Indiana's State Nutrient Reduction Strategy

A framework to reduce nutrients entering Indiana's waters

Version 3 – October 2015

Prepared by:

Indiana State Department of Agriculture

Indiana Department of Environmental Management

With contributions from the Indiana Conservation Partnership:

Indiana State Soil Conservation Board (SSCB)
USDA Natural Resources Conservation Service (NRCS)
USDA Farm Service Agency (FSA)
Indiana Association of Soil and Water Conservation Districts (IASWCD)
Indiana Department of Natural Resources (IDNR)
Purdue Cooperative Extension

And also by members of the:

Indiana Nutrient Management Soil Health Strategy Workgroup

* This nutrient reduction strategy is a living, working document and will be updated every two years.

TABLE OF CONTENTS

Executive Summary

The Indiana Nutrient Reduction Strategy represents the state's commitment to reduce nutrient runoff into Indiana's waters from point sources and non-point sources alike. The objectives of this strategy include acknowledgment of the challenges facing the improvement of Indiana's impaired waters; involvement and engaging of stakeholders in the state's efforts to reduce nutrient loads; prioritization of HUC 8 watersheds and first-round HUC 12 watersheds; discussion of water quality monitoring and regulatory control of point sources; the inventory and utilization of resources to achieve their highest impact on nutrient reduction; and encouragement of voluntary incentive based conservation through the many state and federal water quality related programs.

The Indiana Nutrient Reduction Strategy serves as a renewed effort to encourage outreach and education to conservation partnerships and the public regarding stewardship of Indiana's waters. This strategy acknowledges that while the potential to reduce nitrogen and phosphorus entering our waters is great, the achievement of these objectives is dependent upon the cooperation of state, federal and local organizations and initiatives, positively changing individuals' behavior via understanding their motivations, as well as many other complex factors, including the location and nature of conservation practices on productive agricultural ground and other rural best management practices (BMPs) such as filter strips buffers and managed drainage. Septic system management, appropriate residential fertilizer applications, erosion control at construction sites, and urban BMPs such as green infrastructure will be key to controlling nutrient runoff. As such, there will always be a need for continued efforts in conservation, education, outreach and research in order to maintain progress.

The document serves several functions. These are:

- To recognize water quality trends and concerns within the state of Indiana.
- To prioritize watersheds and coordinate implementation of current local, state and federal cost-share programs and grants which positively impact water quality in the state.
- To provide a summary of current water monitoring and permitting efforts in Indiana as well as significant changes and/or timelines therein regarding goals, targets or protocols for improved or increased monitoring and permitting.
- To illustrate the significance and achievements of the Indiana Conservation Partnership and its member entities as an invaluable resource in addressing Hoosiers' water quality challenges and concerns.
- To serve as a strategic document for seeking continued funding sources for current and future efforts concerning water quality in Indiana.
- To illustrate the means by which the state of Indiana will provide reports and accountability in these functions to federal agencies, to conservation partners within the state and to the public.

Section 1 – Introduction

National Nutrient Load Concerns and Priorities

Eutrophication, or nutrient enrichment of waters, is a concern in many areas of the United States as well as around the world. When excess nutrients like nitrogen and phosphorus enter our waterbodies, it stimulates excessive plant growth, often called an algal bloom, which can lead to low oxygen levels in the water. These areas of very low oxygen cannot support aquatic life and are often called "dead zones", also referred to as hypoxia.
The dead zone or Hypoxia Zone in the Gulf of Mexico is among the most pressing, where nutrient loads from the Mississippi/Atchafalaya River Basin (Figure 1) are contributing to eutrophication and harmful algal blooms that in 2014 covered an area approximately 5,052 square miles or about the size of Connecticut. (Figure 2)
http://water.epa.gov/type/watersheds/named/msbasin/zone.cfm.

Figure 1 – Mississippi/Atchafalaya River Basin
Image source: http://water.epa.gov/type/watersheds/named/msbasin/marb.cfm

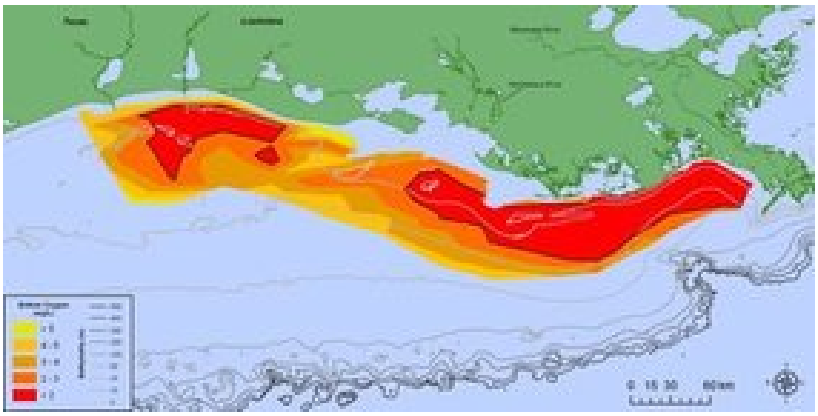


Figure 2 – 2014 Hypoxia Zone in the Gulf of Mexico
Image source: http://water.epa.gov/type/watersheds/named/msbasin/zone.cfm

As a result of this issue going on in the Gulf of Mexico, the Mississippi River/Gulf of Mexico Hypoxia Task Force in 2008 created a priority action plan that calls for each of the major states that drain in the basin to develop a state nutrient reduction strategy to address the issue of excess nitrogen and phosphorus entering their rivers, lakes, streams, aquifers, wetlands, and drinking water supplies.

The development of Indiana's State Nutrient Reduction Strategy is benefitting our state's local waters resources, which in turn will benefit the Gulf of Mexico and the Great Lakes into which Indiana's waterways drain.

Nutrient Load Effects on Indiana's Water

Indiana's surface and ground waters are adversely affected by excessive nutrient loads from point sources and nonpoint sources to our rivers, streams, lakes and aquifers. This is evident in increasing occurrences of cyanobacteria (also known as blue-green algae) blooms Hoosier lakes and reservoirs, which can result in the release of toxins. This is having a negative economic impact by increasing the cost of treating public water supplies as well as reducing the recreational use of lakes for swimming and boating. A number of Indiana's drinking water facilities that use surface water find it necessary to add activated carbon to control taste and odor compounds as well as toxins attributed to harmful algae blooms (HABs). Several public water systems apply hervicicides to their source waters as a means to control HABs. In 2014, the Indiana Department of Natural Resources (IDNR) issued 30 recreational alerts at its public beaches and recreational areas due to algae blooms. In addition, nitrate is one of the most common ground water contaminants found in the State. It represents a threat to drinking water primarily because excess levels can cause methemoglobinemia, or "blue baby" syndrome. Although nitrate levels that affect infants do not pose a direct threat to older children and adults, they do indicate a need for nutrient control.
We must address the health of our water resources in a comprehensive way. Recognizing that what we do on the landscape with urban, rural and agricultural activities and drainage is reflected in our waterways. While regulatory approaches to controlling point sources of nutrients are in place, they remain under continued assessment and improvement, including refining expectations

and operations in wastewater treatment facilities and other municipal systems, such as storm water management and the use of green infrastructure for water infiltration and uptake by plants and trees.
There is also an increased interest in promoting non-regulatory approaches for nonpoint sources such as increased technical and financial assistance for coordinated, effective BMPs on agricultural and urban lands. This includes managing agricultural lands to reduce nutrient loads lost to runoff, managing soil health and water-holding capacity through a system of practices including never-till and cover crops as well as utilizing buffers, filters and other best management practices along waterways in both urban and rural areas.

Indiana Drainage Overview

The State of Indiana has a surface area of approximately 36,532 square miles. There are about 63,000 miles of rivers, streams, ditches and drainage ways in Indiana. In addition, there are approximately 35,673 miles of surface waterways in Indiana greater than one mile in length.

Indiana is made up of three major drainage basins (Figure 3). The blue shaded area on the map shows that the majority of the state drains to the Mississippi River Basin, either to Illinois or through the Wabash River System and into the Ohio River along the southern border of Indiana. The main rivers that drain Indiana in the Mississippi River Basin are the Wabash River, the Tippecanoe River, and the White River; and are known as the Wabash River System. This system drains two-thirds of Indiana's 92 counties and consists of primarily agricultural land with many small towns and some cities located along the rivers.

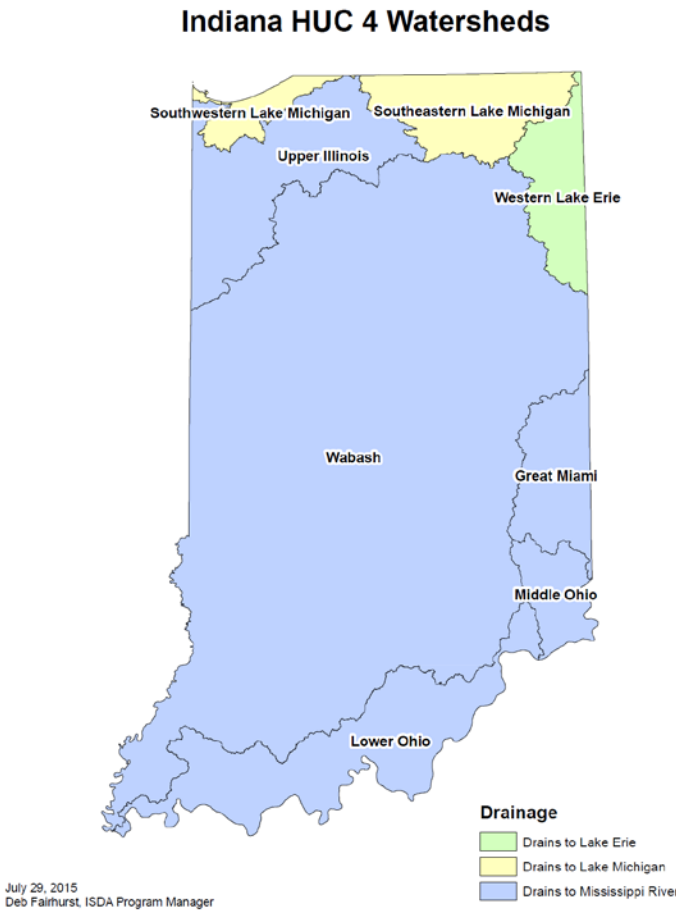


Figure 3 – Indiana's major drainage

The yellow and green shaded areas in Northeast and Northwest Indiana drains to the Great Lakes (Lake Michigan and Lake Erie). The Western Lake Erie Basin (WLEB) (green shaded area) is located in northeast Indiana and covers all or part of 6 counties, covering approximately 812,543 acres. The main rivers that drain the WLEB area are the St. Joseph River, the St. Marys River, and the Upper Maumee River. A portion of northwest Indiana drains to Lake Michigan, and part of northeast Indiana drains to Lake Michigan through the St. Joseph River System (different then the St. Joseph River in the WLEB area).

Section 2 – Engage Stakeholders and Partners

The State of Indiana recognizes that early involvement of stakeholders provides transparency of the process, allows time for trust to develop, permits incorporating local knowledge, and makes it possible to deal most effectively with misperceptions and manage expectations. All of this helps gain buy-in and cooperation from stakeholders and increases the likelihood of moving toward sustainable solutions. During the development of this strategy, we have consulted with the following stakeholders:

Indiana Conservation Partnership - One of the most important tasks in this effort is that of engaging and utilizing the Indiana Conservation Partnership (ICP) and others invested in Indiana's water quality. As both a leadership body and as stakeholders in Indiana's water quality, the ICP actively works to address environmental issues across Indiana at local, state and federal levels. Indiana is a national leader in fostering cooperative, progressive and productive state-wide partnerships and has served as a model for other states. The ICP embodies that reputation. http://icp.iaswcd.org/

The ICP is comprised of eight entities, including the State Soil Conservation Board (SSCB), the Indiana Association of Soil and Water Conservation Districts (IASWCD), the USDA Farm Service Agency (FSA), the USDA Natural Resources Conservation Service (NRCS), the Indiana State Department of Agriculture's Division of Soil Conservation (ISDA-DSC), the Indiana Department of Natural Resources (IDNR), the Indiana Department of Environmental Management (IDEM), and the Purdue Cooperative Extension Service. These partners work together to leverage technical, financial and educational assistance to implement environmental stewardship decisions, practices and technologies. The ICP provides a roadmap for addressing Indiana's conservation issues, and in so doing, functions collectively to touch many other organizations and individuals.

In 2011, the development of a state nutrient reduction strategy became a key action item of the ICP, and as a result, the formation of a State Nutrient Reduction Strategy Workgroup was convened. This workgroup had representatives from the ICP and well as from the U.S. Geological Survey (USGS), Indiana Environmental Institute, Farm Bureau, Indiana Pork Producers, Indiana Poultry, and Indiana Dairy. The workgroup engaged in a productive dialogue about how to effectively develop Indiana's Nutrient Reduction Strategy.

State Soil Conservation Board (SSCB) - The Indiana State Soil Conservation Board is another key group of stakeholders in Indiana's water quality and is a member of the ICP. The SSCB appoints Supervisors as recommended by Soil and Water Conservation Districts (SWCDs) and sets policy governing programs of the ISDA Division of Soil Conservation (DSC) and the activities of SWCDs. Through ISDA and the policies set by the SSCB, this board serves SWCDs by providing state appropriated funding for SWCD operations, providing technical assistance through ISDA DSC employees, and builds district capacity by facilitating information exchange between the SWCDs through SWCD Annual Conference, publications, workshops, and the efforts of the DSC Resource Specialists.

The SSCB also serves as a body for advice and consultation for ISDA and the SWCDs as well as assists in securing federal and state agency help for district programs. Lastly the board administers Clean Water Indiana, a water quality-related erosion and sediment reduction program. The State Soil Conservation Board also has legal authority to develop a regulatory program to be used in the event that voluntary erosion and sediment reduction approaches have been exhausted. This entity, too was consulted in the planning and initiation of the Indiana Nutrient Reduction Strategy. http://www.in.gov/isda/2361.htm

Soil and Water Conservation Districts (SWCDs) – Indiana's Soil and Water Conservation Districts are the grassroots partners in Indiana's effort to improve its waters. Districts not only bring a local environmental perspective to land users and economic developers, but act as local hubs for any and all citizens whom they serve to find information regarding conservation issues and programs available to them. SWCDs most often share residence with local FSA and NRCS offices as well as DSC employees, or are located in close proximity. This not only allows for cooperation and shared resources, but ensures that farmers, landowners and developers can access conservation programs and technical support at local, state and federal levels when they respond to outreach from SWCDs or they themselves reach out to any of these partners.

Partners of the Indiana Conservation Partnership and the State Soil Conservation Board all work closely with SWCDs to ensure that information, technical assistance, funding and programs are made available to landowners and the public in Indiana's 92 counties.
http://www.in.gov/isda/2368.htm

Agricultural Commodity Groups – Indiana Corn, Soybean, Pork, Beef, Dairy and Poultry commodity groups, in cooperation with the Indiana Farm Bureau, the Agribusiness Council of Indiana and Purdue Extension, have all been actively engaged in identifying and approaching the challenges of nutrient loading (and subsequently soil health) in the development of a Nutrient Management and Soil Health Strategy. This effort is the result of the comprehensive input and discussion from members of the Indiana Conservation Partnership as well as many members of the agricultural community at large. In an agricultural state rich with steward-farmers, this partnership is invaluable in addressing water quality and soil health related issues. This Nutrient Management and Soil Health Strategy will be discussed in more detail later on in this strategy.

Municipalities – Primarily those with municipal separate storm sewer systems (MS4S) and major wastewater treatment plants (WWTP) (greater than 1 million gallons design flow per-MGD) were engaged regarding monitoring ambient water quality and/or regarding the non-rule policy document (NPD) setting effluent limits of 1mg/L TP. In advance of implementing the 1mg/L TP effluent limit for major WWTP dischargers, the affected WWTPs were e-mailed and phoned prior to the public notice for a 45-day comment period (to which IDEM received no comments). The NPD was presented to the Environmental Rules Board on 11/14/14 and became effective on 12/12/14.

Section 3 – Watershed Prioritization and Characterization

Prioritize 8-digit Hydrologic Unit Code (HUC) Watersheds

Prioritizing watersheds is an important step in the development of a nutrient reduction strategy because it is where the most impact can be made toward sediment and nutrient reduction loads. As a result, ISDA and IDEM determined, along with assistance and feedback from the ICP, specific watersheds where it is believed that most of the nutrients are coming from, which was determined by using a number of different resources. It was agreed on by ISDA, IDEM and members of the ICP that prioritization would begin at the 8-digit HUC level with subsequent prioritization at the 12-digit BMP implementation scale.

The resources used to assist in determining the priority HUC 8 watersheds included the USGS SPARROW model (http://water.usgs.gov/nawqa/sparrow/), which is a modeling tool for the regional interpretation of water-quality monitoring data and is used to approximate nutrient loads from major watersheds. There are limitations with the SPARROW model and should only be used on a regional scale, so the State of Indiana decided to utilize SPARROW only as a screening level tool and general guidance to improve local impacts. Other resources used in the prioritizing of the HUC 8 watersheds included data analyzed by NRCS to prioritize watersheds for the Mississippi River Basin Initiative (MRBI), IDEM's 303d listings, IDEM 319 approved Watershed Management Plans, IDNR Lake and River Enhancement Watershed Diagnostic studies, and focus on the Conservation Reserve Enhancement Program (CREP). Also in 2011, NRCS developed a geospatial tool known as the State Resource Assessment (SRA) that complements the prioritization of HUC 8 watersheds in Indiana.

Seven HUC 8 watersheds within the Wabash River System, situated along the Wabash and White Rivers, and the Maumee River watershed in northeast Indiana will serve as Indiana's eight prioritized watersheds. (Figure 4) These watersheds are:

- Upper Wabash
- Middle Wabash-Deer
- Middle Wabash-Little Vermillion
- Middle Wabash-Busseron
- Lower Wabash
- Upper White
- Lower White
- Maumee

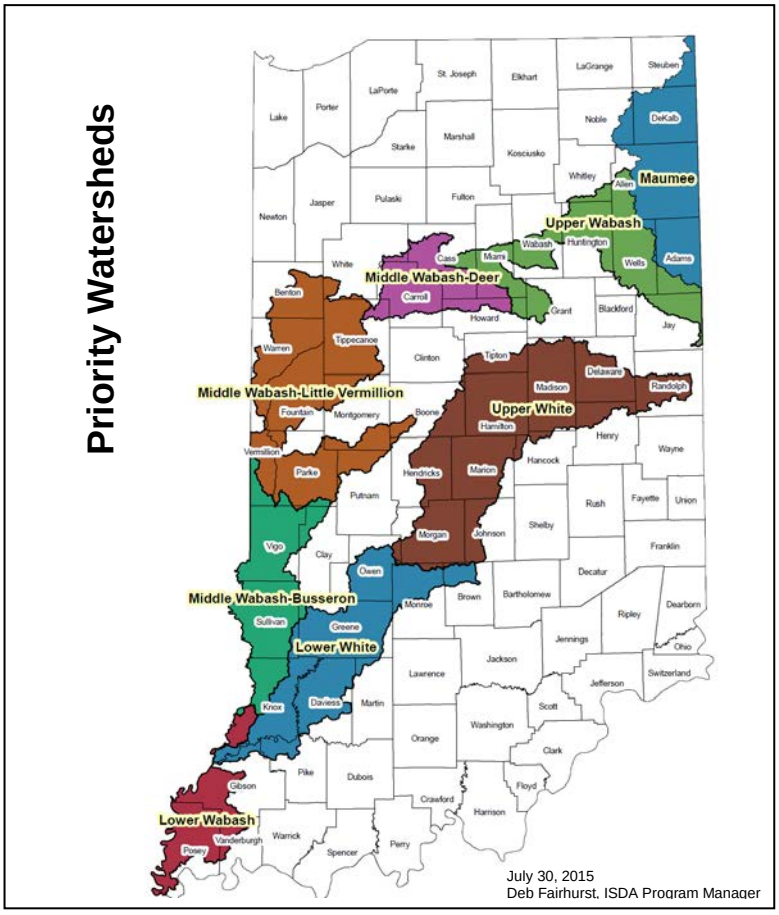


Figure 4 – Indiana's priority watersheds

This was deemed most appropriate for Indiana, as these impaired watersheds along our largest waterways also happen to have the most active locally led initiatives in water quality, nutrient management and soil health programs, as well as initiatives at the state and federal levels. Furthermore, field staff from both state and federal agencies in these watersheds an accessible, excellent resource for education, outreach and technical assistance. Due to these favorable circumstances, these are the watersheds that also have the greatest potential for positive water quality impact.
The ICP determined that, on a practical scale, these watersheds are characterized not only as logistically and environmentally sound targets for prioritization, but are also the most economically viable due to the existing programs and robust infrastructure which exists in these HUC 8 watersheds.

Critical areas defined in approved 9-element Watershed Management Plans will be shared with the ICP and the watershed specialists will work with local watershed groups to implement BMPs in these areas in order to reduce nutrient loads in these watersheds. A collective and cooperative effort between local, state and federal agencies to increase enrollment in existing conservation and water quality programs in the eight priority watersheds will be a primary focus set forth by this strategy. Outreach in this effort will include education on nutrient loading issues in the watersheds by government field staff, and a cooperative targeted outreach campaign between ISDA and the USDA-FSA for CREP enrollment along these river systems. The NRCS Soil Health Campaign as well as that of the Conservation Cropping Systems Initiative (CCSI) will also be directed toward these watersheds, which are largely agricultural. These and many other programs and initiatives will serve as the groundwork on which future efforts will be made.

Further Prioritization

Within the eight HUC 8 prioritized watersheds, two HUC 12 watersheds are of particular focus at this time, as they have significant amounts of water quality data to serve as baselines to allow us to measure changes. Additionally, one forms the primary drinking water reservoir for the City of Indianapolis. These watersheds are:

1. Eagle Creek in central Indiana, which is impounded to form a 1,350 acre reservoir that serves Indianapolis, has a USGS continuous water-quality monitoring sentry gage at Zionsville (USGS 033532000) that reports nitrate concentrations from an instream sensor. It continuously measures turbidity, which USGS plans to develop into a surrogate for continuously reporting suspended sediment as it has done for a similar gage on the White River at Hazleton. USGS also plans to develop a surrogate for total phosphorus at this gage. Eagle Creek at Zionsville is part of the USGS Midwestern Stream Quality Assessment (MSQA), an 11-state, 100 site, intensive water-quality and ecology survey in 2013-2014, coordinated with EPA's National River and Streams Assessment. MSQA at Eagle Creek includes weekly samples analyzed for nearly 300 constituents, including nutrients and pesticides. An autosampler at the site collects daily composite samples. A nutrient processing study at the site includes streambed water samples, periphyton chlorophyll, and a second set of continuous monitoring sensors with added parameters. MSQA includes an ecology survey of habitat, fish, and invertebrates. Eagle Creek has had multiple years of small scale stream monitoring for nutrients by IUPUI, which may

also be useful. Eagle Creek is typical of streams in the Tipton till plain physiographic region, with agricultural tile drainage predominant. Eagle Creek drains to the White River which drains to the Wabash River. The upstream drainage area at the Zionsville gage is 106 square miles.

School Branch Watershed in Indiana

A collaboration of federal, state, local, and academic entities along with dedicated conservation minded farmers in the School Branch watershed near Indianapolis, Indiana will provide a unique monitoring opportunity to assess the chemical, physical, and biological impacts of conservation practices at the watershed, sub-watershed, and edge-of- field scales. The project will measure water quality in tile drains, overland flow, streamwater, and groundwater to assess if conservation cropping systems that improve soil health in predominantly corn and soybean row crop agriculture can decrease the transport of nutrients to streams.

The project builds upon the efforts of the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) National Water Quality Initiative, and monitoring and evaluation efforts from the United States Geological Survey (USGS), Indiana Department of Environmental Management (IDEM), Marion County Health Department (MCHD), USDA NRCS, and Indiana University - Purdue University Indianapolis (IUPUI) Center for Earth and Environmental Services (CEES), the Indiana Geological Survey (IGS), the Office of the Indiana State Chemist (OISC), at different watershed scales. As with all good collaborations each group brings a different skill or component to improve the overall study.

The project area is School Branch, a small (8.4 square miles) watershed located in northeastern Hendricks County, Indiana. School Branch is nested in the Eagle Creek watershed, which is within the Upper White River Watershed. Land use in the watershed is predominately corn and soybean agriculture with interspersed residential and populated areas. School Branch eventually drains into Eagle Creek Reservoir, a primary drinking water source for Indianapolis.

2. Sugar Creek in south-central Indiana has a USGS gage (USGS 03361650) at New Palestine that is a USGS National Water Quality Assessment (NAWQA) Program long-term trends site. This site is sampled approximately three times per month for a long list of NAWQA constituents including nutrients. This site is an MSQA site with the same daily automated sampler as used at Eagle Creek, along with the weekly water-quality sampling and ecology survey of the MSQA. The Sugar creek watershed was thoroughly characterized during earlier NAWQA studies of agricultural chemicals and nutrients transport and tile drain studies. A USGS sediment source tracking study is underway at the New Palestine site. Sugar Creek is typical of streams in the New Castle till plain physiographic province, with agricultural drainage tiles in use. Sugar Creek drains to White River. The upstream drainage area at the New Palestine gage is 94 square miles.

3. Next Steps for further prioritization will be to do watershed characterization of the drainage basins that are monitored and assessed by IDEM on a nine-year rotating basin using a random, stratified approach. Those with drinking water reservoirs and surface

water intakes will be the initial focus and this process will commence in the last calendar quarter of 2015. Characterization will include an inventory of land use, analysis of fixed station and other water quality monitoring data, existing WMPs, current social and environmental indicators as well as current implementation activities. Drinking water sources were a priority in the 2016 319 grant solicitation process as evidenced by the following: "Develop a WMP or implement an IDEM approved WMP that includes a 10-digit HUC watershed with a surface water drinking water facility intake and waters identified in Category 5A of the Draft 2014 §303(d) List of Impaired Waterbodies. Please see the IDEM: Nonpoint Source Pollution Grant Application Solicitation webpage Helpful Links for a map and list of the 19 watersheds that are considered a public water supply priority.

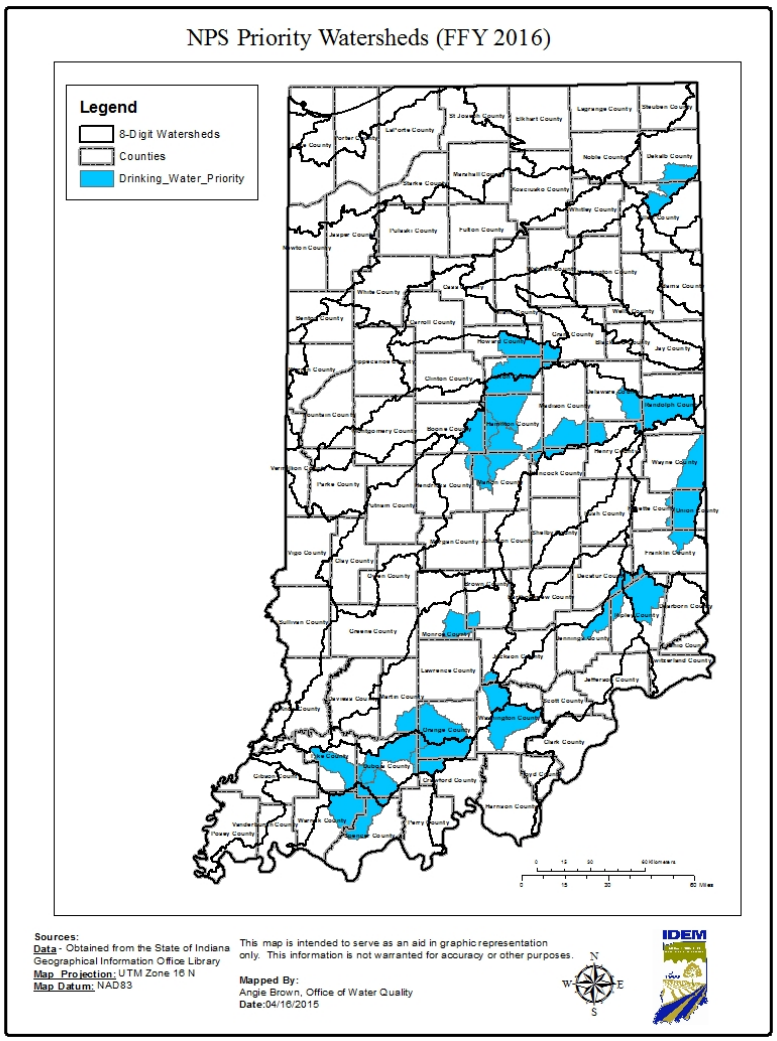


Figure 5

Section 4 – Water Quality Monitoring in Indiana's Waters

The primary goal of the Federal Clean Water Act (CWA) is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." Most of the provisions of the CWA are implemented at the state level in Indiana through various CWA programs at IDEM in the Office of Water Quality (OWQ). Over the last few years, IDEM has sought to recognize the nexus between the CWA and the Safe Drinking Water Act in achieving water quality goals; thus, the *Indiana Water Quality Monitoring Strategy 2011-2019* includes the various surface water monitoring programs as well as the ground water monitoring network. Surface water and groundwater interactions, including the effects of land use on quantity and quality, are being analyzed to assist with OWQ program decisions and are a factor in prioritizing watersheds for nutrient load reductions. School Branch, the National Water Quality Monitoring project described in Section 3, is an example of coupling at differing scales, surface water and groundwater monitoring efforts to characterize a watershed and the effects of different land uses on water quality.

