Office of Water Quality
Total Maximum Daily Load Program

Total Maximum Daily Load for *Escherichia coli* (*E. coli*) For the Middle West Fork White River Watershed, Morgan, Owen, and Greene Counties

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Table of Contents

Tables and Figures

Attachments

Indiana Department of Environmental Management
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May 25, 2005

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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 West Fork White River watershed in Morgan, Owen, and Greene Counties in Indiana.

Background

In 1998, 2002, and 2004, Indiana's section 303(d) list cited the West Fork of the White River as being impaired for *E. coli* along with cyanide, impaired biotic communities, and fish consumption advisories for PCBs and mercury in Morgan, Owen, and Greene Counties. In 2004, Indiana's section 303(d) list cites, in addition to the West Fork White River, Clear Creek-East/West/Grassy Forks, Sycamore Creek, Highland Creek, McCormicks Creek, Stotts Creek, Rattlesnake Creek, East Fork of Fish Creek, Fish Creek, Raccoon Creek-Little Raccoon Creek, Raccoon Creek-Lick Creek, Lambs Creek, Goose Creek, White Lick Creek, Crooked Creek-Banta Creek, Beanblossom Creek, and Indian Creek for *E. coli*. With the addition of the above streams in 2004, the majority of the Middle West Fork White River watershed is impaired for *E. coli*. Certain tributaries to the West Fork of the White River, including Lambs Creek, Goose Creek, White Lick Creek, Crooked Creek-Banta Creek, Stotts Creek, Beanblossom Creek, and Indian Creek fall partly within the study area for this TMDL and are impaired for *E. coli*. However these waterbodies and their associated impairments will be addressed in separate TMDLs.

A reassessment of the *E. coli* impairment was completed on McCormicks Creek, Fish Creek, and the West Fork White River using the *E. coli* sampling completed in 2001. For the 2006 303(d) List, the entire length of McCormicks Creek, the mainstem of Fish Creek, and segment number INW01J9_M1106 for the West Fork White River will be listed for an *E. coli* impairment. The tributary segments of Fish Creek, INW022B_00, INW022C_00, and INW022D_00, will be split from each mainstem segment and considered unassessed until additional data becomes available.

This TMDL will address approximately 193.05 miles of the Middle West Fork White River watershed in Morgan, Owen, and Greene Counties where recreational uses are impaired by elevated levels of *E. coli* during the recreational season. Morgan, Owen, and Greene Counties are located in south-central Indiana (Figure 1). All of the twenty-nine (29) segments of the listed streams for this TMDL are located in the West Fork White River Basin in hydrologic unit codes 05120201 and 05120202. The description of the study area, its topography, and other particulars are as follows:

Waterbody Name	303(d) List ID	Segment ID Number(s)	Length (miles)	Impairment
Clear Creek-East/West/Grassy Forks	152	INW01EE_00	17.23	*E. coli*
Sycamore Creek	152	INW01G2_00	13.36	*E. coli*
Highland Creek	152	INW01G3_00	4.37	*E. coli*
White River (West Fork)	152	INW01G6_M1094	8.95	*E. coli*, cyanide, IBC, FCA for PCB & Hg
White River (West Fork)	152	INW01G1_M1092, INW01G3_M1093, INW01J6_M1105, INW01J9_M1106	13.17	*E. coli*, IBC, FCA for PCB & Hg
White River (West Fork) – Paragon Bridge	152	INW01J3_M1104	6.06	*E. coli*, IBC, FCA for PCB & Hg
White River (West Fork)	154	INW01E3_M1079	8.44	*E. coli*, cyanide, IBC, FCA for PCB & Hg
White River (West Fork)	154	INW01E4_M1080, INW01E6_M1081	7.26	*E. coli*, IBC, FCA for PCB & Hg
White River (West Fork) – Henderson Bridge	154	INW01ED_M1082	3.90	*E.coli*, IBC, FCA for PCB & Hg
White River (West Fork)	155	INW0244_M1011	7.17	*E.coli*, IBC, cyanide, FCA for PCB & Hg
White River (West Fork)	155	INW0221_M1009, INW0223_M1010, INW0266_M1012, INW0229_M1013, INW022F_M1061	26.29	*E.coli*, IBC, FCA for PCB & Hg
McCormicks Creek	133	INW0223_T1018	7.08	*E. coli*, IBC
Rattlesnake Creek	367	INW0225_T1059	3.37	*E. coli*, IBC
Rattlesnake Creek	500	INW0225_00	8.33	*E. coli*
East Fork Fish Creek	499	INW022A_00, INW022A_T1025	8.17	*E. coli*
Fish Creek	499	INW022C_00, INW022D_00, INW022E_00	25.44	*E. coli*
Raccoon Creek-Little Raccoon Creek	501	INW0227_00	9.84	*E. coli*
Raccoon Creek-Lick Creek	501	INW0228_00	14.99	*E. coli*

Historical data collected by IDEM documented elevated levels of *E. coli* in the West Fork White River from 1991 to 1996. This data was the basis for the listing of the West Fork White River on the 1998 and 2002 303(d) list. IDEM completed three intensive surveys of the watershed for the

Middle West Fork White River in 2001. In the first intensive survey, IDEM sampled twelve sites, five times, with the samples evenly spaced over a 30-day period from July 23, 2001, to August 20, 2001 (Figure 2A). Only one site, WWU140-0019 did not violate the single sample maximum standard and only two sites, WWU140-0030 and WWU140-0019, did not violate the geometric mean standard during this sampling event.

In the second intensive survey, IDEM sampled ten sites, five times, with the samples evenly spaced over a 30-day period from August 1, 2001, to August 29, 2001 (Figure 2B). Only two sites, WWL020-0030 and WWL020-0012, did not violate the single sample maximum standard for this sampling event. Of the ten sites sites where a geometric mean could be calculated, seven sites violated the geometric mean standard.

In the third intensive survey, IDEM sampled twenty-eight (28) sites, five times, with the samples evenly spaced over a 30-day period from September 11, 2001 to October 10, 2001(Figures 2A, 2B). Only one site, WWU160-0031, did not violate the single sample maximum standard during this sampling event. For those sites where a geometric mean could be calculated, only one site, WWU160-0031, did not violate the geometric mean standard. These intensive surveys fall within Indiana's recreational season (April 1st through October 31st). Based on these intensive surveys in 2001, IDEM determined that an *E. coli* TMDL would need to be completed on the Middle West Fork White River watershed (Attachment A).

A Hoosier Riverwatch Group also completed *E. coli* sampling on McCormicks Creek. This group sampled one site approximately once a year from 1996 to 2002. This site violated the single sample maximum standard each time it was sampled (Figure 2B, Attachment A). (McKalip, J., 2004)

The McCormicks Creek State Park sampled six sites for fecal coliform in March 2004 (Vance, J., 2004). Research indicates that *E. coli* is approximately 80% of fecal coliform. Using this estimation, if the samples had been taken during Indiana's recreational season, two of the sites would violate the single day maximum standard (Attachment B).

The Morgan County Watershed Initiative (MCWI) completed a watershed management plan for the White River Watershed in North Central Morgan County. The watershed management plan included the watersheds of Sycamore Creek and Highland Creek. The MCWI contracted with Goode and Associates to collect *E. coli* samples at three sites on Sycamore Creek and one site on Highland Creek monthly from January of 2002 through January of 2003. The samples were collected during both wet and dry conditions. During the recreational season, the sites on Sycamore Creek violated the single sample maximum standard eight times and the site on Highland Creek violated the single sample maximum standard once (Figure 2A, Attachment A). (Morgan County Watershed Initiative, 2003)

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 is 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.

Water quality *E. coli* load duration curves were created using IDEM's data. 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). The *E. coli* values at two of the sampling sites WWU160-0004 and WWL020-0003, were plotted with the corresponding flow duration interval to show the *E. coli* violations of the single-sample maximum standard and geometric mean standard during the recreational season. These sampling sites are IDEM's fixed station sites that had *E. coli* data that collected approximately monthly from 1991 to 2001. These sampling sites are representative of the hydrodynamics of the Middle West Fork White River watershed (Attachment C).

Numeric Targets

The impaired designated use for the waterbodies in the Middle West Fork White River watershed is for total body contact recreational use during the recreational season, April 1st through October 31st.

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:

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

For the Middle West Fork White River watershed during the recreational season (April 1st through October 31st) 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

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

Watershed Characterization

The Middle West Fork of the White River flows southwest from Johnson County through Morgan and Owen Counties into Greene County. There are many tributaries that enter the Middle West Fork of the White River (Figure 1).

The tributaries of Crooked Creek-Banta Creek, White Lick Creek, Stotts Creek, Lambs Creek, Goose Creek, Indian Creek, and Beanblossom Creek are listed on the 2004 303(d) list for *E. coli*. Based on sampling completed in 2001, each of these tributaries is contributing to the *E. coli* impairment in the Middle West Fork White River. Due to different circumstances with each of these tributaries, *E. coli* TMDLs for these tributaries will be completed separately. *E. coli* TMDLs for Lambs Creek, Goose Creek, Indian Creek, and Beanblossom Creek were started in 2004. Crooked Creek/Banta Creek, White Lick Creek, and Stotts Creek will have *E. coli* TMDLs completed at a later date.

The tributaries of Sycamore Creek, Clear Creek/Grassy Fork, Rattlesnake Creek, McCormicks Creek, Fish Creek, and Raccoon Creek are listed on the 2004 303(d) list for *E. coli*. Based on *E. coli* sampling completed in 2001, each of these tributaries is also contributing to the *E. coli* impairment in the Middle West Fork White River. Limestone Creek and Little Mill Creek are not listed on the 2004 303(d) list for *E. coli* and the sampling completed in 2001 confirms that these tributaries are not contributing to the impairment on the Middle West Fork White River.

The landuse information, which was gathered from the mid-1970s for the Middle West Fork White River watershed, consisted of approximately 53% forested, 45% agriculture, and 2% developed. Landuse information was also assembled in 1992 using the Gap Analysis Program (GAP). In 1992, approximately 53% of the landuse in the Middle West Fork White River watershed was forested. The remaining landuse for the Middle West Fork White River watershed consisted of approximately 1% developed, 5% palustrine wetlands, 41% agriculture (Figure 3). A comparison of the mid-1970s landuse with the 1992 landuse information shows that no substantial changes to the Middle West Fork White River watershed have occurred.

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. The MCWI also believes native wildlife are contributing to the *E. coli* impairment on Sycamore Creek and Highland Creek watersheds (Morgan County Watershed Initiative, 2003).

Homes within the Middle West Fork White River watershed are almost entirely on septics. Failing septic tanks are known sources of *E. coli* impairment in waterbodies. The Owen County Health Department estimates that about 99% of the homes in the county have septic systems and have an average failing rate for the county of 10-20% (Reeves, J., 2004). Conversations with Morgan and Greene County Health Departments staff indicate that septic system failure does occur, but no tangible septic failure rate has been established by either local Health Department at this time (Morgan County Health Department, 2004 and Rotman, S., 2004). Based on the sites picked by the MCWI, their watershed management plan also indicates that failing septic systems could be contributing to the *E. coli* impairments on Sycamore Creek and Highland Creek watersheds (Morgan County Watershed Initiative, 2003).

National Pollutant Discharge Elimination System (NPDES) Permitted Dischargers

There are twenty-one NPDES permitted facilities in the Middle West Fork White River watershed (Figure 4A, Figure 4B, Table 1). Six of the twenty-one permitted discharges have *E. coli* limits in their permits. Martinsville Municipal STP (IN0020303) had an *E. coli* violation in 2001 and *E. coli* violations in 2002. In 2001, Martinsville Municipal STP did have an enforcement action due to effluent violations that included elevated levels of *E. coli*, poor operation and maintenance, and no biomonitoring (Knox, D., 2004). This enforcement action has been resolved. The Paragon Municipal STP (IN0040479) and Gosport Municipal STP (IN0040088) did not sample for *E. coli* until 2003. The Paragon Municipal STP did sample for total residual chlorine prior to 2003 and had violations of total residual chlorine in 2000. Gosport Municipal STP collected *E. coli* samples from April 2004 to July 2004. *E. coli* violations occurred in three out of the four months. The Upland Subdivision (IN0059871) had *E. coli* violations in 2000. The violations that occurred for these facilities in this time span were sporadic and adjustments were made to correct the cause of the violations. The remaining two facilities that have *E. coli* limits in their permits did not have any violations from 2000 to 2003. Therefore, the six permitted dischargers that have *E. coli* limits are considered to be in compliance and are not considered a significant source of the *E. coli* impairment in the Middle West Fork White River watershed.

Ten of the twenty-one NPDES permitted facilities have total residual chlorine limits in their permits. These dischargers do have possible sanitary components in their discharge. Previously, facilities with design flows under 1 MGD (typically minor municipals and semipublics) were not required to have *E. coli* effluent limits or conduct monitoring for *E. coli* bacteria, provided they maintained specific total residual chlorine levels in the chlorine contact tank. The assumption was that as long as chlorine levels were adequate in the chlorine contact tank, the *E. coli* bacteria would be deactivated and compliance with the *E. coli* WQS would be met by default. The original basis for allowing chlorine contact tank requirements to replace bacteria limits was based on fecal coliform, not *E. coli*. No direct correlation between the total residual chlorine levels and *E. coli* bacteria can be conclusively drawn. Further, it has been shown that exceedances of *E. coli* bacteria limits may still occur when the chlorine contact tank requirements are met. Bradford Woods Camping Area (IN004546) and Mapleturn Utilities had violations of their total residual chlorine limits in 2000 through 2003. Brooklyn Municipal STP had violations of their total residual chlorine limits in 2001 and 2003. Due to the complications of comparing total residual chlorine to *E. coli*, it is difficult to determine to what extent, if any, these ten dischargers could be a source of *E. coli* in the Middle West Fork White River watershed.

