLs are designed as the set of environmental conditions that, when addressed by appropriate controls, will ensure attainment of WQS for the pollutant. For example, the critical conditions for the control of point sources in Indiana are given in 327 IAC 5-2-11.1(b). In general, the 7-day average low flow in 10 years (Q7, 10) for a stream is used as the design condition for point source dischargers. However, *E. coli* sources to Middle Fork Wildcat Creek Watershed arise from a mixture of dry and wet weather-driven conditions, and there is no single critical condition that would achieve the *E. coli* WQS. For the Middle Fork Wildcat Creek Watershed and the contributing sources, there are a number of different allowable loads that will ensure compliance, as long as they are distributed properly throughout the watershed.

For most pollutants, TMDLs are expressed on a mass loading basis (e.g. pounds per day). For *E. coli* indicators, however, mass is not an appropriate measure because *E. coli* is expressed in terms of organism counts (or resulting concentration) (USEPA, 2001). The geometric mean *E. coli* WQS allows for the best characterization of the watershed. Therefore, this *E. coli* TMDL is concentration-based consistent with 327 IAC 5-2-11.1(b) and 40 CFR, Section 130.2 (i) and the TMDL is equal to the geometric mean *E. coli* WQS for each month of the recreational season (April 1 through October 31).

Allocations

TMDLs are comprised of the sum of individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background levels. In addition, the TMDL must include a Margin of Safety (MOS), either implicitly or explicitly, that accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody. Conceptually, this definition is denoted by the equation:

$$TMDL = \sum WLAs + \sum LAs + MOS$$

The term TMDL represents the maximum loading that can be assimilated by the receiving water while still achieving WQS. The overall loading capacity is subsequently allocated into the TMDL components of WLAs for point sources, LAs for nonpoint sources, and the MOS. This *E. coli* TMDL is concentration-based consistent with USEPA regulations at 40 CFR, Section 130.2(i).

Wasteload Allocations

As previously mentioned, there is one (1) permitted discharger in the Middle Fork Wildcat Creek watershed that has a sanitary component to the discharge. The facility already has *E. coli* limits in their permit.

There are no MS4 communities in the Middle Fork Wildcat Creek Watershed.

The City of Rossville is the only CSO community in the Middle Fork Wildcat Creek Watershed (Figure 5). The City of Rossville has two CSO outfalls. These two CSO outfalls discharge to Silverthorn Ditch and Campbells Run. A community with a CSO that believes it is not possible to meet existing water quality based requirements may develop information that supports a use attainability analysis. Such information may be included in the CSO LTCP. The use attainability analysis may result in the revision of designated uses and associated criteria if the applicable requirements of state and federal law, including 40 CFR 131.10 are met. However, states may remove a designated use that is not an existing use. Additionally, any existing use, even if not a designated use, must be protected. Furthermore, downstream water quality standards must be maintained and protected. The City of Rossville LTCP was submitted August 21, 2001. The final LTCP was completed 7/16/2002 and is enforceable by permit.

The WLA is set at the WQS of 125 per one hundred milliliters as a geometric mean based on not less than five samples equally spaced over a thirty-day period from April 1 through October 31.

Load Allocations

The LA for nonpoint sources is equal to the WQS of 125 per one hundred milliliters as a geometric mean based on not less than five samples equally spaced over a thirty-day period from April 1 through October 31. The LA will use the geometric mean of each sampling location to determine the reduction necessary to comply with WQS at each site (Attachment E & F).

Load allocations may be affected by subsequent work in the watershed. Currently there are no watershed projects in this area. It is anticipated that watershed projects will be useful in continuing to define and address the nonpoint sources of the *E. coli* in the Wildcat Creek watershed.

Margin of Safety

A Margin of Safety (MOS) was incorporated into this TMDL analysis. The MOS accounts for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality. The MOS can be either implicit (i.e., incorporated into TMDL analysis thorough conservative assumptions) or explicit (i.e., expressed in the TMDL as a portion of the loadings). This TMDL uses an implicit MOS by applying a couple of conservative assumptions. First, no rate of decay for *E. coli* was applied. *E. coli* bacteria have a limited capability of surviving outside of their hosts and therefore, a rate of decay normally would be applied. However, applying a rate of decay could result in a discharge limit that would be greater than the *E. coli* WQS, thus no rate of decay was applied. Second, the *E. coli* WQS

was applied to all flow conditions. This adds to the MOS for this TMDL. IDEM determined that applying the *E. coli* WQS of 125 per one hundred milliliters to all flow conditions and with no rate of decay for *E. coli* is a more conservative approach that provides for greater protection of the water quality.

Seasonality

Seasonality in the TMDL is addressed by expressing the TMDL in terms of the *E. coli* WQS for total body contact during the recreational season (April 1 through October 31) as defined by 327 IAC 2-1-6(d). There is no applicable total body contact *E. coli* WQS during the remainder of the year in Indiana. Because this is a concentration-based TMDL, *E. coli* WQS will be met regardless of flow conditions in the applicable season.

Monitoring

Future *E. coli* monitoring of the Middle Fork Wildcat Creek Watershed will take place during IDEM's five-year rotating basin schedule and/or once TMDL implementation methods are in place. Monitoring will be adjusted as needed to assist in continued source identification and elimination. IDEM will monitor at an appropriate frequency to determine whether Indiana's 30-day geometric mean value of 125 *E. coli* per one hundred milliliters is being met. When these results indicate that the waterbody is meeting the *E. coli* WQS, the waterbody will then be removed from the 303(d) list.

Reasonable Assurance Activities

Reasonable assurance activities are programs that are in place or will be in place to assist in meeting the Middle Fork Wildcat Creek Watershed TMDL allocations and the *E. coli* Water Quality Standard (WQS).

<u>National Pollutant Discharge Elimination System (NPDES) Permitted Dischargers</u>

The one (1) NPDES permitted facility in this watershed contains a sanitary component in the discharge. This facility was in compliance during the sampling period and is not considered a significant source of *E. coli*.

<u>Storm Water General Permit Rule 13</u>

There are no Municipal Separate Storm Sewer System communities within the Middle Fork Wildcat Creek watershed.

<u>Confined Feeding Operations and Concentrated Animal Feeding Operations</u>

CFO and CAFO are required to manage manure, litter, and process wastewater pollutants in a manner that does not cause or contribute to the impairment of *E. coli* WQS.

<u>Watershed Projects</u>

While there are no watershed projects in the Middle Fork Wildcat Creek watershed, there are currently several watershed projects located within the larger Wildcat Creek Watershed.

IDEM has recently hired a Watershed Specialist for this area of the state. The Watershed Specialist will be available to assist stakeholders with starting a watershed group, facilitating planning activities, and

serving as a liaison between watershed planning and TMDL activities in the Middle Fork Wildcat Creek Watershed.

TMDLs

Currently, there are three additional TMDL projects within the Wildcat Creek Watershed, Upper Wildcat Creek, Middle Fork Wildcat Creek, and South Fork Wildcat Creek. Upper Wildcat Creek flows into Lower Wildcat Creek. Middle Fork Wildcat Creek flows into the South Fork Wildcat Creek, which then flows into the Lower Wildcat Creek. All of these watersheds are part of the same 8-digit Hydrologic Unit Code (05120107) as the Middle Fork Wildcat Creek.

Potential Future Activities

Nonpoint source pollution, which is the primary cause of *E. coli* impairment in this watershed, can be reduced by the implementation of "best management practices" (BMPs). BMPs are practices used in agriculture, forestry, urban land development, and industry to reduce the potential for damage to natural resources from human activities. A BMP may be structural, that is, something that is built or involves changes in landforms or equipment, or it may be managerial, that is, a specific way of using or handling infrastructure or resources. BMPs should be selected based on the goals of a watershed management plan. Livestock owners, farmers, and urban planners can implement BMPs outside of a watershed management plan, but the success of BMPs would be enhanced if coordinated as part of a watershed management plan. Following are examples of BMPs that may be used to reduce *E. coli* runoff:

Riparian Area Management - Management of riparian areas protects streambanks and river banks with a buffer zone of vegetation, either grasses, legumes, or trees.

Manure Collection and Storage - Collecting, storing, and handling manure in such a way that nutrients or bacteria do not run off into surface waters or leach down into ground water.

Contour Row Crops - Farming with row patterns and field operations aligned at or nearly perpendicular to the slope of the land.

No-Till Farming - No-till is a year-round conservation farming system. In its pure form, no-till does not include any tillage operations either before or after planting. The practice reduces wind and water erosion, catches snow, conserves soil and water, protects water quality, and provides wildlife habitat. No-till helps control soil erosion and improve water quality by maintaining maximum residue plant levels on the soil surface. These plant residues: 1) protect soil particles and applied nutrients and pesticides from detachment by wind and water; 2) increase infiltration; and 3) reduce the speed at which wind and water move over the soil surface.

