

CHAPTER 3

UNDERSTANDING HISTORIC SUBWATERSHED CONDITIONS

A key part of the White River Watershed Project was gathering baseline information for all three of the subwatersheds. The purpose was to have the best understanding of current water quality and land use conditions in order to understand what needed protection and what needed correction with regards to non-point source pollution in each subwatershed. This was accomplished through gathering the historic data collected by various state and federal agencies (stated below), as well as conducting a detailed water monitoring and land use/land cover analysis program (Chapter 4).

3.1 Federal Data

3.1.1 United States Geological Survey (USGS)

The White River basin is part of the National Water Quality Assessment (NAWQA) Program, a program started in 1991 by the United States Geological Survey (USGS). As part of this program, ongoing monitoring is occurring to determine trends in surface and ground water quality on a long term scale. The USGS has completed several studies of the White River that directly relate to the type of monitoring being done for the White River Watershed Project.

A study done by the USGS, “Occurrence of Pesticides in the White River, Indiana, 1991-95”, monitored pesticide concentrations within the basin. The study found that the dominant pesticides used within the basin were herbicides which were specifically applied to corn and soybeans. It was estimated that ninety-six percent of the total agricultural pesticide used in the White River basin were on corn and soybean crops. Of particular importance were Atrazine concentrations which were detected in all of the samples taken and ranged as high as 11 µg/L. Atrazine is typically detected in surface water samples during the growing season, much less frequently if at all during the remainder of the year. Peak Atrazine concentrations can be found in late May or early June, typically following the first runoff event after application.

The USGS performed another similar study, “Water-quality Assessment of the White River Basin, Indiana—Analysis of Available Information on Nutrients 1980-92”. Results of this study showed that nutrient concentrations were higher in the urbanized areas of the West Fork, primarily due to increased amounts of treated municipal sewage, combined sewer overflows and runoff from urban impervious surfaces. Ammonia and total phosphorus were higher on the downstream side of Muncie than on the upstream side.

On the East Fork of the White River total phosphorus concentrations increased with increasing streamflow, explained by non-point source additions washed off land surfaces (as phosphorus runoff is usually associated with sediment runoff), while concentrations on the West Fork decreased with increasing streamflow, consistent with the dilution of non-point sources as streamflow increases. Seasonal trends were also noted for both parameters, with ammonia concentrations found to be higher in the winter and total phosphorus concentrations found to be higher in the summer and fall.

Fenelon & Moore (1998) performed a study that looked at the transport of agrichemicals to both surface and groundwater in central Indiana. Results of their study showed that pesticides were more readily detectable in surface water than in groundwater, but nitrate potentially impacted both. Subsurface tile drains were found to rapidly transport large quantities of these chemicals from agricultural fields to adjacent surface water.

With more than fifty percent of the cropland in Indiana being drained either by ditches or by tile drains, Indiana ranks second in the United States in terms of total area of drained land.

Another study by J.M. Fenelon, “Water Quality in the White River Basin, Indiana 1992-96” monitored both nutrient and pesticide concentrations within the basin. This study found nitrate concentrations to range from 2-6 mg/L, higher than other NAWQA sites but still below the mandated drinking water standard of 10 mg/L. Pesticide concentrations along urban and agricultural areas were reported as being the highest in the nation, and were both proportional to quantity of pesticide used and heavily affected by the presence of tile drains.

3.1.2 USEPA

3.1.2.1 Hazardous Waste and Superfund Sites

The following information is from BioMuncie.org, <http://www.biomuncie.org>.

There are two permitted solid waste sites in Delaware County. Muncie Sanitation District (811 East Centennial Avenue) and the East Central Recycling Transfer Station (701 East Centennial Avenue). There are currently no permitted hazardous waste disposal facilities in the county.

Even though there are no current hazardous waste disposal facilities in the county, at least two hazardous waste sites have been formally identified in Delaware county by IDEM and are described in the 2002 Commissioners Bulletin: The Albany Sludge Pit (located on Hwy 67SW in Albany) and Stout Storage Battery (located at 2505 W 8th Street in Muncie). The sludge pit served as an uncontrolled dumpsite and sewage release site. Lead, PCBs and solvents have been detected in the soil and groundwater. Action has begun to contain the problem and a three-year study ending in 2003 has been implemented to monitor progress. The old lead battery site has been cleaned and is considered safe for residential or commercial use. (IDEM, 2002 <http://www.in.gov/idem/land/statecleanup/club.html>)