IDEM Monitoring Programs

IDEM's surface water monitoring programs are implemented in the Watershed Assessment and Planning Branch and are guided by the *Indiana Water Quality Monitoring Strategy 2011-2019.* IDEM collects surface water quality, biological, and habitat data for the following purposes:

- To fulfill requirements of the CWA §305(b), §303(d) and §314 to assess all waters of the state to determine if they are meeting their designated uses and to identify those waters that are not;
- To support OWQ programs including WQ standards development, NPDES permitting, and compliance;
- To support public health advisories and address emerging water quality issues;
- To support watershed planning and restoration activities;
- To determine WQ trends and evaluate performance of programs; and
- To engage and support a volunteer citizen scientist monitoring network across the state.

The following monitoring programs are employed to achieve the above objectives:

- Probabilistic monitoring in one basin/year on a 9-year rotating basin cycle;
- Fixed Station monitoring at 165 sites across the state (2 added in 2014 for NRCS National Water Quality Initiative);
- Fish Tissue and sediment contaminants' monitoring on a 5-year rotating basin cycle;
- Targeted monitoring for Total Maximum Daily Load (TMDL) reassessments and document development, watershed baseline planning, and performance measures to determine if best management practices implemented in accordance with an approved 9-Element Watershed Management Plan have improved water quality. (to read about restoration success stories, please go to: http://www.in.gov/idem/nps/3360.htm);

- Cyanobacteria monitoring of 10-12 lakes at State of Indiana recreational sites;
- Special studies such as Hydrograph Controlled Release Facilities and Grand Calumet Beneficial Use Delisting project;
- Thermal verification studies; and
- Hoosier River Watch Program. http://www.in.gov/idem/riverwatch/index.htm

Please see the table in Appendix B of IDEM surface water monitoring projects for 2015.

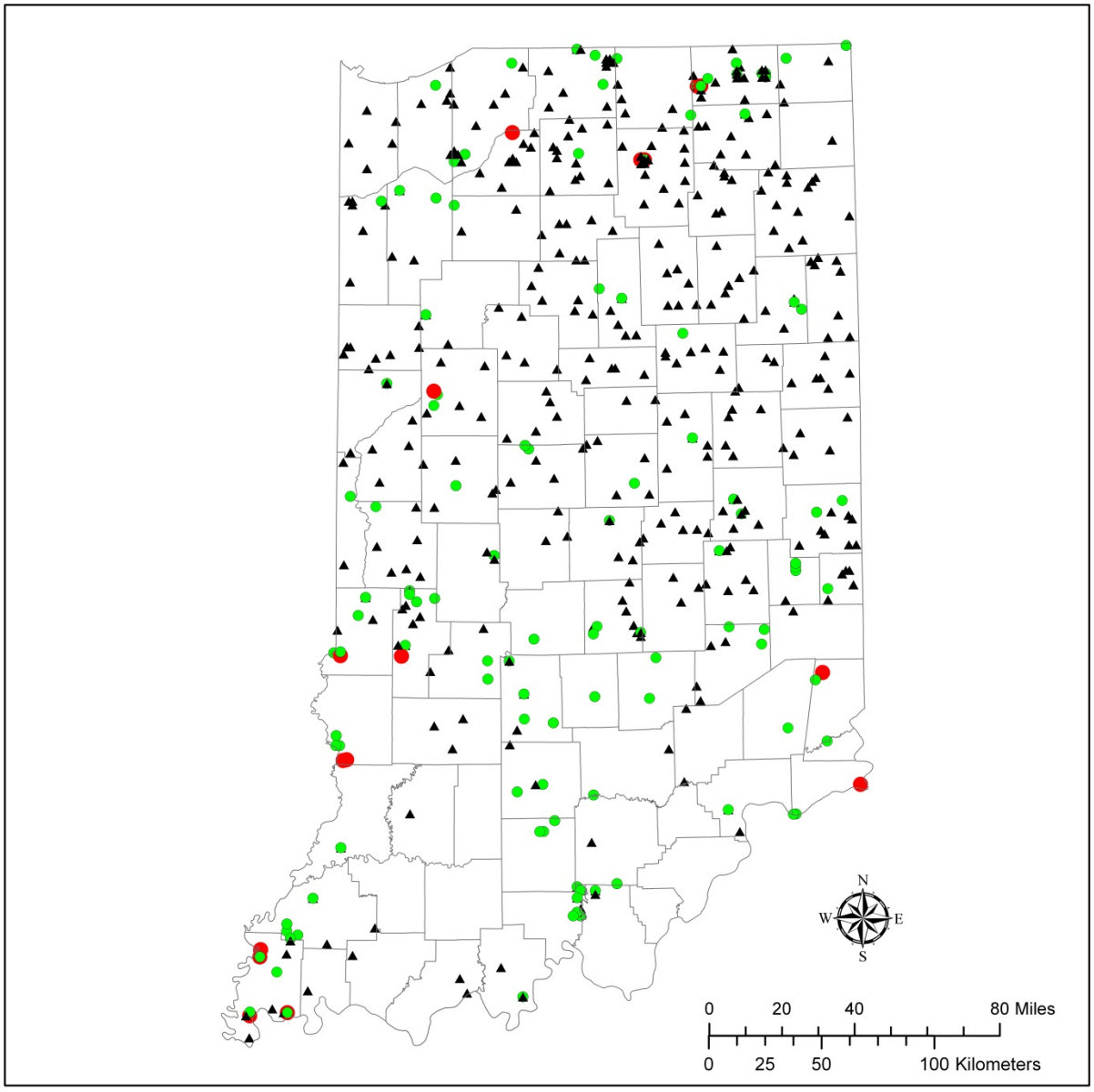
Prioritizing sub-watersheds for future program actions in the Western Lake Erie Basin (WLEB) is an example of how these data are used to make management decisions. An analysis of data from the 12 fixed station sites in the WLEB for total phosphorous (TP) from 2006 to 2014 using both the LOADEST model and load duration curves shows that the St. Mary's watershed is the most significant contributor of TP loads to the Maumee River. Hence, this gives us a good starting point for targeting efforts and defining next actions to develop our Domestic Action Plan as required by the Great Lakes Water Quality Agreement (GLWQA).

In 2008, the Indiana Department of Environmental Management (IDEM) Ground Water Section began collecting untreated water samples from ground water wells statewide as part of a Ground Water Monitoring Network (GWMN). A large percentage of Hoosiers drink residential well water that is not regulated by the Safe Drinking Water Act, and this was the impetus for starting the GWMN in Indiana. With the GWMN, IDEM seeks to:

1. Collect ground water samples from public water supply (PWS) wells and private residential wells within distinct hydrogeologic areas of the state with the overall goal to determine the quality of ground water in the state's aquifers,
2. Identify and expand sampling in areas with notable contamination, and
3. Practice continual improvement adjusting the GWMN as necessary to best fit resources (monetary/field support) and data gap needs.

The GWMN has grown each year with ground water samples having been collected from over 240 public water supply wells and approximately 700 private residential wells. The data set is reaching the point that a statistical analysis can be conducted to determine significance of the results with site variables. On the next page (Figure 6) is the map depicting nitrogen results.

Nitrogen, Nitrate-Nitrite Concentrations (mg/L)



This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.

Mapped By:
Kevin Spindler, Office of Water Quality
Date:11/18/14

Sources:
Non Orthophotography Data - Obtained from the State of Indiana Geographical Information Office Library
Orthophotography - Obtained from Indiana Map Framework Data (www.indianamap.org)
Map Projection: UTM Zone 16 N **Map Datum:** NAD83

IDEM

Legend
Nitrogen, Nitrate-Nitrite (mg/L)
RESULT
- ▲ < 0.1
- ● 0.1 - 10.0
- ● 10.0 - 27.0

Figure 6 – Nitrogen, Nitrate-Nitrite Concentrations (mg/L)

There is a wealth of monitoring data available in Indiana from the US Geological Survey (USGS), IDEM, various watershed organizations as well as from university research and environmental consulting groups. The Indiana Water Monitoring Council has adopted the goal of creating a single location where water monitoring data from multiple sources throughout the state can be accessed for more comprehensive analysis of water quality.

IDEM's External Data Framework, which will be fully launched in the last quarter of 2015, will provide acceptance criteria for three "tiers" of data based on data documentation for quality assurance in order to optimize the abundant data collected by various levels of government, universities, nonprofit organizations, and various other sources.

IDEM Lake Monitoring Data

The Indiana Clean Lakes Program was created in 1989 as a program within the Indiana Department of Environmental Management's (IDEM) Office of Water Management. The program is administered through a grant to Indiana University's School of Public and Environmental Affairs (SPEA) in Bloomington. The Indiana Clean Lakes Program is a comprehensive, statewide public lake management program having five components:

1. Public Information and Education
   - Produce and distribute the quarterly Water Column newsletter
   - Sponsor the annual Indiana Lake Management Conference
   - Prepare informational brochures
   - Prepare lake assessment reports
   - Conduct training and informational workshops

2. Technical Assistance
   - Assist lake associations with interpreting water quality data
   - Attend lake association meetings
   - Present programs to lake associations

3. Volunteer Lake Monitoring (the latest report can be found at: http://www.indiana.edu/~clp/documents/Vo%20Report%202009-2011.pdf)
   - Citizen volunteers monitor water transparency on 80 Indiana lakes
   - Volunteers in an expanded program collect monthly samples for total phosphorus and chlorophyll *a* analysis

4. Lake Water Quality Assessment (the latest report can be found at: http://www.indiana.edu/~clp/documents/LWQA%202009-2011.pdf)
   - Conduct routine assessments of water quality on Indiana lakes
   - Identify regional and/or temporal patterns in lake data
   - Identify lake conditions that warrant further attention

5. Coordination with Other State and Federal Lake Programs
   - Work with other state and federal agencies to coordinate efforts and enhance the protection of Indiana lakes

Harmful Algae Bloom (HAB) Monitoring Data

IDEM's blue-green algae (cyanobacteria) surveillance program samples fourteen sites on twelve IDNR public access beaches and analyzes those samples for the type and quantity of blue-green algae present and for the following toxins which may be produced by certain types of blue-green algae: microcystin, cylindrospermopsin (only done if species that produce it are present) and anatoxin-a. For protection of human health from exposure to the algae and any of the toxins, Indiana will use the World Health Organization (WHO) guideline level of 100,000 cells/ml or a microcystin toxin level of 6 parts per billion (ppb) for a Recreation Advisory. Beaches will be closed if microcystin toxin reaches 20 ppb. The WHO has not set guideline values for cylindrospermopsin or anatoxin-a. Indiana will use 5 ppb of cylindrospermopsin and 80 ppb of anatoxin-a for a Recreation Advisory, consistent with the state of Ohio recommendations. Toxin results will be posted if they meet those threshold numbers. Exact cell counts and toxin levels can be found in the Test Results section of the web site. Swimming areas will stay on the High Cell Count Alert until the cell counts fall below 100,000.

Following are the results of the sampling over the last five years:

Indiana Department of Environmental Management
Protecting Hoosiers and Our Environment Since 1986
Office of Water Quality

Cell Count Summary

Recreation Advisory Issued at 100,000 Cells

Year Sampled	2015	2014	2013	2012*
# Lakes	14	14	12	10
# Samples	86	81	63	70
Highest Cell Count	810,000	935,000	3.3 million	1.8 million
% Over 100,000	52.3	37.5	57	76
% Over 1 million	0	0	11	16

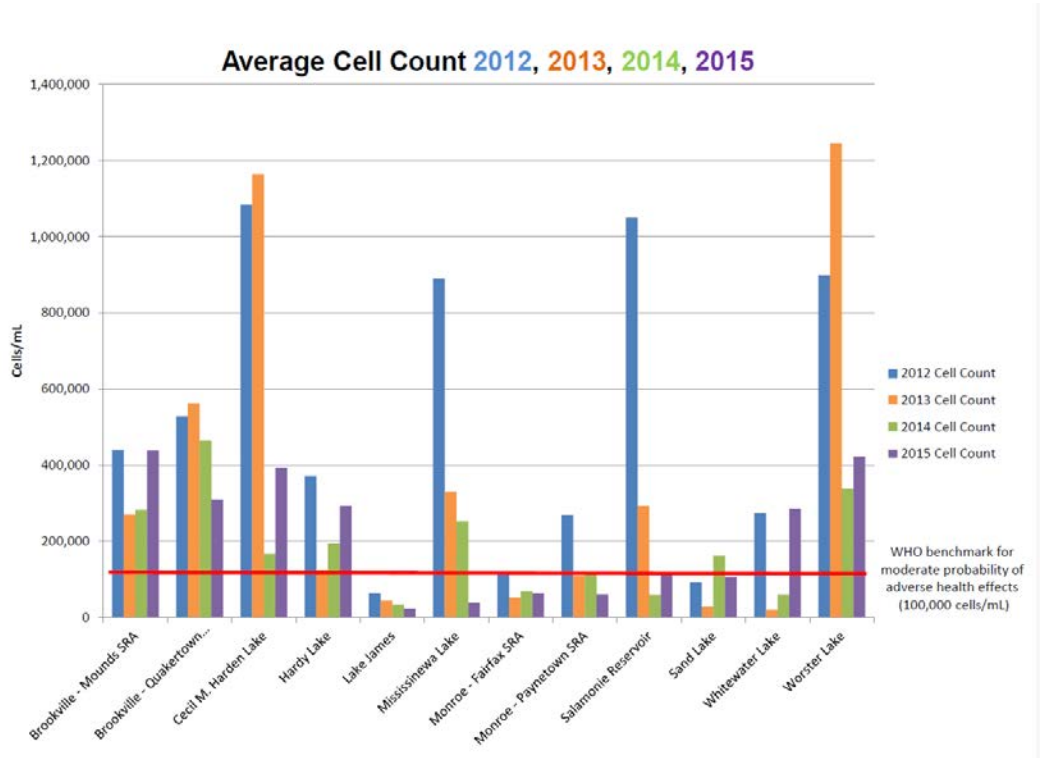
*Drought

Microcystin Toxin Summary

Sensitive Population Warning Level 6 ppb
Beach closure at 20 ppb

Year Sampled	2015	2014	2013	2012*
% Detections	37	33	30	44
Highest concentration (ppb)	7.83	1.8	2.8	4.3
Average Concentration (ppb)	0.51	0.24	0.23	0.49

*Drought



The Blue-Green Algae home page is found at: http://www.in.gov/idem/algae/ and the cell count and toxin test results may be found at: http://www.in.gov/idem/algae/2343.htm.

CWA 305(b) Water Quality Assessments

CWA 305(b) requires states to assess water quality conditions of all waters of the state. IDEM conducts two types of CWA 305(b) assessments. Comprehensive basin assessments are based on statistical analyses of data collected by IDEM's Probabilistic Monitoring program and reflect overall water quality conditions throughout a given basin. Waterbody-specific assessments are based on data collected by both the Probabilistic and Targeted Monitoring programs and are representative of conditions in a given waterbody. These assessments are based on Indiana's water quality standards (WQS). Indiana's WQS provide narrative and numeric water quality criteria Indiana waters must meet to ensure that they support their designated beneficial uses – the activities that we as a society want those waters to support and the benefits that we want them to provide. Indiana's WQS may be found online at:
http://www.in.gov/idem/cleanwater/2329.htm

To make waterbody-specific 305(b) assessments, IDEM follows the processes outlined in its Consolidated Assessment and Listing Methodology (CALM), which describes the designated beneficial uses IDEM assesses, types and amount of data needed to make each type of assessment, and the water quality criteria used to make them. The CALM also explains IDEM's Consolidated Listing Process, which places all Indiana waters into one or more of five categories depending on what is known about their water quality and the extent to which they are meeting their designated beneficial uses. IDEM's most recent CALM is available online in the Notice of Public Comment Period for the 2014 303(d) list: http://www.in.gov/idem/nps/2647.htm

The 303(d) List of Impaired Waters

CWA Section 303(d) requires states to develop a list of impairments identified through IDEM's 305(b) assessments for which a Total Maximum Daily Load (TMDL) must be developed. IDEM's 303(d) program develops the 303(d) List of Impaired Waters as part of its Consolidated List and publishes both in the Indiana Integrated Water Monitoring and Assessment Report every two years. IDEM's most recent Integrated Report can be found online at:
http://www.in.gov/idem/nps/2647.htm

The 303(d) list is a subset of IDEM's Consolidated List. The Consolidated List includes assessment information for all waters of the state while the 303(d) List includes just those water that are known to be impaired.

IDEM relies primarily on data collected by the Watershed Assessment and Planning Branch monitoring programs for its CWA 305(b) assessments, which are how most impairments are identified. However, IDEM also solicits additional data and information from external parties to develop its list, including state and federal agencies, colleges and universities and local organizations, such as county health departments, cities and towns, and watershed management groups, to develop its 303(d) list.

IDEM publishes the draft 303(d) list and the CALM every two years for a 90-day public comment period in order to lend transparency to its assessment and listing processes and to give the public an opportunity to provide input regarding these processes and any additional information that might be useful for developing the 303(d) list. U.S. EPA also provides comments during this time. After the public comment period ends, IDEM reviews all comments received, makes any necessary revisions, and works with U.S. EPA to get formal approval of the 303(d) list.

Total Maximum Daily Loads (TMDLs)

CWA Section 303(d) requires states to develop Total Maximum Daily Loads (TMDLs) for waterbodies that are not meeting their WQS and have been placed on the state's 303(d) list for one or more impairments. A TMDL is a report that identifies the maximum amount of pollutant that a waterbody can receive and still meet water quality standards, and allocates that amount among the sources of the pollutant in the watershed. The TMDL also provides information that can be used to guide restoration activities in the watershed aimed at mitigating the impairment(s) identified.

The completion of a TMDL is just the first step in remedying an impairment. Once a TMDL is completed, IDEM will work with local watershed groups wherever possible to implement the recommendations in TMDL document, which are intended to help restore the water body to the point at which it meets water quality standards. More information on the TMDL program, including completed TMDL reports and those still in progress may be found online at: http://www.in.gov/idem/nps/2647.htm .

IDEM has submitted to EPA for approval a proposed TMDL prioritization process that will address nutrient pollution by focusing on impaired biotic communities where the habitat is good. TMDLs will be developed for streams and rivers with impaired biotic communities and *E. Coli* impairment caused by one or more of the following conditions:

- Dissolved oxygen
- Algae
- Total Suspended Solids
- Phosphorus

Section 5 – Setting Nutrient Reduction Goals

The quantitative measure of the state's progress in nutrient reduction will be addressed in sections to follow.

Narrative Limits

The state of Indiana currently has narrative limits in place regarding minimal criteria for water quality. The language defining these narrative limits is quoted verbatim below:

"All surface waters at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

(A) Will settle to form putrescent or otherwise objectionable deposits.

(B) Are in amounts sufficient to be unsightly or deleterious.

(C) Produce:

(i) color;

(ii) visible oil sheen;

(iii) odor; or

(iv) other conditions;

in such degree as to create a nuisance.

(D) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to:

(i) create a nuisance;

(ii) be unsightly; or

(iii) otherwise impair the designated uses

(327 IAC 2-1-6 Minimum surface water quality standards)

Numerical Criteria

The development of numeric criteria is a requirement of Section 303(c) (33 U.S.C. 1313(c)) of the CWA which directs states to adopt water quality standards for their navigable waters. Section 303(c)(2)(A) and EPA's implementing regulations at 40 CFR part 131 require, among other provisions, that state water quality standards include the designated use or uses to be made of the waters and criteria that protect those uses. Nutrient criteria are also necessary to support 303(d) listing decisions, development of Total Maximum Daily Loads (TMDLs), and determination of permit limits. Indiana envisions that the codification of numeric nutrient criteria will be a driving force for water quality trading between point sources and agricultural producers, from which ecological benefits beyond just the reduction in nutrients will be realized. Indiana is one of three states (Ohio and Kentucky, the others) to participate in the Electrical Power Research Institute's pilot water quality nutrient trading program for the Ohio River, and has been an integral part of helping to develop it.

With that said, the development of numeric nutrient criteria for Indiana waters continues to present difficult and complex challenges. How these challenges are addressed has profound effects on the assessment and management of water quality. The precise cause and effect relationships of nutrients in the aquatic environment are not well quantified leading to uncertainties in the development of scientifically sound numeric nutrient criteria.

IDEM's focus with regard to these efforts has shifted from developing numeric nutrient criteria for lakes and reservoirs to rivers and streams. After analyzing existing data for flowing waters, IDEM has identified data gaps that are important in determining relationships between nutrient loads, excessive nutrients and their impact on biological communities. Therefore, IDEM plans to collect additional data in 2017, resources permitting, to clarify the uncertainties and fill the gaps in information regarding the correlation of nutrients and biological integrity.

Indiana has, in the meantime, adopted the following draft nutrient benchmarks, which are monitored by the IDEM and are considered alongside the state's narrative limits in nutrient TMDLs:

Total Phosphorus	Not to exceed 0.3 mg/L
Nitrate+Nitrite	Not to exceed 10 mg/L (current Drinking Water standard)
Dissolved Oxygen	Not to be below 4.0 mg/L or consistently in the range of 4.0 to 5.0 mg/L
pH Values	Not to be above 9.0 or consistently close to the standard (8.7 or above)
Algae Growth	Should not be "excessive" based on field observations by trained staff

Section 6 – Programs and Projects Supporting Nutrient Reduction

Regulations/ Policies/ Programs/Funding Sources/Education/Management Practices Addressing Nutrient Reduction

Indiana already has an impressive infrastructure in place that serves to educate conservation partners and the public. This infrastructure, which exists in the form of state and federal entities, is the most important tool we have in our "toolbox". By organizing educational and outreach events, helping to leverage state and federal funds, offering technical assistance and expertise, and providing cost-share programs to those wishing to put conservation practices on the ground, state and federal employees are directly promoting grass roots solutions to environmental issues by empowering agri-business, educational institutions, farmers, landowners, watershed groups and other environmental organizations to be a part of the solution. While the majority of these programs and initiatives directly improve water quality by reducing sediment and/or nutrient loss or runoff, many others have similar benefits through wildlife habitat improvement and other means.

State departments like the ISDA, IDEM and IDNR are all invested in the continued growth and promotion of grants and programs that improve the state's water quality. Such initiatives include the CREP, the Lake and River Enhancement Program (LARE), the Healthy Rivers Initiative (HRI) and other programs, practices and grants funded by IDEM 319 monies awarded to the State by the US Environmental Protection Agency (EPA), as well as Indiana's own Clean Water Indiana funds. IDEM's statewide Ground Water Monitoring Network (GWMN), which is funded in part by the Clean Water Act (CWA) Section 106 grant, samples ground water to determine the quality of ground water across the state. The GWMN samples for over 400 analytical parameters which include nitrate-nitrate, pesticides and pesticide degradates at each ground water well sampled. A main goal of the GWMN is to be able to monitor trends in ground water quality which could be used in monitoring nutrient reduction over time with long-term sampling. Farm bill programs are also available through the USDA NRCS and the FSA which offer cost-share of best management practices that reduce runoff, increase nutrient uptake and improve the health of our soils. These and other grant-funded or cost-share programs and initiatives will be described in the following section.

Indiana State Department of Agriculture (ISDA)

Conservation Reserve Enhancement Program (CREP) - The Conservation Reserve Enhancement Program (CREP) is a voluntary federal and state natural resource conservation program that addresses water quality and wildlife issues by reducing sediment and nutrient runoff and enhancing wildlife habitats. This program is designed to help alleviate some of the concerns of high nonpoint source sediment, nutrient, pesticide, and herbicide losses from agricultural lands by establishing buffers along bodies of water, planting trees in floodplain areas, and restoring wetlands to improve water quality.
CREP in Indiana was first announced in 2005 across three HUC 8 watersheds in the state. The program expanded in 2010 to include eleven HUC 8 watersheds in Indiana, covering a total of 65 Indiana counties. (Figure 7)

As of July of 2015, nearly 9942 acres of buffers have been implemented along bodies of water protecting to date over 525 linear miles of water ways. The ISDA has invested over $2.8 million in state funds to implement these conservation practices, and for every state dollar that is invested, $7-$10 federal dollars are matched through the Conservation Reserve Program (CRP) incentives available through FSA. The goal of the program is to enroll 26,250 acres of buffer land, protecting 3,000 linear miles of water bodies in the Wabash watershed.
Information about the Conservation Reserve Enhancement Program can be found here: http://www.in.gov/isda/2561.htm.

Through CREP, program participants receive financial incentives from the ISDA and the FSA to voluntarily enroll in the program and implement conservation practices on environmentally sensitive land. Eligible practices include:

- Permanent Native Grasses
- Hardwood Tree Planting
- Wildlife Habitat
- Riparian Forest Buffers
- Grassed Filter Strips
- Bottomland Timber Establishment
- Wetland Restoration

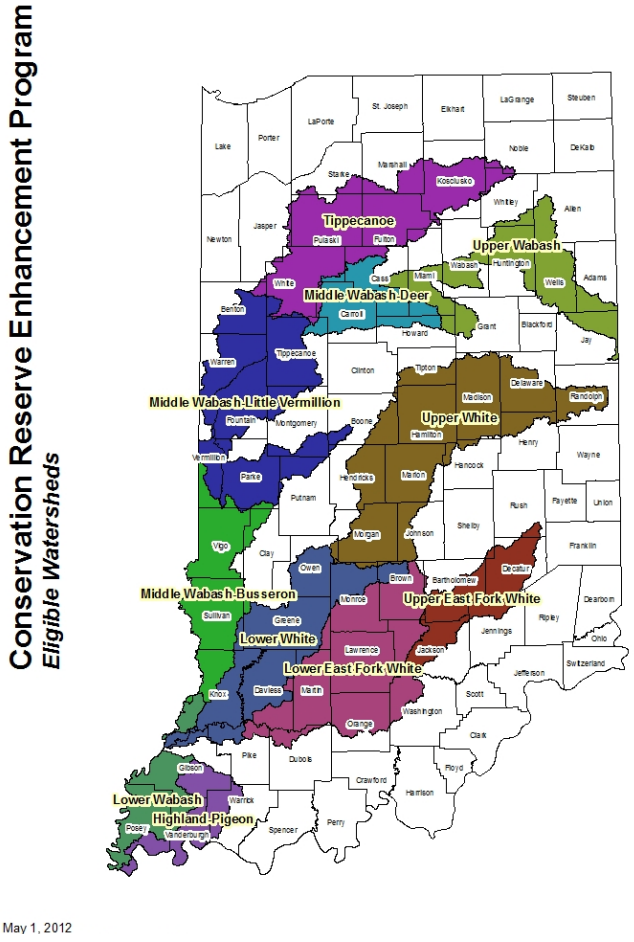


Figure 7 - CREP Watersheds

From July of 2006 to April 2015, ISDA and The Nature Conservancy (TNC) had an agreement under CREP to establish permanent easements along portions of the Tippecanoe River. This program allowed landowners to permanently enroll wildlife habitats and tree plantings as protected land.

Total acreage of Easements	Total number of Landowners	Total Dollars to be Expended
888.93 acres	17	$444,464.99

INfield Advantage (INFA) - The INfield Advantage (INFA) program is a proactive, collaborative opportunity for farmers to collect and understand personalized, on-farm data to optimize their management practices to ultimately improve their bottom line and benefit the environment. Participating farmers use precision agricultural tools and technologies to conduct research on their own farms, such as aerial imagery and the corn stalk nitrate test to determine nitrogen use efficiency in each field that they enroll. Through the INFA, farmers use this data from their own farms and others in their area to evaluate the effectiveness and economic pros and cons of different management practices, such as nutrient application rates, timing, and form. Farmers not only evaluate the effectiveness of different practices on their own farm, but benefit from aggregate data across multiple farms and years.

The program started in 2010 as a pilot project in Jasper County in northwest Indiana. It has expanded now to include many areas of the state. Figure 8 and 9 show how the program has expanded over the last six years. In 2015, there are 29 groups including 346 producers, 828 fields, and 57,960 acres.

The INFA program will continue to expand in future years through cooperation with the Indiana Corn/Soy and Purdue University.

Information about the INfield Advantage program can be found at http://www.infieldadvantage.org/.