Manure Nutrient-Testing - If manure application is desired, sampling and chemical analysis of manure should be performed to determine nutrient content for establishing the proper manure application rate in order to avoid overapplication and run-off.

Drift Fences - Drift fences (short fences or barriers) can be installed to direct livestock movement. A drift fence parallel to a stream keep animals out and prevents direct input of *E. coli* to the stream.

Pet Clean-up / Education - Education programs for pet owners can improve water quality of runoff from urban areas.

Septic Management/Public Education - Programs for management of septic systems can provide a systematic approach to reducing septic system pollution. Education on proper maintenance of septic systems as well as the need to remove illicit discharges could alleviate some anthropogenic sources of *E. coli*.

Conclusion

The sources of *E. coli* to the Middle Fork Wildcat Creek Watershed include both point and nonpoint sources. In order for the Middle Fork Wildcat Creek Watershed to achieve Indiana's *E. coli* WQS, the wasteload and load allocations have been set to the *E. coli* WQS of 125 per one hundred milliliters as a geometric mean based on not less than five samples equally spaced over a thirty day from April 1 through October 31. Achieving the wasteload and load allocations for the Middle Fork Wildcat Creek Watershed depends on:

1) Permitted facilities following their permits.
2) Nonpoint sources of *E. coli* being controlled by implementing best management practices in the watershed.
3) Implementation of the *E. coli* TMDLs completed on the impaired tributaries throughout the entire 8-digit Wildcat Creek watershed (05120107).

The next phase of this TMDL is to identify and support the implementation of activities that will bring the Middle Fork Wildcat Creek Watershed in compliance with the *E. coli* WQS. IDEM will continue to work with its existing programs on implementation. In the event that designated uses and associated water quality criteria applicable to the Middle Fork Wildcat Creek Watershed are revised in accordance with applicable requirements of state and federal law, the TMDL implementation activities may be revised to be consistent with such revisions. Additionally, IDEM will work with local stakeholder groups to pursue best management practices that will result in improvement of the water quality in the Middle Fork Wildcat Creek Watershed.

REFERENCES

Cleland, B. 2002 TMDL Development from the "Bottom Up"-Part II. Using Duration Curves to Connect the Pieces. America's Clean Water Foundation.

Mississippi Department of Environmental Quality. 2002. Fecal Coliform TMDL for the Big Sunflower River, Yazoo River Basin.

USEPA. 2001. Protocol for Developing Pathogen TMDLs. United States Environmental Protection Agency, 841-R-00-002.

Noles, Ron. 2007. Tippecanoe County Health Department. Personal Communication.

Jones, Kris. 2007. Carroll County Health Department. Personal Communication.

Yeary, Steve. 2007. Clinton County Health Department. Personal Communication.

Table 2: NPDES Permits in the Middle Fork Wildcat Creek Watershed

Facilities with *E. coli* Limits		
Permit No.	Facility Name	Receiving Waters
IN0020907	Rossville Municipal Sewer Treatment Plant	Wildcat CR via Silverthorn Ditch
Facilities with no Sanitary Component		
Permit No.	Facilty Name	Receiving Waters
INS100002	INDOT S.R. 26 Bridge Replacement	Wildcat CR (S Fork) and Middle Fork

Table 3: Confined Feeding Operations in the Middle Fork Wildcat Creek Watershed

		Approved Animals				
Log Number	**Name**	**Nursery Pigs**	**Growerfinishers**	**Sows**	**Beef**	**Veal (Calves)**
86	Calvert Farms Inc	1440	1420	171	0	0
1105	Stout	300	525	155	0	0
2063	Crum	270	1160	122	0	0
1725	Unger Farms	640	320	72	0	0
1347	Mcpork Farms	0	2100	0	0	0
33	Unger	0	8000	0	0	0
4270	Mcquern	230	580	136	30	0
1077	Crum C/0 Bradley	1050	1700	474	0	0
3350	Gray	865	225	104	0	0
89	Larson Farms #1	0	350	100	0	0
2498	Avery	450	150	36	60	0
567	Spraker	500	750	0	0	0
2452	Larson Farms #2	325	325	165	0	0
53	Spraker	220	440	96	0	0
2715	Pigtail/ Windmill Swine Farm	0	0	1393	0	0
2269	C/O David Wagoner	200	800	130	0	0
2841	C & R S Farms Inc	0	800	0	0	0
1720	Meador	500	850	394	0	0
3705	Howard	700	700	238	0	0
602	Gascho	250	600	29	0	0
3162	Deaton Farms, Inc.	0	0	0	0	252
1721	Rinehart	600	600	232	43	0
3904	Skiles Farms Inc	1380	1820	580	0	0
4654	Cottrell	70	180	38	0	0
2479	Windy Lane Farms Inc	500	500	0	0	0
1889	Meadowlane Farms	700	350	150	0	0
1350	Woodhouse Farms	300	1200	200	0	0
98	Skg Good Farms Inc	350	655	125	0	0
4401	Hufford	534	0	290	0	0
4197	Frey Farms-Bol Farm	466	3700	243	0	0
1985	Sa & Kl Skiles Farms Inc	1000	1350	272	0	0
2449	Long & Hufford Farms Inc	0	0	1510	0	0
2813	Robison	700	350	94	30	0
2822	Lahrman	1075	850	260	0	0
2992	Huffer	325	325	66	0	0
112	Mohler	300	600	115	0	0

Table 4: Concentrated Animal Feeding Operation in the Middle Fork Wildcat Creek Watershed

		Approved Animals		
Log Number	**Name**	**Layers**		
ING802381	Rose Acre Farms, Inc. Co. Line Egg Farm	1095270		