The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) tracks EPA's hazardous waste sites that have the potential for releasing hazardous substances into the environment. They list the following current hazardous waste sites in Delaware County (there are an additional 50 archived locations listed in Appendix C):

Table 3.1: Superfund Sites in Delaware County (EPA CERCLIS Database <http://cfpub.epa.gov/supercpad/cursites/srchsites.cfm>)(NPL = National Priorities List)

EPA ID ▼	Site Name ▼	City ▼	County ▼	State ▼	NPL Status ▼
IND981194079	BAKER PROPERTY	MUNCIE	DELAWARE	IN	NO
IND006419733	FRANK FOUNDRIES CORPORATION	MUNCIE	DELAWARE	IN	NO
IN0001899269	MEMORIAL DRIVE DUMP	MUNCIE	DELAWARE	IN	NO
INN000509013	MUNCIE MERCURY HOUSE	MUNCIE	DELAWARE	IN	NO
IND984895870	MUNCIE RACE TRACK	MUNCIE	DELAWARE	IN	NO
INN000508755	MUNCIE RESIDENTIAL MERCURY	MUNCIE	DELAWARE	IN	NO
IND006062582	WESTINGHOUSE/ABB POWER	MUNCIE	DELAWARE	IN	NO

The Agency for Toxic Substances and Disease Registry (<http://www.atsdr.cdc.gov/>) identifies incidences at the following hazardous sites: Baker Garage, 1996, the Battery Case Dump, in 1991, Franks Foundry Corp. in 1996 and 2000; the Lennington and Thornburgh Sludge Dumps, 1990 and 1991; the Memorial Drive Dump in 1997. The Lennington Area Dump is located at Eaton Avenue and SR 35S in Muncie. The CDC toxic substances report for this site in 1990, indicated private groundwater contamination: 35mg lead (MCL 0.05mg); iron 7mg, sodium 180mg. The Thornburgh Sludge Dump located at SR and CR 700N in Albany has been cleaned after the EPA found lead contamination in 1991. The site continues to be monitored.

There are about 4000 Leaking Underground Storage Tanks (LUST) sites in the state of these over eighty require attention in Delaware County. (IDEM, <http://www.in.gov/idem/land/lust/>) A list of Active LUST Sites in Delaware County was extracted from the state database (see Appendix C). Underground storage tanks are typically found at gas or service stations, dry cleaners, airport or truck refueling facilities, in homes or businesses where heating oil was stored. Gasoline, diesel fuel, hydraulic fuel, jet fuel, oil, perchloroethylene (dry cleaning), are some of the contaminants that leak from older tanks. A fuel additive called MTBE, methyl tertiary-butyl ether, is also a source of concern. "In December 1997, EPA issued a drinking water advisory that states concentrations of MTBE, in the range of 20 to 40 ppb of water or below will probably not cause unpleasant taste and odor for most people, recognizing that human sensitivity to taste and odor varies widely. The advisory is a guidance document that recommends keeping concentrations below that range." The EPA recommends but does not require drinking water be tested for MTBE.