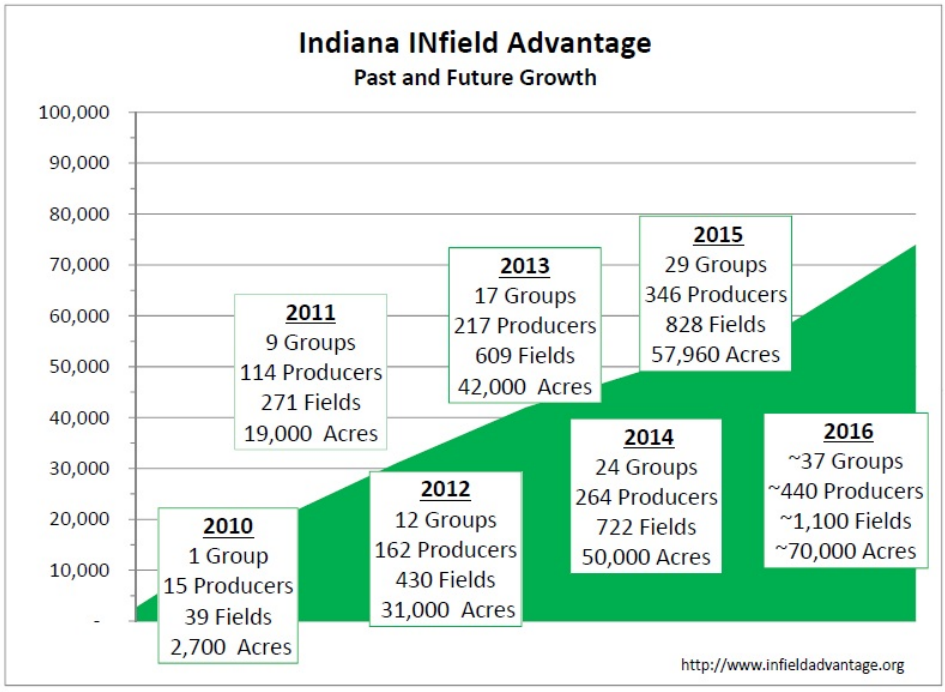


Figure 8 - Graph showing the Growth of the INfield Advantage Program

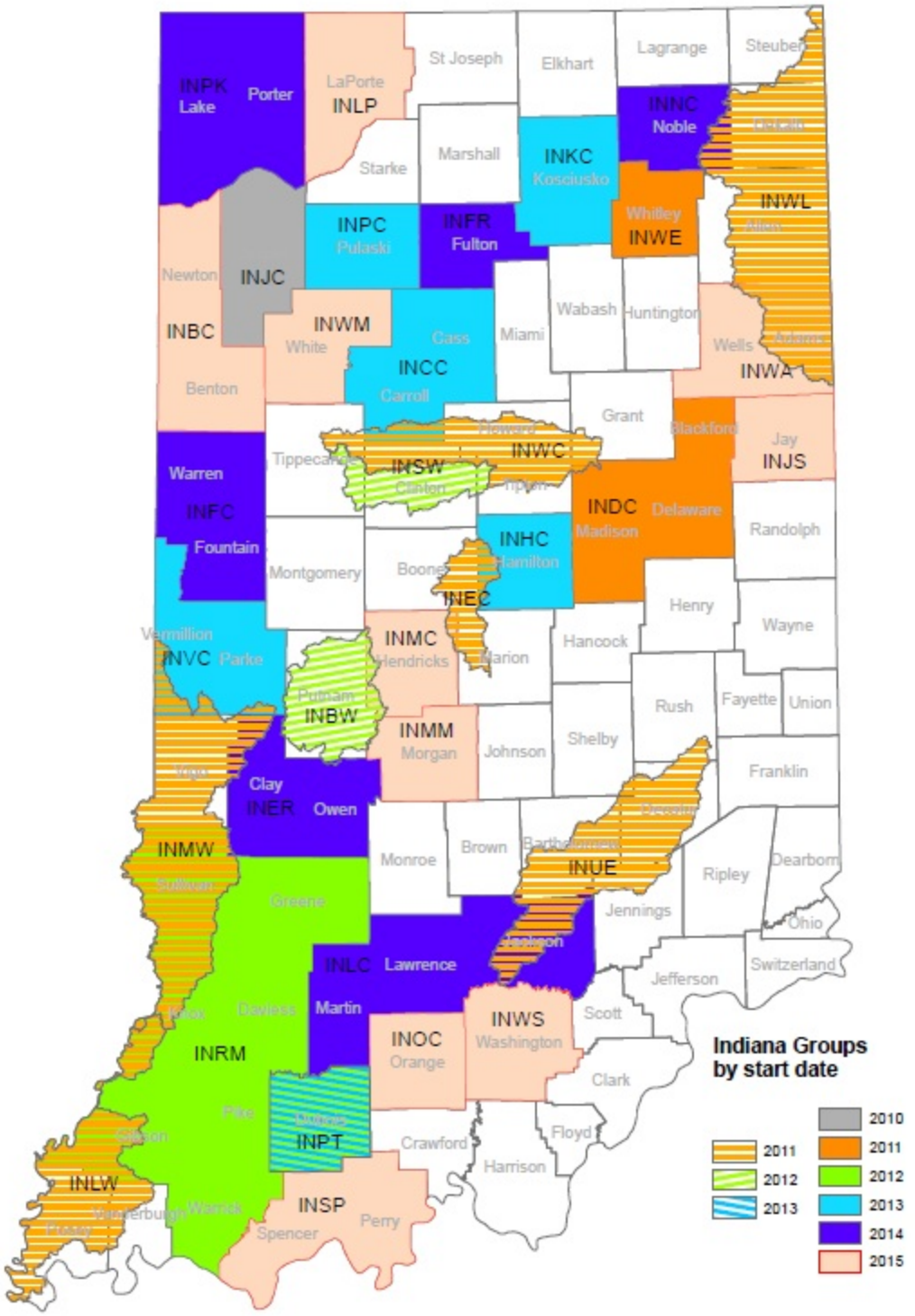


Figure 9 - 2015 INfield Advantage (INFA) map

Clean Water Indiana (CWI) - The Clean Water Indiana (CWI) Program was established to provide financial assistance to SWCDs, landowners and conservation groups. The financial assistance supports the implementation of conservation practices which reduce nonpoint sources of water pollution through education, technical assistance, training, and cost sharing programs. The CWI program is responsible for providing local matching funds as well as grants for sediment and nutrient reduction projects through Indiana's SWCDs. The State Soil Conservation Board (SSCB) directs ISDA in the use of CWI funds.

In 1999, the Clean Water Indiana Program was created by a unanimous vote of the Indiana General Assembly by amending the Indiana District Law to add this program authority (IC-14-32-8). The purpose of the CWI Program is to provide assistance to help protect and enhance Indiana's streams, rivers and lakes by reducing the amount of polluted storm water runoff from urban and rural areas entering surface and ground water. The CWI program did not receive funding to carry out the program until 2001. The CWI is supported by a portion of the Indiana Cigarette Tax Revenue on a biannual basis.

The ISDA-Division of Soil Conservation administers the dollars appropriated by Indiana legislators under the direction of the SSCB. Once the program was funded, the SSCB established a policy that all CWI Funds would be used for local projects that had direct benefit to water quality, and that policy is still used today. The Division worked closely with the Indiana Association of Soil and Water Conservation Districts (IASWCD) to develop a formula for awarding CWI funds to local SWCDs based on the amount of local match (county funding for district programs) the respective districts received at that time. The districts are required to submit a CWI Project(s) proposal for approval by the SSCB on an annual basis with the intention for the grant money to be used within two years from approval.

Since the start of the program funding in 2001, millions of CWI dollars have been utilized by the SWCDs to implement local projects, also resulting in thousands of dollars of cash and in-kind support. The districts use the grant money in four basic areas; 1) cost-share/incentives for applying conservation practices; 2) purchase of equipment for the purpose of renting it to land users for applying conservation practices; 3) contracting for technical assistance to survey, design, and oversee construction of conservation practices; and 4) non-point source pollution prevention related information materials, planning assistance and projects.

The figures on the two following pages show two examples of the impact of the CWI grants. Figure 10 shows the coverage of grants in Indiana counties in 2012. Figure 11 shows the multi-district CWI grant approvals in dollars in 2015.

For more information on the Clean Water Indiana program visit the website at http://www.in.gov/isda/2379.htm.

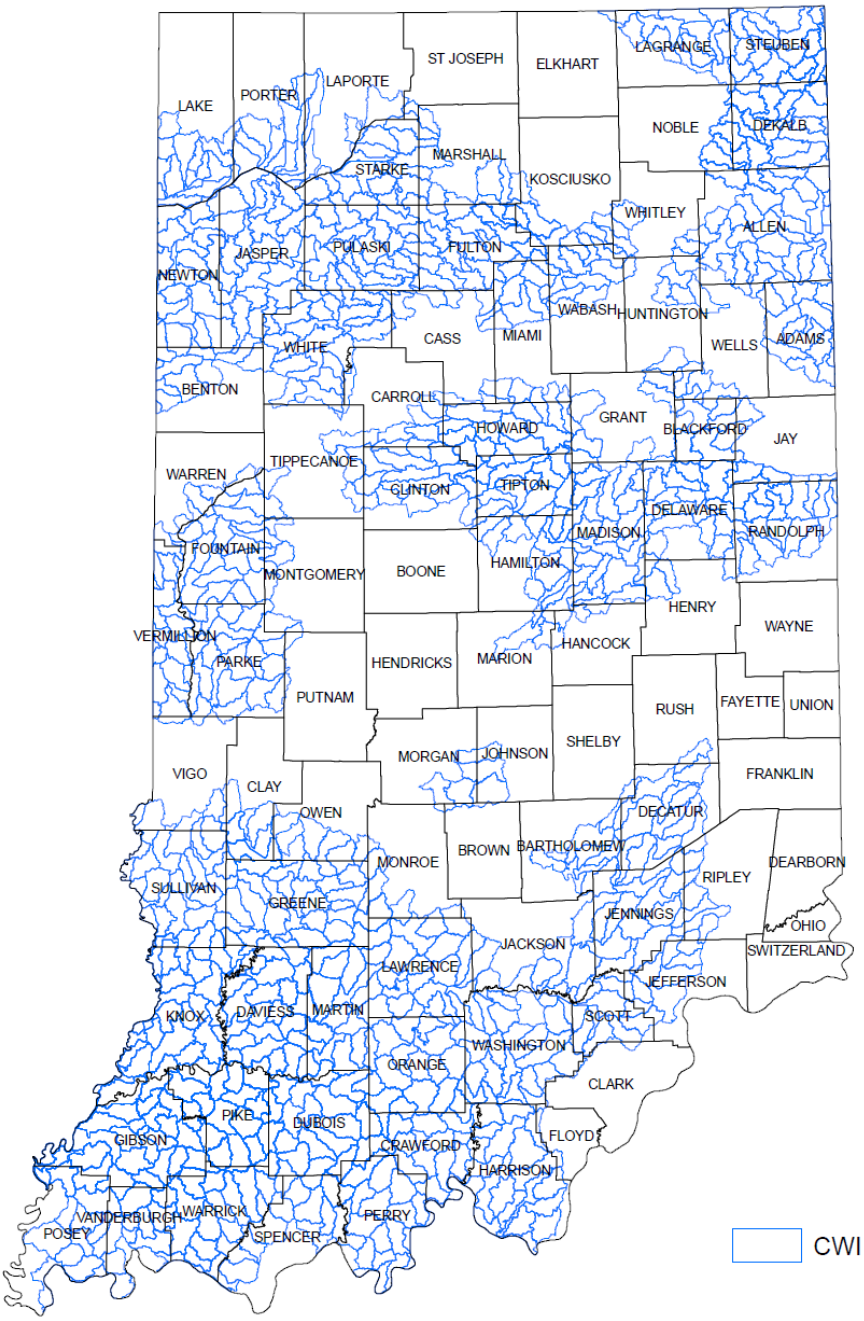
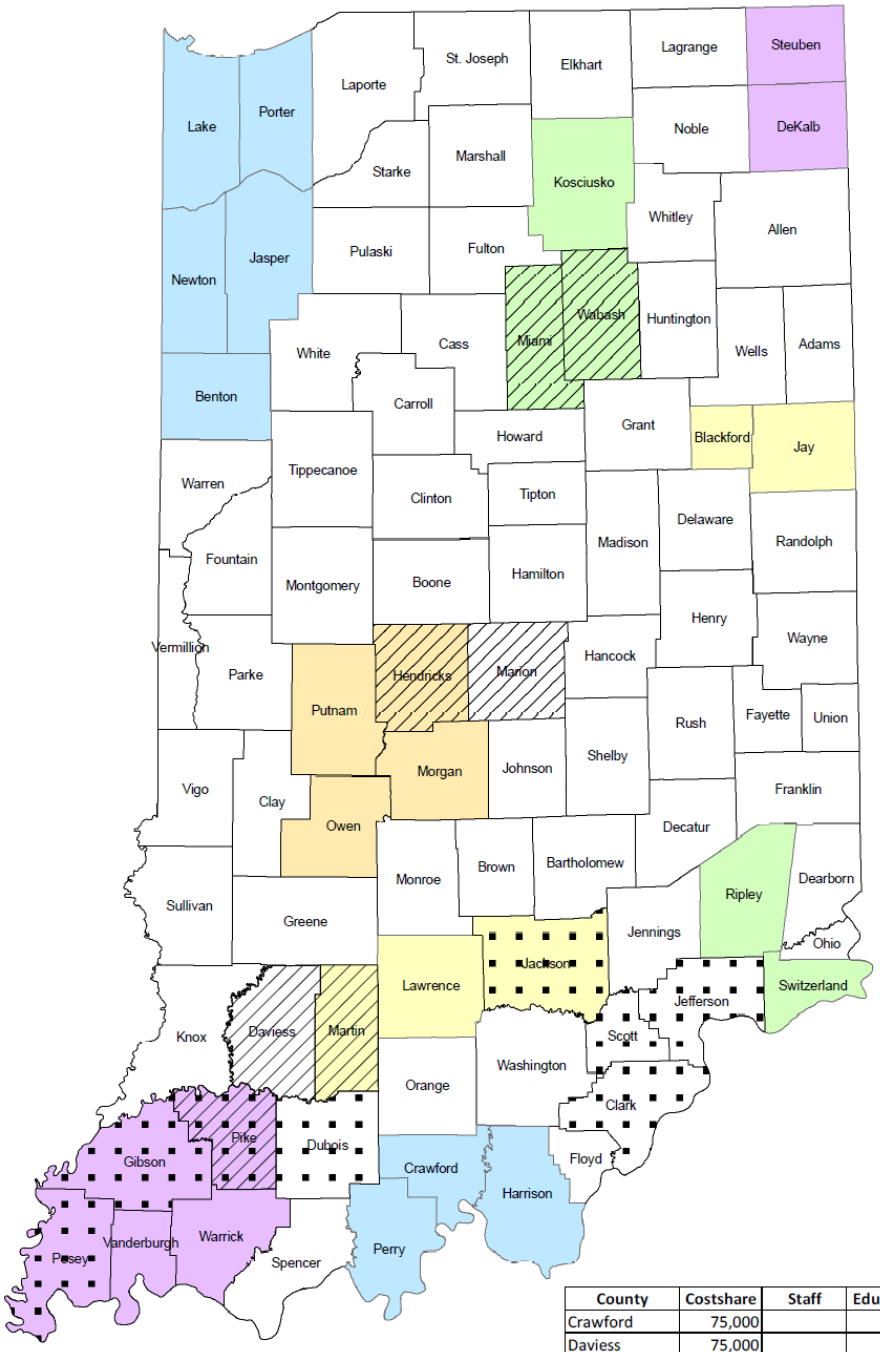


Figure 10 - CWI Grants Coverage in 2012

2015 CWI Multi-District Grants



County	Costshare	Staff	Education	Total
Crawford	75,000			75,000
Daviess	75,000			75,000
Dekalb	72,000		3,000	75,000
Dubois	75,000			75,000
Hendricks	75,000			75,000
Jay	34,000	40,000	1,000	75,000
Jefferson	75,000			75,000
Lawrence	60,000		900	60,900
Marion	34,000	24,000	2,000	60,000
Miami		75,000		75,000
Newton	72,500		2,500	75,000
Pike		75,000		75,000
Ripley	75,000			75,000
Wabash	75,000			75,000
Total	**797,500**	**214,000**	**9,400**	**1,020,900**

October 22, 2014
Deb Fairhurst, ISDA Program Manager

Figure 11 - CWI Grant Approvals in 2015

Indiana Department of Environmental Management (IDEM)

Clean Water Act (CWA) Section 106 Funding - The federal Clean Water Act (CWA) Section 106 provides funding for a wide range of water quality activities which could include water quality planning and assessments; ambient monitoring of surface water and monitoring ground water as highlights of this funding mechanism. IDEM has utilized CWA Section 106 funding to support the statewide Ground Water Monitoring Network (GWMN) which is managed through IDEM's Drinking Water Branch, Ground Water Section. The goals of the GWMN include determining the quality of ground water in the state's aquifers, identifying areas of notable contamination and to monitor ground water quality trends statewide. Utilization of the information gathered for the GWMN to monitor nitrate-nitrite, pesticides and pesticide degradates determining possible sources for management purposes and to assist with decision making for attaining nutrient in ground water is one of the major goals of the GWMN.

IDEM Section 319 (h) Grant Funding **-** The Federal Clean Water Act (CWA) Section 319(h) provides funding for various types of projects that work to reduce nonpoint source water pollution. The Indiana State Nonpoint Source Management Plan (http://www.in.gov/idem/nps/3036.htm) guides the usage of the CWA Section 319 funds received by IDEM from the U.S. EPA. Funds may be used to conduct assessments, develop and implement TMDLs and watershed management plans, provide technical assistance, demonstrate new technology and provide education and outreach. Organizations eligible for funding include nonprofit organizations, universities, and local, State or Federal government agencies. A 40 percent (non-federal) in-kind or cash match of the total project cost must be provided. (Figure 12)

Projects are administered through grant agreements that spell out the tasks, schedule and budget for the project. Projects are normally two to three years long and work to reduce nonpoint source pollution and improve water quality in the watershed primarily through:

- Education and outreach designed to bring about behavioral changes and best management practice (BMP) implementation that leads to reduced nonpoint source pollution;
- The development of watershed management plans that meet U.S. EPA's required nine elements; and,
- The implementation of watershed management plans through a cost-share program focusing on BMP implementation that address water quality concerns.

As a requirement of the 319 program, IDEM submits a Non-Point Source (NPS) Program Annual Report to EPA. This is a comprehensive report that includes input from and cooperation with state, federal, local, and private partners, which is critical to Indiana's NPS Program's success. IDEM's NPS Program utilizes multiple partnerships to reach diverse stakeholder groups and further NPS management goals in Indiana. The fiscal year 2015 annual report is completed and can be viewed at http://www.in.gov/idem/nps/files/nps_annual_report_2015.pdf

IDEM Section 205j Grant Funding – (http://www.in.gov/idem/nps/2525.htm) The federal Clean Water Act Section 205(j) provides funding for water quality management planning, which is then allocated by each state. The act states that the grants are to be used for water quality management and planning, including, but not limited to:

- Identifying most cost effective and locally acceptable facility and non-point source measures to meet and maintain water quality standards;
- Developing an implementation plan to obtain state and local financial and regulatory commitments to implement measures developed under subparagraph A;
- Determining the nature, extent, and cause of water quality problems in various areas of the state. In previous cycles, grants have been awarded to municipal governments, county governments, regional planning commissions, and other public organizations.

Projects are administered through grant agreements that spell out the tasks, schedule, and budget for the project. For both 205j and 319h projects, IDEM project manager's work closely with the project sponsors to help ensure that the project runs smoothly and the tasks of the grant agreement are fulfilled. Site visits are conducted at least quarterly to touch base on the project, provide guidance and technical assistance as needed, and to work with the grantee on any issues that arise to ensure a successful project closeout. (Figure 12)

In recent years, Indiana has generally received around three and a half million dollars each year for 319 grant funding. Since 1994, Indiana has directed over 38.5 million dollars of its USEPA 319 nonpoint source grant funding to projects related to reducing nutrient loads to Indiana surface water.

Indiana NPS Water Quality Improvement Projects 2009-2014

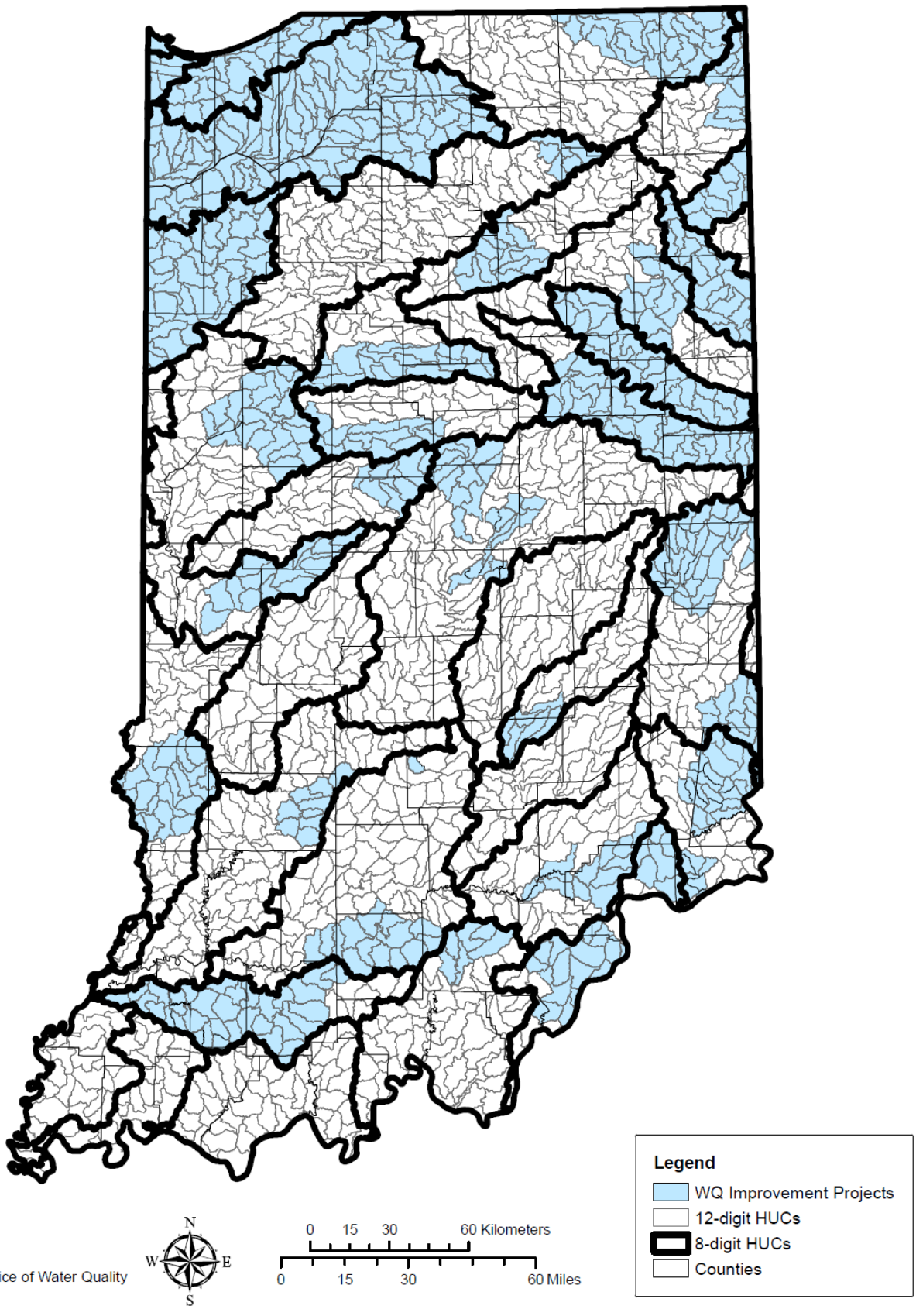


Figure 12 - NPS Water Quality Improvement Projects funded by 319(h) and 205(j)

National Pollutant Discharge Elimination Systems (NPDES) - NPDES permit requirements ensure that, at a minimum, any new or existing point source must comply with technology-based treatment requirements that are contained in 327 IAC 5-5-2. According to 327 IAC 5-2-2, "Any discharge of pollutants into waters of the State as a point source discharge, except for exclusions made in 327 IAC 5-2-4, is prohibited unless in conformity with a valid NPDES permit obtained prior to discharge." This is the most basic principal of the NPDES permit program.

The Commissioner of IDEM determined that an effluent containing no more than 1.0 milligram per liter (mg/l) of TP (TP) as a monthly average is needed for sanitary wastewater treatment plants with average design flows greater than or equal to 1 million gallons. Thus, IDEM set a practical state treatment standard of 1.0 mg/l total phosphorus for 1 mgd or greater sanitary wastewater dischargers to significantly reduce the discharge of nutrients to surface waters of the state to protect downstream water uses. Pursuant to 327 IAC 5-10-2(a)(2) the Commissioner may determine, irrespective of the quantitative TP content of the discharge, that phosphorus reduction is needed to protect downstream uses. IDEM considers this Nonrule Policy applicable to all major sanitary dischargers that are scheduled to submit a permit renewal application after January 1, 2015. NPDES permit applications due and received prior to that time received a "report only" requirement for TP upon renewal/issuance, but will receive a 1 mg/l TP limit during the next permit renewal cycle after January 1, 2015.

This NPD will have a substantial impact amounting to a nearly 60% reduction on TP loads from major sanitary dischargers over the next five years as permits are renewed. TP loads from major sanitary dischargers from across the state have been approximately 229,631 pounds per year whereas with the 1.0 mg/l TP limit, the estimated state-wide load is 93,241 pounds per year. (Figure 13)

Additionally, IDEM will implement Total Maximum Daily Load (TMDL) load reductions as written and approved for total phosphorous upon the renewal of any affected permit, and IDEM will continue to implement phosphorus removal as required by 327 IAC 5-10-2. See figures in Appendix A in the index for facilities with water quality monitoring for phosphorus, including facilities with permit limit notations.

IDEM's position is that applying the state treatment standard of 1 mg/l to the limiting nutrient (phosphorus) sufficiently addresses potential water quality impacts from point sources and therefore, there is not a need to interpret Indiana's narrative criteria into water quality-based effluent limits at this time.