Figure 1: Middle Fork Wildcat Creek Watershed

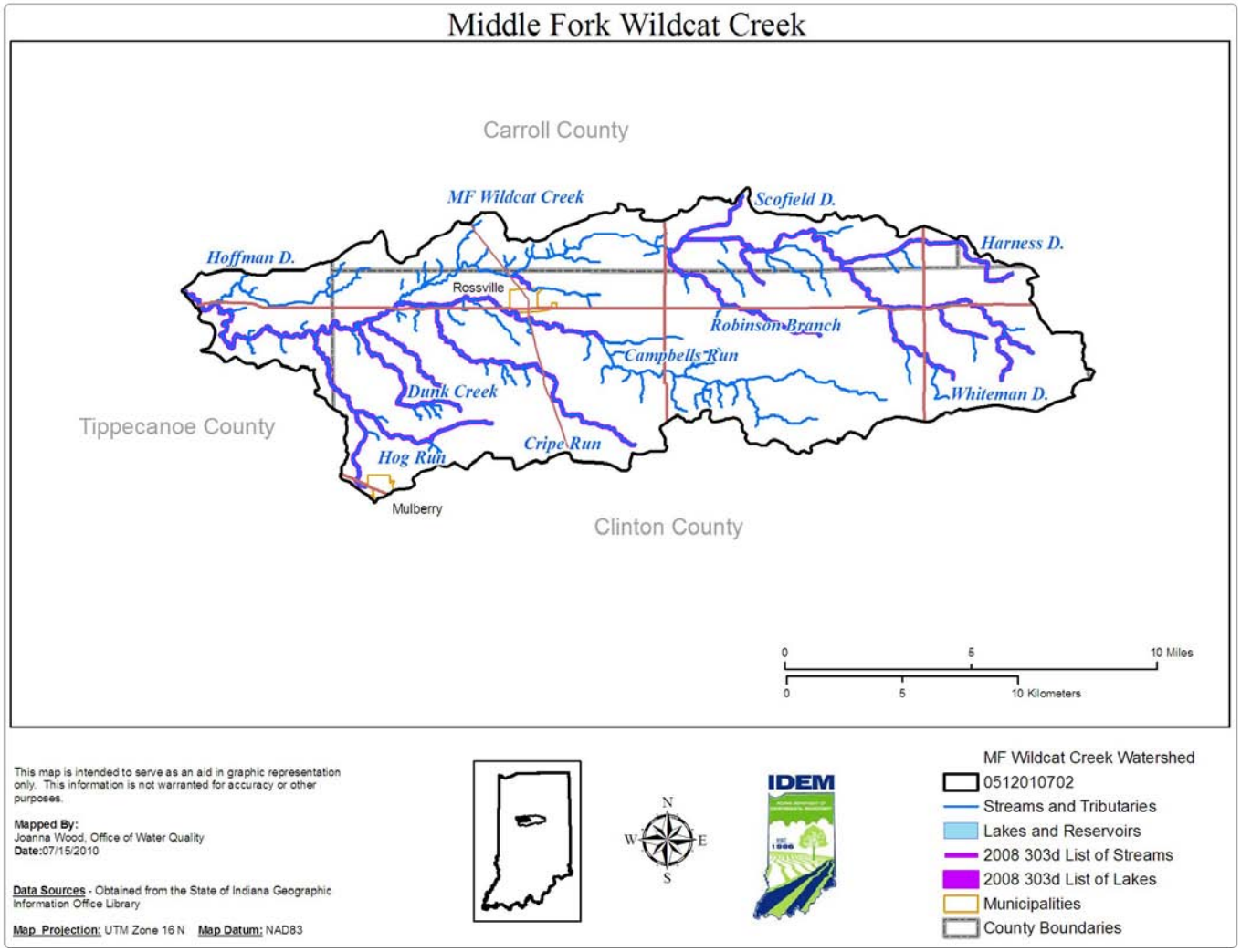


Figure 2: Sampling Activities

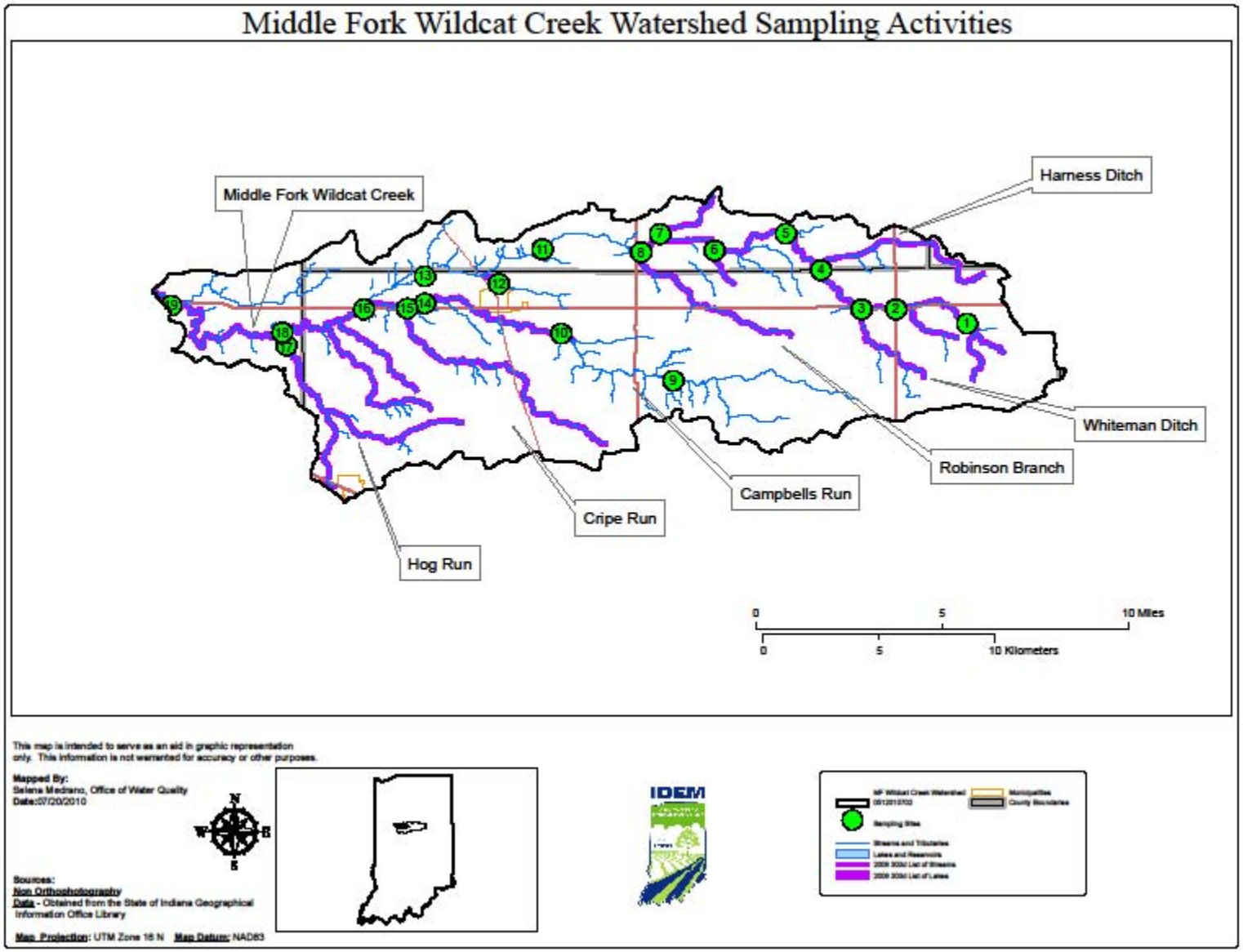


Figure 3: Landuse

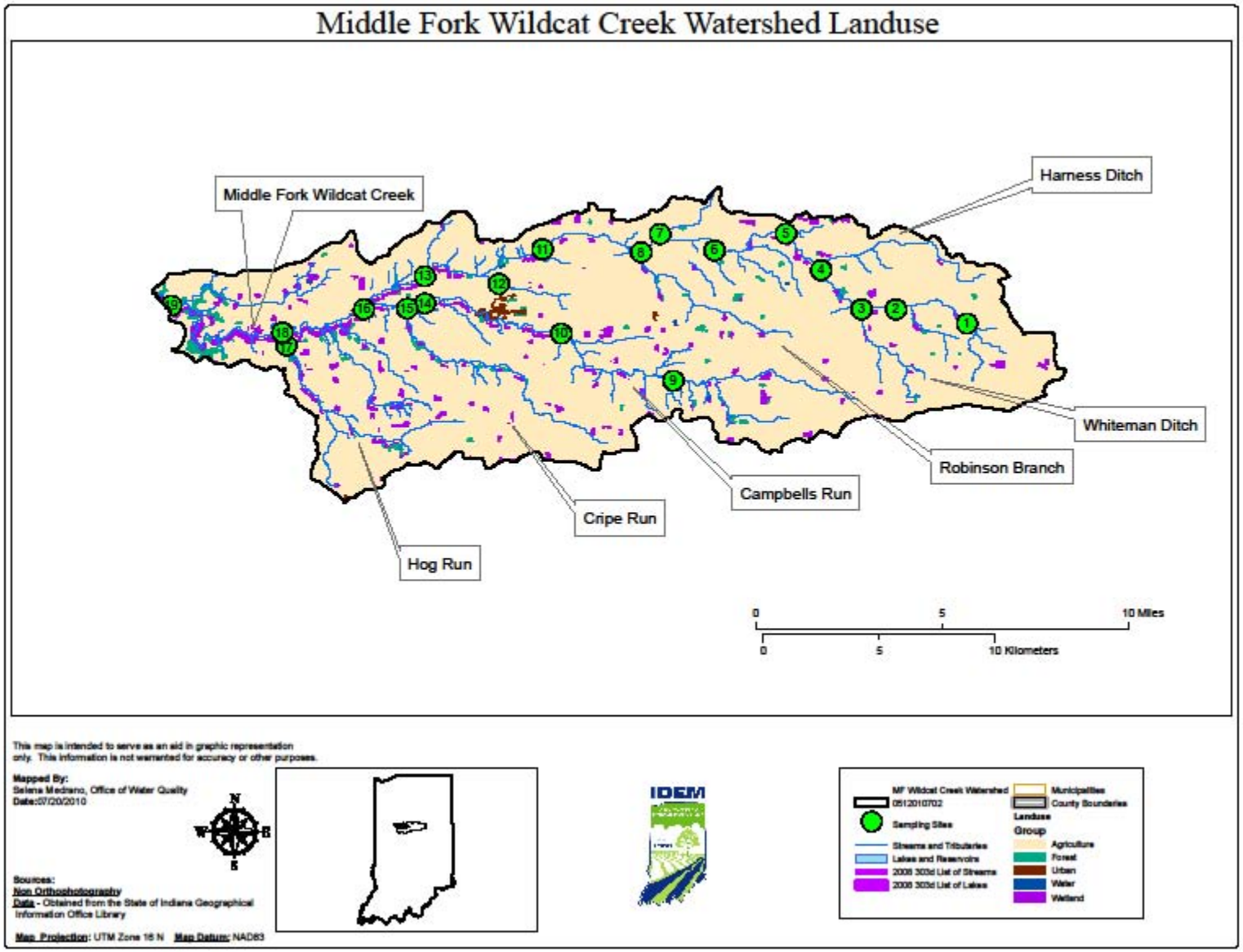
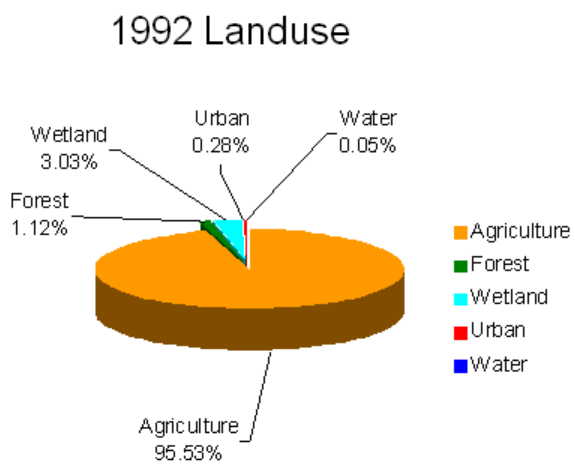