3.1.2.2 NPDES Permits

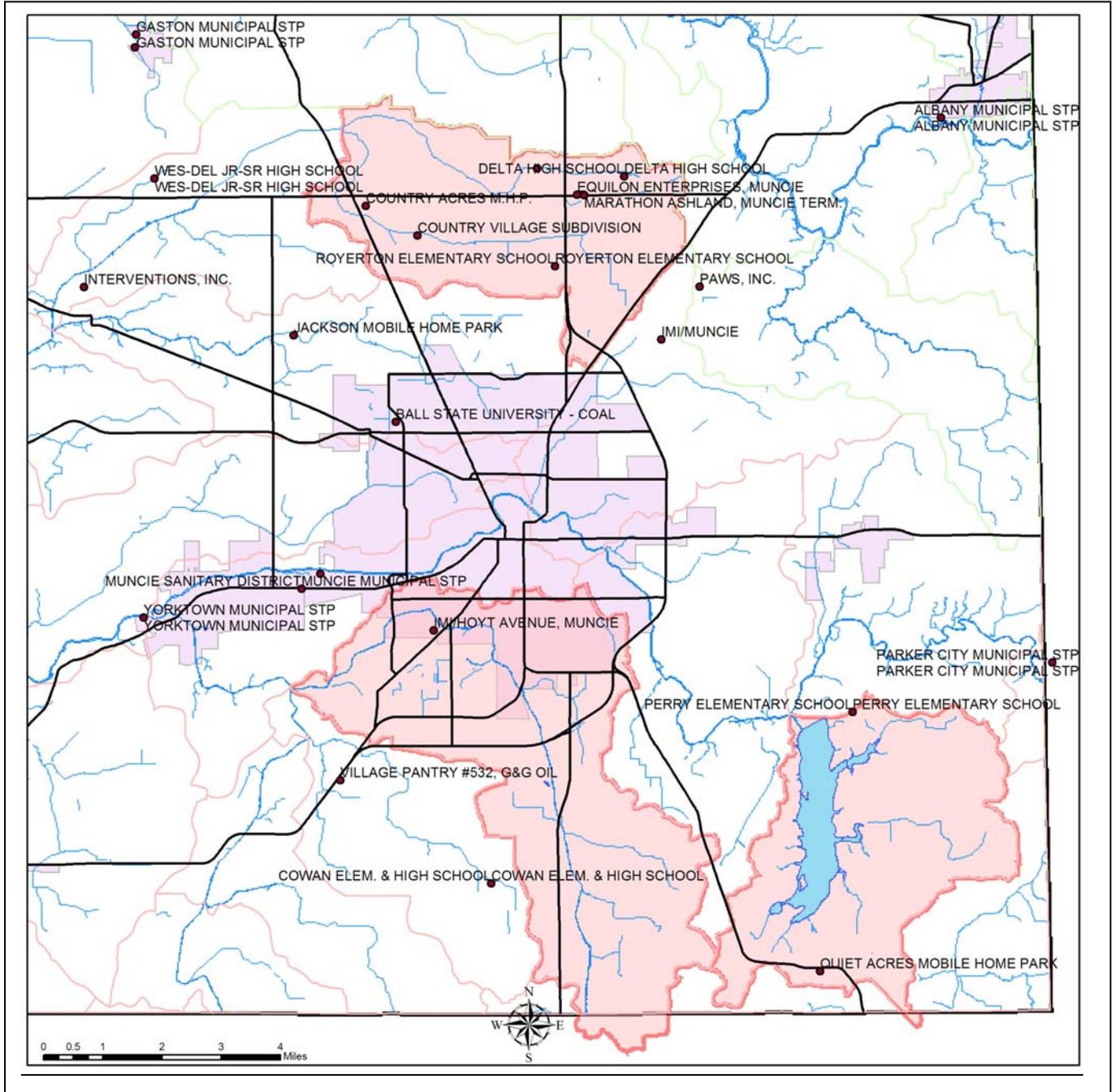


Figure 3.1: NPDES Locations and Permit Holders

3.2 State Data

3.2.1 State Designated Uses of Waterbodies

The following is a list of uses each waterbody in Indiana must meet by law (Indiana Administrative Code, Title 327, Article 2-1-3) as designated by the Indiana Water Pollution Control Board (IWPCB): (For the definition of the Board, see Appendix D.)

Full body contact recreation

Between April 1 and October 31

Aquatic Life

Warm water aquatic communities and (where natural conditions permit) put-and-take trout fishing

Public and Industrial water supply

At point of take (Waters must meet minimum quality standards.)

Agriculture

(Waters used for this purpose must meet minimum quality standards.)

Additional uses identified by the IWPCB which are not applicable to any waterbodies in Delaware County at the time of publication:

Where multiple uses have been designated for a body of water, the most protective of all simultaneously applicable standards will apply.

Limited Use

All waters in which naturally poor physical characteristics (including lack of sufficient flow), naturally poor chemical quality, or irreversible man-induced conditions, which came into existence prior to January 1, 1983, and having been established by use attainability analysis, public comment period, and hearing may qualify to be classified for limited use and must be evaluated for restoration and upgrading at each triennial review of this rule.

Exceptional Use

All waters which provide unusual aquatic habitat, which are an integral feature of an area of exceptional natural beauty or character, or which support unique assemblages of aquatic organisms may be classified for exceptional use.

Indiana has developed a water quality standard for each of these six uses. By definition, a standard must contain both narrative and numeric criteria. At the time Indiana established its water quality standards, the state chose to establish a narrative standard to cover all the waters of the state and numeric standards for some (but not all) of the parameters. The Indiana Department of Environmental Management sets these standards, which are listed in Title 327, Article 2-1-6 of the Indiana Administrative Code. The numeric criteria for parameters studied during this project can be found in Section 3.3.1 of this document. (For the entire listing of narrative and numeric criterion, please see the above referenced section of the IAC.)