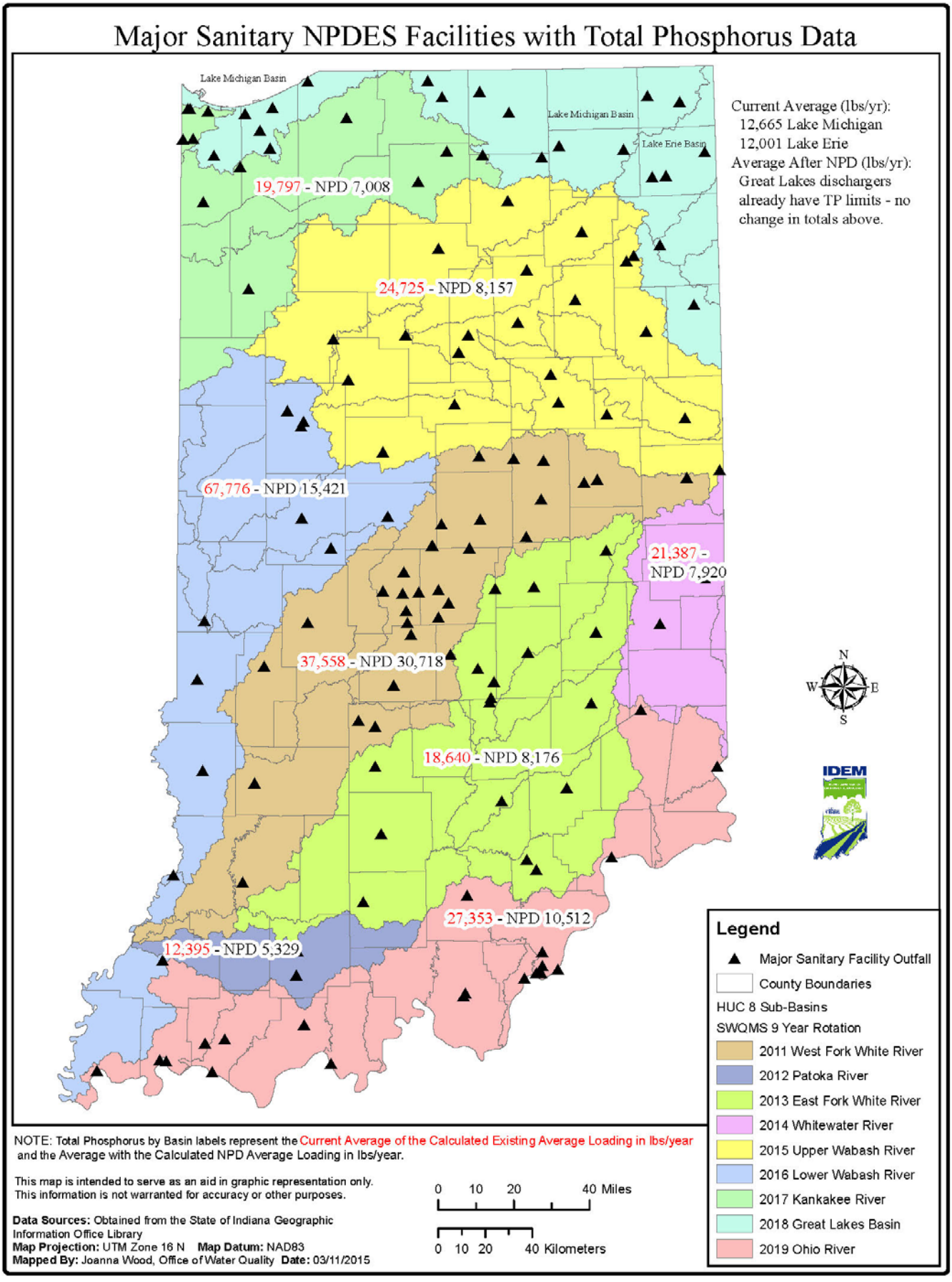

Major Sanitary NPDES Facilities with Total Phosphorus Data
Lake Michigan Basin
Lake Michigan Basin
Lake Erie Basin
Current Average (lbs/yr):
12,665 Lake Michigan
12,001 Lake Erie
Average After NPD (lbs/yr):
Great Lakes dischargers already have TP limits - no change in totals above.
19,797 - NPD 7,008
24,725 - NPD 8,157
67,776 - NPD 15,421
21,387 - NPD 7,920
37,558 - NPD 30,718
18,640 - NPD 8,176
27,353 - NPD 10,512
12,395 - NPD 5,329
N
W
E
S
IDEM
Legend
Major Sanitary Facility Outfall
County Boundaries
HUC 8 Sub-Basins
SWQMS 9 Year Rotation
2011 West Fork White River
2012 Patoka River
2013 East Fork White River
2014 Whitewater River
2015 Upper Wabash River
2016 Lower Wabash River
2017 Kankakee River
2018 Great Lakes Basin
2019 Ohio River
NOTE: Total Phosphorus by Basin labels represent the Current Average of the Calculated Existing Average Loading in lbs/year and the Average with the Calculated NPD Average Loading in lbs/year.
This map is intended to serve as an aid in graphic representation only.
This information is not warranted for accuracy or other purposes.
0 10 20 40 Miles
0 10 20 40 Kilometers
Data Sources: Obtained from the State of Indiana Geographic Information Office Library
Map Projection: UTM Zone 16 N Map Datum: NAD83
Mapped By: Joanna Wood, Office of Water Quality Date: 03/11/2015

Figure 13

Confined Feeding Operations (CFOs) - In Indiana, an animal feeding operation with 300 or more cattle, 600 or more swine or sheep, 30,000 or more poultry, or 500 horses in confinement is a CFO. A person must request and receive IDEM approval before starting construction of a CFO, or starting expansion of a CFO to increase animal population or manure storage capacity. As of July 1, 2012, the revised CFO rules required that farmers apply manure to their fields on the basis of the soil's phosphorus content. Previously, manure was applied to fields based on soil nitrogen content and nitrogen needs for the coming crop. New regulations require that soil phosphorus not exceed 200 parts per million by 2018. That means that over the next three years, farmers will need to continue to monitor soil phosphorus concentrations and work to begin the gradual process of reducing the phosphorus content of their fields. Additionally, there are rules specific to CFO operators regarding winter manure application and soil phosphorus. Under the new regulations, manure application on frozen and snow-covered ground is no longer permitted; however, there are exceptions for emergency situations. Operators can apply for special permits that allow for winter application if a farm was previously permitted with less than 120 days of manure storage.

Concentrated Animal Feeding Operations (CAFOs) - The terms CFO and CAFO relate to the size of the CFO. A Concentrated Animal Feeding Operation (CAFO) is a CFO that meets the threshold animal numbers for a large CAFO. Many of the program's requirements apply to CFOs of all sizes. Some requirements apply only to CAFOs. Indiana revised its Confined Feeding Operation Rule, which is found at: 327 IAC 19 and its Concentrated Animal Feeding Operations Rule, 327 IAC 15-16. Information may be found at: http://www.in.gov/idem/landquality/2349.

Fertilizer and Detergent Regulations - Thirty-five years ago, Indiana became the first state in the nation to protect its lakes and waterways by prohibiting the use of laundry detergents containing phosphorous under IC 13-18-9 and, in 2012, the state legislature extended the phosphorus ban to detergents used in residential automatic dishwashers. On July 28, 2010, the Indiana rule, *Certification for Distributors and Users of Fertilizer Materials*, 355 IAC 7-1.1, went into effect. The date for full compliance with the requirements of this rule was January 1, 2012. The purpose of this rule is to ensure that fertilizer users are competent to apply and handle these materials safely and effectively and in a manner that minimizes negative impacts on water quality and the environment.

Storm Water Runoff Programs

- Municipal Separate Storm Sewer Systems (MS4s)
  MS4s are required to develop Storm Water Quality Management Plans (SWQMPs) as part of their permit requirements. As part of their Public Education component, MS4s have taken an active role to educate the general public and commercial industry on the use of fertilizer, including the use of phosphorous free options. In addition to these education efforts, MS4s are required to address this issue on those facilities that they own and/or operate. The rule specifically states "minimization of pesticide and fertilizer use." While this is a basic non-descriptive requirement, MS4s have incorporated this element into their SWQMPs. As the Storm Water Program re-evaluates future requirements, this

topic will continue to be assessed and where appropriate and applicable, provisions and requirements will become part of the regulation.

- Construction Site Run-off
  There are no specific regulatory requirements in the Rule regarding the application of nutrients on active construction sites during the stabilization of the site. However, the technical standards and specifications in the *Indiana Storm Water Quality Manual* encourages utilization of soil tests and lower application rates for fertilizer. Additionally, the premise of the Construction Site Run-off regulation is reducing sediment discharges, which in turn reduce the discharge of nutrients (phosphorous).

- Industrial Site Run-off
  Due to the diversity and uniqueness of industrial facilities, it is problematic to develop a "one size fits all" approach. Therefore, IDEM deals with such facilities on a case-by-case basis. Issues that are considered in such an approach include, but are not limited to, concentration and loading of the discharge, the applicable aspects (flow, impairments, downstream uses, etc.) of the receiving stream, and the facilities' treatment capabilities.

Indiana Department of Natural Resources (IDNR)

Healthy Rivers Initiative (HRI) – Since 2010, the Healthy Rivers Initiative has been one of the largest land conservation initiatives to be undertaken in Indiana. The HRI exists as a partnership of agencies and organizations who work with willing landowners to permanently protect over 43,000 acres in the Wabash River and Sugar Creek floodplains of west-central Indiana, and over 26,000 acres of the Muscatatuck River bottomlands in southeast Indiana. (Figure 14) These projects involve the protection, restoration and enhancement of water quality as well as riparian and aquatic habitats. This initiative benefits threatened and migratory species that rely on those habitats, and benefits the public and surrounding communities by providing flood protection, ground water protection and improved water quality. The program also provides recreational opportunities for current and future generations who enjoy our water resources.

As of 2014, the HRI program has protected 31,359 acres in the Wabash River and Sugar Creek floodplains and the Muscatatuck River bottomlands in Indiana.

57 river miles have been protected: 39 miles in the Wabash River and Sugar Creek area, and 18 miles in the Muscatatuck River area.

11,816 acres of Conservation Areas have been purchased.

All of these areas are managed by the IN Department of Natural Resources.

For more information on the Healthy Rivers Initiative, visit the website at http://www.in.gov/dnr/6498.htm.

Healthy Rivers INitiative

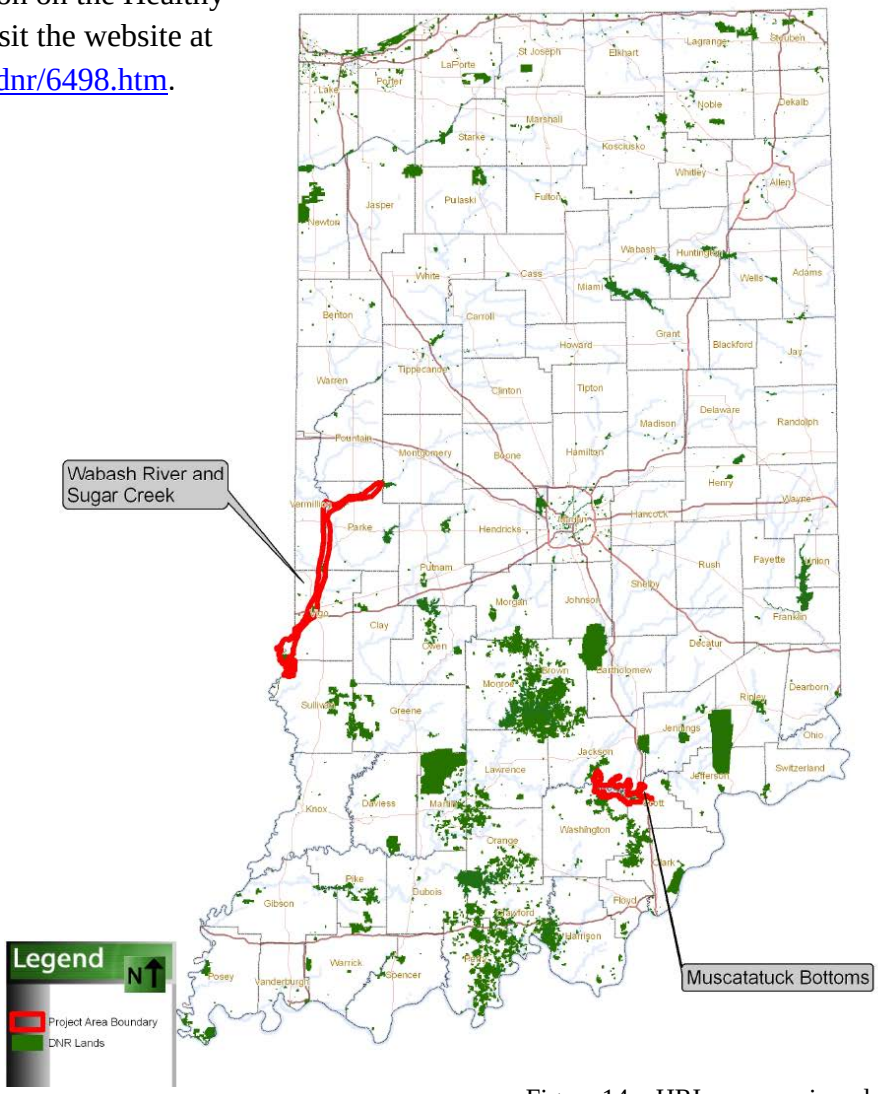


Figure 14 – HRI areas are in red

Lake and River Enhancement (LARE) Grant - http://www.in.gov/dnr/fishwild/2364.htm
The Lake and River Enhancement program is part of the Aquatic Habitat Unit of the Fisheries Section in the Division of Fish and Wildlife, Indiana Department of Natural Resources (IDNR). The LARE program goals include operating a scientifically-effective program in a cost-efficient manner to protect and enhance aquatic habitat for fish and wildlife; and to insure the continued viability of Indiana's publicly accessible lakes and streams for multiple uses, including recreational opportunities. This is accomplished through grant projects that reduce non-point sediment and nutrient pollution of surface waters to a level that meets or surpasses state water quality standards. LARE grants are prioritized towards activities involving publicly accessible lakes and rivers, and involve organizations having the resources and ability to properly administer the funds. This includes non-profit organizations such as formally established lake associations, and governmental entities including cities, counties, conservancy districts, soil and water conservation districts, as well as other local units of government. Participation in the program requires the submittal of an application form for each program element. There are five different kinds of LARE grants awarded annually by the Director of IDNR:

LARE Project Grants
These "traditional" LARE grants, awarded since 1989, are available on a competitive basis for several actions that can address the ecology and management of lakes and rivers and their watersheds. Depending on the needs of the waterbody, funds can be granted for: 1) Lake or River Watershed Diagnostic Study, 2) Engineering feasibility study of proposed measures, 3) Design and/or construction projects for specific sediment or nutrient control measures, 4) Bioengineering for bank stability, and 5) Biomonitoring.

Watershed Land Treatment Grants
Grants are awarded to Soil and Water Conservation Districts (SWCD's) who work with local landowners to install or adopt various conservation measures directly on the land in targeted watersheds. Technical assistance in the design and installation is provided by personnel of NRCS, ISDA and the SWCD's.

Sediment Removal Plan Development or Sediment Removal Grants
Grant funds may be used to contract for the production of a sediment removal plan or, if such a plan has already been prepared, for funds to be used for a sediment removal project. A sediment removal plan is a prerequisite to acquiring grant funds for actual sediment removal projects.

Exotic Plant or Animal Control Grants
Grant funds may be used for the development of aquatic vegetation management plans or, if such a plan has already been prepared, for actual control of invasive vegetation in lakes or rivers. An aquatic vegetation management plan is a prerequisite to acquisition of grant funds for actual vegetation control. Efforts are limited to management and control of invasive vegetation, not native plants that are considered a nuisance.

Logjam Removal Grants
Grant funds may be used to removal logjam from qualifying rivers.

USDA, Natural Resources Conservation Service (NRCS)

Conservation Stewardship Program (CSP) - The Conservation Stewardship Program (CSP) is a voluntary program that encourages agricultural producers to improve conservation systems by improving, maintaining, and managing existing conservation activities and undertaking additional conservation activities. The Natural Resources Conservation Service administers this program and provides financial and technical assistance to eligible producers. CSP is available on Tribal and private agricultural lands and non-industrial private forestland (NIPF) on a continuous application basis.
http://www.nrcs.usda.gov/wps/portal/nrcs/main/in/programs/financial/csp/

Wetland Reserve Program (WRP) – The Wetland Reserve Program is another voluntary conservation program that allows landowners to enroll sensitive land to help restore, protect and enhance wetland restorations. It is the Nation's premier wetlands restoration program. WRP provides habitat for fish and wildlife, including threatened and endangered species, improves water quality by filtering sediments and chemicals, reduces flooding, recharges groundwater, protects biological diversity and provides opportunities for educational, scientific and limited recreational activities. Through this program landowners can enroll eligible land through Permanent Easements, 30-year Easements, Term Easements or 30-year Contracts. This program is part of the new Agricultural Conservation Easement Program under the new Farm Bill.
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/acep/

Mississippi River Basin Initiative (MRBI) - To improve the health of the Mississippi River Basin, including water quality, wetland restoration, and wildlife habitat, the Natural Resources Conservation Service has established the Mississippi River Basin Healthy Watersheds Initiative (MRBI). Through this Initiative, NRCS and its partners will help producers voluntarily implement conservation practices in targeted watersheds within the Mississippi River Basin. The targeted MRBI watersheds are determined by NRCS through a state resource assessment. (Figure 15)
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/in/programs/landscape/?cid=nrcs144p2_031031

Regional Conservation Partnership Program (RCPP) - The Regional Conservation Partnership Program (RCPP) promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS provides assistance to producers through partnership agreements and through program contracts or easement agreements.
RCPP combines the authorities of four former conservation programs – the Agricultural Water Enhancement Program, the Chesapeake Bay Watershed Program, the Cooperative Conservation Partnership Initiative and the Great Lakes Basin Program. Assistance is delivered in accordance with the rules of EQIP, CSP, ACEP and HFRP; and in certain areas the Watershed Operations and Flood Prevention Program. (Figure 15)
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/in/programs/farmbill/rcpp/?cid=stelprdb1248173

Environmental Quality Incentives Program (EQIP) -The EQIP program is a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical

assistance to eligible participants to install or implement structural and management practices on eligible agricultural land, with a focus on cover crops, nutrient management, conservation tillage, and livestock/animal waste systems. (Figure 15)
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/in/programs/?cid=nrcs144p2_031015

EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. The local conservation district approves the plan. EQIP may cost-share up to 75 percent of the costs of certain conservation practices. Incentive payments may be provided for up to three years to encourage producers to carry out management practices they may not otherwise use without the incentive. However, limited resource producers and beginning farmers and ranchers may be eligible for cost-shares up to 90 percent. Farmers and ranchers may elect to use a certified third-party provider for technical assistance.

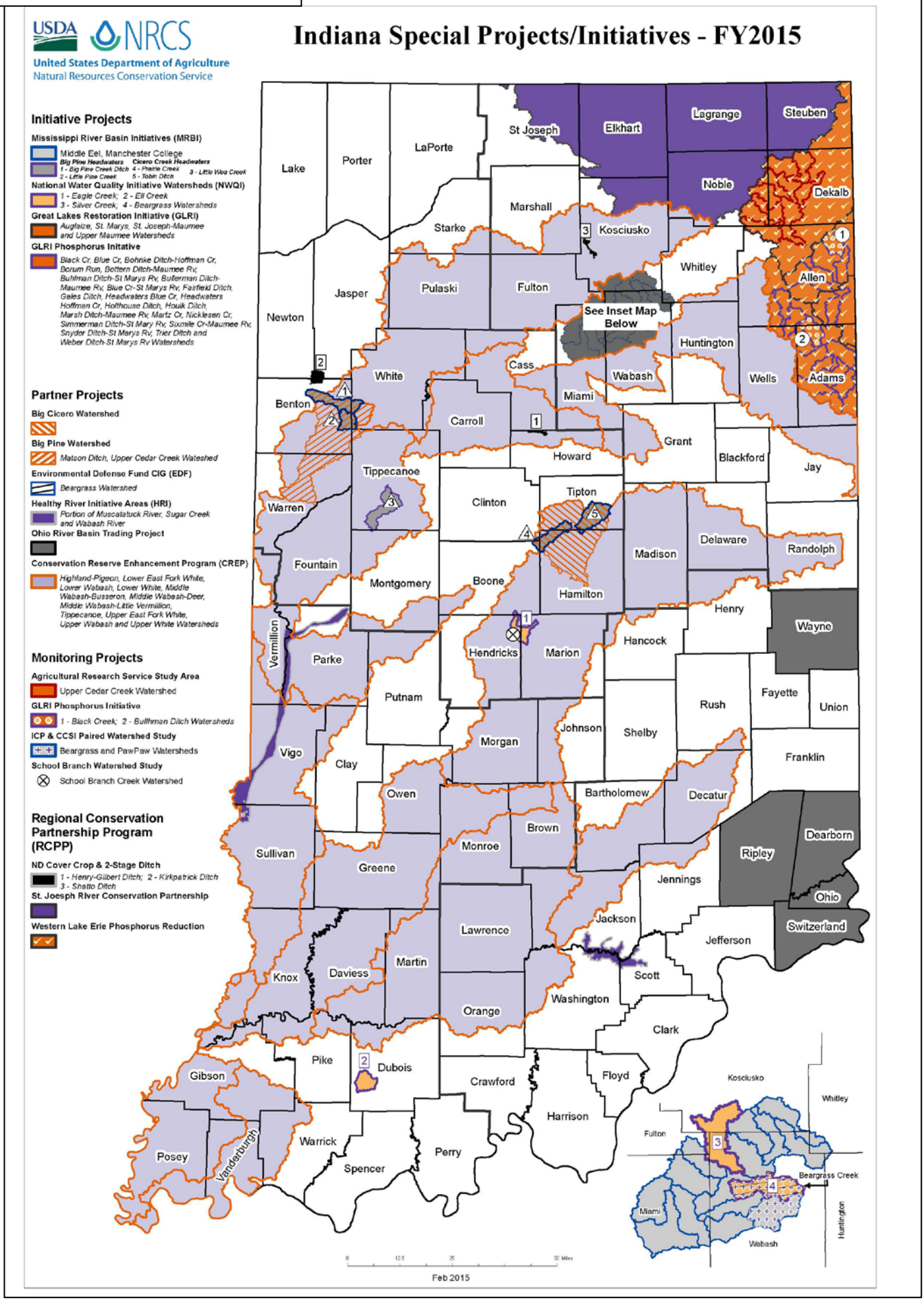
National Water Quality Initiative (NWQI) - The National Water Quality Initiative has a valuable presence in smaller HUC-12 watersheds within the Eel, Patoka and Upper White (HUC-8) watersheds in Indiana. Farmers and landowners are able to participate in this initiative though enrollment in the Environmental Quality Incentive Program (EQIP), wherein financial and technical assistance are provided to apply conservation and/or management practices through a systems approach in order to control and trap nutrient and manure runoff from agricultural land (Figure 15).
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/in/programs/landscape/?cid=nrcs144p2_031016

Great Lakes Restoration Initiative (GLRI) - The Great Lakes Restoration Initiative (GLRI) was launched in 2010 with NRCS as one of a number of federal agency partners. GLRI helps NRCS accelerate conservation efforts on private lands located in targeted watersheds throughout the region. Through GLRI, NRCS works with farmers and landowners to combat invasive species, protect watersheds and shorelines from non-point source pollution and restore wetlands and other habitat areas.

- ***Great Lakes Restoration Initiative for Phosphorus (GLRI-P)*** – This GLRI project is specifically focused on targeted HUC 12 watersheds in the WLEB area. Figure 15 shows where GLRI targeted projects are located in Indiana within the Western Lake Erie Basin watershed.

http://www.nrcs.usda.gov/wps/portal/nrcs/detail/in/programs/landscape/?cid=nrcseprd390813

Figure 15 – NRCS Program Initiatives



USDA, Farm Service Agency (FSA)

Conservation Reserve Program Funding **-** The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation (CCC). CRP is administered by the Farm Service Agency, with NRCS providing technical land eligibility determinations, Environmental Benefit Index Scoring, and conservation planning.

The Conservation Reserve Program reduces soil erosion, protects the Nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract, 10-15 year contracts. Cost sharing is provided to establish the vegetative cover practices.
http://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index
http://www.nrcs.usda.gov/wps/portal/nrcs/detail/in/programs/financial/?cid=stelprdb1119594

Safe Acres for Wildlife Enhancement (SAFE) – This initiative is a voluntary program available under the Conservation Reserve Program (CRP) continuous sign-up, designed to address state and regional high priority wildlife objectives. This program targets habitat restoration for specific wildlife species designated by the U.S. Fish and Wildlife Service as threatened or endangered including the lesser prairie chicken, the New England cottontail, bobwhite quail, and grassland birds. Producers within a SAFE area can submit offers to voluntarily enroll acres in CRP contracts for 10-15 years. In exchange, producers receive annual CRP rental payments, incentives and cost-share assistance to establish, improve, connect or create higher-quality habitat. http://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2015/CRPProgramsandInitiatives/State_Acres_for_Wildlife_Enhancement_SAFE_Initiative.pdf

Other Programs and Projects

Conservation Cropping Systems Initiative (CCSI) **-** The Indiana Conservation Cropping Systems Initiative (CCSI) promotes a systematic approach to production agriculture focusing on Continuous no-till/strip-till, nutrient and pest management, precision farming, and cover crops. The result is improved soil quality, water quality and profitability on Indiana cropland. The CCSI is a resource for the 92 Indiana Soil and Water Conservation Districts to carry out their conservation cropping systems goals and objectives. For the CCSI program, Indiana is split into four geographic regions and each region has farms that are known as Hub Farms, which serve as demonstration farms of a system of conservation practices and also has research on cover crops, corn stalk nitrate test, soil testing, etc. conducted on the farms in cooperation with Purdue

University. These Hub farms also serve as a resource for SWCDs to hold field days for landowners and farmers (Figure 16). Efforts from the CCSI have been closely coordinated with the NRCS Soil Health Campaign and represent a strong partnership in Indiana which serves as a national model and example. CCSI and its cooperative efforts with state and federal initiatives have actively fostered environmental stewardship, conservation farming and dedication to improving soil and water resources since its inception. http://ccsin.iaswcd.org/

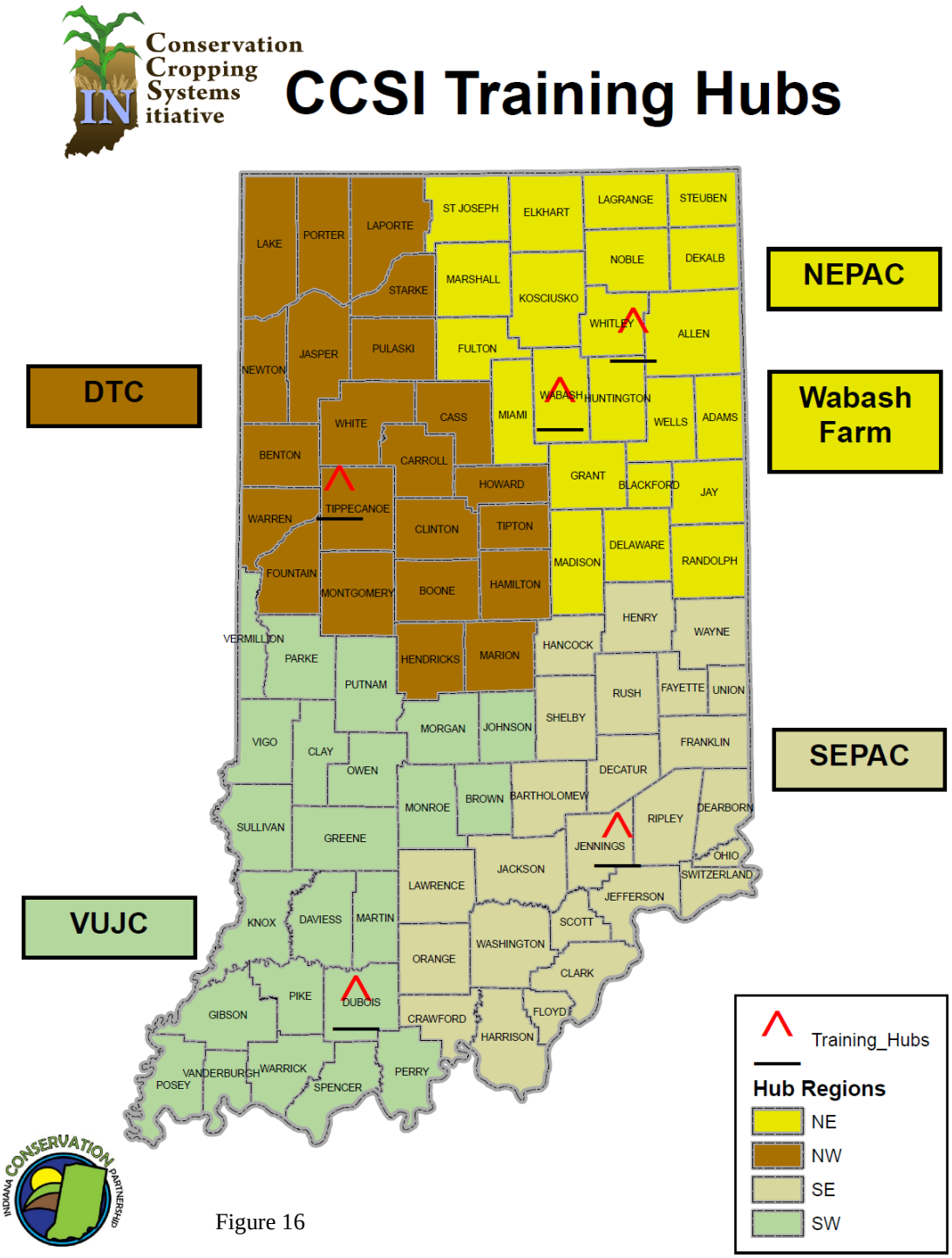


Figure 16

NRCS Soil Health Campaign – Mirroring the CCSI's efforts, the NRCS soil health campaign consists of diligent outreach and education concerning the benefits of cover crops paired with no-till or reduced tillage systems to improve tilth and water infiltration as boons to soil health. While this campaign, as with CCSI, is directed at soil health rather than water quality, the impacts on the latter are both direct and positive through their reduction of surface erosion (through reduced rain impact on exposed soil) and nutrient loss (through improved nutrient uptake from living cover as well as increased infiltration due to greater soil porosity and increased organic matter). There are many efforts by NRCS and the ICP partners to advance this Soil Health Campaign toward addressing Indiana's primary resource concerns, and several of these efforts are explained in more detail in the next section.

Ohio River Basin Water Quality Trading Project: Pilot Trading Plan by the states of Indiana, Kentucky and Ohio - In August 2012, representatives from the states of Indiana, Kentucky, and Ohio signed an agreement to create the Ohio River Basin Water Quality Trading Program (http://wqt.epri.com/), a pilot program allowing farmers and industrial facilities to trade pollution credits to reduce fertilizer run-off and nutrient discharges. It is aimed at achieving water quality standards in watersheds along the Ohio River by allowing dischargers to purchase pollution reductions from other sources. The project was conceived by Electric Power Research Institute (EPRI) in conjunction with the states of Indiana, Ohio, Kentucky, the U.S. Department of Agriculture Natural Resources Conservation Service, American Farmland Trust, the Ohio Farm Bureau, and ORSANCO. It was initially funded by a Conservation Innovation Grant (CIG) to the EPRI and is now privately funded and supported by over a dozen organizations and utilities like AEP and Duke Power with technical support from local, state and federal agencies. Indiana counties participating include Wayne, Dearborn, Ripley, Ohio, and Switzerland. The ISDA-DSC District Support Specialist for the region has been serving as an advisor and representative for the project and works with EPRI, American Farmland Trust, DSC Resource Specialists, participating County SWCDs, and USDA-NRCS District Conservationists.