Figure 4: Middle Fork Wildcat Creek Watershed Landuse Comparison



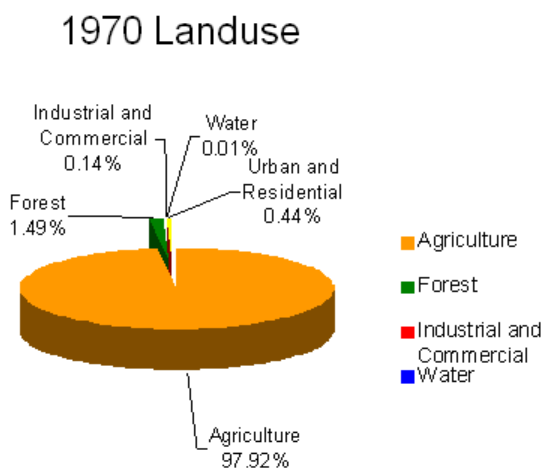


Figure 5: Permitted Facilities

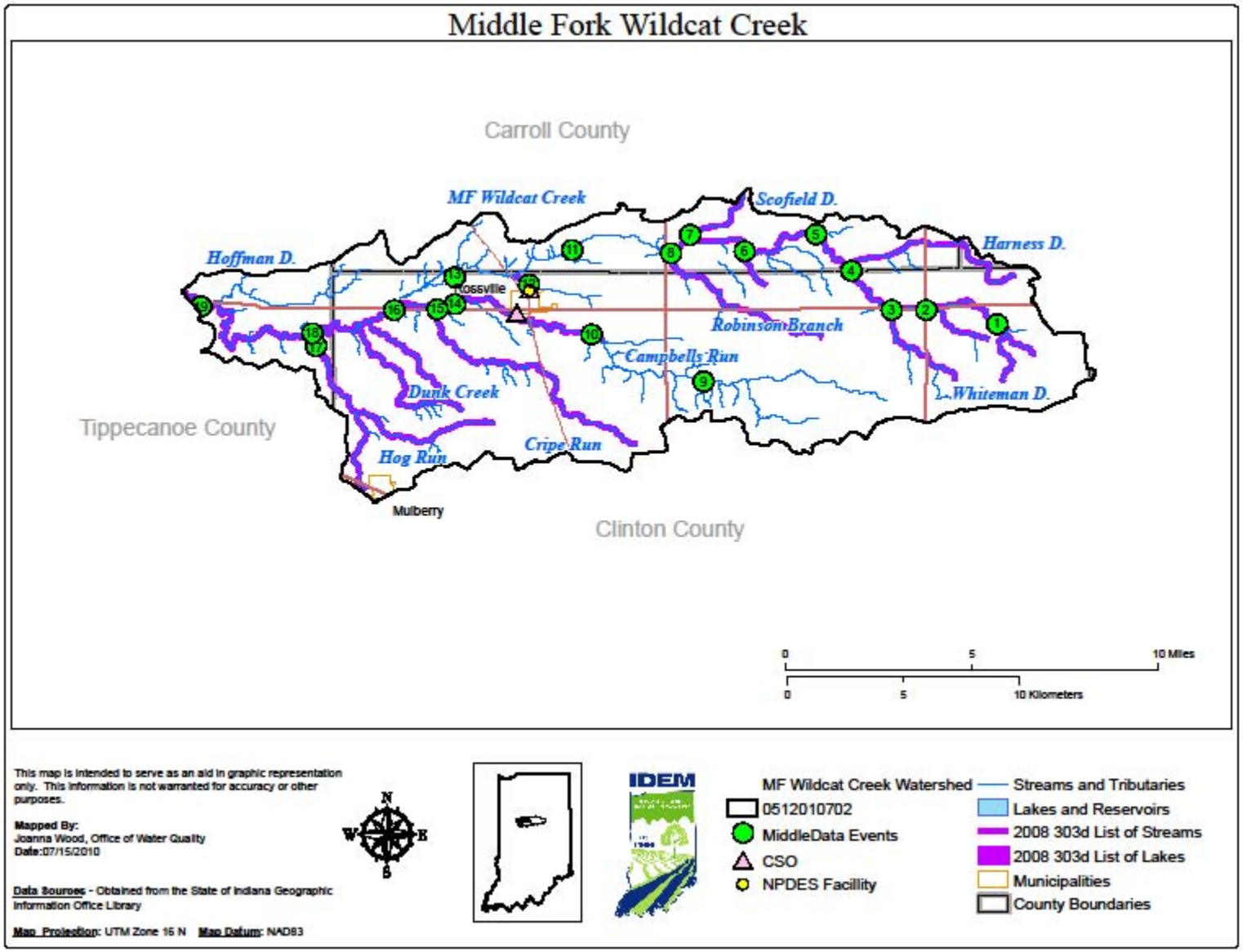
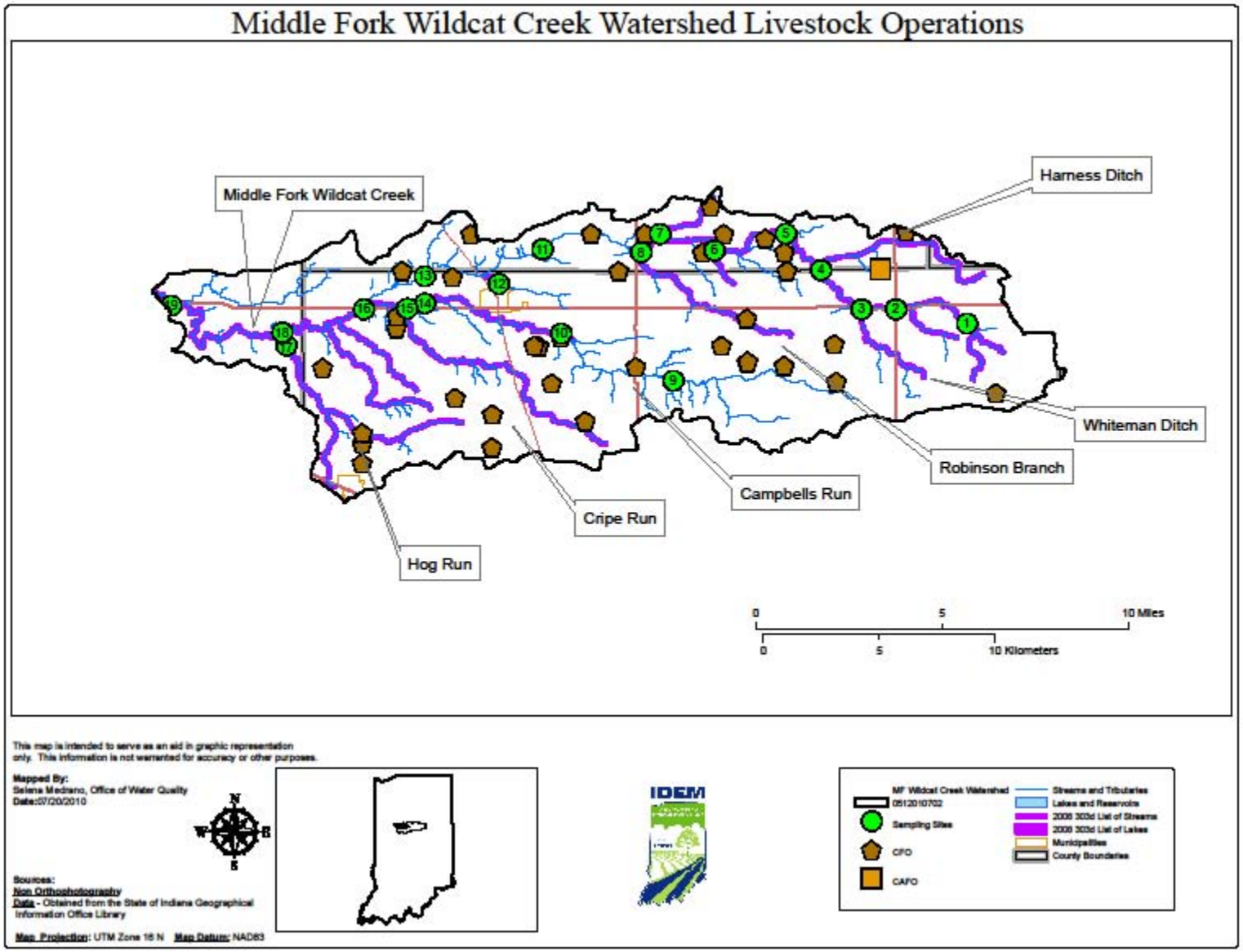