3.2.2 Indiana Department of Environmental Management

As described above, IDEM sets quality standards for surface water bodies as per federal mandate under the Clean Water Act. Status of Indiana surface waterbodies is determined through IDEM's state-wide monitoring program. The waterbodies that are found not to meet those standards are then placed on what is referred to as Indiana's 303(d) list of impaired waters. That list is part of a biennial report submitted to the U.S. Environmental Protection Agency called the Indiana 305(b) Report. Waterbodies are ranked according to the severity of the pollution found and the designated uses of the individual body. (For the latest version of the 305(b) report [named the 2002 Integrated Water Quality Monitoring and Assessment Report], go to <http://www.in.gov/idem/water/planbr/wqs/quality.html>.)

3.2.2.1 2004 303(d) List

There are currently 22 stream segments listed as not meeting state water quality standards within Delaware County. (See Table 3.1 for a complete listing.) Below is a brief description of the program methodology and the list itself for Delaware County streams taken from the *Notice of Public Comment Period and Public Meetings, Updated List of Impaired Waters under Section 303(d) of the CWA*. For a complete description of IDEM's methodology, please refer to this document found at <http://www.in.gov/idem/water/planbr/wqs/notice04.pdf>.

"Use Support/Impairment status is determined for each stream waterbody using the assessment guidelines provided in the U.S. EPA documents *Guidelines for Preparation of the State Water Quality Assessments (305[b] Reports) and Electronic Updates: Report Contents*. Washington, DC: U. S. Environmental Protection Agency. (EPA-841-B-97-002A.) and *Guidance for 2004 Assessment, Listing, and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act, July 21, 2003*, Watershed Branch, U. S. Environmental Protection Agency. Available results from six monitoring result types listed below are integrated to provide an assessment for each stream waterbody for 305(b) reporting and 303(d) listing purposes.

Physical/chemical water results

Fish community assessment

Benthic aquatic macroinvertebrate community assessments

Fish tissue and surficial aquatic sediment contaminant results

Habitat evaluation

E. coli monitoring results

In the 2004 303(d) list, IDEM proposes to add a number of waterbodies to Category 5. For a stream to be listed it must have been sampled and the data collected must support 303(d) listing. The waterbodies proposed to be added to the 2004 303(d) list are primarily in the West Fork White River and Patoka River basins which were sampled in the summer of 2001. The samples were subsequently analyzed and indicate waterbody impairment." <http://www.in.gov/idem/water/planbr/wqs/303d.html>

Table 3.2: 2004 303(d) List of Impaired Waterbodies for Delaware County, IN

303(d) #	MAJOR BASIN	14 DIGIT HYDROLOGIC UNIT CODE	COUNTY	SEGMENT ID NUMBER	WATERBODY NAME	PARAMETERS OF CONCERN
102	W. FORK WHITE	5120201020020	DELAWARE	INW0122_T1011	BUCK CREEK	IBC, E. COLI
102	W. FORK WHITE	5120201020060	DELAWARE	INW0126_T1012	BUCK CREEK	IBC, E. COLI
102	W. FORK WHITE	5120201020030	DELAWARE	INW0123_00	BELL CREEK-BETHEL BROOK	E. COLI
102	W. FORK WHITE	5120201020040	DELAWARE	INW0124_00	BELL CREEK- WILLIAMS DITCH	E. COLI
102	W. FORK WHITE	5120201020050	DELAWARE	INW0125_00	BELL CREEK- NO NAME CREEK	E. COLI
136	W. FORK WHITE	5120201050010	DELAWARE	INW0151_00	PIPE CREEK-YEAGER FINLEY MENARD DITCH	IBC, E. COLI
158	W. FORK WHITE	5120201020060	DELAWARE	INW0126_T1010	WHITE RIVER	E. COLI
158	W. FORK WHITE	5120201030010	DELAWARE	INW0131_T1013	WHITE RIVER	E. COLI
158	W. FORK WHITE	5120201030020	DELAWARE	INW0132_T1014	WHITE RIVER	E. COLI
162	W. FORK WHITE	5120201010090	DELAWARE	INW0119_T1006	WHITE RIVER	E. COLI
162	W. FORK WHITE	5120201010100	DELAWARE	INW011A_T1007	WHITE RIVER	E. COLI
162	W. FORK WHITE	5120201010120	DELAWARE	INW011C_T1008	WHITE RIVER	E. COLI
162	W. FORK WHITE	5120201010130	DELAWARE	INW011D_T1009	WHITE RIVER	IBC, E. COLI
162	W. FORK WHITE	5120201010090	DELAWARE	INW0119_00	STONEY CREEK AND OTHER TRIBUTARIES	E. COLI
162	W. FORK WHITE	5120201010100	DELAWARE	INW011A_00	MUD CREEK AND OTHER TRIBUTARIES	E. COLI
162	W.FORK WHITE	5120201010130	DELAWARE	INW011D_00	MUNCIE CREEK- OTHER TRIBUTARIES	E. COLI
520	W. FORK WHITE	5120201040010	DELAWARE	INW0141_00	KILLBUCK CREEK	IBC, E. COLI
520	W. FORK WHITE	5120201040020	DELAWARE	INW0142_00	KILLBUCK CREEK- THRUSTON DITCH	IBC, E. COLI
520	W. FORK WHITE	5120201040030	DELAWARE	INW0143_00	JAKES CREEK- EAGLE BRANCH	E. COLI
520	W. FORK WHITE	5120201040040	DELAWARE	INW0144_00	KILLBUCK CREEK- PLEASANT RUN CREEK	IBC, E. COLI
520	W. FORK WHITE	5120201040050	DELAWARE	INW0145_00	KILLBUCK CREEK	E. COLI
521	W. FORK WHITE	5120201030010	DELAWARE	INW0131_00	YORK PRAIRIE CREEK AND OTHER TRIBUTARIES	E. COLI