The remaining five of twenty-one dischargers do not have *E. coli* or total residual chlorine limits in their permits. None of these five dischargers have a sanitary component to their discharge and therefore, *E. coli* limits do not apply to their permits. These permitted dischargers are not contributing to the sources of *E. coli* in the Middle West Fork White River watershed.

Storm Water General Permit Rule 13

There are three municipal separate storm sewer systems (MS4) communities, the City of Martinsville, the City of Indianapolis, and Morgan County, in the Middle West Fork White River watershed. Guidelines for MS4 permits and timelines are outlined in Indiana's Municipal Separate Storm Sewer System (MS4) Rule 13 (327 IAC 15-13-10 and 327 IAC 15-13-11). It is difficult to determine if these MS4 communities are a significant source of *E. coli* in the Middle West Fork White River watershed.

Confined Feeding Operations and Confined 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 confined animal feeding operations (CAFOs). There are two CFOs in the Middle West Fork White River watershed (Figure 5). Neither CFO is considered a CAFO (Table 2). The CFOs and CAFO regulations (327 IAC 16, 327 IAC 15) require operations "not cause or contribute to an impairment of surface waters of the state." The currently active animal operations in Middle West Fork White River watershed have no open enforcement actions at this time. Therefore, these operations are not considered a significant source of *E. coli* for the Middle West Fork White River TMDL.

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. Through windshield surveys, the MCWI found a concentration of livestock operations in the Sycamore Creek watershed (Morgan County Watershed Initiative, 2003). No specific information on these small livestock operations is currently available for the remaining portion of the Middle West Fork White River 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

The linkage between the *E. coli* concentrations in the Middle West Fork White River watershed and the potential sources 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. Analysis of the data for the Middle West Fork White River watershed indicates that a significant amount of the *E. coli* load enters the Middle West Fork White River 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 West Fork White River 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 non-point).

In order to develop a load duration curve, continuous flow data is required. The USGS gage for the West Fork White River (03354000) located near Centerton, Indiana was used for the development of the *E. coli* load duration curve analysis for the Middle West Fork White River watershed TMDL. USGS gage 03354000 is located on the West Fork White River in Morgan 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 *E. coli* per 100 ml and 125 *E. coli* 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 West Fork White River watershed. However, sampling sites, WWU160-0004 and WWL020-0003, on the Middle West Fork White River provides the best description of the sources of *E. coli* to the Middle West Fork White River watershed (Figure 2A and Figure 2B, Attachment D). These sampling sites are IDEM Fixed Station sites and have *E. coli* sampling from 1991 to 2001. 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 Middle West Fork White River watershed (noted by the diamonds above the curve on far right side of the figure in Attachment D).

While there are point source contributions, c~~. C~~ompliance with the numeric *E. coli* WQS in the Middle West Fork White River watershed most critically depends on controlling of nonpoint sources using best management plans (BMPs). If the *E. coli* inputs can be controlled, then total~~full~~ body contact recreation use in Middle West Fork White River 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 ~~environmental~~ 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 West Fork White River 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 West Fork White River 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 ~~and the USEPA allows~~ because *E. coli* ~~to be~~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 are twenty-one permitted dischargers in the Middle West Fork White River watershed. Sixteen of the twenty-one permitted dischargers have a sanitary component to their discharge. Six of these sixteen permitted dischargers already have *E. coli* limits in their permits. The remaining ten of these sixteen permitted dischargers have total residual chlorine limits in their permits. IDEM's TMDL program recommends the addition of *E. coli* limits to these ten permits during the next permit renewal.

There are three MS4 communities, the City of Martinsville, City of Indianapolis, and Morgan County, in the Middle West Fork White River watershed. To date, stormwater permits have not been finalized for any of these MS4 communities. Guidelines for MS4 permits and timelines are outlined in Indiana's Municipal Separate Storm Sewer System (MS4) Rule 13 (327 IAC 15-13-10 and 327 IAC 15-13-11).

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 1st through October 31st.

Load Allocations

The LA 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 1st through October 31st. The assumption used in this load allocation strategy is that there are equal bacterial loads per unit area for all lands within the watershed. Therefore, the relative responsibility for achieving the necessary reductions of bacteria and maintaining acceptable conditions is determined by the amount of land under the jurisdiction of the various local units of government within the watershed. This gives a clear indication of the relative amount of effort that will be required by each entity to restore and maintain the total body contact designated uses to the Middle West Fork White River watershed.

The government entities with the largest portion of the land area in the Middle West Fork White River watershed are Washington Township in Owen County (8.91%) and Washington Township in Morgan County (8.15%). Government entities utilizing four to six percent of the overall land area use the second largest portion of land area. Government entities utilizing two to three percent of the overall land area use the third largest portion of the land area. The remaining users, with percentages of one percent and lower, consist of the small cities or where only portions of the townships are included in the watershed (ESRI, 2004). (Table 3 and Figure 6)

IDEM describes the use of this method as a preliminary step to establish responsibility equally among the entities in the watershed. The method alleviates problems with perceived unfair reduction burdens amongst entities. Later, the state, or a locally lead effort, will pursue more detailed source identification and implementation through the appropriate funding sources. Currently, the MCWI watershed management plan for North Central Morgan County outlines nonpoint sources of *E. coli* and implementation activities that would help reduce the *E. coli* in Sycamore Creek and Highland Creek watersheds. There are currently no watershed projects for the rest of the Middle West Fork White River watershed. It is anticipated that additional watershed projects will be useful in defining the nonpoint sources of the *E. coli* in the Middle West Fork White River 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 1st through October 31st) 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 monitoring of the Middle West Fork White River watershed will take place during IDEM's five-year rotating basin schedule and/or once TMDL implementation methods are in place. During the five-year rotating basin schedule, IDEM will monitor the Middle West Fork White River watershed for *E. coli*. Monitoring will be adjusted as needed to assist in continued source identification and elimination. When these results indicate that the waterbody is meeting the *E. coli* WQS, IDEM will monitor at an appropriate frequency to determine if Indiana's 30-day geometric mean value of 125 *E. coli* per one hundred milliliters is being met.

Reasonable Assurance Activities

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

National Pollutant Discharge Elimination System (NPDES) Permitted Dischargers

For the permitted dischargers that have only total residual chlorine limits in their current permits, IDEM's TMDL program proposes the *E. coli* limits and monitoring be added when the next permit renewals are issued. Bradford Woods Camping Area (IN0045446) permit is proposed to have E.coli limitations added to their permit which is currently under review. This addition of E.coli limits is based on a waste load allocation conducted in 2003.

Storm Water General Permit Rule 13

MS4 permits are being issued in the state of Indiana. The three MS4 communities in the Middle West Fork White River watershed are the City of Martinsville, City of Indianapolis, and Morgan County. Once these permits have been issued and implemented, they will improve the water quality in the Middle West Fork White River watershed. Guidelines for MS4 permits and timelines are outlined in Indiana's Municipal Separate Storm Sewer System (MS4) Rule 13 (327 IAC 15-13-10 and 327 IAC 15-13-11). These permits will be used to address storm water impacts in the Middle West Fork White River watershed.

Confined Feeding Operations and Confined Animal Feeding Operations

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

Watershed Projects

The Indiana Department of Natural Resources collects information on tillage systems and the corresponding soil loss in watershed around the State of Indiana. For the Middle West Fork White River watershed, in 1997, more conventional farming practices were observed (37% of the farms), as compared to no-till farming practices (27% of the farms.) As of 2004, more farmers are using no-till farming (30% of the farms) as compared to conventional farming (28% of the farms) (Eck, K., 2004). Conventional farming uses tillage operations before and after planting where as no-till farming does not include any tillage operations either before or after planting. No-till farming helps control soil erosion and improves water quality by maintaining maximum residue plant levels on the soil surface. No-till farming reduces wind and water erosion, catches snow, conserves soil and water, protects water quality, and provides wildlife habitat. 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.

The MCWI completed a watershed management plan for Lambs Creek, Sycamore Creek, and Highland Creek watersheds that includes management plans for forested land, row crops, buffer strip projects, livestock management, commercial and industrial issues, and planning and zoning (Morgan County Watershed Initiative, 2003).

Two 319 grants were awarded to the Morgan County Soil & Water Conservation District & MCWI. One 319 grant is to complete a watershed management plan on the White Lick Creek watershed. The watershed management plan will contain information on the *E. coli* impairment. The second 319 grant is to implement the completed watershed management plan for the White River watershed in north central Morgan County. The implementation will includes a cost-share program targeted to livestock producers in the watershed. Both 319 grants started in September 2003 and will end in September 2005.

A 319 grant was awarded to the Hoosier Environmental Council to complete a watershed management plan for Beanblossom Creek. This watershed management plan will contain information on the *E. coli* impairment. This 319 grant will begin in 2005.

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 West Fork White River watershed.

TMDLs

TMDLs have been completed and approved on two upstream portions of the West Fork White River for *E. coli*. These TMDLs are the West Fork White River, Muncie to Marion-Hamilton County Line and West Fork White River, Marion County to the Town of Waverly. These TMDLs have identified the sources of *E. coli* upstream that, when the TMDLs are implemented to reduce these sources, will improve the water quality of the West Fork White River in Morgan, Owen, and Greene Counties.

In addition, TMDLs for *E. coli* have been started for Lambs Creek, Indian Creek, and Beanblossom Creek in 2004. White Lick Creek, Crooked Creek-Banta Creek, and Stotts Creek will have *E. coli* TMDLs completed on them at a later date. The development and implementation of these TMDLs will identify sources and through implementation reduce these sources of *E. coli* on these tributaries, and subsequently improve the water quality of the Middle West Fork White River watershed.

Potential Future Activities

Non-point 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.

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 West Fork White River watershed include both point and nonpoint sources. In order for the Middle West Fork White River watershed to achieve Indiana's *E. coli* WQS, the wasteload and load allocations for the Middle West Fork White River watershed in Indiana 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 1st through October 31st. Achieving the wasteload and load allocations for the Middle West Fork White River watershed depends on:

1) *E. coli* limits being added to sanitary dischargers who currently only monitor for total residual chlorine
2) CFOs not violating their permits
3) nonpoint sources of *E. coli* being controlled by implementing best management practices in the watershed.
4) Implementation of the *E. coli* TMDL completed on the impaired tributaries in the Middle West Fork White River watershed.
5) The issuance of the MS4 permits for the City of Indianapolis, City of Martinsville, and Morgan County.

The next phase of this TMDL is to identify and support the implementation of activities that will bring the Middle West Fork White River 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 West Fork White River 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 West Fork White River watershed.

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Table 1: NPDES Permits in the Middle West Fork White River Watershed

Facilities with *E. coli* Limits

Permit No.	Facility Name	Receiving Waters
IN0020303	Martinsville Municipal STP	West Fork White River
IN0040479	Paragon Municipal STP	West Fork White River
IN0059871	The Uplands Subdivision	Unnamed Tributary
IN0060577	McCormick's Creek Elementary School	McCormicks Creek
IN0060640	Town of Monrovia Wastewater	Unnamed Tributary to Sycamore Creek
IN0040088	Gosport Municipal STP	West Fork White River

Facilities with Total Residual Chlorine Limits

Permit No.	Facility Name	Receiving Waters
IN0020192	Spencer Municipal STP	West Fork White River
IN0030830	Monrovia Elementary & High School	Sycamore Creek
IN0038466	Timber Ridge Camp	McBride Branch Creek
IN0045446	Bradford Woods Camping Area	Sycamore Creek
IN0049361	Mapleturn Utilities WWTP	West Fork White River
IN0057487	Rolling Vista Estates WWTP	Unnamed Ditch
IN0109967	Highland Lakes Baptist Center	Highland Creek
IN0030201	McCormick's Creek State Park	West Fork White River
IN0039772	Brooklyn Municipal STP	White Lick Creek
IN0052256	Wildwood Shores Development	West Fork White River

Facilities with no Total Residual Chlorine or *E. coli* Limits

Permit No.	Facility Name	Receiving Waters
IN0005045	Hydraulic Press Brick Company	White Lick Creek
IN0004693	IPALCO, Eagle Valley Station	West Fork White Rive
IN0051993	Morgan County Rural Water Co.	West Fork White River
ING080152	Marathon-Tobacco Road	Spring Lake to West Fork White River
INP000158	Linel Signature	N/A

Table 2: Permitted Confined Feeding Operations in the Middle West Fork White River Watershed

			Approved Animals				
Log Number	**Name**	**NPDES Permit Number**	**Nursery Pig**	**Growerfinishers**	**Sowboars**	**Beef**	**Turkeys**
315	Dan Ennis		1500				
4742	Baker Farms		500	1000			