Figure 6: Livestock Feeding Operations



Attachment A

E. coli Data for the Middle Fork Wildcat Creek Tributary Watershed TMDL

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Site	Stream Name	Description	LSITE	Sample Date	*E coli* (MPN/100mL)	Geometric Mean
1	Middle Fk Wildcat Cr	CR 800 E	WAW030-0040	01-Jul-03	2420.00	1377.33
				08-Jul-03	1119.85	
				15-Jul-03	866.40	
				22-Jul-03	1291.00	
				29-Jul-03	1299.70	
				29-Jul-03	1732.90	
2	Middle Fk Wildcat Cr	SR 29	WAW030-0002	01-Jul-03	2420.00	1733.84
				08-Jul-03	1119.85	
				15-Jul-03	1203.30	
				22-Jul-03	1986.30	
				29-Jul-03	2419.10	
3	Whiteman Ditch	SR 26	WAW030-0039	01-Jul-03	2420.00	1637.25
				08-Jul-03	2613.00	
				15-Jul-03	2419.20	
				22-Jul-03	686.70	
				29-Jul-03	1119.90	
4	Middle Fk Wildcat Cr	CR 800 S	WAW030-0037	01-Jul-03	2419.17	1686.68
				08-Jul-03	1732.87	
				15-Jul-03	2420.00	
				22-Jul-03	1553.10	
				29-Jul-03	866.40	
5	Middle Fk Wildcat Cr	CR 700 S	WAW030-0004	01-Jul-03	866.40	1317.23
				08-Jul-03	1986.28	
				15-Jul-03	2420.00	
				22-Jul-03	1553.10	
				29-Jul-03	613.10	
6	Middle Fk Wildcat Cr	CR 300 E	WAW030-0005	01-Jul-03	461.10	1006.07
				08-Jul-03	1732.87	
				15-Jul-03	2420.00	
				22-Jul-03	1732.90	
				29-Jul-03	307.60	
7	Scofield Ditch	CR 700 S	WAW030-0038	01-Jul-03	1553.07	470.28
				08-Jul-03	2420.00	
				15-Jul-03	517.20	
				22-Jul-03	137.60	

				29-Jul-03	86.00	

8	Robertson Br	CR 750 S	WAW030-0007	01-Jul-03	1732.87	1725.66
				08-Jul-03	1299.65	
				15-Jul-03	2420.00	
				22-Jul-03	1986.30	
				29-Jul-03	1413.60	
9	Campbells Run	CR 00	WAW030-0015	01-Jul-03	2420.00	1710.44
				08-Jul-03	1046.24	
				15-Jul-03	1986.30	
				22-Jul-03	1203.30	
				29-Jul-03	2419.20	
10	Campbells Run	CR 300 W	WAW030-0034	01-Jul-03	613.10	1360.75
				08-Jul-03	1413.60	
				15-Jul-03	2420.00	
				22-Jul-03	1986.30	
				29-Jul-03	1119.90	
11	Middle Fk Wildcat Cr	Prince William Rd	WAW030-0009	01-Jul-03	770.10	1454.53
				08-Jul-03	1986.28	
				15-Jul-03	2420.00	
				22-Jul-03	2419.20	
				29-Jul-03	727.00	
12	Silverthorn Ditch	CR 480 W	WAW030-0011	01-Jul-03	1203.31	1619.95
				08-Jul-03	1413.60	
				15-Jul-03	2420.00	
				22-Jul-03	1119.90	
				29-Jul-03	2420.00	
13	Middle Fk Wildcat Cr	CR 680 W	WAW030-0014	01-Jul-03	547.50	1475.62
				08-Jul-03	1986.28	
				08-Jul-03	1986.28	
				15-Jul-03	2420.00	
				22-Jul-03	2419.20	
				29-Jul-03	816.40	

14	Campbells Run	CR 680 W	WAW030-0020	01-Jul-03	1203.31	1367.87
				08-Jul-03	2419.17	
				15-Jul-03	2420.00	
				22-Jul-03	2420.00	
				29-Jul-03	280.90	
15	Cripe Run	SR 26	WAW030-0021	01-Jul-03	579.40	1438.03
				08-Jul-03	1732.87	
				15-Jul-03	2420.00	
				22-Jul-03	2419.20	
				29-Jul-03	1046.20	
16	Middle Fk Wildcat Cr	SR 26 at Edna Mills	WAW030-0022	01-Jul-03	1119.85	1297.31
				08-Jul-03	1553.07	
				15-Jul-03	2420.00	
				22-Jul-03	2419.20	
				29-Jul-03	360.90	
17	Hog Run	CR 100 S	WAW030-0023	01-Jul-03	488.40	1561.71
				08-Jul-03	2419.17	
				15-Jul-03	2420.00	
				15-Jul-03	2420.00	
				22-Jul-03	2420.00	
				29-Jul-03	866.40	
18	Middle Fk Wildcat Cr	CR 1050 E	WAW030-0024	01-Jul-03	488.40	1166.12
				08-Jul-03	1732.87	
				15-Jul-03	2419.20	
				22-Jul-03	2420.00	
				29-Jul-03	435.20	
19	Middle Fk Wildcat Cr	SR 26	WAW030-0026	01-Jul-03	201.40	775.24
				01-Jul-03	275.50	
				08-Jul-03	1553.07	
				15-Jul-03	1413.60	
				22-Jul-03	2420.00	
				22-Jul-03	2420.00	
				29-Jul-03	235.90	

Attachment B

Historic *E. coli* Data for the Middle Fork Wildcat Creek Watershed TMDL

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Site Number	Project Name	Stream Name	Description	LSITE
	1998 USGS E coli	Middle Fk Wildcat Cr	CR 775 E	WAW030-0031
	1998 USGS E coli	Middle Fk Wildcat Cr	CR 775 E	WAW030-0031
	1998 USGS E coli	Middle Fk Wildcat Cr	CR 775 E	WAW030-0031
	1998 USGS E coli	Middle Fk Wildcat Cr	CR 775 E	WAW030-0031
	1998 USGS E coli	Middle Fk Wildcat Cr	CR 775 E	WAW030-0031
	1998 USGS E coli	Middle Fk Wildcat Cr	CR 775 E	WAW030-0031
17	2005 Fixed Station	Middle Fk Wildcat Cr	SR 26 at Edna Mills	WAW030-0022

Sample Date	Sample Number	E_ Coli (CFU/100mL)	E_ Coli (MPN/100mL)	Geometric Mean
03-Aug-98	AA07560	97		246.2077028
10-Aug-98	AA07587	2700		
17-Aug-98	AA09460 (D)	180		
17-Aug-98	AA07614	210		
24-Aug-98	AA07641	150		
31-Aug-98	AA07668	150		
23-Sep-05	AA28948		1100	1

Attachment C

Hoosier Riverwatch data for the Middle Fork Wildcat Creek Watershed TMDL

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Hoosier Riverwatch Data

Chemical Data

Site ID	WaterShed Name	River Name	Description	Time	Date	Weather
138	Wildcat 05120107	Hog Run	NW 1/4, NW 1/4. Sec. 6, T 22N, R 2W. Ross Twp.		10/16/2000	Overcast

Biological Data

Excellent PTS 23 or More	Good PTS	Fair PTS	Poor PTS
	17-22	16-Nov	10 or less

Site ID:	Watershed Name	River Name	Description	Time	Date	Weather
138	Wildcat 05120107	Hog Run	NW 1/4, NW 1/4. Sec. 6, T 22N, R 2W. Ross Twp.		10/16/2000	Overcast

Habitat Data

If the CQHEI score is over 100, consider it a high quality stream. CQHEI scores greater than 60 hav

Site ID	WaterShed Name	River Name	Description	Time	Date	Weather
138	Wildcat 05120107	Hog Run	NW 1/4, NW 1/4. Sec. 6, T 22N, R 2W. Ross Twp.		10/16/2000	Overcast

Past Weather	Water Quality	DO (ppm)	DO (% Saturatio	E-coli (colonies	General Coliforms	pH	BOD 5 (mg/L)
Showers	81.65	9.33	85	0		7.6	7.33

Past Weather	Sampling Technique	Habitat Sampled	Native Mussels	Zebra Mussels	Rusty Crayfish	Vegetation Present	Algae % Cover
Showers	,D-Net	,,,undercut, sediment	NO	NO		NO	0

ve been found to be 'generally conducive to the existence of warmwater fauna.'