The Electric Power Research Institute's Ohio River Basin Trading Pilot Project is a first-of-its-kind inter-state trading program with participation from Indiana, Ohio and Kentucky. Indiana alone has been contracted to remove 22,000 pounds of total nitrogen and 11,000 pounds of total phosphorus over the five-year period of the pilot. A total of $100,000 in cost-share monies for each of the three partner states were distributed to farmers for implementation of approved water quality Best Management Practices. In Indiana practices for cover crops, heavy use protection areas for livestock, and cropland to hayland conversion were approved. All practices have been installed for two years and continue to be inspected and verified by DSC staff. This project has not only gained regional interest, but also international attention, and is the largest water quality trading project in the world. In 2014, the project was featured in many newsletters and articles, including the Wall Street Journal.

Encourage Actions that are Voluntary, Incentive-based, Practical, Cost-effective, and Accountable

Why does proactive, voluntary conservation matter? It matters because of the impact that conservation practices have on water quality both within the state of Indiana and in the water bodies outside of our state. It matters because the impact of the conservation practices results in reductions of nutrient loads.

Indiana's Conservation Partnership Soil Health Philosophy

http://www.in.gov/isda/files/ICP_Soil_Health_Philosophy_final.pdf

The Indiana Conservation Partnership (ICP) includes eight Indiana agencies and organizations that share a common goal of promoting conservation. To accomplish this goal, the ICP members provide technical, financial and educational assistance to support and implement economically and environmentally compatible land and water stewardship decisions, practices and technologies. The ICP and our primary customers – Indiana farmers – are recognized as national leaders in our collaborative efforts to incorporate soil health management systems into conservation planning, education activities and farm management.

Indiana's soil health strategy and priority focus has achieved tremendous success in addressing the state's primary natural resource concerns. The ICP endorses these four key **Soil Health Principles** for all lands:

- Minimize Disturbance
- Optimize Soil Cover
- Optimize Biodiversity
- Provide Continuous Living Roots

Regenerating soil health is a journey. Meeting the **Objectives of Soil Health Improvement** should be part of an overall approach to management decisions and field operations. To fully implement a ***conservation cropping system*** that improves soil health we will help farmers understand the importance of continually working toward the following objectives:

- Increas**ing** organic matter
- Increas**ing** aggregate stability
- Increas**ing** water infiltration
- Increas**ing** water-holding capacity
- Improv**ing** nutrient use efficiency
- Enhanc**ing** and diversify**ing** soil biology

The ICP works with farmers to help them implement a conservation cropping system approach to improve the health of their soil. This "system" of practices and management results in improvements to soil health that helps to address Indiana's primary natural resource concerns. Although implementing a single management practice may slow the degradation of soil function, it will rarely achieve the broad improvements of our resource objectives.

The elements of a conservation cropping system go beyond the minimum standards. It is critical to emphasize descriptive adjectives associated with each practice element, such as:

- **Quality** No-till/Strip till
- **Adaptive** Nutrient Management
- **Integrated** Weed and Pest Management
- **Diverse** and **Strategic** Cover Crop Integration
- **Diverse** Conservation Crop Rotations
- **Precision** Farming Technology
- **Prescriptive** Conservation Buffers

These practices when incorporated into a profitable and sustainable soil health system can help farmers go beyond simply maintaining the soil to actually improving its health. Since the benefits achieved through this system can begin to degrade if the application of the system stops, soil health is a never-ending journey towards constantly improving the soil over time.

For many farmers, implementing a conservation cropping system may require significant changes in their operations and management. Building a successful conservation cropping system can take time, even years. The ICP commits to providing support for our customers through ongoing education, support and financial and technical assistance so that soil health improvement is possible across all agricultural sectors and becomes the management system of choice.

A System's Approach of Conservation Practices

One of the most wide-scale and effective efforts in Indiana on water quality improvement is the education and promotion of soil health systems and conservation cropping systems in agriculture. ISDA, NRCS, SWCDs and the other members of the ICP are actively promoting a total *conservation cropping systems* approach to farming which focuses on soil health and function. Soil health practices include no-till (never-till), using diverse cover crops, adaptive nutrient management, integrated weed and pest management, diverse crop rotations, precision farming technology and prescriptive buffers.
https://prod.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_030628.pdf

Conservation Tillage Practices, such as no-till, strip-till, ridge till and mulch till, are practices that leave crop residues on the soil surface to reduce soil erosion by water.
Cover Crops are crops grown between regular cash crops like corn and soybeans so that there is a living root growing all year long. Cover crops reduce soil compaction; they cover the soil and protect it from erosion; improve soil structure; increase soil organic matter; fix nitrogen and scavenge nitrogen depending on the species of cover crop used; and can produce forage or pasture.

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Soil Health is the Goal!

Integrated Conservation Cropping Systems is the Right System

November, 2011

SOIL HEALTH = CONSERVATION CROPPING SYSTEMS

No (NEVER)-Till / Strip-Till + Cover Crops and Crop Rotations + Precision Nutrient and Pest Management + Buffers

KEY POINTS

- Soil health addresses multiple priority resource issues
- NRCS has a focused message to farmers, the public, and employees
- Farmers perceive changes to their current management as **RISK** that impedes adoption

High Quality technical assistance, education, and planning directly to the farmer is essential = **NRCS** is the **key** agency capable of helping farmers achieve soil health and the associated benefits

WHY FARMERS *WANT* HEALTHY SOILS:

- Decreased inputs (diesel, time, labor, nutrients, pesticides)
- Increased Soil Health
  - Organic matter = carbon
  - Reduced compaction
  - Nutrient sequestration and cycling (less inputs)
  - Increased water holding capacity and infiltration
  - Structural stability
  - Yield protection
  - "Insurance" against extremes in weather, input costs, markets

WHY THE PUBLIC *NEEDS* HEALTHY SOILS:

- Less energy (irrigation, nutrients, pesticides) and fuel needs
- Water quality (reduces nutrient and sediment loading)
- Air quality (reduces sediment, carbon, and nitrous oxide emissions)
- Ensures a stable, sustainable, secure, healthy domestic food source
- Increased infiltration = reduced runoff = **reduced flooding AND drought protection**
- Wildlife habitats

WHY USDA/NRCS IS FOCUSING ON SOIL HEALTH

- Healthy soils address multiple resource concerns across the nation
- Soil Health ensures **relevance** and **confidence** in NRCS from all of agriculture
- Farmers see that conservation makes sense and money
- Low technical and financial assistance needs
- Less need for expensive, high technical assistance practices (structures, waterways, etc.)
- Applicable coast to coast, north to south; Large/small; traditional/ organic; beginning/limited

RESULTS GET ON THE GROUND

Indiana's Tillage Transects

The tillage transect is a cropland survey conducted each spring following planting in each county by ICP personnel and Earth Team volunteers. Using a predetermined route, staff look at farm fields in their county collecting data on tillage methods, plant cover, residue, etc. in order to tell the story of conservation efforts in Indiana. The survey uses GPS technology and provides a statistically reliable method for estimating farm management and related annual trends. Transects are usually conducted bi-annually in the spring before crops are planted. ISDA maintains tillage transect reports dating back to 1990 on their website http://www.in.gov/isda/2383.htm and includes the most recent transect results.

The fall of 2014 was the first-ever statewide fall tillage and cover crop transect done in Indiana. This was done as part of a collaborative effort between ISDA, NRCS, Indiana's 92 SWCDs and other members of the Indiana Conservation Partnership (ICP). The report shows significant increases in the adoption of conservation practices on farm fields by Hoosier farmers.

The fall transect estimated one million acres of living plant cover such as cover crops and winter cereal grains were planted on Indiana farms last year. These important plants protect soil from rain, snow and extreme cold, and retain valuable nutrients in fields benefitting water quality, and feeding diverse populations of soil biology. Residues protected from environmental elements play a key role in building soil organic matter and soil health.
The report also shows most Indiana farmers left their tillage equipment in the shed this past fall to protect their fields with harvested crop residues. Results for residues and soil undisturbed on harvested acres during the winter months include:

- 77% of corn acres
- 79% of small grain acres
- 82% of soybean acres

"We believe the no-till acres represented in the fall transect data are at a much higher and sustainable quality because farmers are using multiple conservation practices implemented as part of a system on their fields," said Jane Hardisty, NRCS State Conservationist. "The results of the transect show Indiana is a top leader in the nation in acres of cover crops planted which is important during weather extremes like those we have experienced this year."

"We know that farmers seek to retain soil and nutrients on the land, which promotes improved soil health and water quality. Therefore, tracking trends in conservation tillage, energy consumption and cropping systems is an important and valuable activity," said Ted McKinney, Director of ISDA. "Transects give conservation partners the opportunity to observe the current land use conditions and discuss the resource needs and accomplishments related to the soil and water resources in each county. Such efforts are particularly rewarding when the results show that Indiana is among the leaders in soil conservation and water quality."

The following two links are maps of Indiana showing the percentage of acres of corn residues and soybean residues left on the soil last year as determined by the fall 2014 Fall Tillage and Cover Crop Transect.
http://www.in.gov/isda/files/2014_Corn_Residue_Not_Tilled.pdf
http://www.in.gov/isda/files/2014_Soybean_Residue_Not_Tilled.pdf

As a national leader in use of cover crops, nutrient management and advocating of soil health and productivity, Indiana is perhaps the best example in the nation for the benefits that improving soils' nutrient uptake and water-holding capacities can do to reduce nutrient loss and excessive runoff from agricultural and other managed lands. (Figure 17)

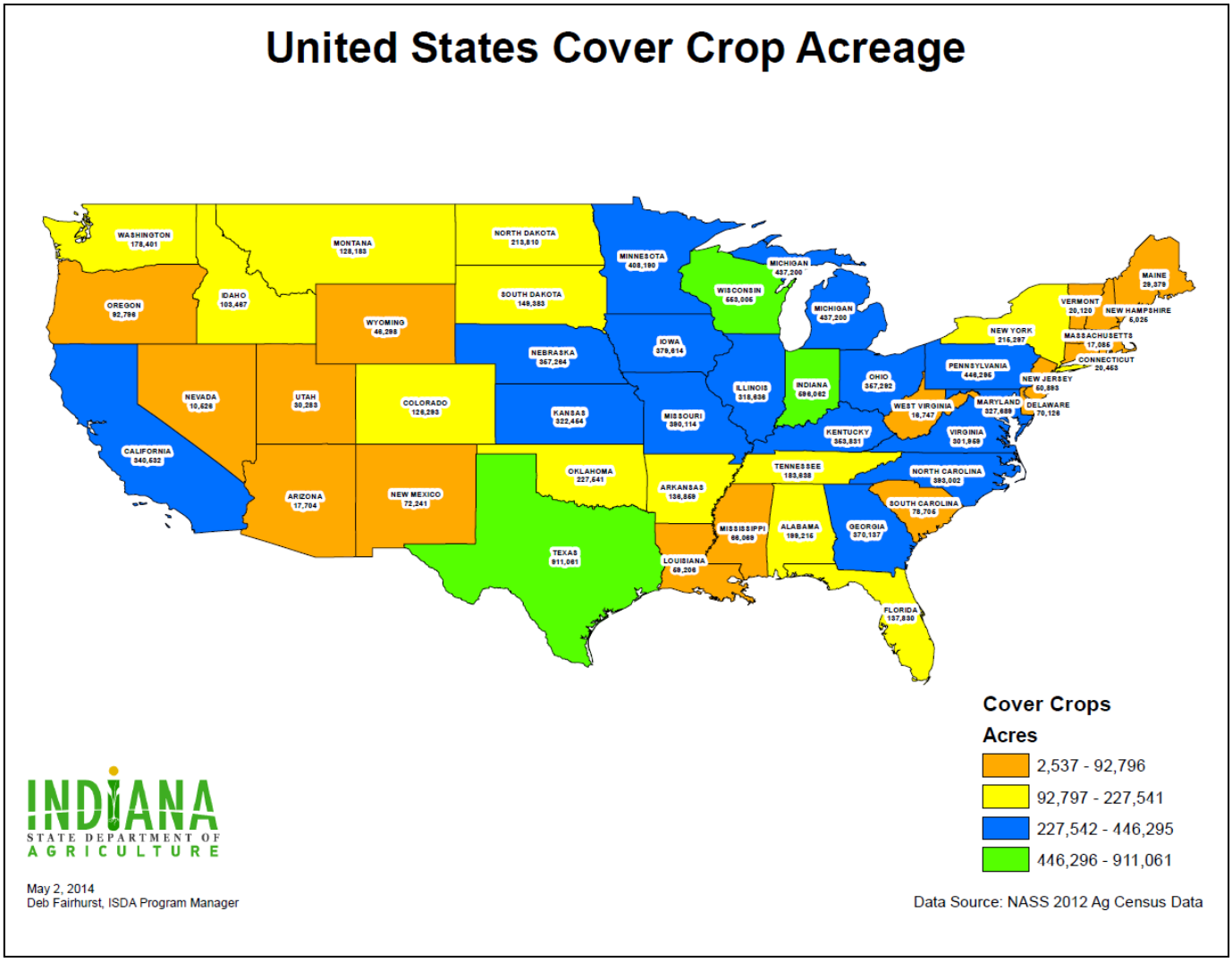
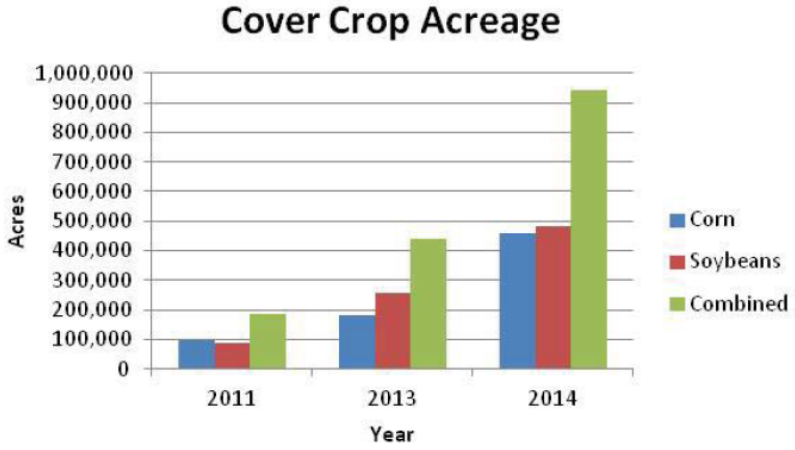
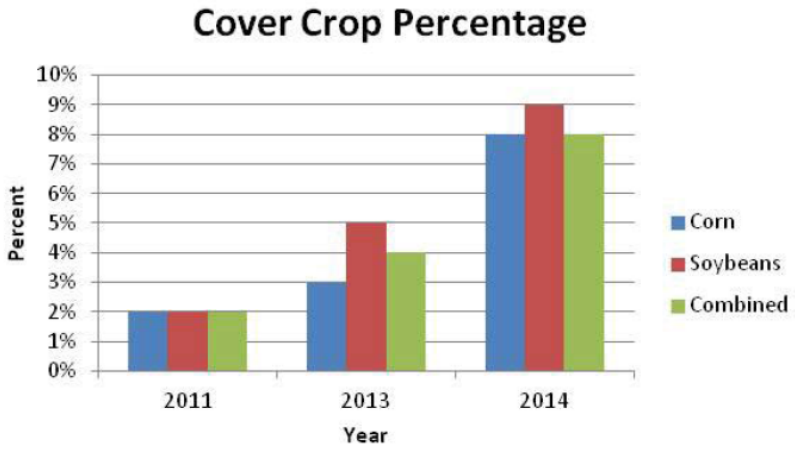


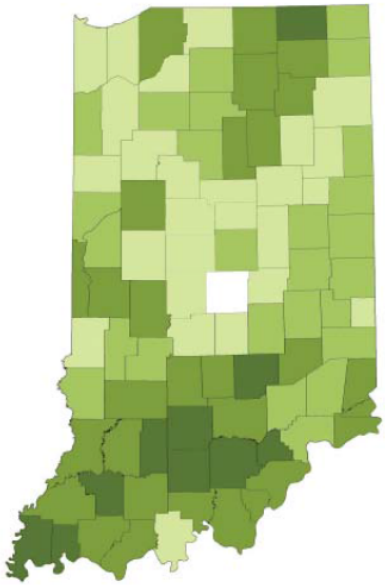
Figure 17 – Cover crops acres by state according to the NASS 2012 Ag Census Data

* Refer to Figures 18, 19 and 20 to show trends in cover crop adoption, and usage of no-till and conservation tillage in Indiana.

Indiana Cover Crops: 2011-2014

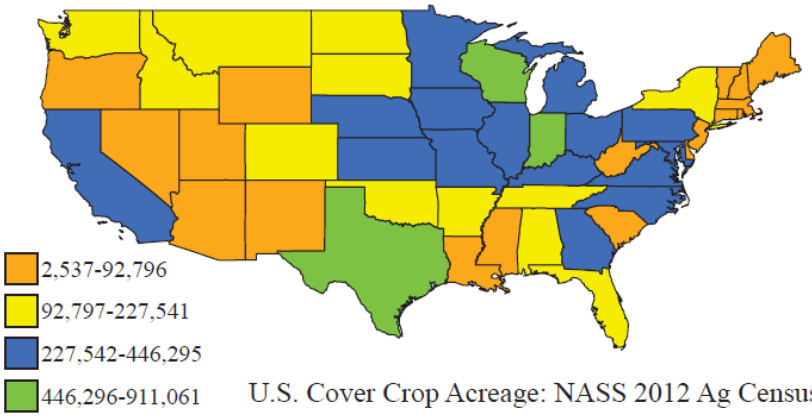






*Note: Darker colors indicate counties that had a greater percent of combined corn and soybean acres utilizing cover crops in 2014.

* Please note that no data is collected for Marion County.
* 2011 and 2013 cover crop data was collected during the spring tillage transect. Figures collected in this manner may not be a true reflection of cover crop implementation because of winter kill and other factors.
* A fall cover crop transect was completed in 2014. Data from this transect is included. Further fall transects are planned at this time.



U.S. Cover Crop Acreage: NASS 2012 Ag Census

Cover Crop Acreage Change 2011-2014

	Acres	Percent Change
Corn	364,881	379%
Soybeans	395,480	450%
Combined	760,361	413%

Cover Crop Percentage Change 2011-2014

	Percentage Point Change	Percent Change
Corn	6	300%
Soybeans	7	350%
Combined	6	300%

Cover Crop Implementation

Acreage	2011	2013	2014
Corn	96,200	183,100	461,081
Soybeans	87,800	258,000	483,280
Combined	184,000	441,100	944,361
Percent	**2011**	**2013**	**2014**
Corn	2%	3%	8%
Soybeans	2%	5%	9%
Combined	2%	4%	8%

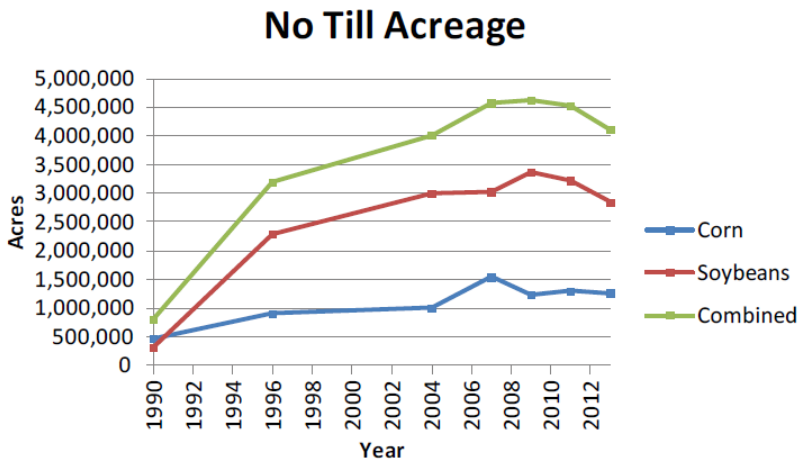
For more information about the transect program, including county level transect data, please see: http://in.gov/isda/2383.htm

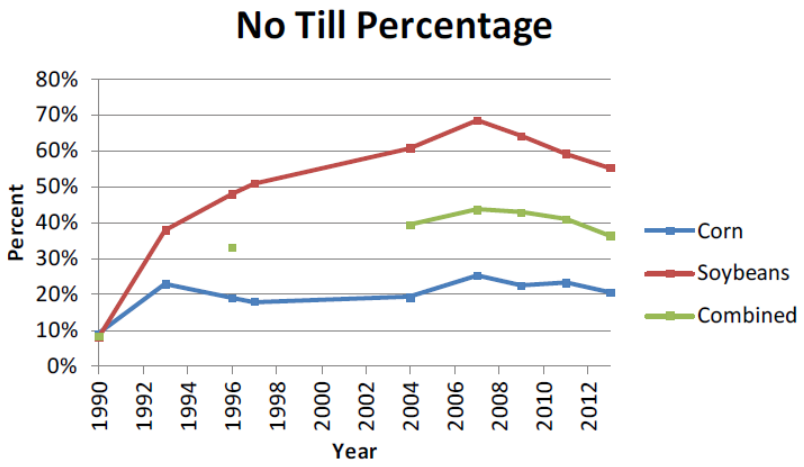
October 8, 2015
Leah Harmon, ISDA District Support Specialist

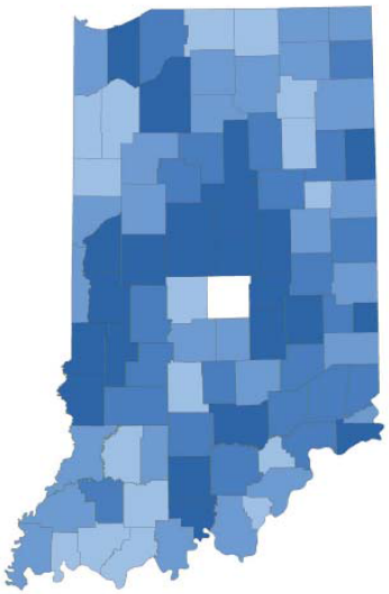
Figure 18 - http://www.in.gov/isda/2383.htm

Indiana No Till: 1990-2013

No Till: Any direct seeding system, including site preparation, with minimal soil disturbance (includes strip & ridge till).







*Note: Darker colors had a greater percent increase in total no till acres (corn and soybeans) from 1990-2013

No Till Percentage Change 1990-2013		
	Percentage Point Change	Percent Change
Corn	12	129%
Soybeans	47	592%
Combined	28	338%

No Till Acreage Change 1990-2013		
	Acres	Percent Change
Corn	787,445	164%
Soybeans	2,518,051	769%
Combined	3,305,496	410%

* Please note that not all counties have data for all years. No tillage data is collected for Marion county.
* Total Acreage Data is not available for 1993 or 1997, thus not allowing a calculation for combined no till percentages.

No Till Implementation							
Acreage	1990	1996	2004	2007	2009	2011	2013
Corn	479,255	912,186	1,011,467	1,542,152	1,244,400	1,296,300	1,266,700
Soybeans	327,249	2,291,014	3,002,974	3,032,493	3,375,300	3,225,400	2,845,300
Combined	806,504	3,203,200	4,014,441	4,574,645	4,619,700	4,521,700	4,112,000

Percentage	1990	1993	1996	1997	2004	2007	2009	2011	2013
Corn	9%	23%	19%	18%	19%	25%	23%	23%	21%
Soybeans	8%	38%	48%	51%	61%	69%	64%	59%	55%
Combined	8%	N/A	33%	N/A	39%	44%	43%	41%	36%

For more information please see: http://in.gov/isda/2383.htm

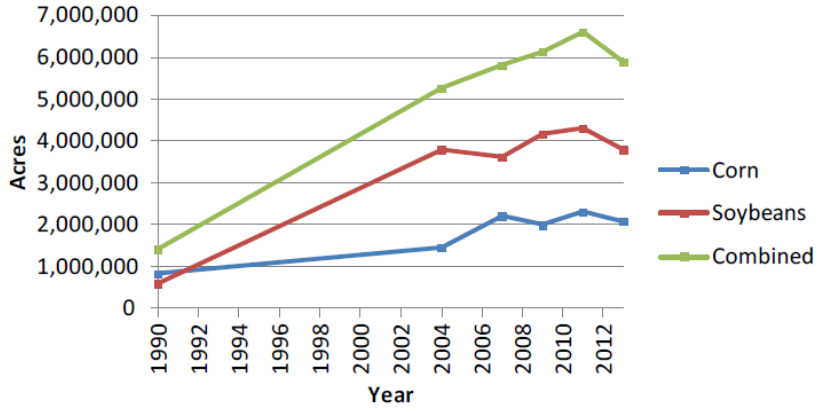
April 22, 2015
Leah Harmon, ISDA District Support Specialist

Figure 19 - http://www.in.gov/isda/files/No_Till_Trends_1990-2013_Statewide.pdf

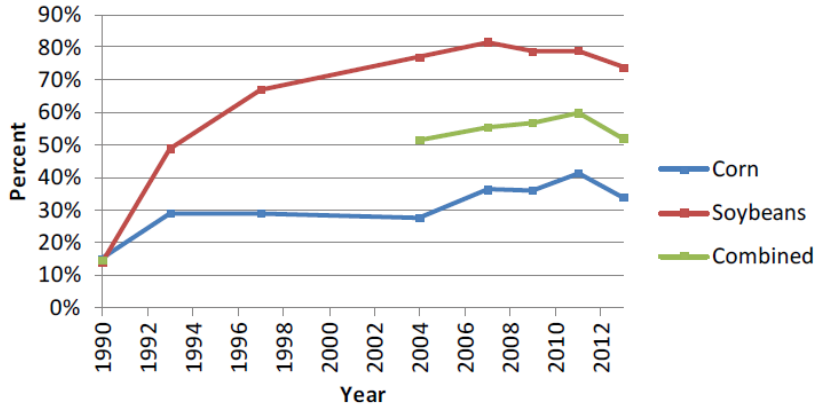
Indiana Conservation Tillage: 1990-2013

Conservation Tillage: any system that leaves at least 30% residue cover after planting

Conservation Tillage Acreage

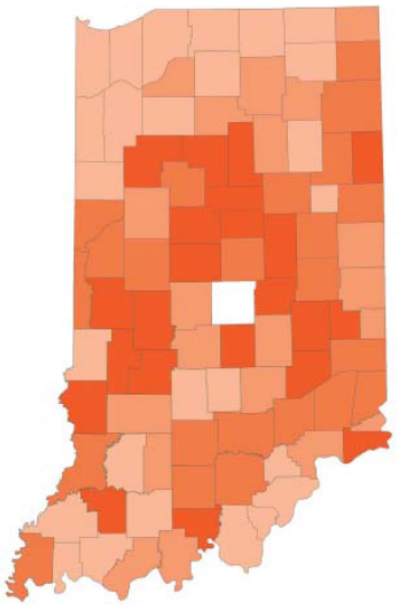


Conservation Tillage Percentage



* Please note that not all counties have data for all years. No tillage data is collected for Marion county.

* Total Acreage Data is not available for 1993 or 1997, thus not allowing a calculation for combined conservation tillage percentages.



*Note: Darker colors had a greater percent increase in total conservation tillage acres (corn and soybeans) from 1990-2013

Conservation Tillage Percentage Change 1990-2013		
	Percentage Point Change	Percent Change
Corn	19	126%
Soybeans	60	427%
Combined	37	258%

Conservation Tillage Acreage Change 1990-2013		
	Acres	Percent Change
Corn	1,262,700	153%
Soybeans	3,208,441	630%
Combined	4,471,141	317%

Conservation Tillage Implementation						
Acreage	1990	2004	2007	2009	2011	2013
Corn	824,200	1,455,828	2,202,153	1,988,000	2,304,200	2,086,900
Soybeans	588,159	3,797,671	3,613,545	4,156,160	4,296,000	3,796,600
Combined	1,412,359	5,253,499	5,815,697	6,144,160	6,600,200	5,883,500

Percentage	1990	1993	1997	2004	2007	2009	2011	2013
Corn	15%	29%	29%	28%	36%	36%	41%	34%
Soybeans	14%	49%	67%	77%	82%	79%	79%	74%
Combined	15%	N/A	N/A	52%	55%	57%	60%	52%

For more information please see: http://in.gov/isda/2383.htm

April 22, 2015
Leah Harmon, ISDA District Support Specialist

Figure 20 - http://www.in.gov/isda/files/Conservation_Tillage_Trends_1990-2013_Statewide.pdf

Nutrient Management/Soil Health Strategy

Agricultural commodity groups in Indiana, including those of corn, soybeans, pork, dairy, cattle and poultry have voluntarily created a Nutrient Management and Soil Health (NMSH) strategy with input and dialogue from the US Environmental Protection Agency (USEPA), NRCS, ISDA, IDEM and the Farm Bureau. This document, which complements Indiana's state nutrient reduction strategy, highlights the challenges posed to agriculture in responsibly managing and reducing nutrient and sediment loss. It also incentivizes improvements along these lines by highlighting the economic and environmental benefits of promoting and building soil health, which reduces nutrient loss and runoff by improving water holding capacity, increases nutrient exchange and uptake by plants and strengthens soil structure resulting in reduced sedimentation.