Note: **Bold** text indicates watersheds that are included in this management plan.
(IBI = Impaired Biotic Communities)

3.2.2.2 Fish Consumption Advisories (FCA)

There are official recommendations regarding human consumption of fish caught in various waterbodies across the United States. Below are the waterbodies listed and the reasons for the listing. (For a the complete Delaware County advisory, see Appendix D.) (Indiana Department of Health, 2004, http://www.state.in.us/isdh/dataandstats/fish/fish_adv_index.htm)

Upper White River Watershed in Delaware County

The White River is under a fish consumption advisory for mercury and Polychlorinated Biphenyls (PCBs).

Killbuck/Mud Creek Subwatershed

There currently is no FCA listed for this watershed.

Buck Creek Subwatershed

Buck Creek is under a fish consumption advisory for mercury and Polychlorinated Biphenyls (PCBs) (IDEM 2003).

Prairie Creek Subwatershed

There currently is no FCA listed for this subwatershed.

3.2.2.3 Total Maximum Daily Load

Public and Project Involvement

Section 303(d) of the federal Clean Water Act requires states to identify waterbodies that do not or are not expected to meet minimum water quality standards for each state (which are listed previously in Table 3.1). From this list, states are required to develop Total Maximum Daily Loads (TMDLs) for each parameter a waterbody is listed for.

It is important to note that while the development of numerical Total Maximum Daily Loads for each cited impairment is mandated, the implementation of TMDL plans is currently voluntary. This is where watershed management plans, like this one, can help eliminate the potential for making implementation mandated. One of the goals for this plan is to remove 303(d) listed streams from that list, thereby resulting in voluntary compliance of the TMDL goals.

During the development of this watershed management plan, a TMDL was under development for *E. coli* on the White River. This included the portion of the Upper White River Watershed that flows through Delaware County. The White River Watershed Project, and some of our partners, worked with TetraTech, Inc. (the contractor hired to develop the TMDL) to assist them with gathering land use and water quality information for Delaware County.

One of those partners, the Muncie Sanitary District provided them with their water quality data. They supplied TetraTech, Inc. with long term monitoring data, locations of Combined Sewer Overflows, data related to the Stream Reach Characterization, data related to the U.S. EPA Storm Water Management Model (SWMM), and maps, plus copies of newspaper articles relating to the TMDL developmental process. In addition to this, the WRWP Watershed Coordinator attended the public meetings and forwarded on meeting information to project participants and encouraged them to attend.

Upper White River Watershed TMDL Schedule

The White River (within Delaware County) is listed to submit TMDLs for the following impairments: Mercury, PCBs, *E. coli*, and Impaired Biotic Communities. The dates for TMDL submittal are December 31 of the following years, in respective order, 2013, 2013, 2005 and 2008.

A TMDL for *E. coli* has been developed for the West Fork of the White River beginning in Muncie and ending in Indianapolis. The report lists that a 91% reduction in *E. coli* is needed in the White River segment from East Memorial Drive in Muncie to Anderson City Park to be in compliance with state regulations.