Past Weather	I	II	III	IV	V	VI	CQHEI
Showers	16	6	15	12	1	0	50

Water Temp (C)	Temp Change (C)	Orthophosphate	Total Phosphat	Nitrate NO3	Nitrite NO2 (mg/l)	Turbidity (NTU)	Additional Test 1	Additional Test 2
	0			0.09		46	N/A	N/A

Diversity Score	Pollution Tolerance Score (PTS)	Stonefly Larvae	Mayfly Larvae	Caddis Fly Larvae	Dobsonfly Larvae	Riffle Beetle	Water Penny	Right-Handed Snail
	21		4	6		1		

Comments

Additional Test 3	Additional Test 4	Comments
N/A	N/A	

Damsel Fly Nymph	Dragonfly Nymph	Sowbug	Scud	Crane Fly Larvae	Clams/ Mussels	Crayfish	Midge Larvae	Black Fly Larvae
1	2			1				

Planaria	Leech	Left-Handed Snail	Aquatic Worms	Blood Midge	Rat-Tailed Maggot	Comments

Attachment D

Load Duration Curves and Precipitation Graphs for the Middle Fork Wildcat Creek Watershed TMDL

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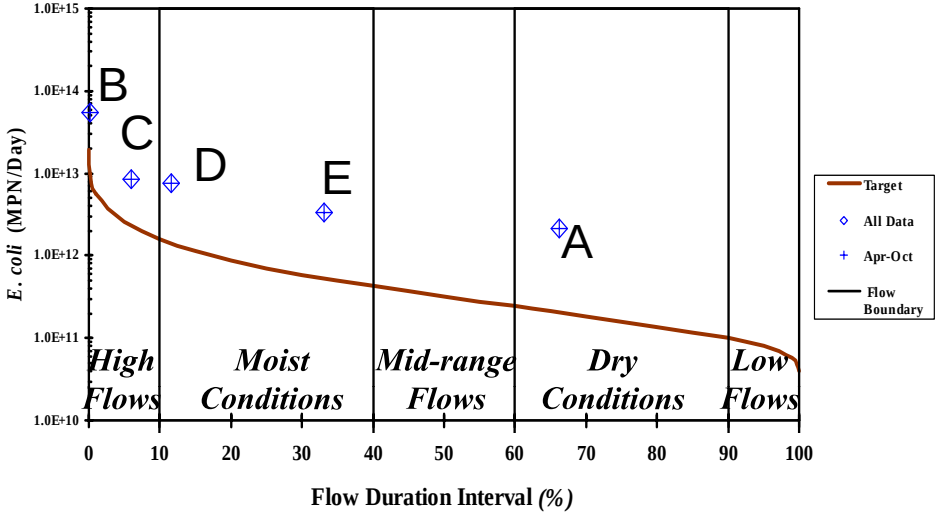
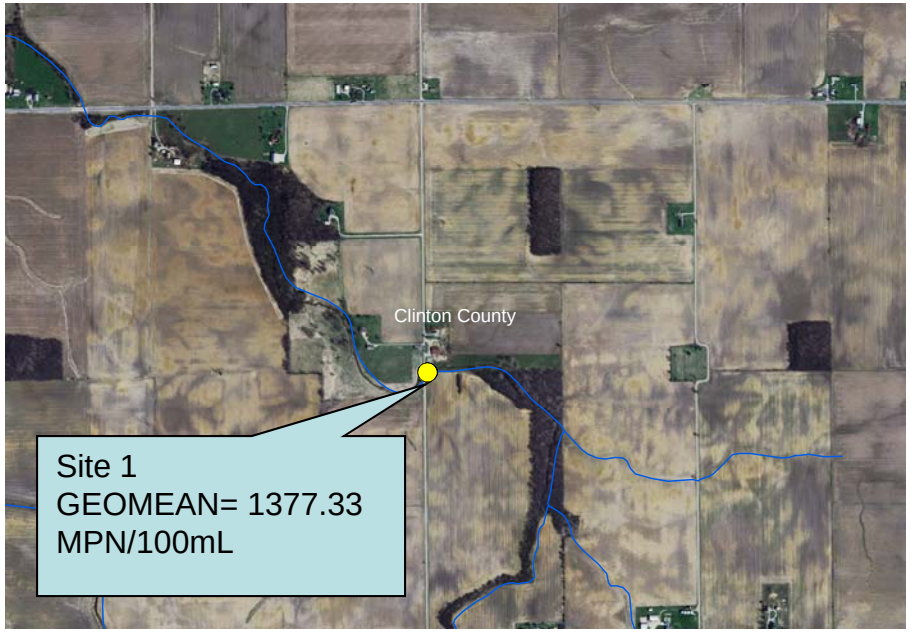
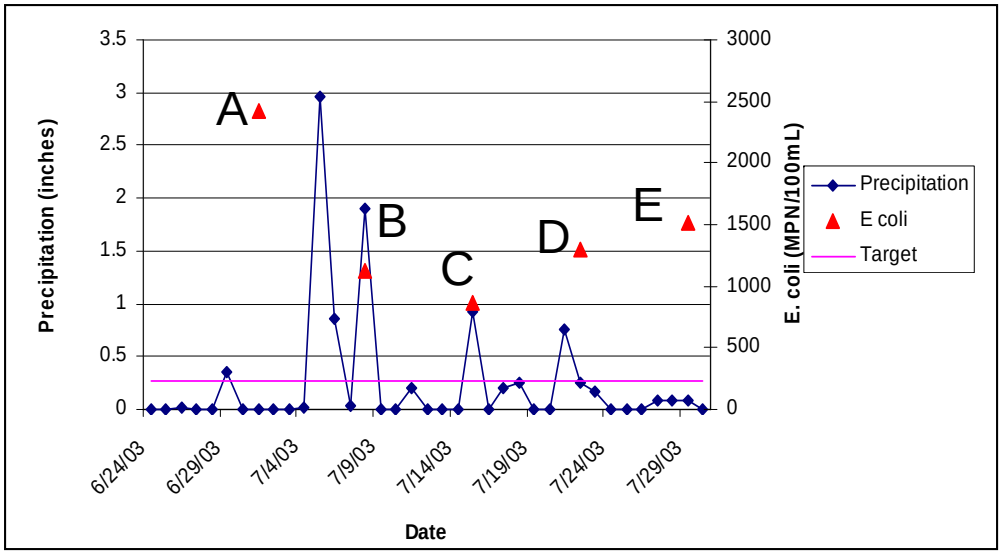
Middle Fork Wildcat Creek
Site1: WAW030-0040