This effort is also keenly focused on education and outreach of these challenges and goals for the agricultural community. Representatives from the agricultural community in Indiana who are responsible for the development of the Nutrient Management and Soil Health Strategy are also actively engaged in creating Educational Material Implementation Plans for producers to utilize in these efforts. Similarly, systems approaches to nutrient management and soil health improvement are already highlighted and encouraged within the strategy itself. Educational materials available and information on topics included under this NMSH strategy are Manure Management, Phosphorus Management, Nitrogen Management, Soil Sampling & Nutrient Management, Tillage and Planting Systems, Cover Crops, Drainage & Ditch Management, and Water Management. The website for the information on this strategy and the educational materials can be found at https://inagnutrients-public.sharepoint.com.
The State of Indiana intends to use the Nutrient Management and Soil Health Strategy as an Agricultural Industry Implementation plan of this State Nutrient Reduction Strategy. The NMSH strategy 10 year framework document is attached in Appendix C of this document.

EPA Region 5 Nutrient Reduction Load Modeling and Mapping: Watershed-Wide

In 2011, ISDA adopted the use of the Region 5 Nutrient Load Reduction Model developed by EPA for three 319 funded watersheds, the Tippecanoe River, Upper Eel River, and the Upper Wabash River watersheds, in which three DSC staff were located to assist with the installation of conservation practices on the ground. IDEM utilizes this Region 5 model for all of its 319 funded projects as required by EPA.

This model estimates sediment, nitrogen and phosphorus load reductions from individual BMPs on the ground. ISDA saw the value of using this model as a means to measure the load reductions coming from all technical assisted projects in Indiana that was being done by all of our staff, not just by the three staff working in the 319 funded watersheds. Its use has been standardized by ISDA, and the Region 5 model is now used statewide to model all the conservation practices that are implemented through assistance of all the ICP partnership staff. There is much data that goes into the preparation of the final reports, and Figure 21 shows the methodology by which we work through.

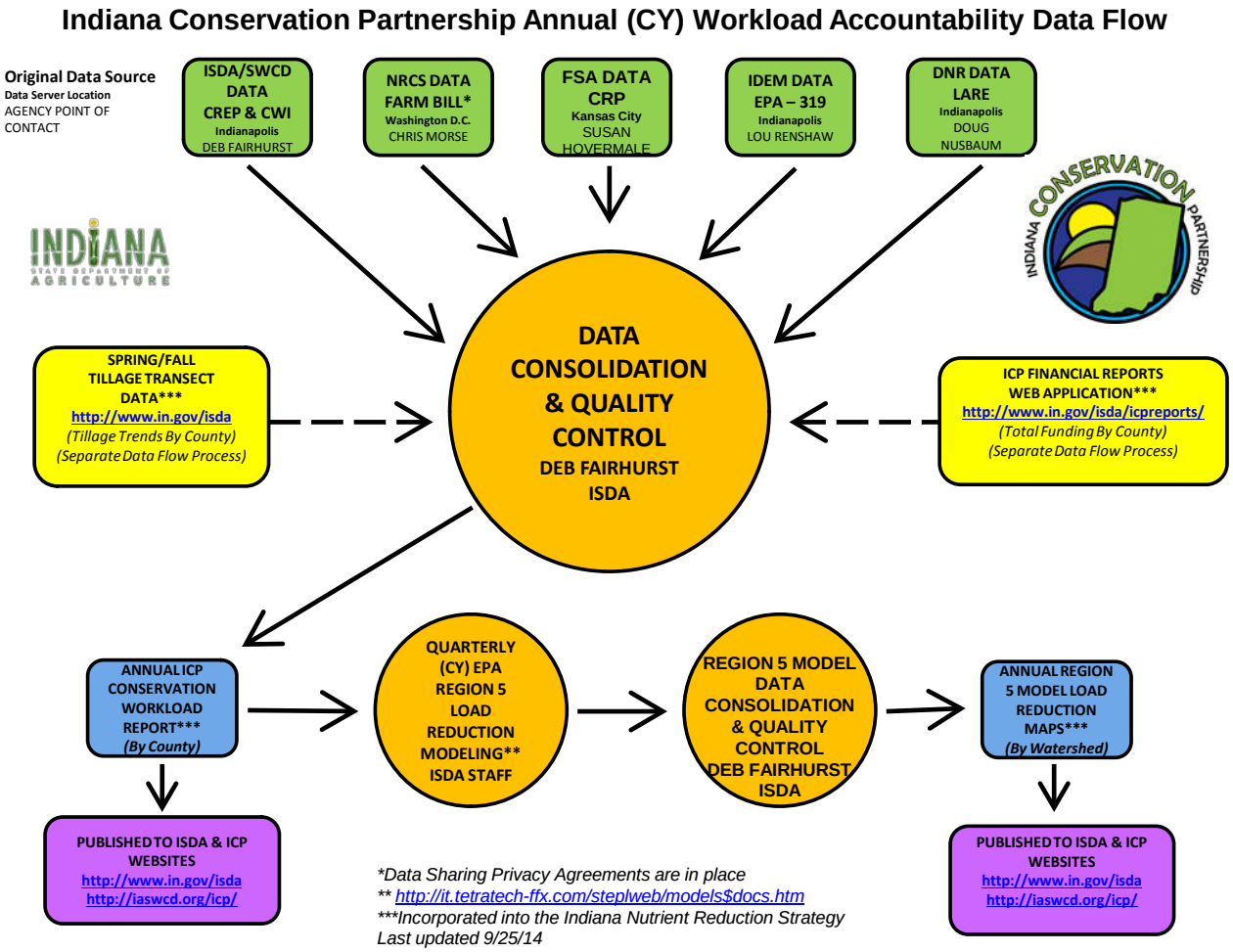
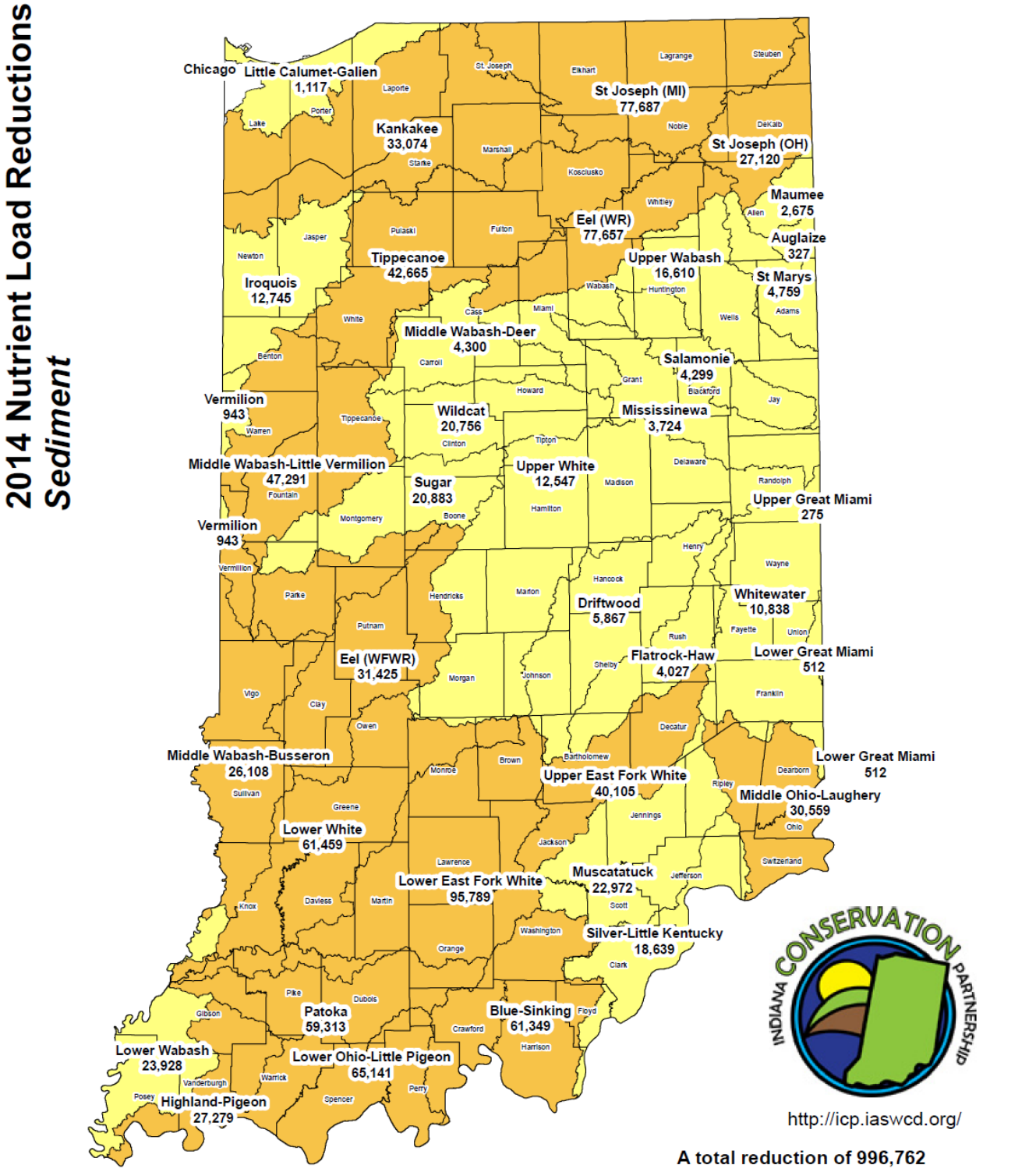


Figure 21 – Methodology Chart

Figures 22-24 illustrate the Nitrogen, Phosphorus and Sediment load reductions from all assisted conservation practices reported by staff in the Conservation Partnership for 2014 practices. While this model is project-specific, it provides a valuable perspective on a larger scale when showing the collective reductions of practices across several programs. ISDA and the partnership have been doing this watershed-side modeling and mapping since 2013, and it has received much attention both in Indiana and nationwide. The accountability/verification and annual reporting on implementation are current expectations among Indiana's Conservation Partner's and are regularly being refined and improved. There is the intention to continue to measure the impact of the BMPs through this reporting mechanism in future years.

An Annual Accomplishments report for 2014 is prepared and can be found here: https://myshare.in.gov/isda/Division%20of%20Soil%20Conservation%20Maps/ICP%20Conservation%20Accomplishments%20and%20Sediment%20and%20Nutrient%20Load%20Reductions/2014%20ICP%20Conservation%20Accomplishments/2014%20ICP%20Conservation%20Accomplishments%20and%20Region%205%20Load%20Reductions%20Report.pdf

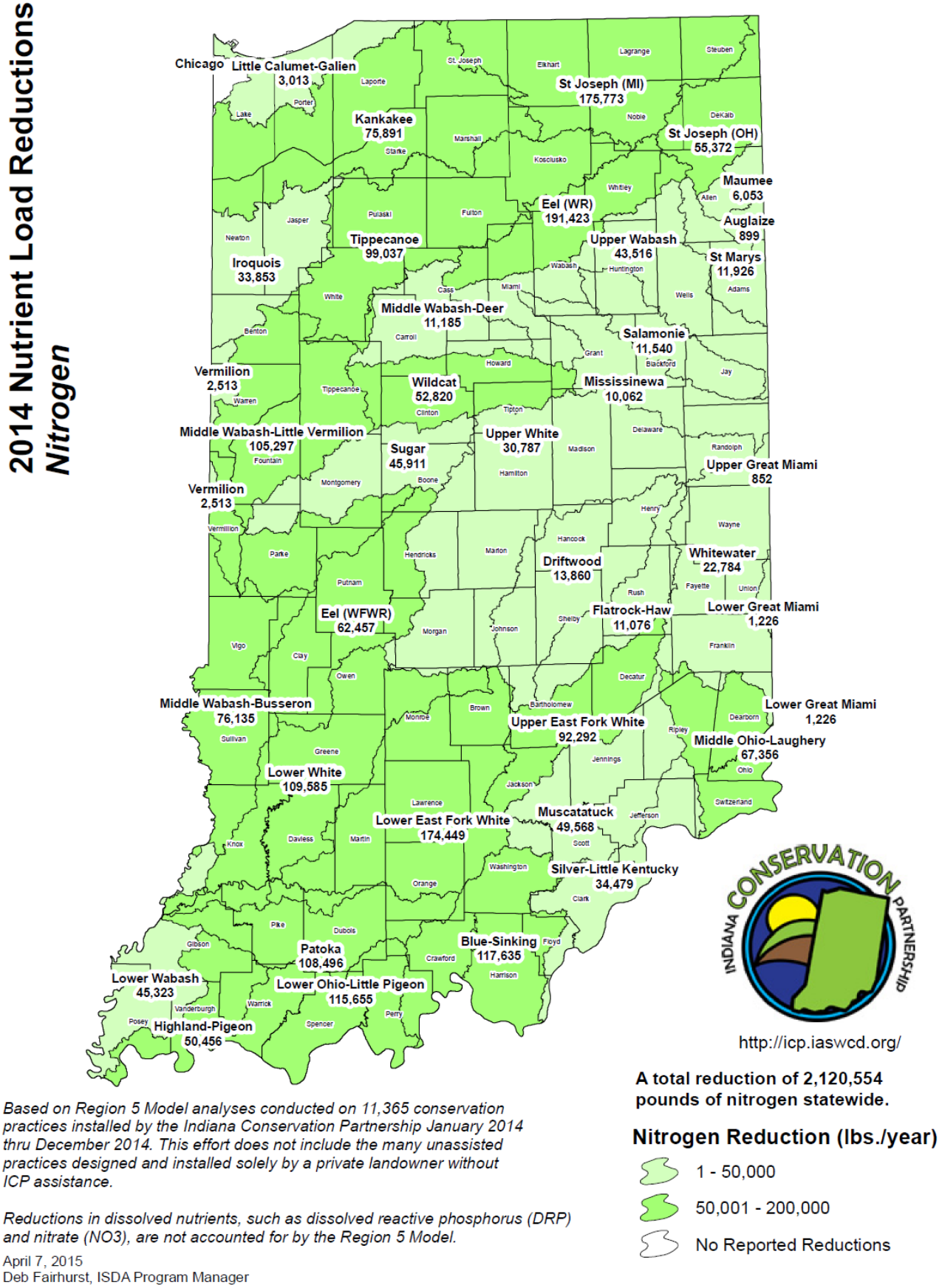


Based on Region 5 Model analyses conducted on 11,365 conservation practices installed by the Indiana Conservation Partnership January 2014 thru December 2014. This effort does not include the many unassisted practices designed and installed solely by a private landowner without ICP assistance.

Reductions in dissolved nutrients, such as dissolved reactive phosphorus (DRP) and nitrate (NO3), are not accounted for by the Region 5 Model.

April 7, 2015
Deb Fairhurst, ISDA Program Manager

Figure 22 – Sediment Load Reductions from 2014 Practices



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Reductions in dissolved nutrients, such as dissolved reactive phosphorus (DRP) and nitrate (NO3), are not accounted for by the Region 5 Model.

April 7, 2015
Deb Fairhurst, ISDA Program Manager

Figure 23 – Nitrogen Load Reductions for 2014 Practices

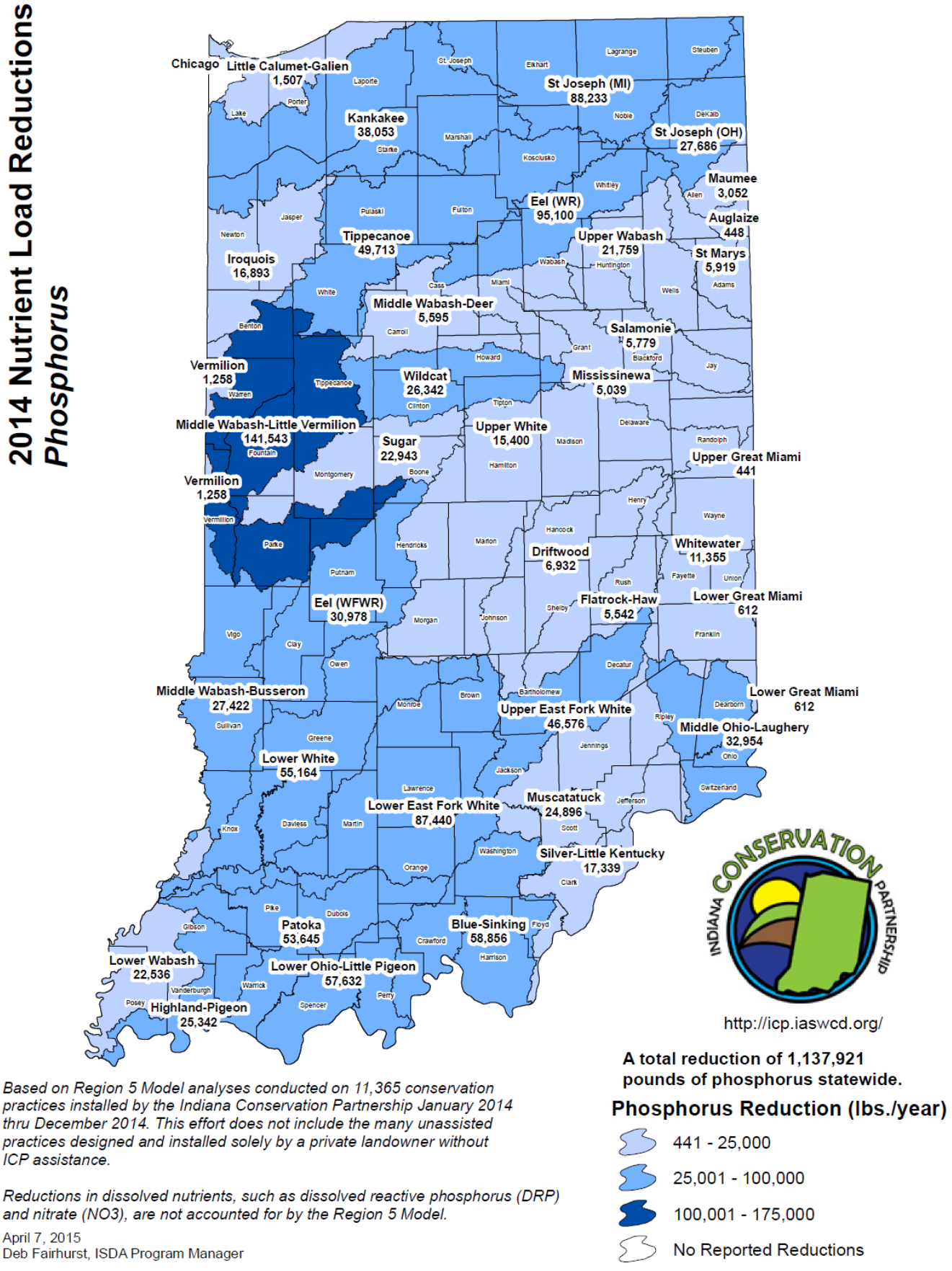


Figure 24 – Phosphorus Load Reductions for 2014 Practices

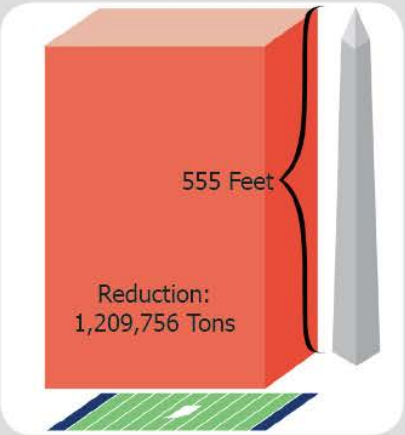
Indiana Nutrient and Sediment Load Reductions

Voluntary conservation efforts from private landowners in Indiana with support from the Indiana Conservation Partnership have reduced nutrients and sediment from entering Indiana's waterways. The figures below represent these efforts since 2013.

Sediment
A football field covered to a depth of 560 feet, which is taller than the Washington Monument

Nitrogen
12.5 freight cars

Phosphorus
6.25 freight cars



Top Conservation Practices in Indiana

By quantity of practices installed and reduction per practice:

- No Till
- Reduced Tillage
- Cover Crops
- Grassed Waterways
- Wetland Enhancement
- Filter Strips
- Nutrient Management
- Riparian Buffers

For more information about conservation practices visit: nrcs.usda.gov

Indiana Conservation Partnership (ICP)

Data is collected by Indiana Conservation Partnership Agencies and aggregated using the USEPA's Region 5 Model to show total nutrient and sediment reductions.

soil and water conservation

DNR INDIANA DEPARTMENT OF NATURAL RESOURCES

IDEM

INDIANA STATE DEPARTMENT OF AGRICULTURE

INDIANA CONSERVATION PARTNERSHIP
icp.iaswcd.org

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

With Support From:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

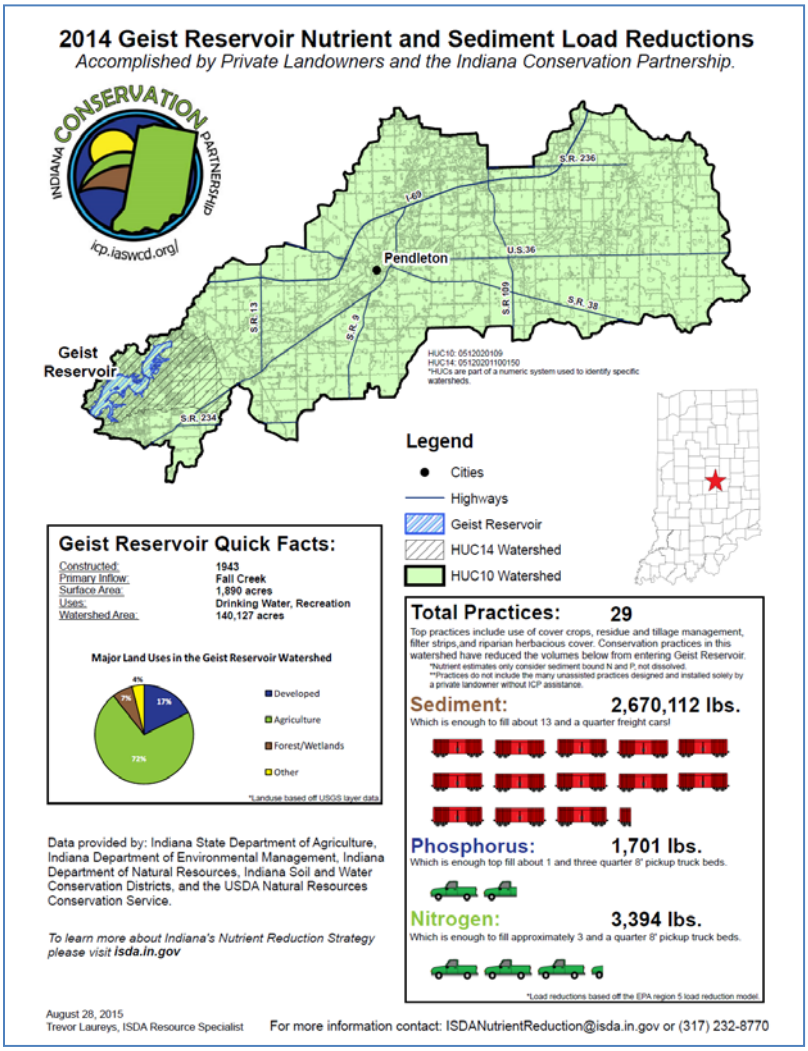
For more information about Indiana's Nutrient Reduction Strategy, please see isda.in.gov

EPA Region 5 Nutrient Load Reduction Model Updates

EPA is in the planning stages of updating the Region 5 Model to include three more worksheets; one for Conservation Easements, one for Green Roofs, and one for Water Quantity. Once this gets developed, ISDA and the ICP plan to use these worksheets to further the watershed-wide modeling and mapping of conservation practices implemented through assistance by conservation partnership staff. This will be important to show the continued progress of what Indiana's impact is on the sediment and nutrient reductions in our local waters, thus showing a positive impact toward the Gulf of Mexico and the Great Lakes.

Significant Waterbodies

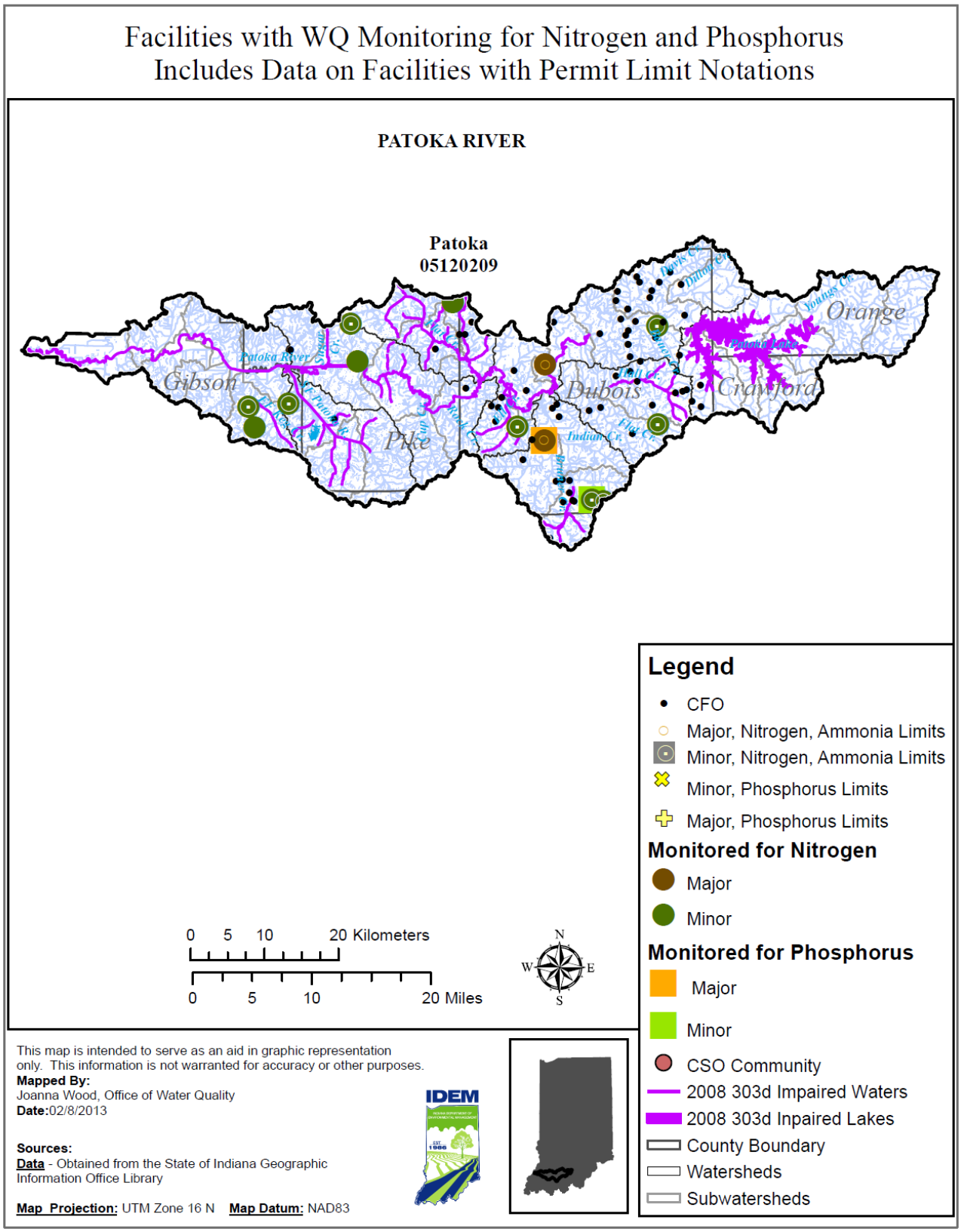
ISDA is in the process of preparing one page reports for significant waterbodies in Indiana based on the Region 5 Load Reduction modeling efforts taking place. We will continue to produce these for many significant waterbodies in Indiana in the near future and these will be made available in the next updated version of this strategy and are also available on the Nutrient Reduction Strategy webpage on the ISDA website at http://www.in.gov/isda/2991.htm. Below is an example of one these reports.