Table 3: Land Area Distribution for the Middle West Fork Watershed

Municipality	County	Square Mile	Percent
Washington Township	Owen	47.55	8.91
Washington Township	Morgan	43.49	8.15
Clay Township	Owen	35.30	6.61
Franklin Township	Owen	35.09	6.57
Jefferson Township	Morgan	34.36	6.44
Clay Township	Morgan	28.72	5.38
Lafayette Township	Owen	28.46	5.33
Ray Township	Morgan	25.77	4.83
Montgomery Township	Owen	23.53	4.41
Wayne Township	Owen	22.08	4.14
Highland Township	Greene	18.15	3.40
Green Township	Morgan	17.91	3.36
Baker Township	Morgan	15.62	2.93
Morgan Township	Owen	15.40	2.89
Madison Township	Morgan	12.54	2.35
Beech Creek Township	Greene	12.16	2.28
Bean Blossom Township	Monroe	10.58	1.98
Monroe Township	Morgan	10.34	1.94
Jefferson Township	Owen	9.77	1.83
Richland Township	Monroe	8.56	1.60
White River Township	Johnson	8.35	1.56
Ashland Township	Morgan	8.13	1.52
Harrison Township	Owen	7.58	1.42
Harrison Township	Morgan	7.22	1.35
Washington Township	Monroe	7.14	1.34
Jefferson Township	Greene	6.80	1.27
Taylor Township	Owen	4.41	0.83
City of Martinsville	Morgan	4.39	0.82
Brown Township	Morgan	4.32	0.81
Benton Township	Morgan	4.14	0.77
Jackson Township	Morgan	4.14	0.77
Gregg Township	Morgan	3.88	0.73
City of Indianapolis	Morgan	2.87	0.54
Jennings Township	Owen	2.70	0.51
Union Township	Johnson	1.39	0.26
Marion Township	Owen	0.99	0.19
Total		**533.82**	**100.00**

Figure 1: Middle West Fork White River Watershed TMDL

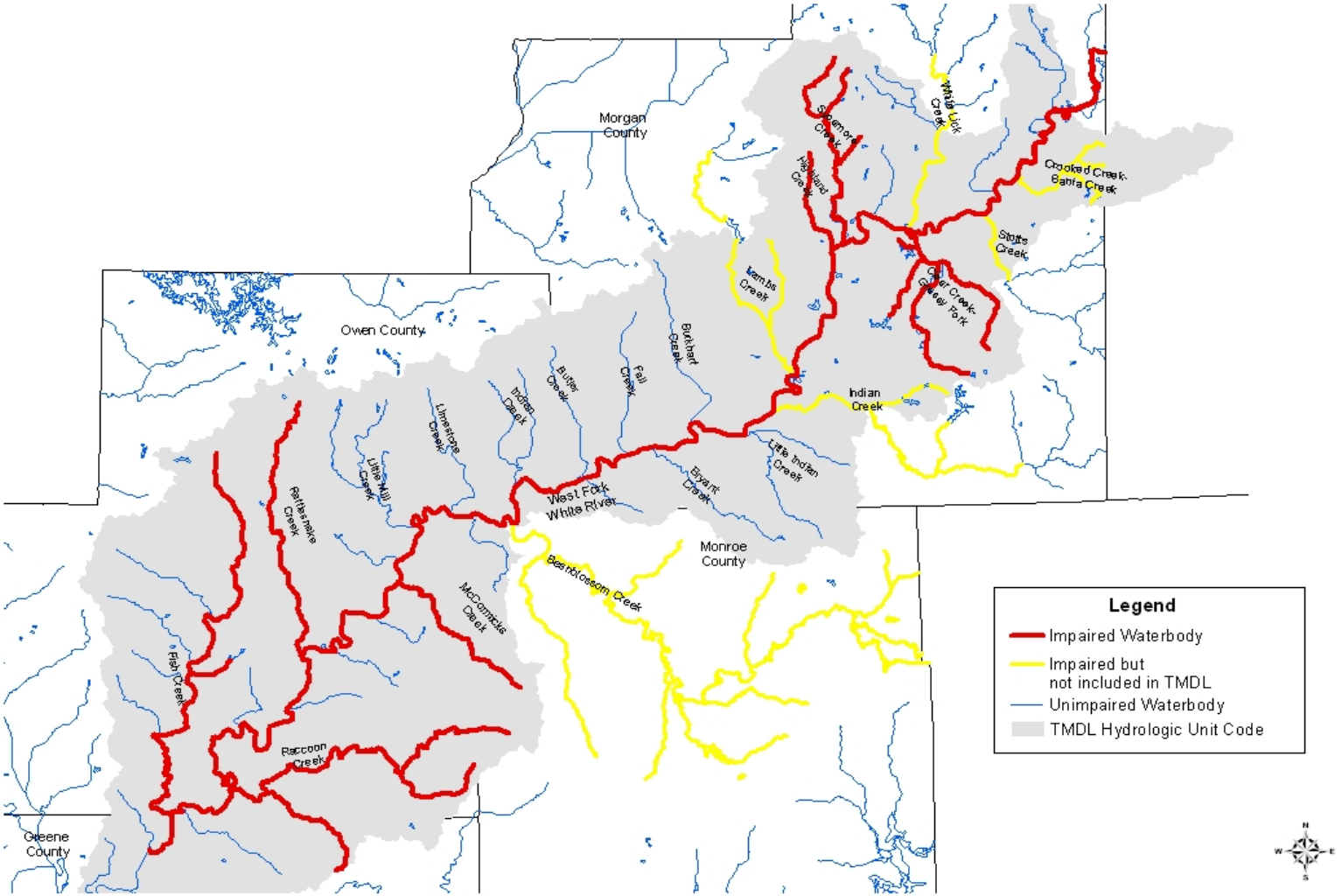


Figure 2A: Sampling Sites in Middle West Fork White River Watershed, Morgan County

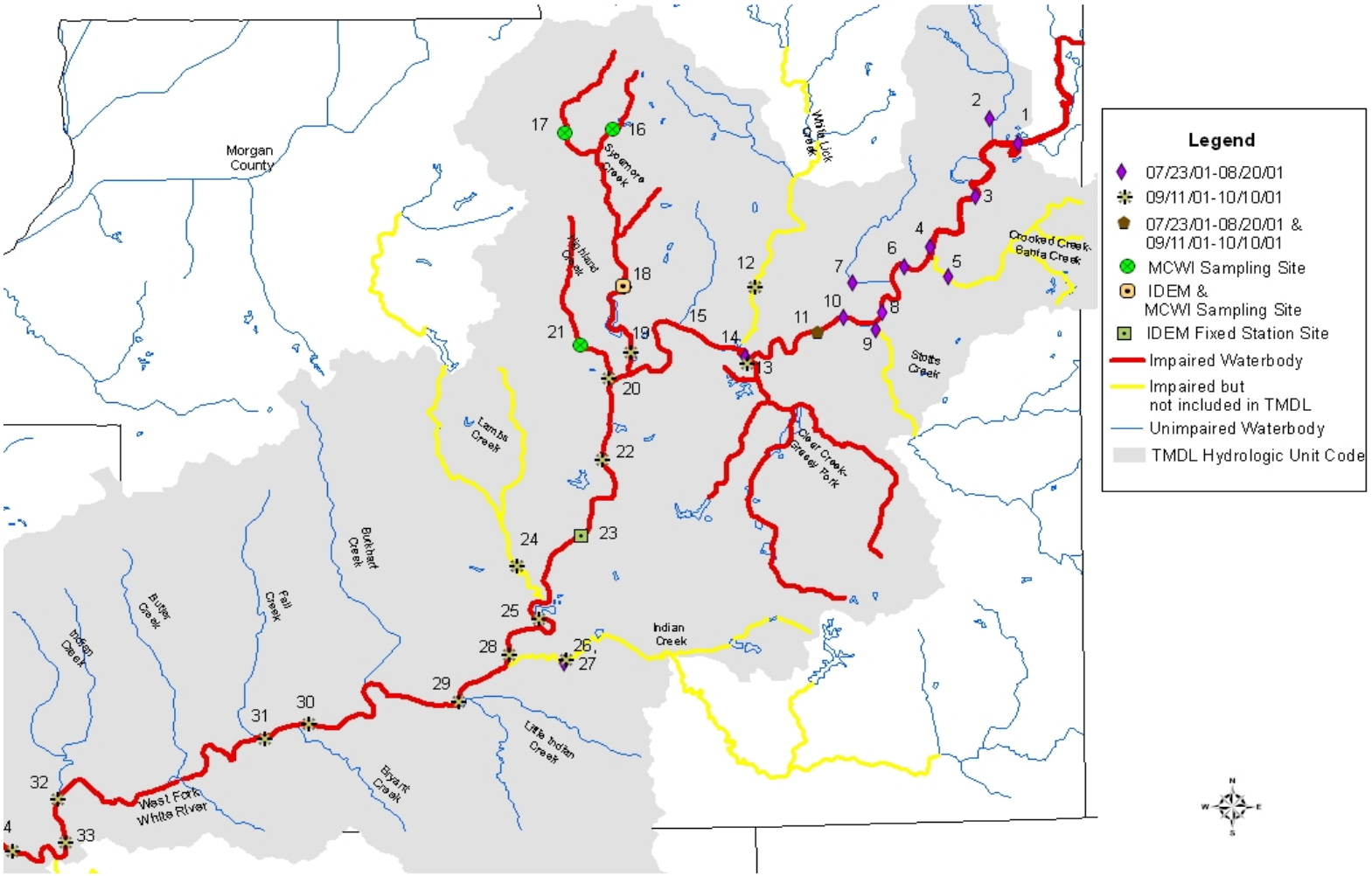


Figure 2B: Sampling Sites in Middle West Fork White River Watershed, Owen and Greene Counties