Load Duration Curve





Precipitation

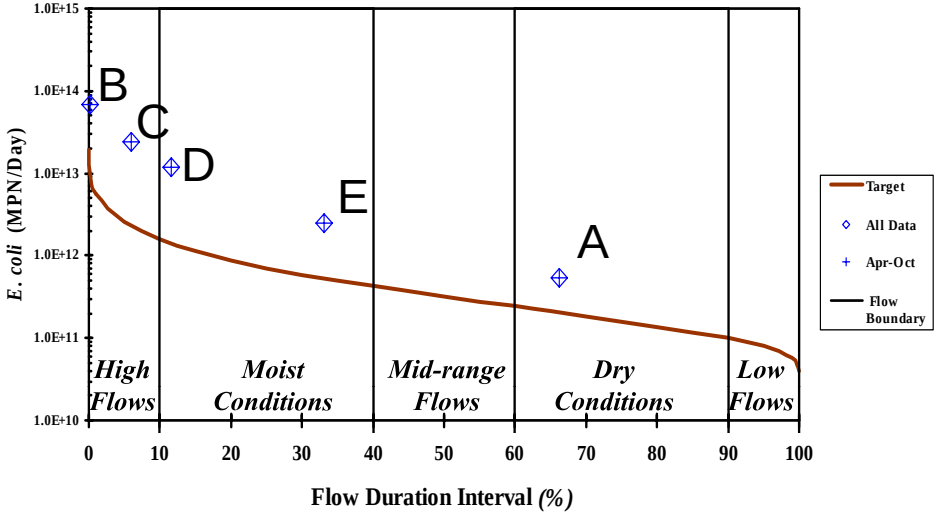


USGS Lafayette Flow Gage.
Frankfort Precipitation Station - State Climate Office

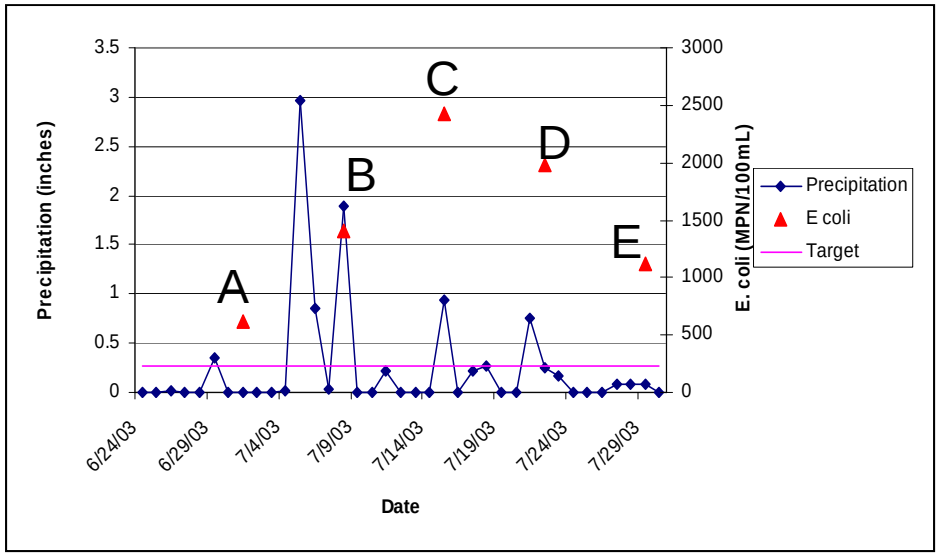
Drainage Area:
121.03 Square Miles

Campbell's Run at CR 300 W
Site 10: WAW030-0034

Load Duration Curve



Precipitation

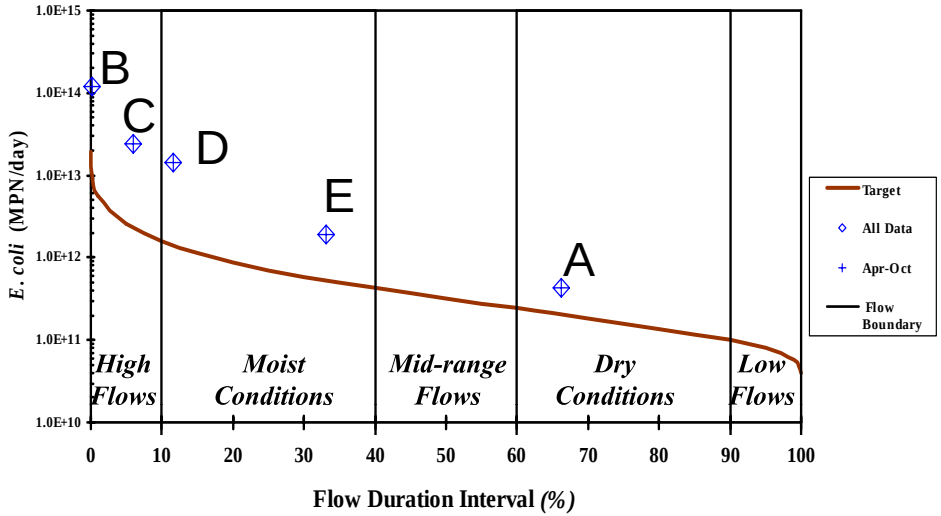


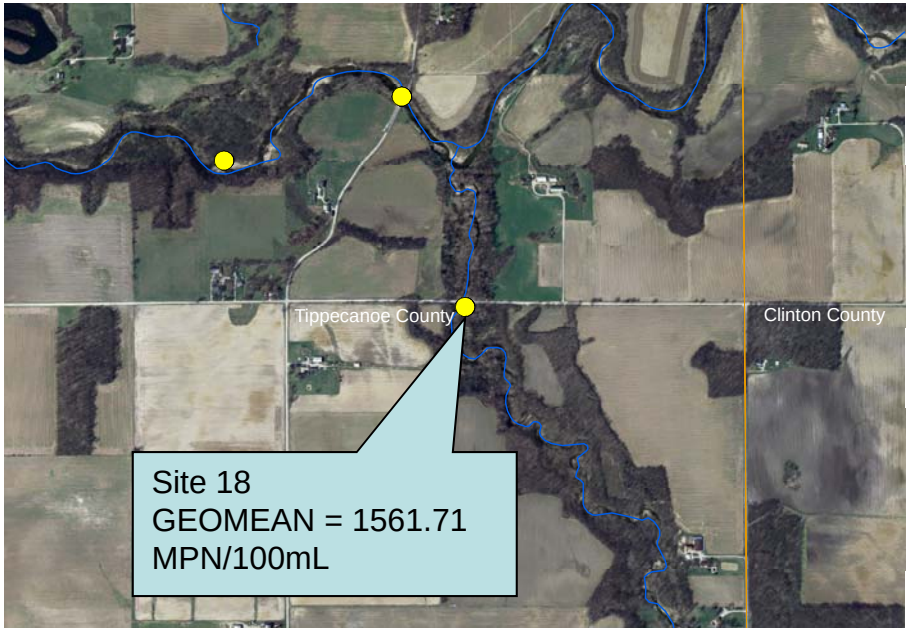
USGS Lafayette Flow Gage.
Frankfort Precipitation Station - State Climate Office

Drainage Area:
121.03 Square Miles

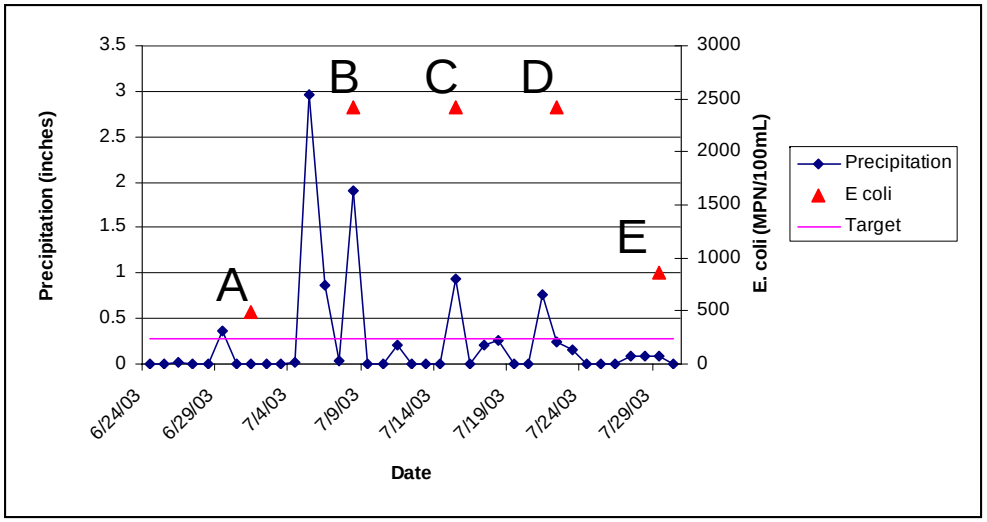
Hog Run at CR 100 S
Site 17: WAW030-0023