(IDEM, 2003 <http://www.in.gov/idem/water/planbr/wqs/tmdl/assess/wfwhiterscrprt.pdf>)

2003 IDEM TMDL Report

Below are the preliminary sources identified in the TMDL report (IDEM, 2003 <http://www.in.gov/idem/water/planbr/wqs/tmdl/assess/wfwhiterscrprt.pdf>):

“First, CSOs are contributing the largest *E. coli* loads compared to the other source categories evaluated. The current estimate of *E. coli* from CSOs throughout the watershed is based on the assumption that the average per outfall load from Alexandria, Anderson, Elwood, Noblesville, and Tipton is similar to that from Muncie. Even if the average per outfall load is half that of Muncie (which is unlikely), CSOs remain the largest of source categories evaluated. Septic systems and cattle are contributing the next greatest amount of *E. coli* compared to the other source categories evaluated.

The estimated load is based on a number of assumptions, of course, but the results do not change dramatically even if some of the assumptions are changed significantly. For example, if only 20 percent of the septic systems are failing (instead of the assumed 40 percent) the load from septic systems is still more than that from the wastewater treatment plants or the bypasses. Cattle in streams are the next greatest source of *E. coli* loading among those evaluated. They remain the second greatest source (of the categories evaluated) even if only 10 percent of the cattle instead of 50 percent have direct access to streams.

It is important to note that the information regarding *E. coli* in the 2003 TMDL Report addresses only the waste generation and potential transport of *E. coli* in the watershed. It does not address the impact of the sources on resulting water quality. Loads from some of the sources, such as CSOs and storm water runoff, will be driven by wet weather events. During such events the flow in the streams will provide some dilution of the bacteria load. Loads from other sources, such as cattle, septic systems, and wastewater treatment plants, will continue during low flow conditions when there is less dilution capacity in the stream. These factors and others that affect instream conditions will be explored further during the modeling process.”

Killbuck/Mud Creek Subwatershed

Killbuck Creek is listed to submit TMDLs for the following three impairments: Mercury, PCBs, and Pathogen Indicators (*E. coli*). The dates for TMDL submittal are December 31 of the following years, in respective order, 2013, 2013 and 2005.

Buck Creek Subwatershed

Buck Creek is listed to submit TMDLs for the following three impairments: Mercury, PCBs, and Impaired Biotic Communities. The dates for TMDL submittal are December 31 of the following years, in respective order, 2013, 2013 and 2008.

Prairie Creek Subwatershed

There are no waterbodies in the Prairie Creek Watershed that are scheduled to develop TMDLs, due to the fact that there are no waterbodies listed on IDEM's 303(d) list.

For more on IDEM's TMDL Program, go to:

<http://www.in.gov/idem/water/planbr/wqs/tmdl/tmdldocs.html>.

3.2.2.4 Upper White River Watershed Restoration Action Strategy (UWRWRAS)

Based on this document, created in January 2001, the following are the causes and contributing activities of water pollution in the White River Watershed Basin.

Table 3.3: UWRWRAS Listed Causes of Water Pollution and Contributing Activities

Cause	Activity associated with cause
Nutrients	Fertilizer on agricultural crops and residential/ commercial lawns, animal wastes, leaky sewers and septic tanks, direct septic discharge, atmospheric deposition, wastewater treatment plants
Toxic Chemicals	Pesticide applications, disinfectants, automobile fluids, accidental spills, illegal dumping, urban stormwater runoff, direct septic discharge, industrial effluent
Oxygen-Consuming Substances	Wastewater effluent, leaking sewers and septic tanks, direct septic discharge, animal waste
E. coli	Failing septic systems, direct septic discharge, animal waste (including runoff from livestock operations and impacts from wildlife), improperly disinfected wastewater treatment plant effluent

3.2.3 Indiana Department of Natural Resources

The West Fork of the White River is on the list of outstanding rivers with the Indiana Natural Resources Commission (<http://www.in.gov/nrc/policy/outstand.html>), from Farmland to the confluence with the Wabash River. This stretch passes through Daviess, Delaware, Gibson, Knox, Greene, Hamilton, Madison, Morgan, Owen and Randolph Counties. It has been listed for the following three reasons:

1. Nationwide Rivers Inventory Rivers. The 1,524 river segments identified by the National Park Service in its 1982 "Nationwide Rivers Inventory" as qualified for consideration for inclusion in the National Wild and Scenic Rivers System.
2. State Heritage Program Sites. Rivers identified by state natural heritage programs or similar state programs as having outstanding ecological importance.
3. Canoe Trails. State-designated canoe/boating routes.