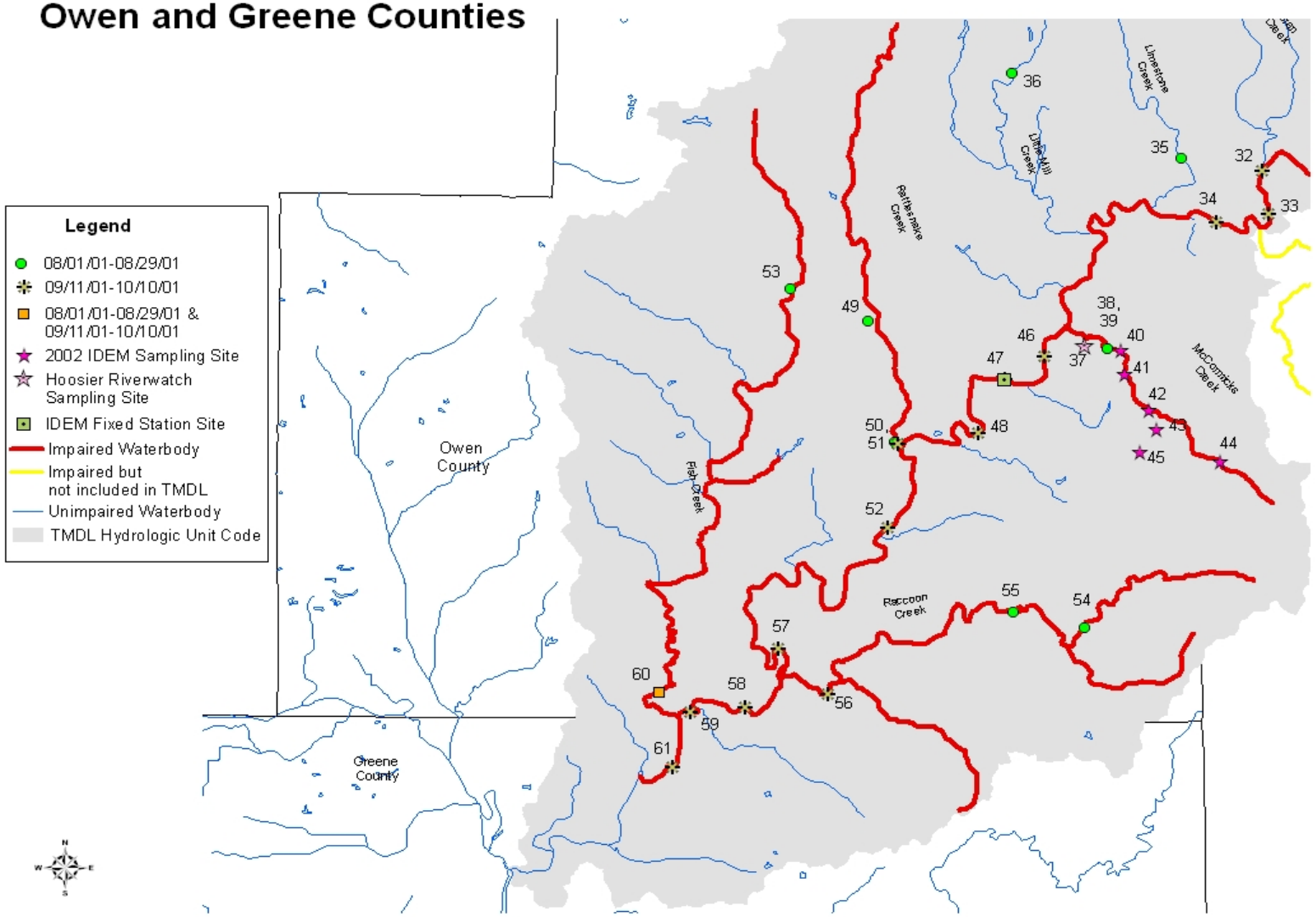


Figure 3: Landuse in Middle West Fork White River Watershed

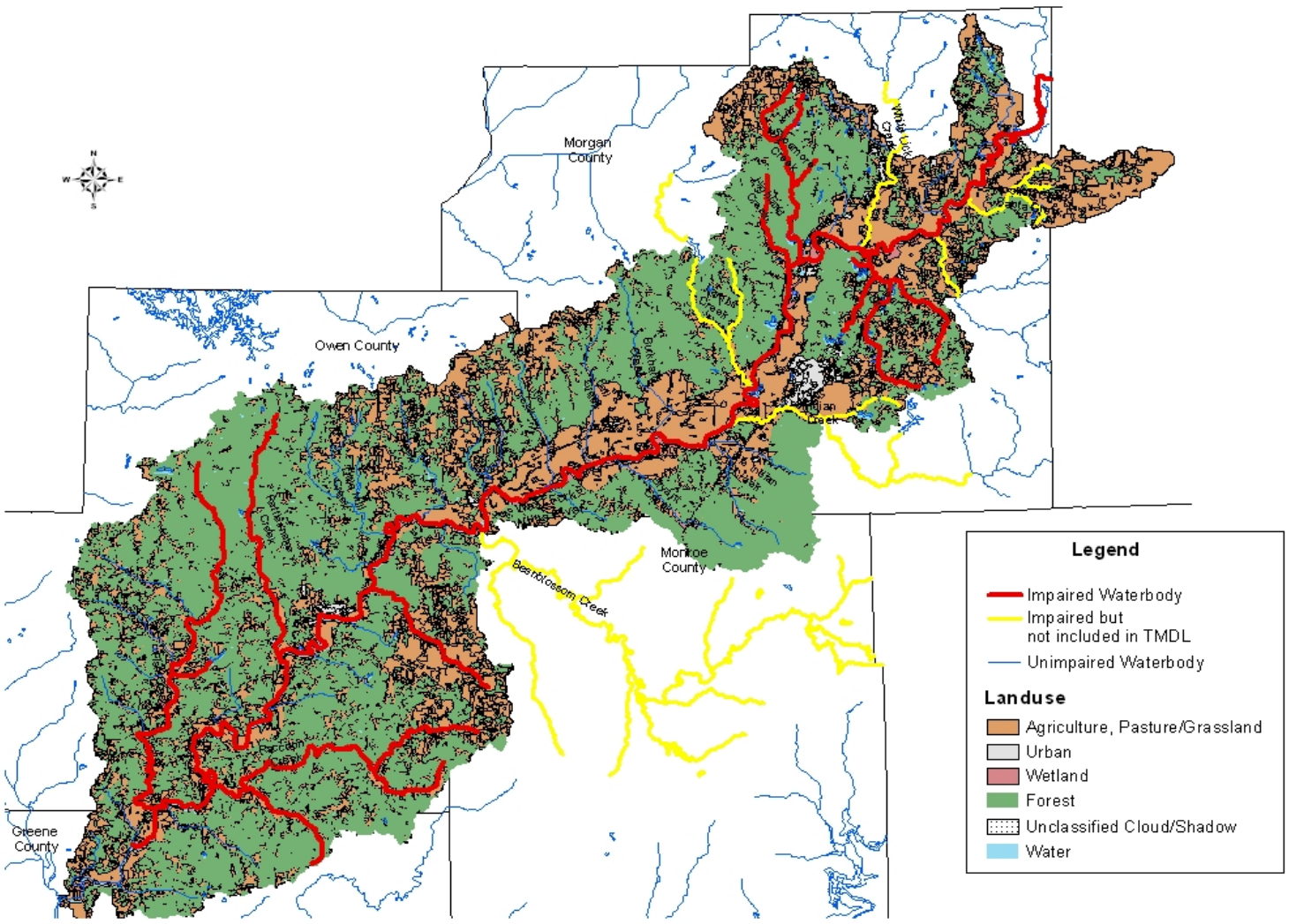


Figure 4A: NPDES Permits in Middle West Fork White River Watershed, Morgan County

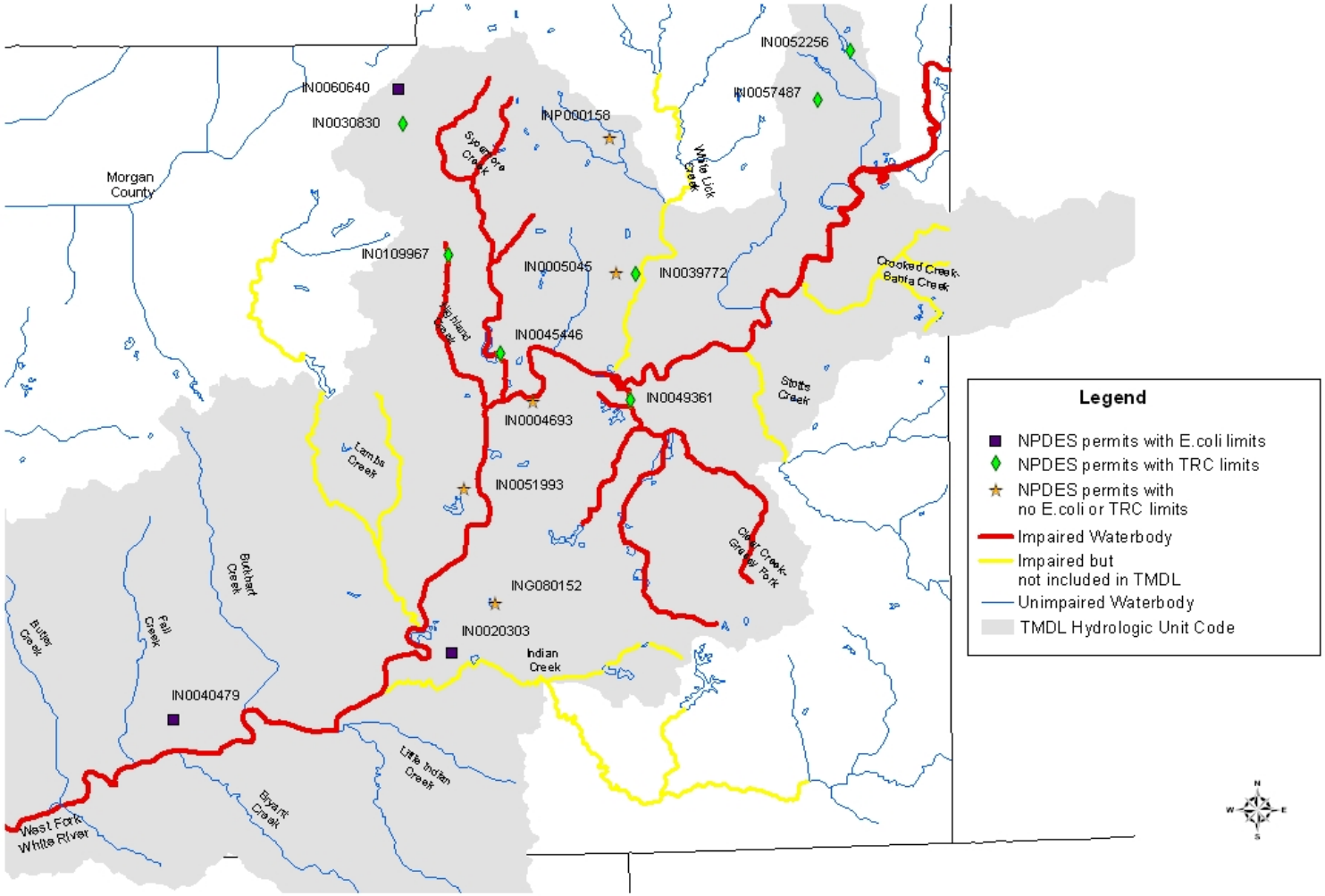


Figure 4B: NPDES Permits in Middle West Fork White River Watershed, Owen and Greene Counties

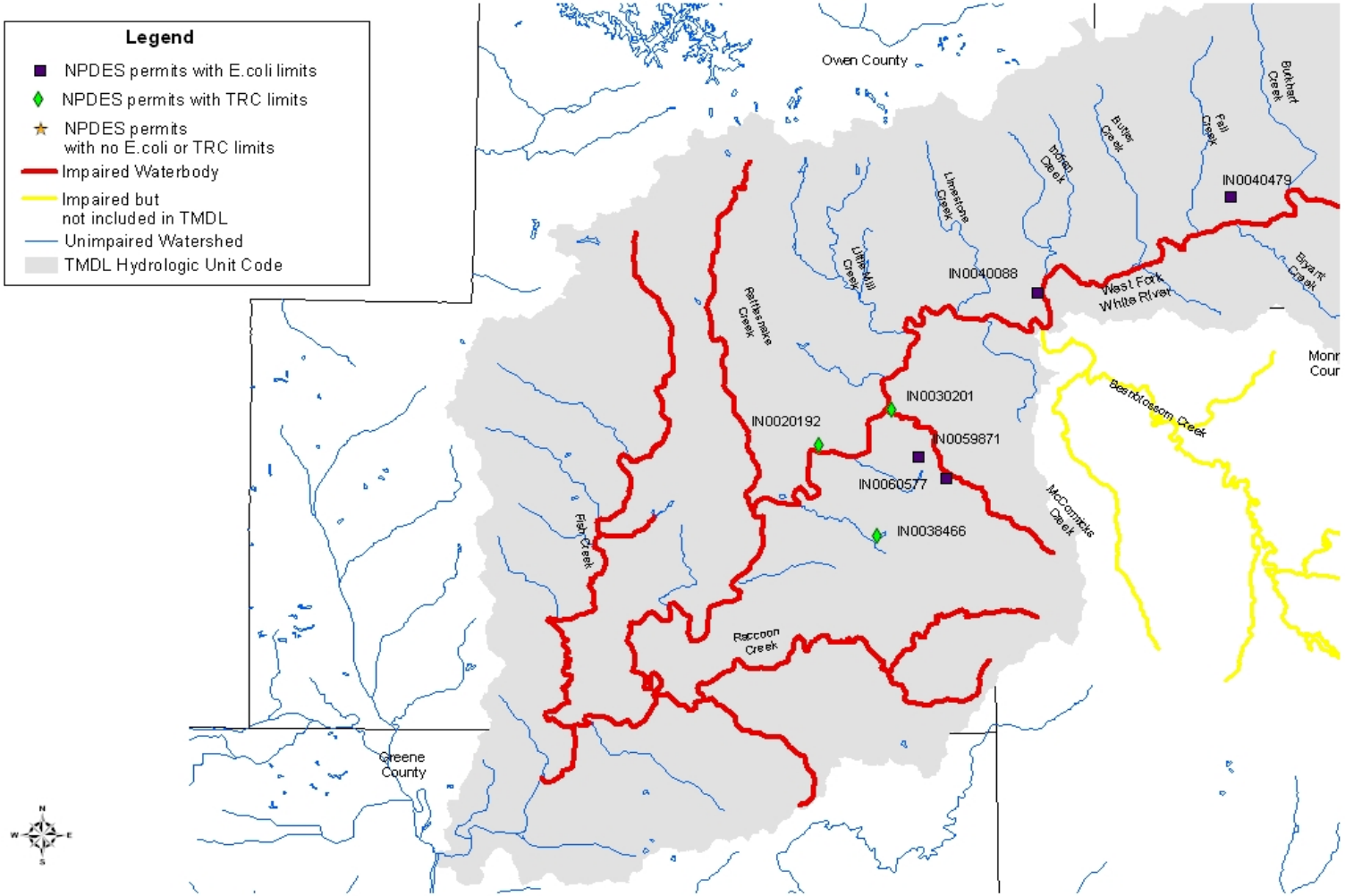


Figure 5: CFOs in Middle West Fork White River Watershed

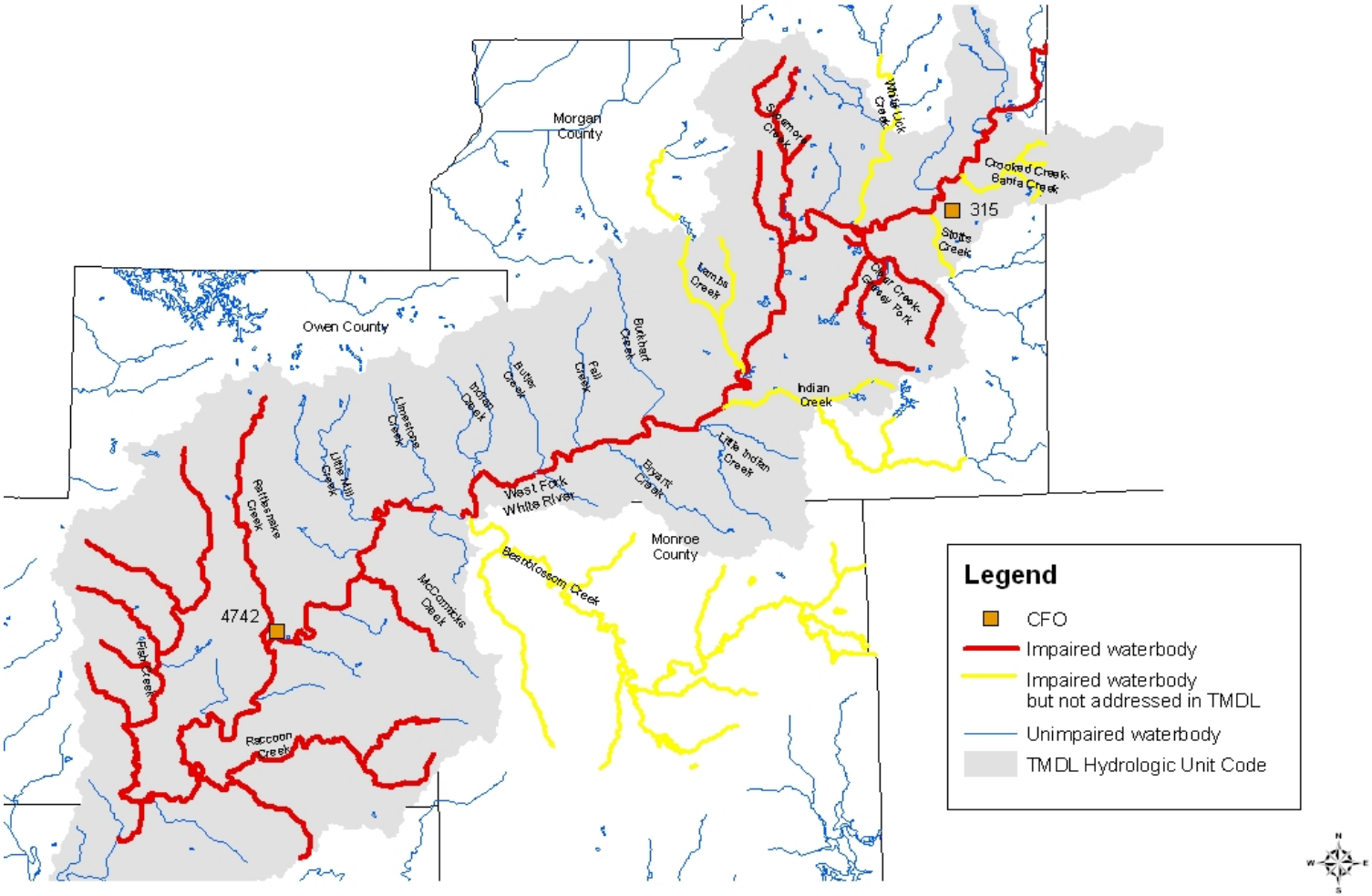


Figure 6A: Land Area Distribution in Middle West Fork White River Watershed, Morgan County