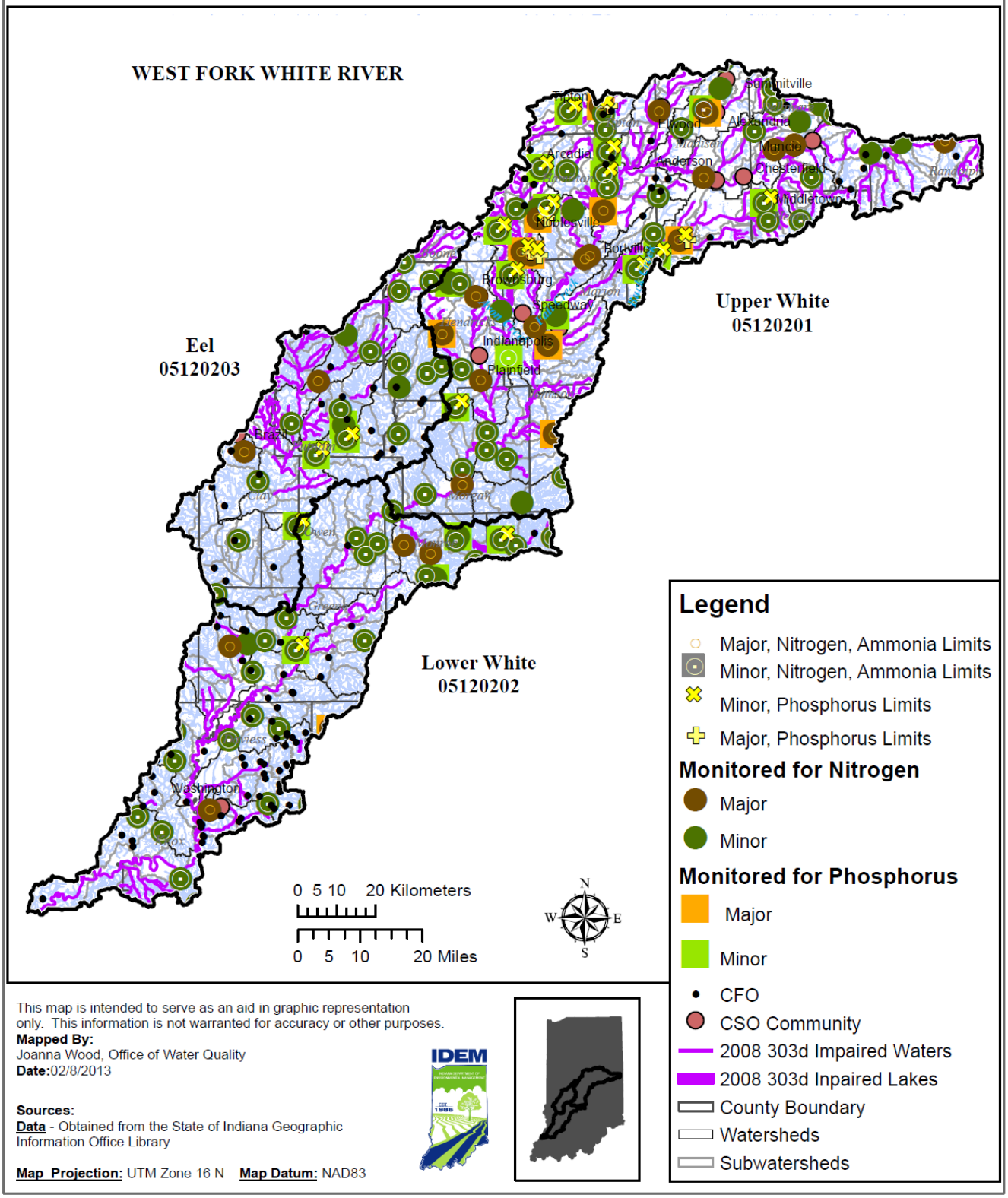
An electronic version of this strategy can be found on the ISDA website at www.isda.in.gov

If you have questions, comments or feedback about this strategy, please use ISDANutrientReduction@isda.in.gov or call (317) 232-8770.

Appendix A


Facilities with WQ Monitoring for Nitrogen and Phosphorus
Includes Data on Facilities with Permit Limit Notations
PATOKA RIVER
Patoka
05120209
Gibson
Pike
Dubois
Crawford
Orange
Patoka River
Patoka Lake
Indian Cr.
Flat Cr.
Legend
CFO
Major, Nitrogen, Ammonia Limits
Minor, Nitrogen, Ammonia Limits
Minor, Phosphorus Limits
Major, Phosphorus Limits
Monitored for Nitrogen
Major
Minor
Monitored for Phosphorus
Major
Minor
CSO Community
2008 303d Impaired Waters
2008 303d Inpaired Lakes
County Boundary
Watersheds
Subwatersheds
0 5 10 20 Kilometers
0 5 10 20 Miles
N
W
E
S
This map is intended to serve as an aid in graphic representation only. This information is not warranted for accuracy or other purposes.
Mapped By:
Joanna Wood, Office of Water Quality
Date:02/8/2013
Sources:
Data - Obtained from the State of Indiana Geographic Information Office Library
Map Projection: UTM Zone 16 N Map Datum: NAD83
IDEM

Facilities with WQ Monitoring for Nitrogen and Phosphorus
Includes Data on Facilities with Permit Limit Notations



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Joanna Wood, Office of Water Quality
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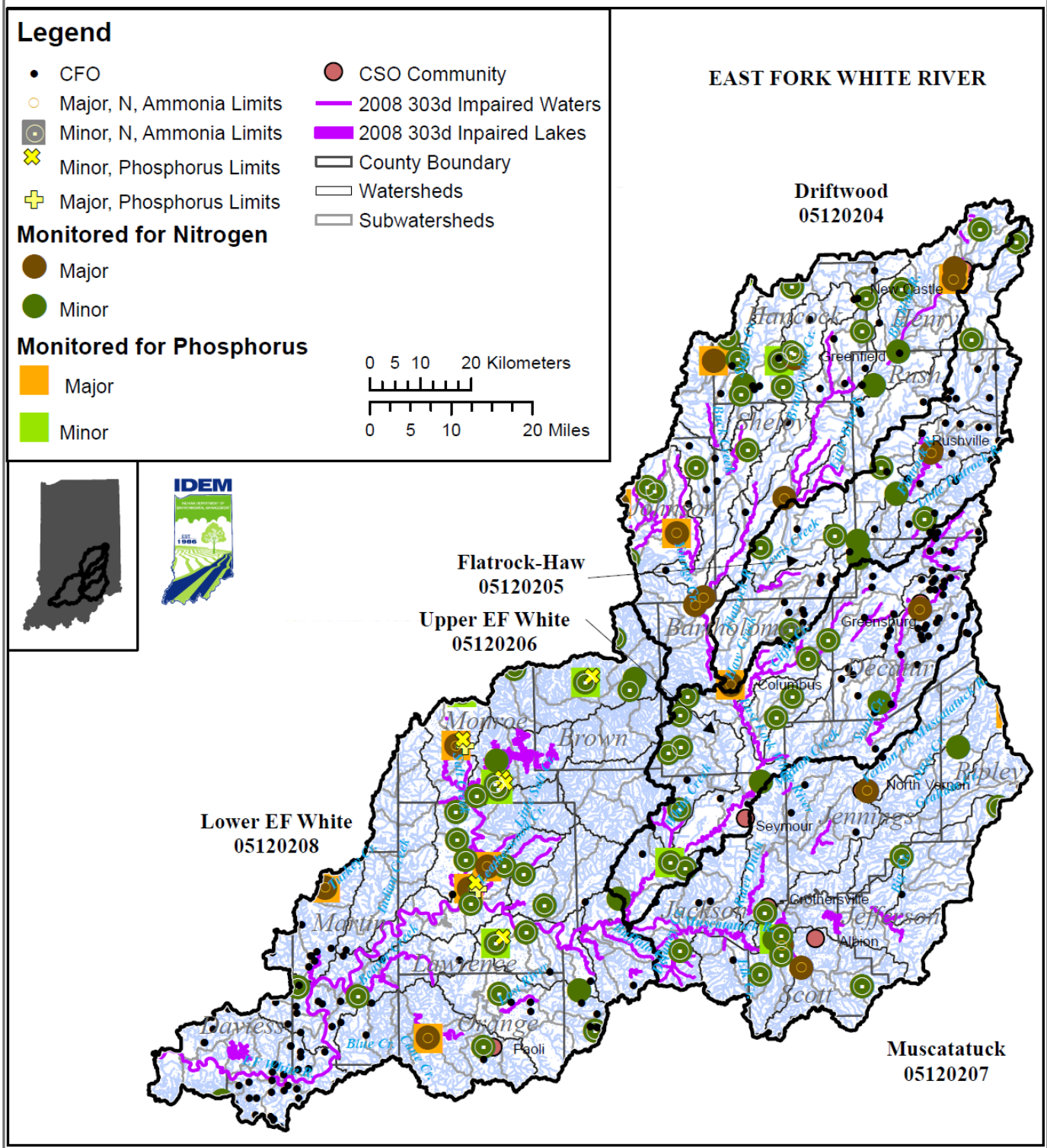

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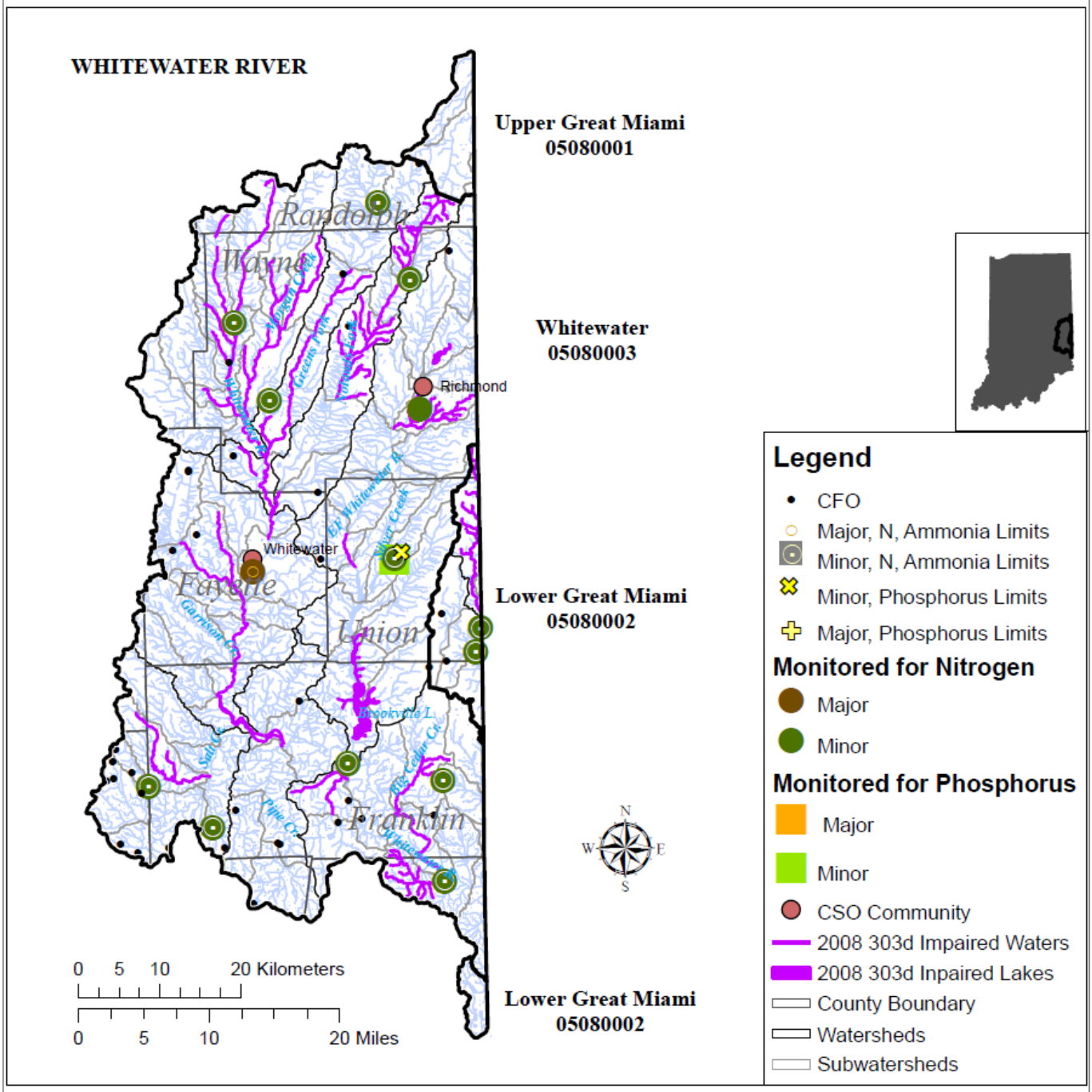

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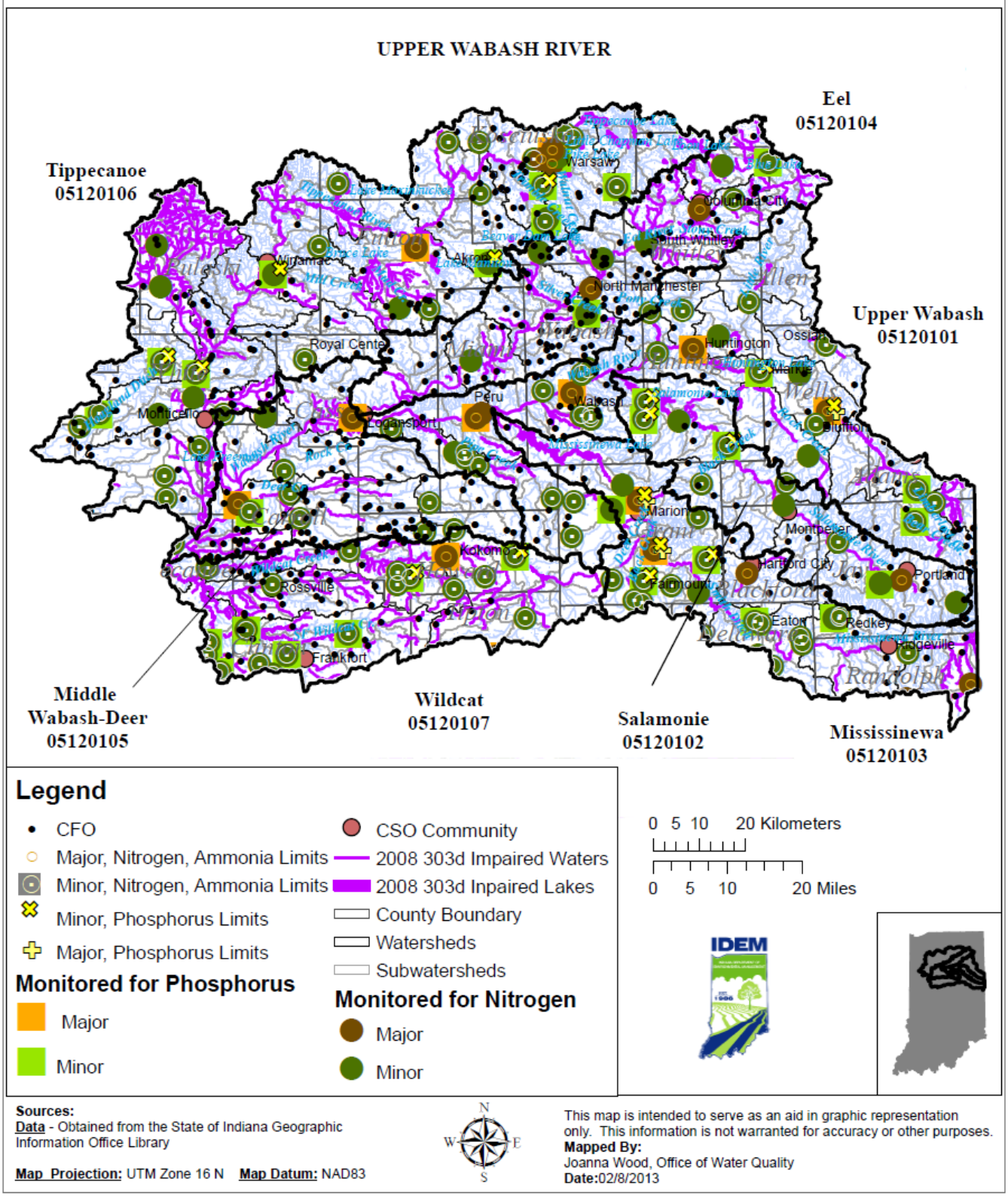

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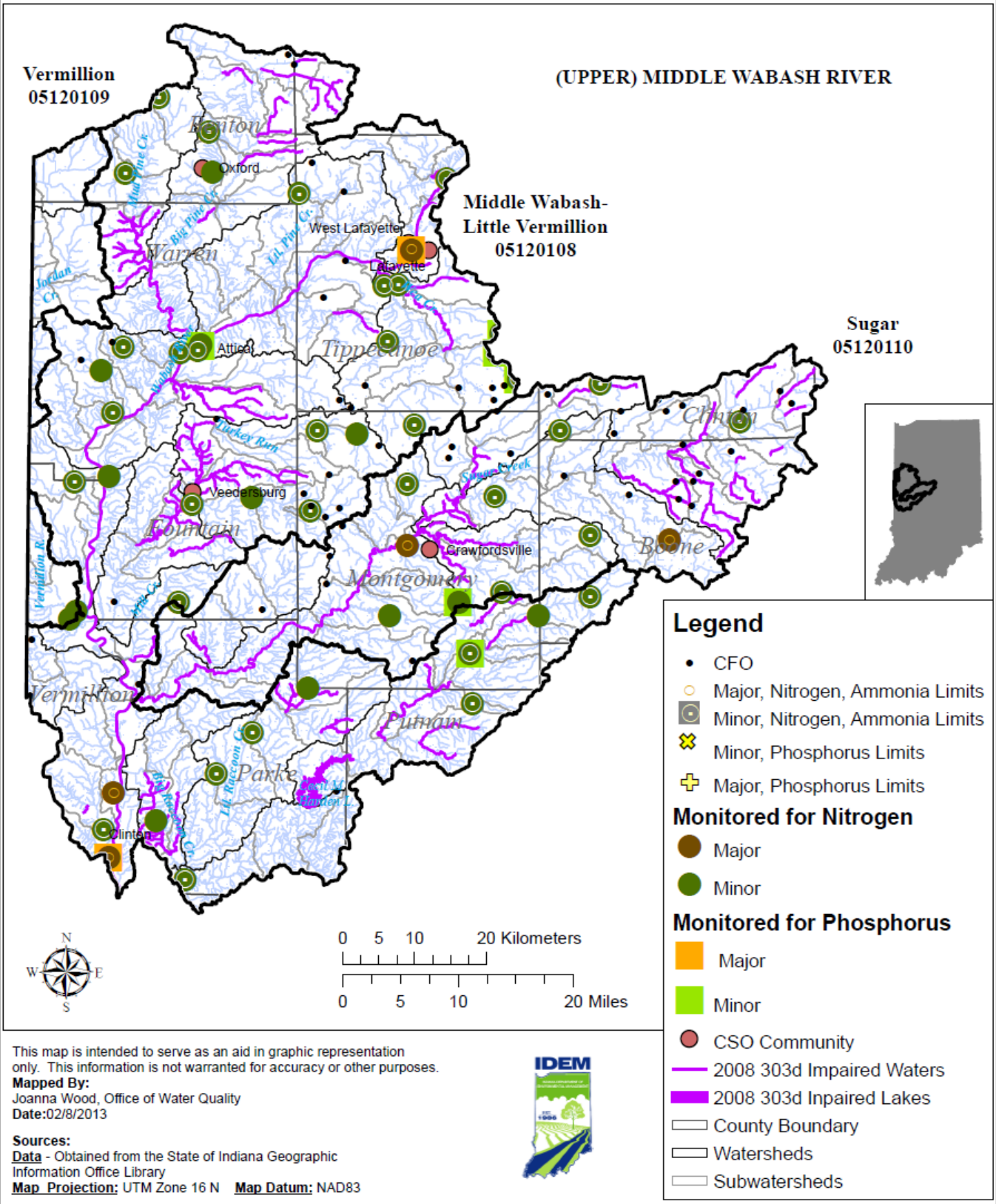

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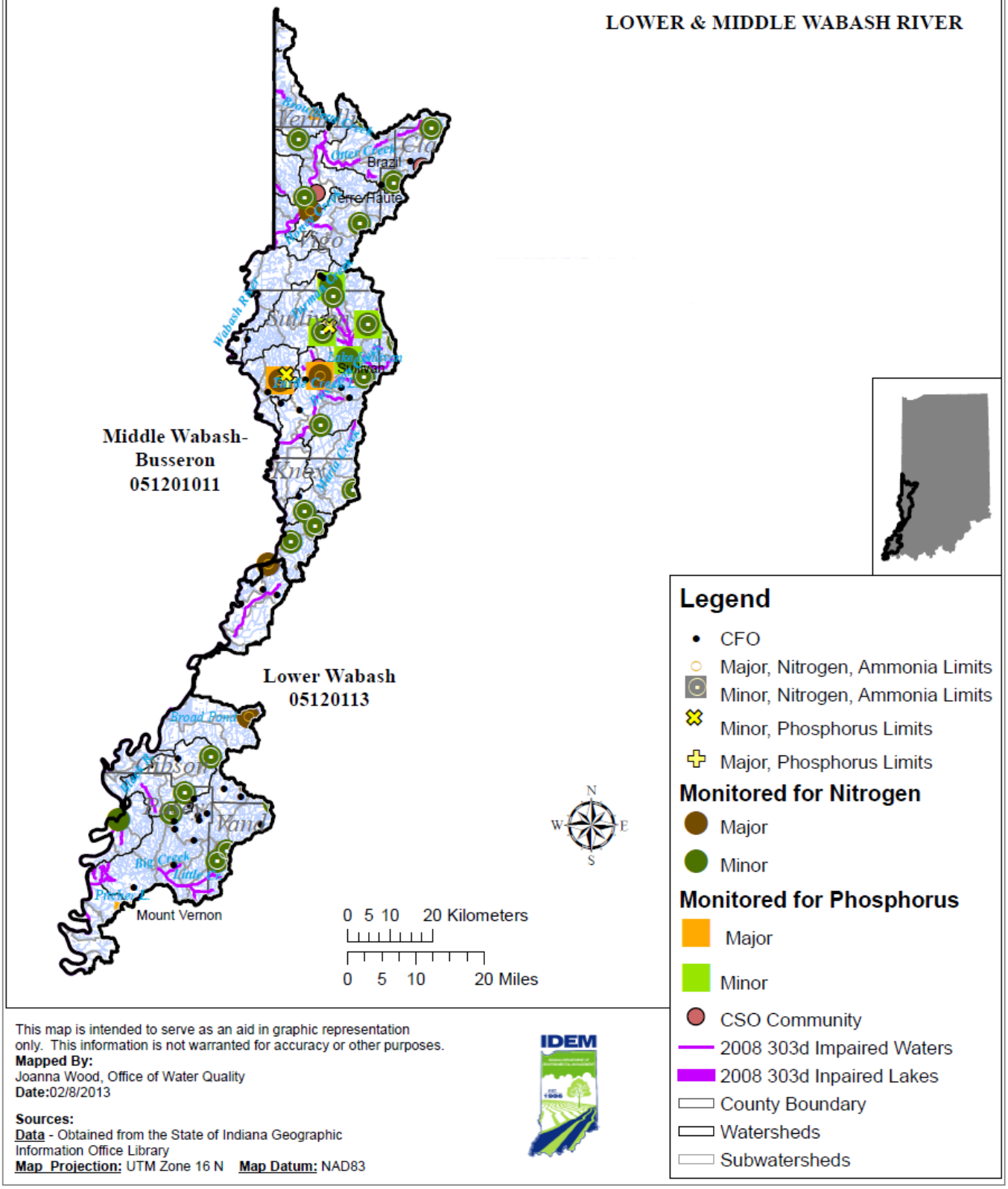

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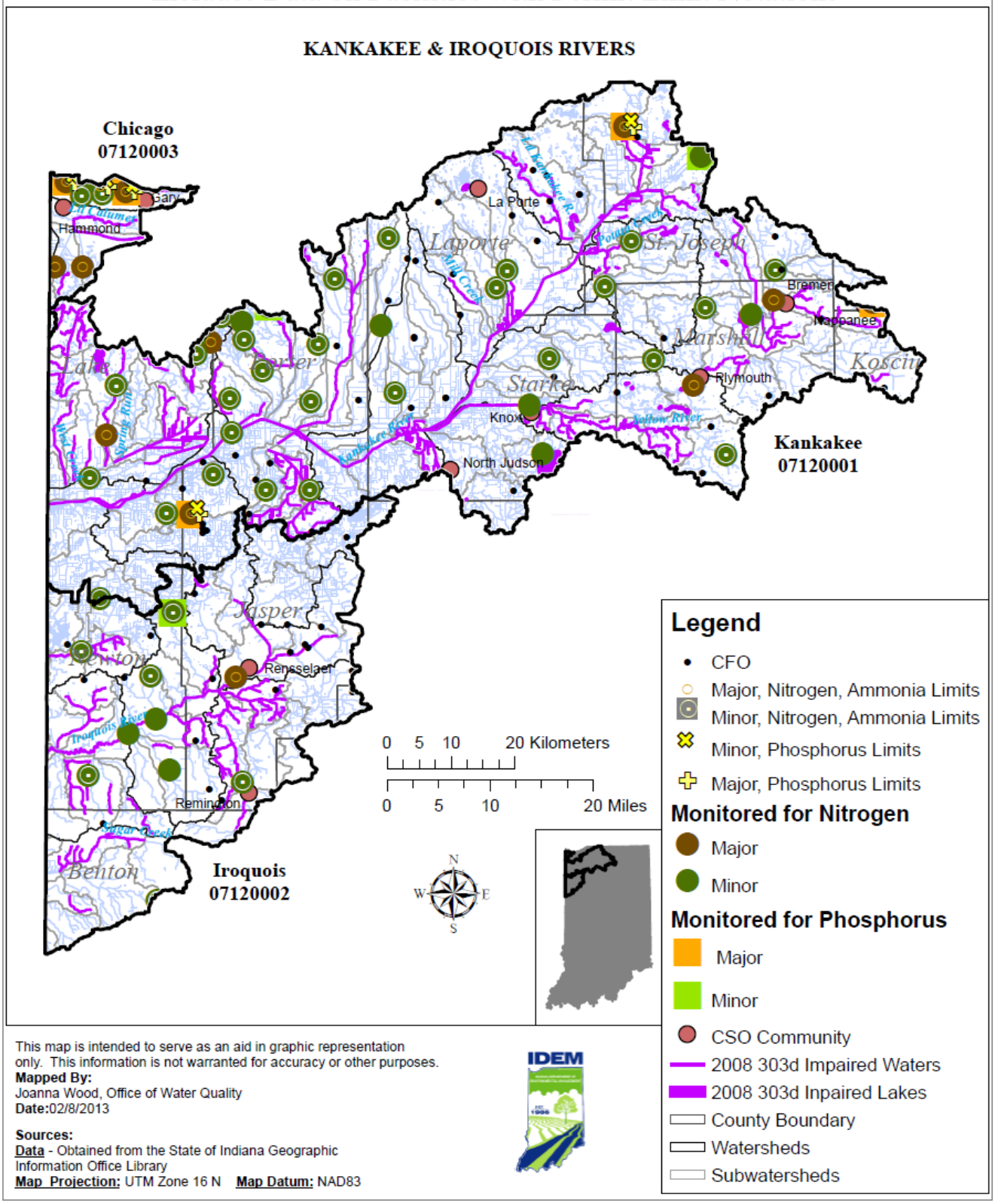

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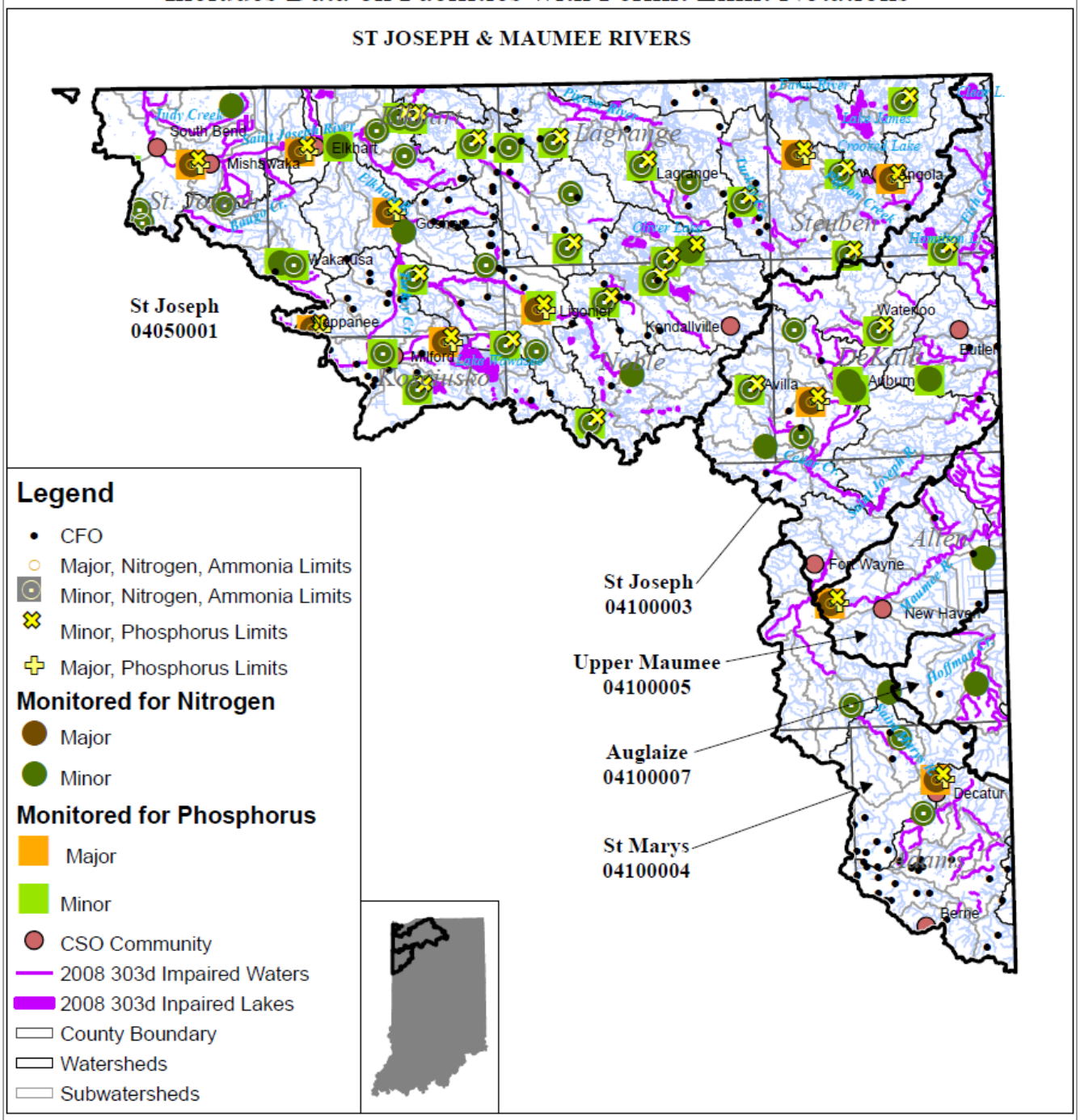