Load Duration Curve





Precipitation

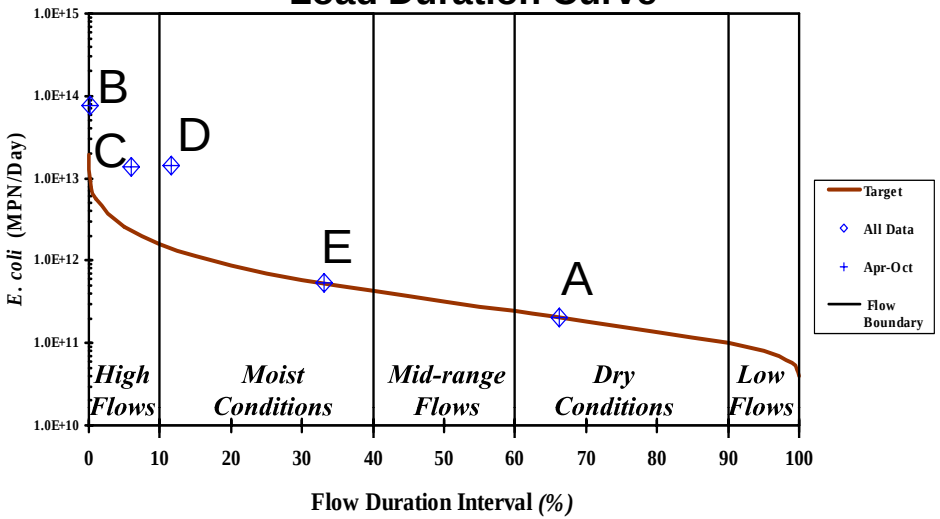


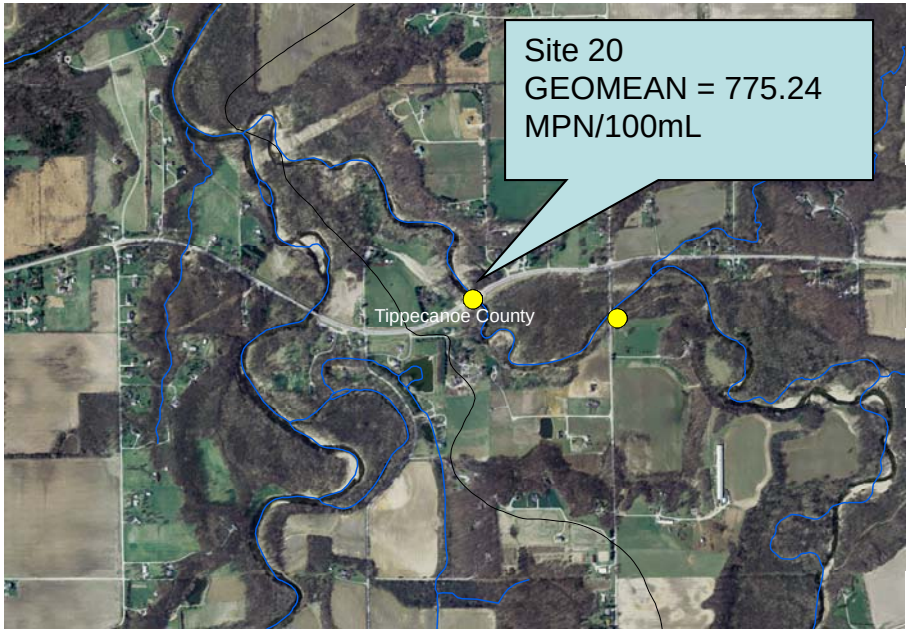
USGS Lafayette Flow Gage.
Frankfort Precipitation Station - State Climate Office

Drainage Area:
121.03 Square Miles

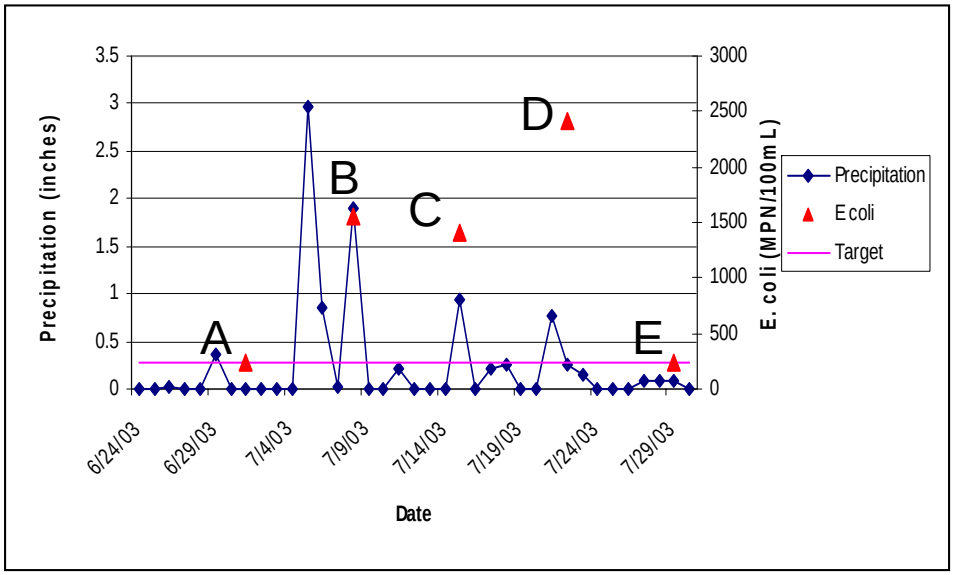
Middle Fork Wildcat Creek at SR 26
Site 19: WAW030-0026

Load Duration Curve





Precipitation



USGS Lafayette Flow Gage.
Frankfort Precipitation Station - State Climate Office

Drainage Area:
121.03 Square Miles

Attachment E

Load Reductions for the Middle Fork Wildcat Creek Watershed TMDL

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Site Number	LSITE	Stream Name	Description	Geometric Mean	Percent Reduction Needed
1	WAW030-0040	Middle Fk Wildcat Cr	CR 800 E	1377.33	90.92%
2	WAW030-0002	Middle Fk Wildcat Cr	SR 29	1733.84	92.79%
3	WAW030-0039	Whiteman Ditch	SR 26	1637.25	92.37%
4	WAW030-0037	Middle Fk Wildcat Cr	CR 800 S	1686.68	92.59%
5	WAW030-0004	Middle Fk Wildcat Cr	CR 700 S	1317.23	90.51%
6	WAW030-0005	Middle Fk Wildcat Cr	CR 300 E	1006.07	87.58%
7	WAW030-0038	Scofield Ditch	CR 700 S	470.28	73.42%
8	WAW030-0007	Robertson Br	CR 750 S	1725.66	92.76%
9	WAW030-0015	Campbells Run	CR 00	1710.44	92.69%
10	WAW030-0034	Campbells Run	CR 300 W	1360.75	90.81%
11	WAW030-0009	Middle Fk Wildcat Cr	Prince William Rd	1454.53	91.41%
12	WAW030-0011	Silverthorn Ditch	CR 480 W	1619.95	92.28%
13	WAW030-0041	Rossville WWTP Effluent	Rossville Municipal WWTP Outfall on Silverthrone Ditch	17.17	n/a
14	WAW030-0014	Middle Fk Wildcat Cr	CR 680 W	1475.62	91.53%
15	WAW030-0020	Campbells Run	CR 680 W	1367.87	90.86%
16	WAW030-0021	Cripe Run	SR 26	1438.03	91.31%
17	WAW030-0022	Middle Fk Wildcat Cr	SR 26 at Edna Mills	1297.31	90.36%
18	WAW030-0023	Hog Run	CR 100 S	1561.71	92.00%
19	WAW030-0024	Middle Fk Wildcat Cr	CR 1050 E	1166.12	89.28%
20	WAW030-0026	Middle Fk Wildcat Cr	SR 26	775.24	83.88%

Attachment F

Segment Load Reductions for the Middle Fork Wildcat Creek Watershed TMDL

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Segment ID	Miles	Sample Maximum	Target	Total Needed Reduction	Segment Percentage of Watershed	Segment Load Reduction
INB0721_01	10.03	2420	235	2185	6.67%	145.71
INB0721_T1012	2.54	2420	235	2185	1.69%	36.84
INB0721_T1013	5.70	2420	235	2185	3.79%	82.80
INB0721_T1014	7.19	2420	235	2185	4.78%	104.50
INB0722_01	7.97	2420	235	2185	5.30%	115.81
INB0722_T1012	1.43	2420	235	2185	0.95%	20.82
INB0722_T1013	2.32	2420	235	2185	1.54%	33.74
INB0722_T1014	6.73	2420	235	2185	4.48%	97.82
INB0723_01	25.05	2420	235	2185	16.66%	364.03
INB0723_02	12.78	2420	235	2185	8.50%	185.72
INB0723_T1012	11.23	2420	235	2185	7.47%	163.18
INB0724_01	15.57	2420	235	2185	10.35%	226.20
INB0724_02A	0.31	2420	235	2185	0.21%	4.49
INB0724_02B	0.28	2420	235	2185	0.19%	4.12
INB0724_T1002	3.24	2420	235	2185	2.15%	47.07
INB0724_T1003	1.82	2420	235	2185	1.21%	26.42
INB0725_01	5.03	2420	235	2185	3.34%	73.03
INB0725_02	8.73	2420	235	2185	5.80%	126.81
INB0725_T1012	3.50	2420	235	2185	2.33%	50.84
INB0725_T1013	7.29	2420	235	2185	4.85%	105.91
INB0725_T1014	11.64	2420	235	2185	7.74%	169.15
	150.38				100.00%	2185