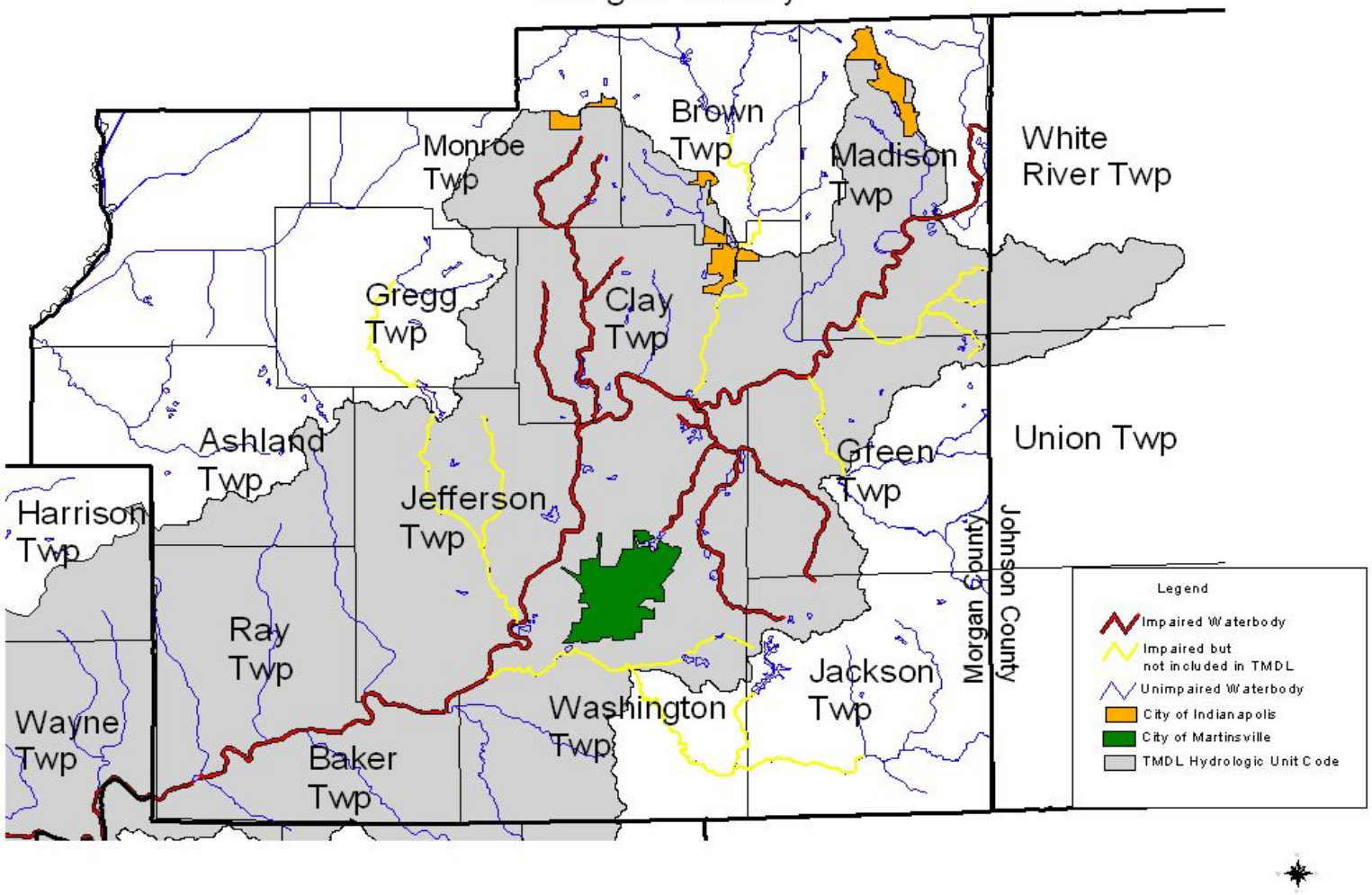
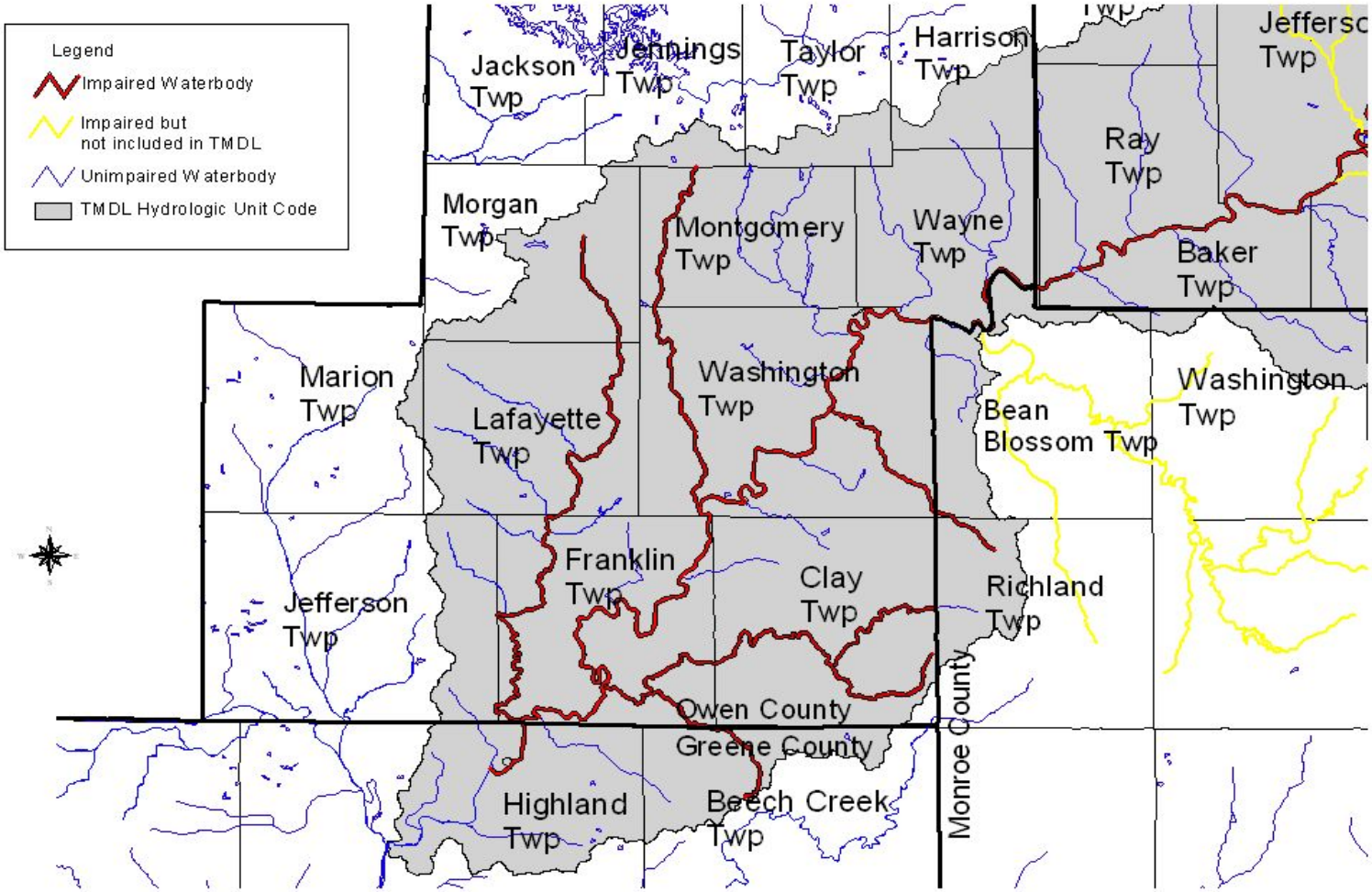


Figure 6B: Land Area Distribution in Middle West Fork White River Watershed, Owen and Greene Counties