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N W E S

0 5 10 20 Kilometers

0 5 10 20 Miles

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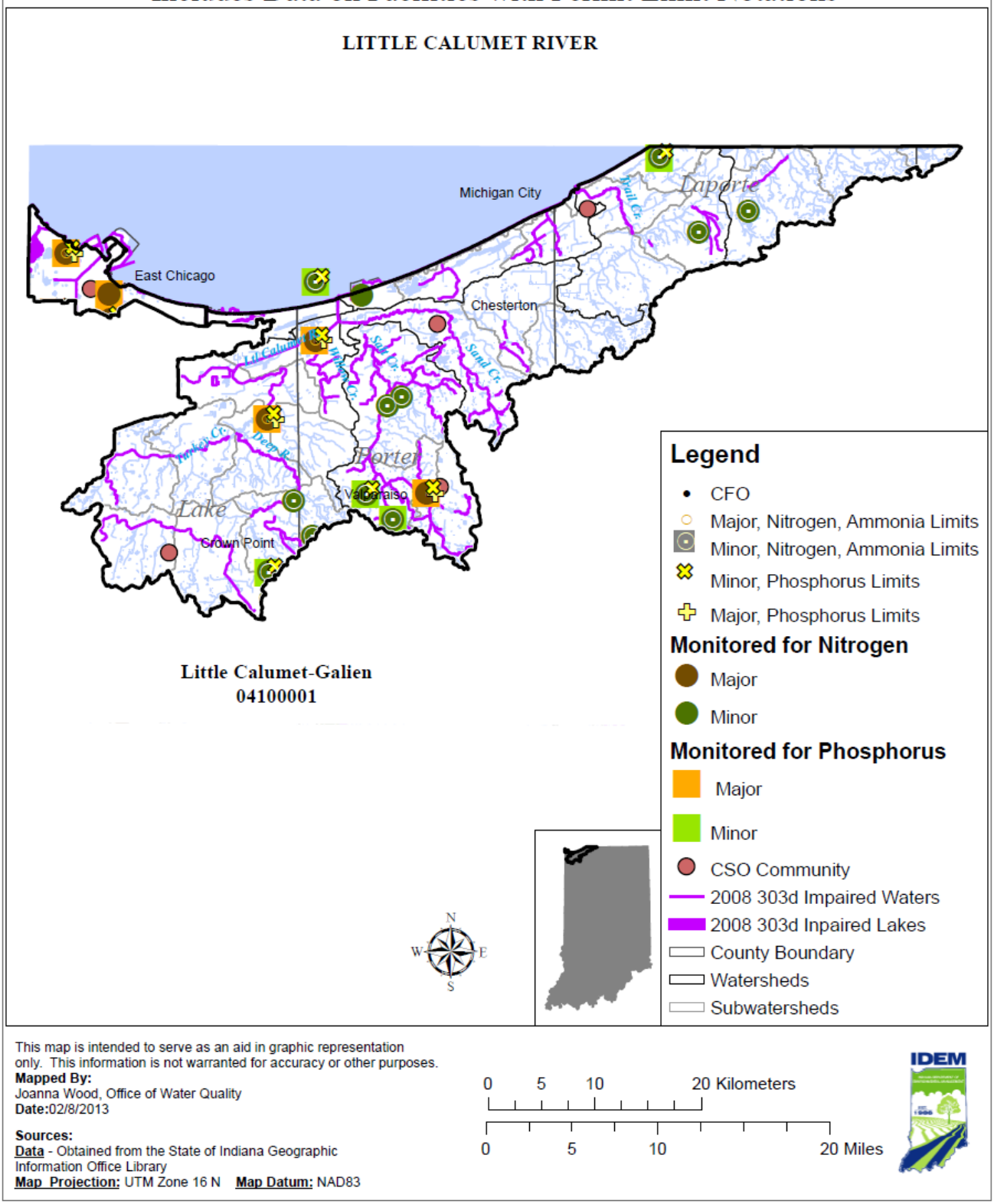

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0 5 10 20 Kilometers

0 5 10 20 Miles

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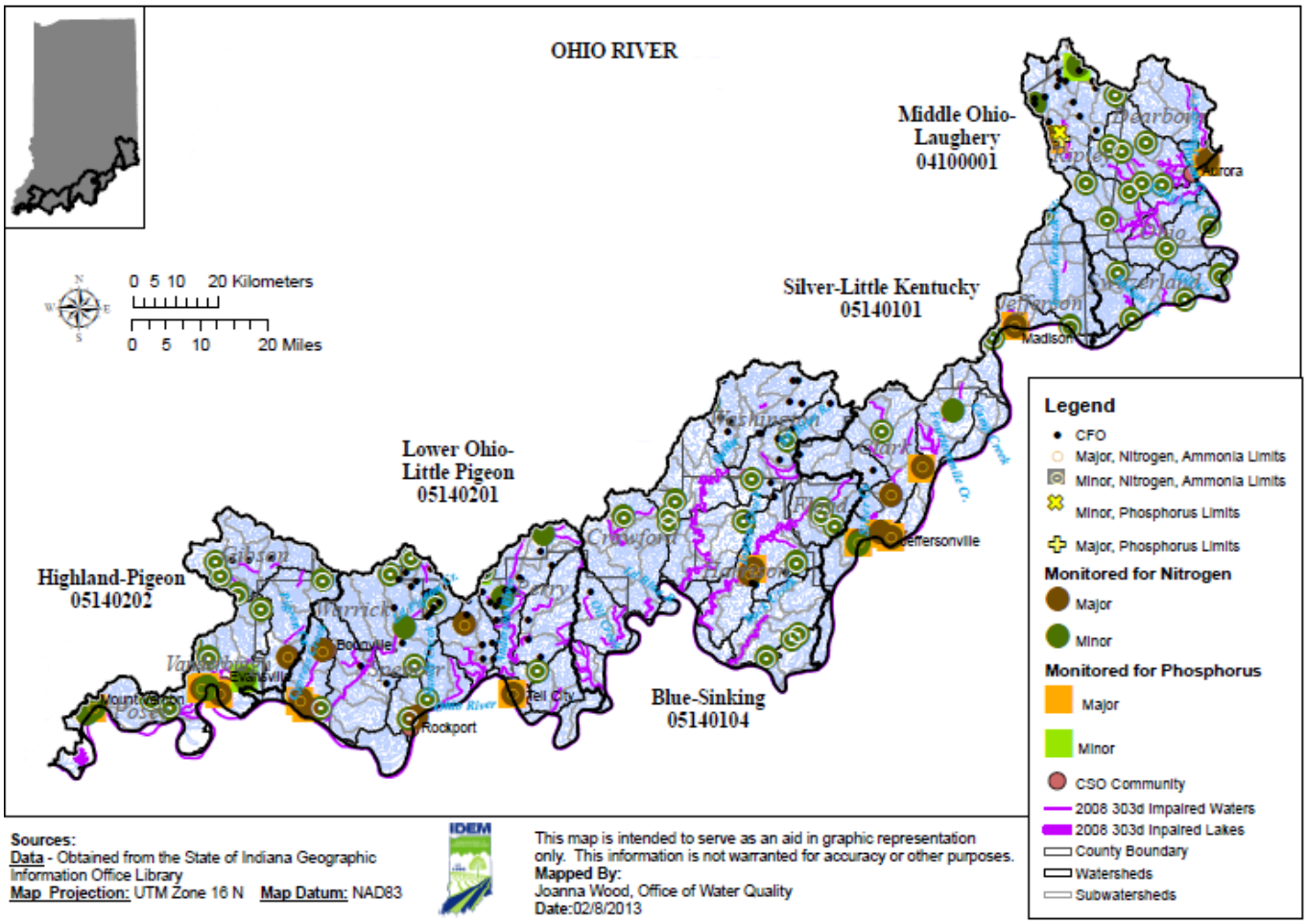

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Joanna Wood, Office of Water Quality
Date:02/8/2013

Watershed Assessment and Planning Branch Monitoring Activities 2015-2016

Fixed Station Monitoring	2015	Parameters	
Watershed or Waterbody Name(s)	165 sites throughout all 9 watershed: Divided into 16 routes sampled monthly (2 added in April 2014 for NWQI)	CHEMISTRY (dissolved vs. total metals at 12 selected sites geographically representative): Alkalinity, Hardness, Calcium, Magnesium, Ammonia-N, Nitrate+Nitrite-N, Nitrogen-TKN, Phosphorous-Total, COD, TOC, BOD, Solids-Total, Solids-Suspended, Solids-Dissolved, Fluoride, Chloride, Sulfate, Cyanide-Total, Cyanide-Free, Cyanide-Amenable, Arsenic (µg/l), Cadmium (µg/l), Chromium-Total (µg/l), Copper(µg/l), Iron (µg/l), Lead (µg/l), Manganese (µg/l), Nickel (µg/l), Potassium (µg/l), Sodium (µg/l), Zinc (µg/l), *E. coli*, RADIOLOGICAL (select sites, drinking water intakes): Alpha (gross), Beta (gross) FIELD: Turbidity, DP, pH, Temperature, Specific Conductance, Weather coding ORGANICS/PESTICIDES (select sites, drinking water intakes): Hexachlorocyclopentadiene, Desethylatrazine, Desisipropylatrazine, Hexachlorobenzene, Simazine, Atrazine, Cloazone, Pentachlorophenol, Lindane, Terbufos, Acetochlor, Alachlor, Heptachlor, Metolachlor, Chlorpyrifos, Cyanazine, Penimethalin, Heptachlor Epoxide, Ocychlordane, Gamm-Chlordane, Alpha-Chlordane, Trans-Nonachlor, endrin, Cis-Nonachlor, P,P'-DDT, Bis(2-Ethylhexyl)adipate, Methoxychlor, Bis(-Ethylhexyl)phthalate, Benzoapyrene, Trifluralin, Aldrin, Dieldrin, Propachlor	
Laboratory Analytical Costs/Funding Source	ISDH/106		
Probabilistic Monitoring	**2015**	**Parameters**	**2016**
Watershed or Waterbody Name(s)	Upper Wabash River Basin	*E. coli*, Aluminum, Antimony, Arsenic, Calcium, Cadmium, Chromium, Copper, Lead, Magnesium, Nickel, Selenium, Silver, Zinc, Alkalinity, Total Solids, Dissolved Solids, Total Suspended Solids, Sulfate, Chloride, Hardness, TKN, Ammonia- Nitrogen, Nitrate/Nitrite, Total Phosphorous, TOC, Cyanide-Total, Cyanide-Weak Acid Dissociable, Chemical Oxygen Demand, Dissolved Oxygen, D.O. Saturation, pH, Specific Conductance, Temperature, Turbidity, Fish, Macroinvertebrates, Periphyton, Seston, Habitat	Lower Wabash River Basin
Hydrologic Unit Code(s)	05120101, 05120102, 05120103, 05120104, 05120105, 05120106, 05120107		05120108, 05120109, 05120110, 05120111, 05120113
Laboratory Analytical Costs/Funding Source	Pace Analytical, IDEM Mobile *E. coli* Lab, USGS Algal Biomass Lab, IDEM Fish, Macroinvertebrate and Algal Lab for Specimen Identification		Pace Analytical, IDEM Mobile *E. coli* Lab, USGS Indiana Algal Biomass Lab, IDEM Fish, Macroinvertebrate and Algal Lab for Specimen Identification
Watershed Characterization Studies	**2015**	**Parameters**	**2016**
Watershed or Waterbody Name(s)	(fall 2014 thru fall of 2015) South Fork Blue River	Water sampling monthly for alkalinity, total solids, total suspended solids, total dissolved solids, sulfate, chloride, hardness, ammonia-nitrogen, total Kjeldahl nitrogen, nitrate+nitrite-nitrogen, total phosphorous, total organic carbon and chemical oxygen demand. Field measurements pH, DO, temperature, turbidity, and specific conductance. *E. coli* will be done 5X, flow monthly, Fish, Macroinvertebrates, Habitat , temperature, turbidity, and specific conductance. *E. coli* will be done 5X, flow monthly, Fish, Macroinvertebrates,	TBD

Hydrologic Unit Code(s)	0514010406		
Laboratory Analytical Costs/Funding Source	IDEM Mobile *E. coli* lab ISDH		

Performance Measure Monitoring	2015	Parameters	2016
Watershed or Waterbody Name(s)	Fish Creek, Flowers Creek, , Indian Creek	May vary from year to year depending on the impaired listing. BMPs implemented, critical areas, & land use. E. coli, Dissolved Oxygen, D.O. Saturation, Turbidity, Specific Conductance, Temperature, pH, Ammonia- Nitrogen, Total Phosphorous, Nitrate/Nitrite, TKN, Dissolved Solids, Suspended Solids, Fish, Macroinvertebrates, Habitat	TBD
Hydrologic Unit Code(s)	041000030406, 051201040601, , 050902030902		TBD
Laboratory Analytical Costs /Funding Source	TBD, IDEM mobile *E. coli* lab, IDEM Fish, and Macroinvertebrate Lab for Specimen Identification IDEM mobile *E. coli* lab		TBD, IDEM mobile *E. coli* lab, IDEM Fish, and Macroinvertebrate Lab for Specimen Identification

Toxic Algae Monitoring	2015	Parameters	2016
Watershed or Waterbody Name(s)	Designated swimming beaches in the lakes at the following state owned parks or managed recreation areas: Potato Creek, Pokagon, Chain-o-Lakes, Mississinewa, Salamonie, Raccoon Lake (aka Cecil M. Harden Reservoir), Monroe (2 beaches), Hardy, Whitewater, Brookville (2 beaches), Deam Lake and Starve Hollow	Cyanobacterial identification and Cell Enumeration, Microcystin and Cylindrospermopsin and Anatoxin a toxin analysis	Designated swimming beaches in the lakes at the following state owned parks or managed recreation areas: Potato Creek, Pokagon, Chain-o-Lakes, Mississinewa, Salamonie, Raccoon Lake (aka Cecil M. Harden Reservoir), Monroe (2 beaches), Hardy, Whitewater, Brookville (2 beaches), Deam Lake and Starve Hollow
Laboratory Analytical Costs ($)/Funding Source	IDEM Algal Lab/106		

Fish Tissue Monitoring	2015	Parameters	2016
Watershed or Waterbody Name(s)	Great Lakes Basins Ohio River Valley Basins (Lake Michigan - up to 10 samples will be collected by DNR & analyzed by IDEM)	Percent Moisture, Percent Lipid, PCBs, Organochlorine-Pesticides, Cadmium, Selenium, Lead, Total Mercury (and possibly methylmercury)	(4-5 samples will be collected from Lake Michigan by DNR & analyzed by IDEM) West Fork White River (WFWR) Basin Patoka River Basin (Lake Michigan - up to 10 samples will be collected by DNR & analyzed by IDEM)
Hydrologic Unit Code(s)	Lake Michigan Basin HUC 0404* Lake Erie Basin HUC 0410* Ohio River Valley HUC 0514*		WFWR HUC 05120201, 05120202, 05120203 Patoka River Basin HUC 05120209

Watershed Assessment and Planning Branch Monitoring Activities 2015-2016

Laboratory Analytical Costs /Funding Source	Pace/IN Lab Account		Pace/IN Lab Account
Special Studies	**2015**	**Parameters**	**2016**
Reference Site Selection	At least 20 candidate reference sites (TBD) near the Probabilistic Monitoring Basin (Upper Wabash) and/or contained within the Watershed Characterization Study (South Fork Blue River). Sampling will include fish, macroinvertebrates, diatoms, habitat evaluations, and at least in-situ water chemistry (ideally laboratory water chemistry parameters, algal biomass, and flow as resources allow). Laboratory Analytical Costs/Funding Source: TBD USGS Indiana Algal Biomass Lab, IDEM Fish, Macroinvertebrate and Algal Lab for Specimen Identification	Aluminum, Antimony, Arsenic, Calcium, Cadmium, Chromium, Copper, Lead, Magnesium, Nickel, Selenium, Silver, Zinc, Alkalinity, Total Solids, Dissolved Solids, Total Suspended Solids, Sulfate, Chloride, Hardness, TKN, Ammonia- Nitrogen, Nitrate/Nitrite, Total Phosphorous, TOC, Cyanide-Total, Cyanide-Weak Acid Dissociable, Chemical Oxygen Demand, Dissolved Oxygen, D.O. Saturation, pH, Specific Conductance, Temperature, Turbidity, Fish, Macroinvertebrates, Periphyton, Seston, Habitat, Flow	At least 20 candidate reference sites (TBD) near the Probabilistic Monitoring Basin (Lower Wabash) and/or contained within the Watershed Characterization Study (TBD). Sampling will include fish, macroinvertebrates, diatoms, habitat evaluations, and at least in-situ water chemistry (ideally laboratory water chemistry parameters, algal biomass, and flow as resources allow). Laboratory Analytical Costs/Funding Source: TBD USGS Indiana Algal Biomass Lab, IDEM Fish, Macroinvertebrate and Algal Lab for Specimen Identification
Hydraulic Controlled Release Facilities	Adams Lake Bryant Dupont Lakeville Atlanta Tri-Lakes RSD Center Point Little Raccoon RSD Lyons Morgantown Silver Lake Wakarusa Holton Lakeville Michigantown		No Sampling
Laboratory Analytical Costs /Funding Source	ISDH/106		
Thermal Verification Studies? (July/August sampling)	Cayuga EGS – Wabash River Wabash EGS – Wabash River Perry K EGS –W.F. White River	Fish & Macroinvertebrate Community, Fish Tissue Contaminants, surficial contaminant chemistry & Toxicity Sampling, Habitat & Water Chemistry Analyses , including Water temperature measures	Ratts EGS – White River Petersburg EGS – White River Stout EGS –W.F. White River Eagle Valley EGS – W.F. White River
Laboratory Analytical Costs /Funding Source	URL/ Pace		URL/ Pace

	IDEM Fish and Macroinvertebrate Lab for Specimen Identification No analytical services laboratory needs anticipated		IDEM Fish and Macroinvertebrate Lab for Specimen Identification
Grand Calumet River Area of Concern	Assist U.S. Fish and Wildlife Service with sampling up to 20 sites in the Grand Calumet River Area of Concern (possibly 2 staff from IDEM). Laboratory Analytical Costs/Funding Source: TBD; however, U.S. Fish and Wildlife Service responsible for processing samples	Fish tissue contaminants, sediment toxicity and chemistry, fish and macroinvertebrate community, and habitat evaluations	No Sampling

Appendix C – Nutrient Management/Soil Health Strategy 10-year Framework

Revised Recommendations and Checklist of Success

2012-2013

- ☒ Review and develop models for organizational structure and program implementation
- ☒ Establish organizational structure to develop implementation strategies, coordinate activities of partners, and track progress of plan implementation
- ☐ Establish a council made up of representatives of partners and agricultural organizations to discuss analysis and research needs as well as to serve as a clearinghouse for educational materials
  - ☐ Create a focus on local research using on-farm trials which are conducted under research protocols and with a focus on cutting-edge information
- ☒ Review appropriation of local, state and federal resources expended in Indiana to determine whether money and staff directed for water quality improvements, soil health, and nutrient management are efficiently used and in a complementary manner
- ☐ Develop and implement an educational strategy for education on soil health (focusing on implementing no-till, cover crops, advanced nutrient and pest management, crop rotations, buffers and smart drainage where appropriate) and the 4Rs (Right Source, Right Rate, Right Time, Right Place)
  - ☐ Create and adapt educational material in conjunction with government partners, university researchers and extension, the fertilizer industry, and Certified Crop Advisors (CCAs)
  - ☐ Focus initially on agricultural nutrient retailers and consultants who advise farmers so that they can provide better information on nutrient management and conservation practices
    - ☐ Efforts should include all nutrient forms, including using available manure and poultry litter in addition to commercial fertilizer
  - ☐ Start an outreach program to encourage soil sampling which relies upon correct sampling procedures and that focuses on collecting data of sufficient scale to allow for improved nutrient management decisions
  - ☐ Work to encourage cooperation and partnerships among nutrient retailers, third-party brokers, and livestock and poultry producers for efficient use of manure and compost
  - ☒ Share responsibility for providing speakers at organization, commodity and industry meetings to expose farmers, retailers, and consultants to nutrient management and soil health initiative
  - ☒ Work with media to provide an additional forum for communication of the initiative
  - ☒ Identify partners within academia and Purdue Extension to provide university led educational programming in conjunction with association activities
- ☒ Continue conducting outreach on the updated Confined Feeding Operation (CFO) and Concentrated Animal Feeding Operation (CAFO) National Pollutant Discharge

Elimination System (NPDES) Rules administered by the Indiana Department of Environmental Management

- ☐ Work with CCAs, organizations and partner agencies who are leading local peer groups to develop a standard whereby data can be aggregated to later share at the local level as an educational tool
- ☒ Work with agency partners to determine appropriate criteria and process for establishing priority watersheds and making appropriate watershed designations
  - ☒ Utilize partner organization and government agency information on existing watershed projects
  - ☐ Consider existing nutrient loading
  - ☐ Create initial focus on areas where water quantity issues have a disproportionate impact upon nutrient loss
  - ☐ Consider potential to impact farmer attitudes and practice implementation through education and outreach
- ☐ Establish programs for strategy implementation in priority watersheds
  - ☐ Establish baseline data for priority watersheds
  - ☐ Identify mechanisms and sources of nutrient loss in priority watersheds
  - ☐ Identify practices which can be used to reduce nutrient loss in that watershed and conduct outreach to farmers, ag retailers, consultants and advisors, and partner organizations
  - ☐ Develop a process to account for implementation of soil health strategies as well as improvements in soil health and reduction in nutrient loss
- ☒ Develop baseline data of farmer attitudes towards nutrient management and soil health practices as well as practice implementation
  - ☐ Use existing data from organizations such as the National Agricultural Statistics Service and Universities
  - ☒ Conduct surveys of farmers across the state
  - ☐ Conduct surveys of CCAs and other crop advisers to determine levels of program adoption for their clients

2014-2016

- ☒ Use organizational structure to review implementation strategies previously administered and develop new strategies to implement additional efforts
  - ☒ Add new members who can provide leadership in priority focus areas

- ☐ Develop priority list of issues and questions which need to be addressed through research and education
- ☐ Establish research council of representatives from universities, agencies and ag organizations
  - ☐ Advise on key questions that need to be answered to give farmers information to compare practices and implement strategies on farm

- ☐ Identify research priority needs and opportunities to assist in creation or expansion of research opportunities to address priority issues

☐ Establish education council comprised of educators, researchers, consultants, farmers, ag organization representatives and agency staff to review educational needs for farmers and consultants

- ☐ Review existing educational materials to identify areas of need and updating
- ☐ Seek development of materials such as fact sheets and videos to provide information on nutrient management and soil health practices to farmers
- ☐ Approve materials as valid and accurate for use on www.inagnutrients.org
- ☐ Advise on strategies to enhance educational opportunities to farmers and consultants

☐ Revise and update educational materials based upon best available data

- ☐ Make materials more relevant on a local level by taking into account unique soil and climate factors as well as local production practices
- ☐ Use data from local projects to better illustrate how various practices have performed in a similar geographic area and under specific weather related conditions

☐ Continue efforts to educate on soil health and the 4Rs of nutrient stewardship

- ☒ Improve branding for the NMSH strategy
  - ☐ Develop new logo
  - ☐ Develop consistent theme to be used for educational and ad campaigns
- ☐ Identify additional avenues and partners for educational programs
- ☐ Provide education on outreach and practice implementation to key leaders, including members of the General Assembly and regulatory agencies, as well as local government officials in watersheds where soil health and nutrient implementation strategies are being implemented
- ☒ Establish a robust peer mentoring program which partners farmers implementing soil health strategies and nutrient management with farmers interested in adopting new practices
- ☐ Establish key focus areas such as timing of applications, use of efficiency products and increased use of cover crops
- ☐ Provide information to the public on soil health initiatives, nutrient management and adoption of practices

☐ Explore development of incentive programs

- ☐ Establish efforts to create or expand programs which provide assistance for practice implementation
- ☒ Seek opportunities to create "safe harbor" programs whereby farmers who implement certain nutrient management and soil health practices receive assurance that regulatory action is not taken in relation to those activities for designated periods of time

- ☐ Work to encourage expansion of cooperation and partnerships among nutrient retailers, third-party brokers, and livestock and poultry producers for efficient use of manure and compost
- ☐ Evaluate success of education strategy
  - ☐ Review outreach efforts to determine the number of people exposed to discussions on soil health and nutrient management
  - ☒ Open avenues of discussion with farmers to better understand the advice and recommendations given by fertilizer retailers, consultants and CCAs
  - ☐ Conduct surveys to determine adoption rates of new practices
- ☐ Work with partners to establish more local peer groups and expand existing groups
  - ☐ Identify geographic locations which are currently underserved or which provide production practices or soil and water management conditions that are not readily identifiable within current groups
  - ☐ Identify agencies or organizations to provide financial and technical support
  - ☐ Identify peer group leaders
  - ☐ Identify farmers for peer group inclusion, specifically seeking farmers who have been reluctant to implement soil health strategies
- ☐ Track existing watershed projects to better catalog activity and seek opportunities for collaboration and prioritization of areas with need for assistance
- ☐ Seek adoption of practices in priority watersheds and in critical areas
  - ☐ Work with partners to engage farmers in priority watersheds and in critical areas to adopt management practices which results in improved nutrient control and use
- ☐ Seek ways to provide additional financial support for adoption of practices on farm for those with the greatest financial need, including simplification and expansion of grant and cost-share programs
- ☐ Explore creation of a fund to provide assistance for analysis of on-farm practices, research, and education
  - ☒ Seek out availability of grants from organizations for soil health and nutrient management strategy implementation on farm
  - ☐ Consider increasing the fertilizer tonnage fee to provide funding for on-farm analysis, research, and educational programming
  - ☐ Explore other funding streams

2017-2022

- ☐ Use organizational structure to review implementation strategies previously administered and develop new strategies to implement additional efforts
- ☐ Continue education on soil health and nutrient management
  - ☐ Use local on-farm data in educational programming
  - ☐ Identify priority practices which have not yet been the focus of implementation activities
  - ☐ Expand outreach efforts to local, state and federal government officials on success of implementation and results

- ☐ Revise and update educational materials
  - ☐ Include revisions and additional information developed at a local level
  - ☐ Establish cost estimates for implementation of practices and economic impact of adoption
- ☐ Review and evaluate the implementation of soil health and nutrient management strategies
  - ☐ Consider impacts of regulatory programs such as the certified nutrient applicator program and the fertilizer use rule administered by the Office of Indiana State Chemist and the CFO and CAFO NPDES rule administered by IDEM
  - ☐ Consider voluntary initiatives, including those using programs developed under the soil health and nutrient management strategy
  - ☐ Consider support programs on nutrient management, soil health and water quality
  - ☐ Monitor practice implementation and farmer attitudes through surveys
    - ☐ Review existing data from organizations such as NASS and universities
    - ☐ Conduct follow-up surveys of farmers, CCAs and other crop advisors
    - ☐ Monitor program implementation in priority watersheds
  - ☐ Use water sampling data, where it exists, to review program implementation effectiveness.
- ☐ Continue expansion of peer groups
- ☐ Explore expanding the certified nutrient applicator program to include all nutrient application activities
- ☐ Focus efforts on development and implementation of green infrastructure and technology
  - ☐ Lead a review of drainage practices in Indiana to determine how to better manage water resources, including on-farm drainage
  - ☐ Explore opportunities for innovative technologies such as two-stage ditches, constructed wetlands, bioreactors, blind inlets, and tile-line management
  - ☐ Increase efforts for adoption of manure management technologies such as digesters