Attachment A

E. coli Data for Middle West Fork White River Watershed TMDL

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Attachment B

Fecal coliform data for
Middle West Fork White River Watershed TMDL

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Attachment C

Water Quality Duration Curves for Middle West Fork White River Watershed TMDL

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Attachment D

Load Duration Curves for
Middle West Fork White River Watershed TMDL

Attachment A: *E. coli* Data for Middle West Fork White River Watershed TMDL

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
1	2001 WFWR L. Buck Cr-Wht. Lick Cr. TMDL Asses.	WWU140-0020	West Fork White River	Bridge near Waverly	AA06447	07/23/01	1203	303
					AA06627	07/31/01	613	
					AA06781	08/06/01	80	
					AA07115	08/13/01	38	
					AA07306	08/20/01	2419	
2	2001 WFWR L. Buck Cr.-Wht. Lick Cr. TMDL Asses.	WWU140-0019	Sinking Cr	Bridge off State Road 144	AA06625	07/31/01	<1	N/A
3	2001 WFWR L. Buck-Wht. Lick Cr. TMDL Asses.	WWU140-0022	West Fork White River	Sample from watercraft	AA06452	07/23/01	1120	>417
					AA06636	07/31/01	726	
					AA06776	08/06/01	107	
					AA07120	08/13/01	60	
					AA07311	08/20/01	>2419	
4	2001 WFWR L. Buck Cr-Wht. Lick Cr TMDL Asses.	WWU140-0023	West Fork White River	Sample from watercraft	AA06453	07/23/01	866	>279
					AA06637	07/31/01	613	
					AA06782	08/06/01	66	
					AA07121	08/13/01	20	
					AA07312	08/20/01	>2419	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
5	2001 WFWR Little Buck Cr-White Lick Cr TMDL Asses.	WWU140-0024	Crooked Creek	3 miles southwest of Waverly	AA06448	07/23/01	461	>273
					AA06628	07/31/01	238	
					AA06777	08/06/01	488	
					AA07116	08/13/01	35	
					AA07307	08/20/01	816	
6	2001 WFWR Little Buck Cr-White Lick Cr TMDL Asses.	WWU140-0025	West Fork White River	Sample from watercraft	AA06454	07/23/01	1733	>374
					AA06638	07/31/01	770	
					AA06783	08/06/01	57	
					AA07123	08/13/01	40	
					AA07313	08/20/01	>2419	
7	2001 WFWR Little Buck Cr-White Lick Cr TMDL Asses.	WWU140-0030	Unnamed Tributary	Junction of 600 N and 500 E	AA06451	07/23/01	>2419	N/A
8	2001 WFWR Little Buck Cr-White Lick Cr TMDL Asses.	WWU140-0026	West Fork White River	Sample from watercraft	AA06455	07/23/01	1120	>363
					AA06639	07/31/01	613	
					AA06784	08/06/01	88	
					AA07124	08/13/01	43	
					AA07314	08/20/01	>2419	
9	1996 Synoptic	WWU140-0001	Stotts Creek	New Harmony Road	D120902	04/25/96	70	N/A
					D121284	06/05/96	180	
					D121668	07/12/96	70	
					D122142	10/04/96	110	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
9	2001 WFWR Little Buck Cr-White Lick Cr TMDL Asses.	WWU140-0001	Stotts Creek	New Harmony Road	AA06449	06/23/01	866	713
					AA06633	07/31/01	980	
					AA06778	08/06/01	299	
					AA07117	08/13/01	365	
					AA07308	08/20/01	1986	
10	2001 WFWR Little Buck Cr-White Lick Cr TMDL Asses.	WWU140-0027	West Fork White River	Sample from watercraft	AA06456	07/23/01	1414	>356
					AA06640	07/31/01	687	
					AA06785	08/06/01	74	
					AA07125	08/13/01	33	
					AA07315	08/20/01	>2419	
11	2001 WFWR Little Buck Cr-White Lick Cr TMDL Asses.	WWU140-0002	West Fork White River	Henderson Bridge, CR 390 E	AA06450	07/21/01	1046	>298
					AA06634	07/31/01	866	
					AA06779	08/06/01	72	
					AA07118	08/13/01	15	
					AA07309	08/20/01	>2419	
	2001 WF White River White Lick to Buckhall Bridges	WWU140-0002	West Fork White River	Henderson Bridge, CR 390 E	AA08394	09/11/01	>2400	>1151
					AA08497	09/20/01	>2400	
					AA08650	09/25/01	>2400	
					AA08821	10/02/01	190	
					AA08846	10/10/01	770	
12	1996 Synoptic	WWU150-0007	White Lick Creek	CR 600 N, near Centerton	DI20883	04/25/96	90	N/A
					DI21264	06/04/96	160	
					DI21437	07/11/96	70	
					DI21895	10/03/96	70	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
12	1999 Fixed Station	WWU150-0007	White Lick Creek	CR 600 N, near Centerton	DI27051	04/08/99	80	N/A
					DI27326	05/06/99	310	
					DI27524	06/17/99	25	
					DI27913	08/05/99	100	
					DI28116	09/03/99	370	
					DI28328	10/20/99	18	
	2000 Fixed Station	WWU150-0007	White Lick Creek	CR 600 N, near Centerton	DI29297	03/23/00	23	
					DI2912	04/07/00	220	
					DI29684	05/23/00	180	
					DI29879	06/20/00	870	
					DI30039	07/07/00	1100	
					DI30227	08/02/00	1200	
					DI30424	09/07/00	280	
	2001 Fixed Station	WWU150-0007	White Lick Creek	CR 600 N, near Centerton	DI31786	04/05/01	46	
					DI32003	05/16/01	76	
					DI32184	06/19/01	250	
					DI32602	08/07/01	34	
	2003 Fixed Station	WWU150-0007	White Lick Creek	CR 600 N, near Centerton	AA18052	08/14/03	400	
	2001 WF White River White Lick to Bucknell Bridges	WWU150-0007	White Lick Creek	CR 600 N, near Centerton	AA08396	09/11/01	1700	>373
					AA08499	09/20/01	>2400	
					AA08652	09/25/01	730	
					AA08823	10/02/01	100	
					AA08834	10/10/01	110	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
12	2001 *E. coli* Upper WFWR below Indy	WWU150-0007	White Lick Creek	CR 600 N, near Centerton	AA08483	09/11/01	770	N/A
					AA08705	09/19/01	6867	
					AA08799	09/24/01	5475	
					AA09005	10/03/01	49	
13	2001 *E. coli* Upper WFWR below Indy	WWU140-0029	Clear Creek	N/A	AA08477	09/11/01	980	808
					AA08701	09/19/01	24191	
					AA08796	09/24/01	225	
					AA09002	10/03/01	461	
					AA09024	10/10/01	140	
14	2001 WFWR Little Buck Cr – White Lick Cr TMDL Asses.	WWU140-0028	West Fork White River	Sample from watercraft	AA06457	07/23/01	1414	451
					AA06641	07/31/01	770	
					AA06786	08/06/01	127	
					AA07127	08/13/01	56	
					AA07316	08/20/01	2419	
15	1996 Synoptic	WWU160-0002	West Fork White River	100 ft downstream of Blue Bluff Road	DI20903	04/25/96	1200	N/A
					DI21285	06/05/96	20	
					DI21669	07/12/96	30	
					DI22143	10/04/96	1400	
16	Morgan County Watershed Initiative		Dry Fork Sycamore Creek (d/s of Hart Lake)	Site 1, CR 950 N	430021	04/30/02	110	N/A
					530021	05/30/02	23	
					731021	07/31/02	69	
					828021	08/28/02	610	
					930021	09/30/02	110	
					1030021	10/30/02	520	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
17	Morgan County Watershed Initiative		Sycamore Creek	Site 2, CR 950 N	430022	04/30/02	190	N/A
					530022	05/30/02	730	
					731022	07/31/02	2400	
					828022	08/28/02	690	
					930022	09/30/02	1000	
					1030022	10/30/02	130	
18	1996 Synoptic	WWU160-0003	Sycamore Creek	Robb Hill Road	DI20904	04/25/96	110	N/A
					DI21286	06/05/96	220	
					DI21670	07/12/96	50	
					DI22144	10/04/96	40	
	2001 *E. coli* Upper WFWR below Indy	WWU160-0003	Sycamore Creek	Robb Hill Road	AA08481	09/11/01	435	758
					AA08704	09/19/01	17328	
					AA08797	09/24/01	2419	
					AA09003	10/03/01	249	
					AA09025	10/10/01	55	
	Morgan County Watershed Initiative		Sycamore Creek	Site 3, Robb Hill Road	430023	04/30/02	150	N/A
					530023	05/30/02	310	
					731023	07/31/02	49	
					828023	08/28/02	42	
					930023	09/30/02	93	
					1030023	10/30/02	2400	
19	2001 WF White River White Lick to Buckhall Bridges	WWU160-0031	Sycamore Creek	Highway 67	AA08398	09/11/01	74	56
					AA08501	09/20/01	82	
					AA08654	09/25/01	61	
					AA08826	10/02/01	50	
					AA08837	10/10/01	29	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
20	2001 WF White River White Lick to Buckhall Bridges	WWU160-0030	Highland Creek	Highway 67	AA08399	09/11/01	20000	>1924
					AA08502	09/20/01	>2400	
					AA08655	09/25/01	>2400	
					AA08827	10/02/01	520	
					AA08838	10/10/01	440	
21	Morgan County Initiative		Highland Creek	Site 4, SR 39	430024d	04/30/02	38	N/A
					530024	05/30/02	220	
					731024	07/31/02	110	
					828024	08/28/02	150	
					930024	09/30/02	1300	
					1030024	10/30/02	260	
22	2001 WF White River White Lick to Bucknell Boat	WWU160-0032	West Fork White River	Sample from watercraft	AA08449	09/11/01	>2400	>1053
					AA08542	09/20/01	>2400	
					AA08719	09/25/01	>2400	
					AA08921	10/02/01	170	
					AA09088	10/10/01	550	
23	1996 Synoptic	WWU160-0004	West Fork White River	SR 39 Bridge, Martinsville	DI20905	04/25/96	1000	N/A
					DI21287	06/05/96	100	
					DI21671	07/12/96	10	
					DI22145	10/04/96	60	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
23	1991 Fixed Station	WWU160-0004	West Fork White River	SR 39 Bridge, Martinsville	DI7370	04/11/91	200	N/A
					DI05824	05/06/91	30	
					DI9092	06/05/91	2100	
					DI9276	07/11/91	860	
					DI9301	08/07/91	<10	
					DI9401	09/03/91	90	
					DI9505	10/15/91	20	
	1992 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI18108	03/11/92	700	
					DI11981	04/09/92	30	
					DI13042	08/12/92	3000	
					DI12221	05/07/92	20	
					DI13145	09/10/92	2100	
					DI18210	06/04/92	360	
					DI13330	10/06/92	20	
					DI8314	07/01/92	550	
	1993 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI14610	06/29/93	7400	
					DI14904	07/29/93	420	
					DI15070	08/02/93	290	
					DI15354	10/07/93	160	
	1994 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI16368	04/07/94	40	
					DI16521	05/25/94	30	
					DI16671	06/27/94	6400	
					DI17037	07/26/94	<10	
	1995 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI18653	04/19/95	110	N/A
					DI18884	05/09/95	20	
					DI19201	06/05/95	100	
					DI19308	07/17/95	500	
					DI19712	08/16/95	110	
					DI20116	09/19/95	60	
					D120295	10/11/95	200	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
23	1996 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI21144	04/16/96	50	N/A
					DI21449	05/15/96	1700	
					DI21553	06/12/96	2500	
					DI21902	07/09/96	130	
					DI22025	08/13/96	10	
					DI22472	09/11/96	150	
					DI22680	10/09/96	120	
	1997 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI23327	04/23/97	50	
					DI23441	05/15/97	80	
					DI23556	06/10/97	260	
					DI23670	07/09/97	110	
					DI23776	08/06/97	30	
					DI23907	09/11/97	2300	
					DI24142	10/09/97	230	
	1998 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI25030	04/07/98	10	
					DI25481	07/20/98	1300	
					DI25851	10/08/98	84000	
	1999 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI27050	04/08/99	150	
					DI27325	05/06/99	130	
					DI27523	06/17/99	33	
					DI27912	08/05/99	60	
					DI28115	09/03/99	40	
					DI28327	10/20/99	61	
	2000 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI29411	04/07/00	54	
					DI29683	05/23/00	210	
					DI29878	06/20/00	2000	
					DI30226	08/02/00	1400	
					DI30423	09/07/00	130	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
23	2001 Fixed Station	WWU160-0004	West Fork White River	SR 39, Martinsville	DI31785	04/05/01	23	N/A
					DI32002	05/16/01	44	
					DI32183	06/19/01	340	
					DI32601	08/07/01	23	
24	1996 Synoptic	WWU160-0005	Lambs Creek	Old SR 67/Bain Road	DI20908	04/30/96	200	N/A
					DI21289	06/07/96	<10	
					DI21673	07/17/96	2400	
					DI22147	10/09/96	450	
	2001 Lambs Creek	WWU160-0005	Lambs Creek	Old SR 67/Bain Road	AA04380	06/04/01	>2400	>1807
					AA04538	06/11/01	>2400	
					AA05359	06/25/01	1600	
					AA05537	07/02/01	>2400	
					AA05096	07/18/01	870	
	2001 WF White River White Lick to Buckhall Bridges	WWU160-0005	Lambs Creek	Old SR 67/Bain Road	AA08401	09/11/01	390	>592
					AA08504	09/20/01	980	
					AA08658	09/25/01	610	
					AA08829	10/02/01	130	
					AA08840	10/10/01	>2400	
25	2001 WF White River White Lick to Buckhall Bridges	WWU160-0034	West Fork White River	Sample from watercraft	AA08451	09/11/01	>2400	>1079
					AA08544	09/20/01	>2400	
					AA08721	09/25/01	>2400	
					AA08923	10/02/01	88	
					AA09090	10/10/01	1200	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
26	2001 WF White River White Lick to Bucknell Bridges	WWU170-0030	Indian Creek	Off SR 37, first left 1/3 of mile	AA08400	09/11/01	1700	>812
					AA08503	09/20/01	>2400	
					AA08656	09/25/01	>2400	
					AA08828	10/02/01	200	
					AA08839	10/10/01	180	
27	1996 Synoptic	WWU170-0002	Indian Creek	Jordan Road	DI20910	04/30/96	1600	N/A
					DI21291	06/07/96	20	
					DI21675	07/17/96	180	
					DI22149	10/09/96	210	
	2001 Indian Creek Assessment	WWU170-0002	Indian Creek	Jordan Road	AA06458	07/25/01	276	436
					AA06653	07/30/01	921	
					AA06865	08/07/01	387	
					AA06981	08/14/01	261	
					AA07318	08/21/01	613	
28	2001 WF White River White Lick to Bucknell Boat	WWU160-0033	West Fork White River	Sample from watercraft	AA08452	09/11/01	>2400	>1081
					AA08560	09/20/01	>2400	
					AA08722	09/25/01	>2400	
					AA8924	10/02/01	130	
					AA09091	10/10/01	820	
29	2001 WF White River White Lick to Bucknell Boat	WWU180-0004	West Fork White River	Sample from watercraft	AA08453	09/11/01	>2400	>924
					AA08545	09/20/01	>2400	
					AA08723	09/25/01	>2400	
					AA08925	10/02/01	84	
					AA09092	10/10/01	580	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
30	2001 WF White River White Lick to Bucknell Boat	WWU180-0001	West Fork White River	Bridge: CR 700 W, 2 miles South of Paragon	AA08454	09/11/01	>2400	>954
					AA08546	09/20/01	>2400	
					AA08724	09/25/01	>2400	
					AA08926	10/01/01	110	
					AA09093	10/10/01	520	
31	2001 WF White River White Lick to Bucknell	WWU180-0005	West Fork White River	Sample from watercraft	AA08455	09/11/01	2000	>928
					AA08547	09/20/01	>2400	
					AA08725	09/25/01	>2400	
					AA08928	10/02/01	130	
					AA9094	10/10/01	460	
32	2001 WF White River White Lick to Bucknell Boat	WWU180-0006	West Fork White River	Sample from watercraft	AA08456	09/11/01	>2400	>1539
					AA08548	09/20/01	>2400	
					AA08726	09/25/01	>2400	
					AA08929	10/02/01	520	
					AA09095	10/10/01	1200	
33	2001 WF White River White Lick to Bucknell Boat	WWU180-0007	West Fork White River	Sample from watercraft	AA08457	09/11/01	>2400	>1139
					AA08549	09/20/01	>2400	
					AA08727	09/25/01	>2400	
					AA08930	10/02/01	190	
					AA09096	10/10/01	730	
34	2001 WF White River White Lick to Bucknell Boat	WWL020-0032	West Fork White River	Between old and new bridge, sample from watercraft	AA08458	09/11/01	>2400	>1088
					AA08551	09/20/01	>2400	
					AA08728	09/25/01	>2400	
					AA08931	10/02/01	120	
					AA09097	10/10/01	920	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
35	2001 *E. coli*-Lower WFWR and Eel	WWL020-0029	Limestone Creek	SR 67	AA06615	08/01/01	326	322
					AA06955	08/07/01	194	
					AA07085	08/14/01	461	
					AA07388	08/21/01	579	
					AA08134	08/28/01	204	
36	1996 Watershed	WWL020-0012	Little Mill Cr	US 231	DI21811	08/13/96	200	N/A
	2001 *E. coli*-Lower WFWR and Eel	WWL020-0012	Little Mill Cr	US 231	AA06605	07/31/01	179	70
					AA06931	08/07/01	52	
					AA07084	08/14/01	56	
					AA07387	08/21/01	113	
					AA08133	08/28/01	29	
37	Hoosier Riverwatch Site ID #137		McCormicks Creek	From horse crossing to CCC bridge		10/18/96	300	N/A
						04/29/97	1200	
						10/23/97	4400	
						05/18/98	300	
						05/24/99	0	
						10/07/99	1100	
						04/20/00	1200	
						10/10/00	300	
						05/03/01	1300	
						05/12/02	300	
38	2001 *E. coli*-Lower WFWR and Eel	WWL020-0022	McCormicks Creek	McCormicks Cr State Park Falls	AA06611	08/01/01	435	256
					AA06956	08/08/01	35	
					AA07111	08/15/01	1120	
					AA07414	08/22/01	308	
					AA08160	08/29/01	210	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
39	2001 *E. coli*-Lower WFWR and Eel	WWL020-0028	McCormicks Creek	Highway 46, upstream of Park	AA06613	08/01/01	517	517
					AA06952	08/08/01	613	
					AA07108	08/15/01	173	
					AA07412	08/22/01	435	
					AA08158	08/29/01	1553	
40	2002 McCormicks Creek School	WWL020-0051	McCormicks Creek	McCormicks Cr Park from Upper Falls bridge	AA10730	05/20/02	65	N/A
41	2002 McCormicks Creek School	WWL020-0050	McCormicks Creek	Upstream of McCormicks Creek Elementary School STP	AA10729	05/02/02	690	N/A
42	2002 McCormicks Creek School	WWL020-0049	Final Effluent	McCormicks Cr Elementary School WWTP	AA10728	05/20/02	<1	N/A
43	2002 McCormicks Creek School	WWL020-0045	Tributary to McCormicks Cr	At bridge on south line of Northwest ¼, Northwest 14 of Sec 36	AA10723	05/20/02	140	N/A
44	2002 McCormicks Creek School	WWL020-0013	McCormicks Cr	At Flat Woods Rd, ½ mile east of County Line Rd b/w Sections 31 and 6	AA10721	05/20/02	300	N/A

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
45	2002 McCormicks Creek School	WWL020-0047	Tributary to McCormicks Cr	McCormicks Cr upstream of McCormicks Cr Elementary School WWTP	AA10726	05/21/02	820	N/A
46	2001 WF White River White Lick to Bucknell Boat	WWL020-0033	West Fork White River	Bridge: sample from watercraft	AA08459	09/11/01	>2400	>922
					AA08552	09/20/01	>2400	
					AA08729	09/25/01	1400	
					AA08932	10/02/01	120	
					AA09098	10/10/01	690	
47	1991 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI7371	04/11/91	330	N/A
					DI05825	05/06/91	10	
					DI9093	06/05/91	3900	
					DI9275	07/10/91	40	
					DI9302	08/07/91	250	
					DI9402	09/03/91	30	
					DI9506	10/15/91	10	
	1992 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI11982	04/09/92	40	
					DI12222	05/07/92	40	
					DI8211	06/02/92	40	
					DI8315	07/01/92	440	
					DI13146	09/10/92	70	
					DI13331	10/06/92	130	
					DI13433	11/04/92	1700	
	1993 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI14308	04/13/93	1100	
					DI14439	05/26/93	300	
					DI14905	07/29/93	520	
					DI15355	10/07/93	160	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
47	1994 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI16369	04/07/94	30	N/A
					DI16522	05/25/94	<10	
					DI17038	07/26/94	10	
					DI17782	10/11/94	70	
	1995 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI18654	04/19/95	560	
					DI18885	05/11/95	20	
					DI19202	06/06/95	140	
					DI19309	07/12/95	50	
					DI19713	08/16/95	110	
					DI20117	09/19/95	40	
	1996 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI21041	04/02/96	3600	
					DI21145	04/16/96	50	
					DI21450	05/15/96	320	
					DI21554	06/12/96	2300	
					DI21903	07/12/96	90	
					DI22026	08/13/96	<10	
					DI22473	09/11/96	60	
					DI22681	10/08/96	200	
	1997 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI23328	04/22/97	300	
					DI23442	05/15/97	150	
					DI23557	06/09/97	770	
					DI23671	07/08/97	60	
					DI23777	08/05/97	10	
					DI23908	09/08/97	40	
					DI24143	10/07/97	60	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
47	1998 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI25031	04/09/98	150	N/A
					DI25178	05/08/98	9400	
	1999 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI27295	05/12/99	260	
					DI27493	06/10/99	212	
					DI27674	07/22/99	100	
					DI27882	08/05/99	40	
					DI28085	09/22/99	200	
					DI28297	10/20/99	54	
	2000 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI29432	04/18/00	690	
					DI29679	05/23/00	430	
					DI30233	08/08/00	1400	
					DI30448	09/21/00	<1	
					DI30617	10/13/00	200	
	2001 Fixed Station	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	DI32009	05/23/01	390	
					DI32600	08/07/01	33	
	2001 WF White River White Lick to Bucknell Boat	WWL020-0003	West Fork White River	SR 43 & 46 Bridge South edge of Spencer	AA08460	09/11/01	>2400	>935
					AA08553	09/20/01	>2400	
					AA08730	09/25/01	1700	
					AA08934	10/02/01	100	
					AA09099	10/10/01	730	
48	2001 WF White River White Lick to Buckhall Boat	WWL020-0034	West Fork White River	Sample from watercraft	AA08461	09/11/01	>2400	>878
					AA08554	09/20/01	>2400	
					AA08731	09/25/01	1300	
					AA08933	10/02/01	120	
					AA09100	10/10/01	580	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
49	2001 *E. coli*-Lower WFWR and Eel	WWL020-0030	Rattlesnake Creek	SR 46 West of Spencer	AA06586	07/31/01	189	N/A
					AA06959	08/08/01	153	
50	1996 Synoptic	WWL020-0004	Rattlesnake Creek	CR just West of US 231, South of Spencer	DI20936	05/01/96	110	N/A
					DI21701	07/18/96	140	
	2001 *E. coli*-Lower WFWR and Eel	WWL020-0004	Rattlesnake Creek	CR just West of US 231, South of Spencer	AA06603	08/01/01	687	N/A
					AA07103	08/15/01	461	
					AA07406	08/22/01	184	
					AA08153	08/29/01	222	
51	2001 WF White River White Lick to Buckhall Bridges	WWL020-0031	Rattlesnake Creek	SR 231	AA08660	09/25/01	520	N/A
					AA08833	10/02/01	370	
					AA08844	10/10/01	140	
52	2001 WF White River White Lick to Buckhall Boat	WWL020-0036	West Fork White River	Bridge on SR 46, 4.7 miles West of Spencer on 425 W	AA08462	09/11/01	>2400	>886
					AA08555	09/20/01	>2400	
					AA08732	09/25/01	770	
					AA08935	10/02/01	150	
					AA09101	10/10/01	820	
53	2004 *E. coli*-Lower WFWR and Eel	WWL020-0026	East Fork Fish Creek	Bridge on SR 46, 4.7 miles West of Spencer on 425W	AA06593	07/31/01	113	174
					AA06957	08/08/01	151	
					AA07102	08/15/01	579	
					AA07405	08/22/01	99	
					AA08151	08/29/01	162	

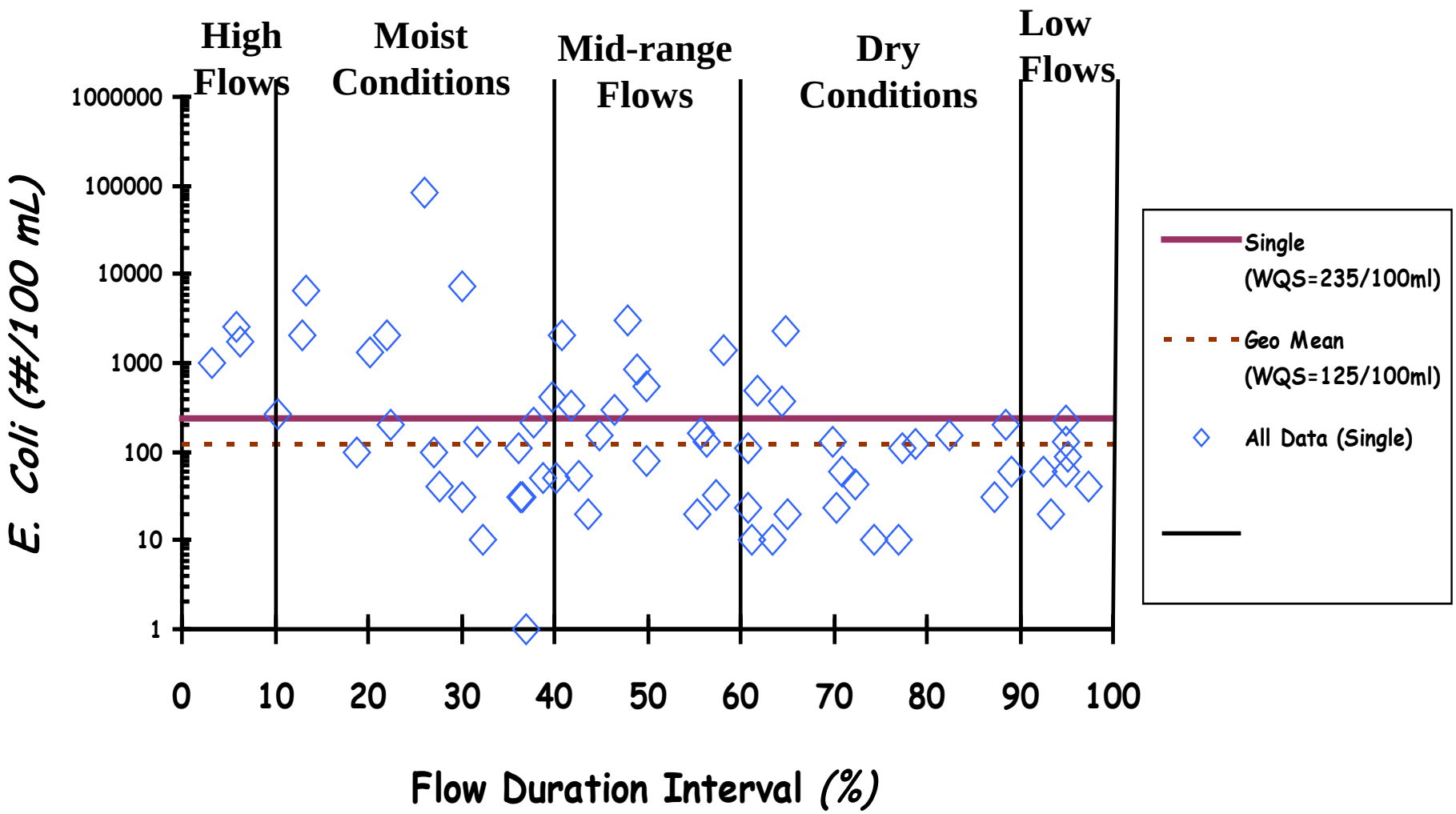
Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
54	2001 *E. coli*- Lower WFWR and Eel	WWL020-0018	Raccoon Creek	SR 43@ Freeman, IN	AA06608	08/01/01	1986	1386
					AA06951	08/08/01	345	
					AA07106	08/15/01	1554	
					AA07411	08/22/01	1986	
					AA08156	08/29/01	2419	
55	2001 *E. coli*- Lower WFWR and Eel	WWL020-0019	Raccoon Creek	CR 775E @ New Hope, Southeast of Freedom	AA06609	08/01/01	1046	616
					AA06950	08/08/01	411	
					AA07105	08/15/01	548	
					AA07408	08/22/01	488	
					AA08155	08/29/01	770	
56	2001 WF White River White Lick to Buckhall Bridges	WWL020-0040	Raccoon Creek	Viles Road, South of New Hope	AA08404	09/11/01	770	355
					AA08506	09/20/01	1200	
					AA08661	09/25/01	370	
					AA08831	10/02/01	260	
					AA08842	10/10/01	63	
57	2001 WF White River White Lick to Buckhall Boat	WWL020-0035	West Fork White River	Sample from watercraft	AA08463	09/11/01	2400	990
					AA08556	09/20/01	2400	
					AA08733	09/25/01	1500	
					AA08936	10/02/01	100	
					AA09102	10/10/01	1100	
58	2001 WF White River White Lick to Buckhall Boat	WWL020-0037	West Fork White River	Sample from watercraft	AA08464	09/11/01	>2400	>710
					AA08557	09/20/01	>2400	
					AA08734	09/25/01	1500	
					AA08937	10/02/01	110	
					AA09103	10/10/01	190	

Site #	Project ID	L-Site #	Stream Name	Description	Sample #	Sample Date	*E. coli* (MPN/100 mL)	Geometric Mean
59	2001 WF White River White Lick to Buckhall Boat	WWL020-0038	West Fork White River	Sample from watercraft	AA08466	09/11/01	2400	<245
					AA08558	09/20/01	2400	
					AA08735	09/25/01	2000	
					AA08938	10/02/01	76	
					AA09105	10/10/01	<1	
60	1996 Synoptic	WWL020-0008	Fish Creek	US 231 South of Spencer, Freedom	DI20940	05/01/96	250	N/A
					DI21321	06/10/96	1600	
					DI21705	07/18/96	50	
	2001 *E. coli*- Lower WFWR and Eel	WWL020-0008	Fish Creek	US 231 South of Spencer, Freedom	AA06604	08/01/01	866	>588
					AA06949	08/08/01	>2419	
					AA07104	08/14/01	272	
					AA07407	08/21/01	299	
					AA08154	08/29/01	411	
	2001 WF White River White Lick to Buckhall Bridges	WWL020-0008	Fish Creek	US 231 South of Spencer, Freedom	AA08405	09/11/01	240	287
					AA08508	09/20/01	980	
					AA08662	09/25/01	290	
					AA08832	10/02/01	110	
					AA08843	10/10/01	260	
61	2001 WF White River White Lick to Buckhall Boat	WWL020-0039	West Fork White River	Sample from watercraft	AA08467	09/11/01	>2400	N/A
					AA08559	09/20/01	1700	
					AA08939	10/02/01	99	
					AA09106	10/10/01	<1	

Attachment B: Fecal coliform data for Middle West Fork White River Watershed TMDL

Site #	Project ID	Stream Name	Description	Sample #	Sample Date	Fecal coliform (colonies/100 mL)
1	McCormicks Creek State Park	McCormicks Creek	Intersection of Banks Rd and Starnes Rd	JV-1	03/25/04	294
2	McCormicks Creek State Park	McCormicks Creek	Intersection of Flatwoods Rd and creek (next to Flatwoods Park)	JV-2	03/25/04	1029
3	McCormicks Creek State Park	McCormicks Creek	Intersection of 350E (eastern school property line) and creek	JV-3	03/25/04	710
4	McCormicks Creek State Park	McCormicks Creek	Intersection of school property line (northern) and adjoining property with creek	JV-4	03/25/04	13
6	McCormicks Creek State Park	McCormicks Creek	Bridle Trail crossing in state park	JV-5	03/25/04	184
8	McCormicks Creek State Park	McCormicks Creek	Next to Old Quarry in state park	JV-6	03/25/04	4

West Fork White River, SR 39 Bridge, Martinsville
WQ Duration Curve *(1991-2001 Monitoring Data)*
Site: WWU160-0004



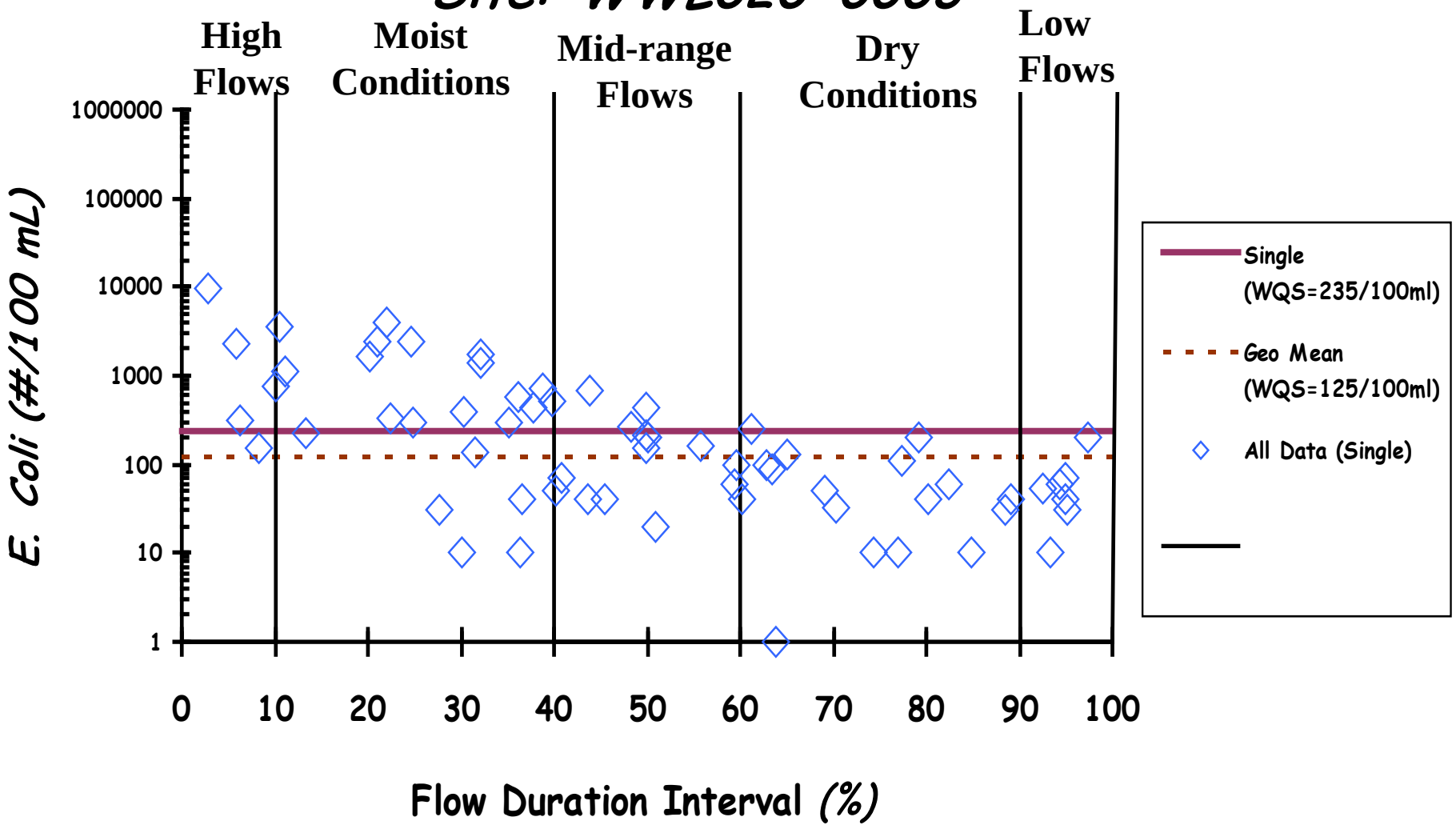
IDEM Data & USGS Gage Duration Interval

2444 square miles

West Fork White River, SR 43 & 46, bridge South edge of Spencer

WQ Duration Curve *(1991-2001 Monitoring Data)*

Site: WWL020-0003



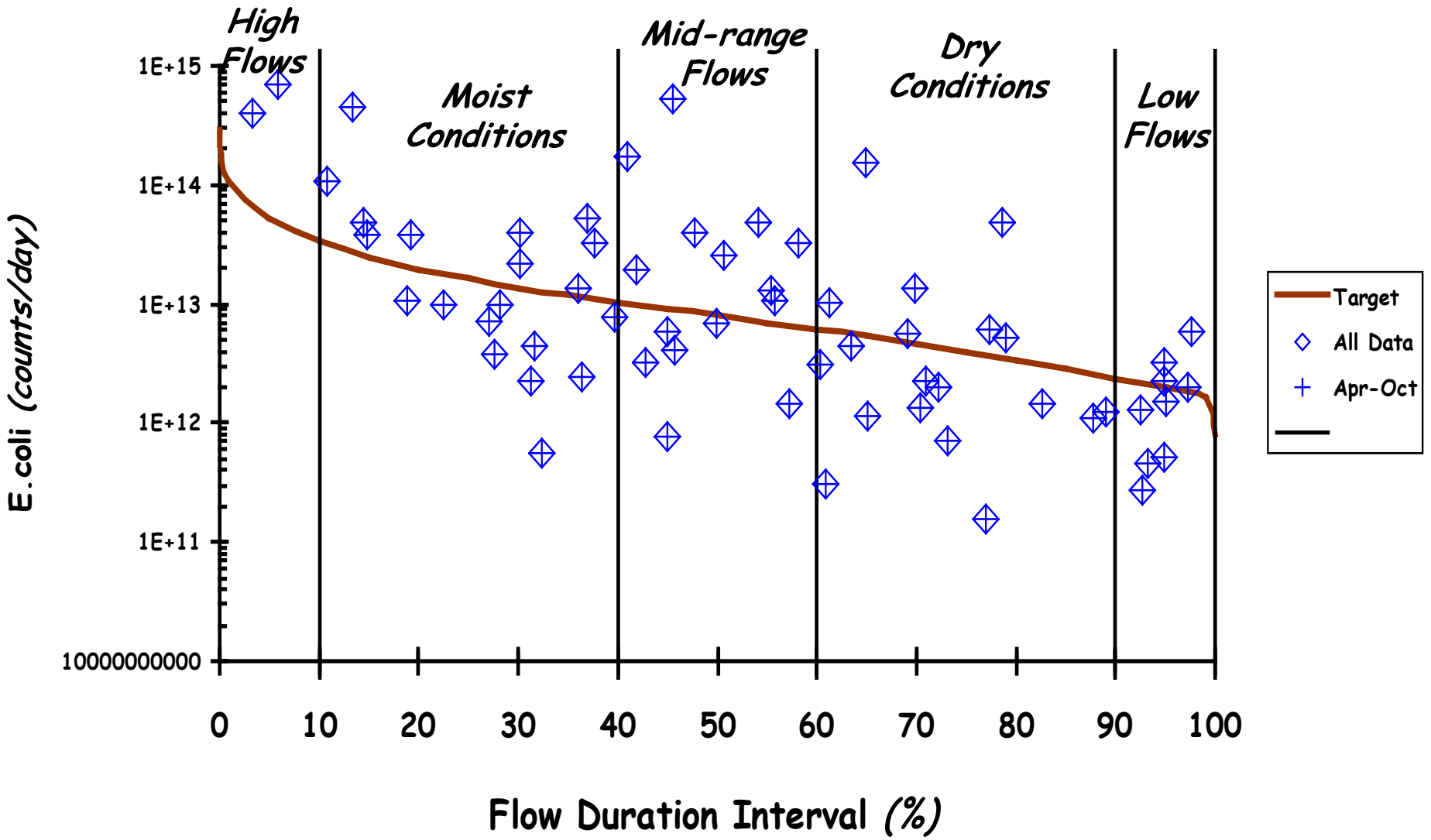
IDEM Data & USGS Gage Duration Interval

2444 square miles

West Fork White River SR 39 Bridge, Martinsville

Load Duration Curve *(1991-2001 Monitoring Data)*

Site: WWU160-0004



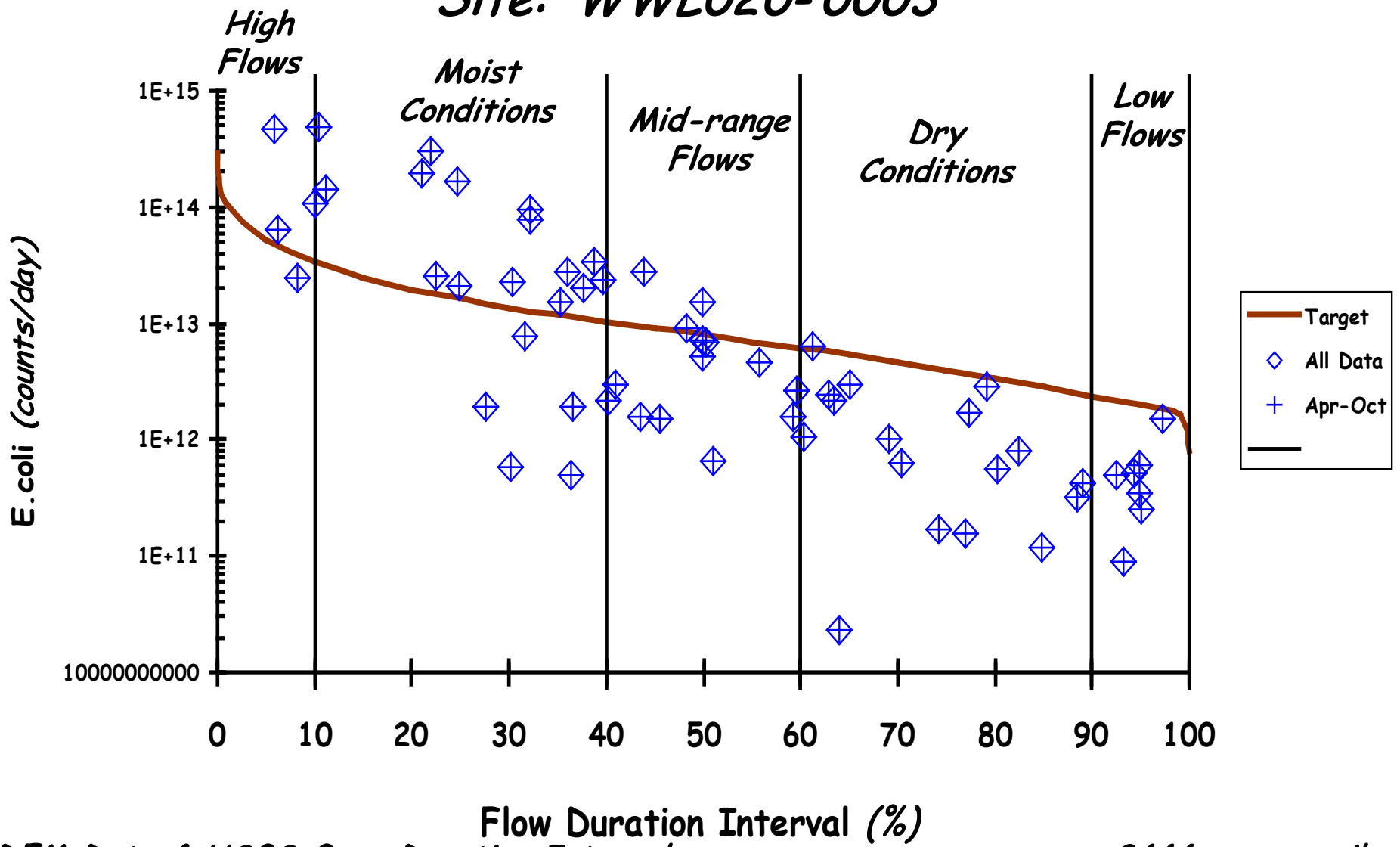
IDEM Data & USGS Gage Duration Interval

2444 square miles

West Fork White River SR 43 & 46, Bridge South Edge of Spencer

Load Duration Curve *(1991-2001 Monitoring Data)*

Site: WWL020-0003



IDEM Data & USGS Gage Duration Interval

2444 square miles