Summaries of IWRA Meeting – Wednesday June 1, 2011

By Sandy Haefner, IUPUI

Oral Session

1) **The Nature Conservancy's Initial Strategies for a Lasting Contribution in the Wabash Watershed**

   John Shuey of The Nature Conservancy explained the efforts TNC is taking to conserve areas in the Wabash Watershed. The Nature Conservancy is interested in the Wabash River for several reasons including the diverse variety of fish species it contains and its' unique abundance of "intact" aquatic communities. Current issues facing the Wabash include excess nutrient inputs, excess sedimentation, hydrologic alterations, and the loss of floodplain connectivity and function. Specific site based conservation strategies for each of these issues were examined including a discussion of 2 stage ditches as a strategy for dealing with issues such as altered hydrology as well as excess nutrients and sedimentation, investment in watershed management and implementation of BMPs to deal with excess nutrients and sedimentation, and reforestation as well as other initiatives to restore floodplain function. The Nature Conservancy's role for many of these strategies will be to act as a catalyst for action by motivating individuals and organizations to engage in conservation-minded practices.

2) **Evaluation of Constructed Wetland in Agricultural Watersheds to Improve Drinking Water Quality**

   Maria Lemke of The Nature Conservancy explained a watershed project examining the effectiveness of BMPs on water quality, hydrology, and biodiversity of several wetland systems of the Mackinaw River in Illinois. Their methods included biotic surveys and outreach efforts conducted by a local landowner in the form of one-on-one interviews and surveys. The water quality parameters measured included temperature, oxygen, conductivity, turbidity, nutrients, and TSS. One study design was a paired-watershed approach that compared a watershed with few BMPs and one with a lot of BMPs. The most often used BMPs in the area included strip till farming, riparian buffers, and grassed waterways. They concluded that intensive outreach efforts can yield a greater acceptance and implementation of management practices but unless tile drainage is specifically addressed in restoration or conservation efforts, one cannot see significant changes in the measured water quality.

3) **Asian Carp Know No Boundaries**

   David Nance of the Indiana Department of Natural Resources Division of Water discussed recent efforts to install an Asian carp barrier fence near Eagle Marsh in Fort Wayne, IN. He discussed the need for such a fence explaining the ecological impacts bighead and silver carp have on

aquatic life. The IDNR's strategies for dealing with these fish are to reduce their population numbers and prevent range expansion. One such way to reduce their range is by closing close critical watershed connections – which is exactly what IDNR, USGS, and several other agencies are attempting to do with the installation of an eight foot fence on a floodplain separating the Wabash River from the Maumee River and the Great Lakes. He explained how this fence will still allow the area to retain all of the benefits of the floodplain but will also act as a temporary measure to prevent the spread of the Asian carp. One highlight was the use of flood inundation mapping to identify possible areas of carp migration during high streamflows.

4) **A Process-Based Restoration Approach for the Wabash River Ecosystem**
In his presentation, Mark Pyron of Ball State University discussed the need to prevent further degradation of the Wabash River ecosystem, historic causes of degradation including reservoir releases and municipal wastes, and current issues facing the Wabash River. These issues include nutrient release from agricultural practices and sewage treatment plants, hydrologic alterations caused by reservoir releases and agricultural practices, an increase in lack of floodplain connections, and invasive species. Process-based restoration efforts are those that restore rivers to natural ecosystems that copy natural biological, chemical, and physical processes. To do this it is necessary to define the central problem, choose methods consistent with the physical and biological potential of the system, choose a scale that is appropriate for the problem, and make predictions about the expected outcomes – if a project's outcomes are not what is expected, modifications should be made and a new restoration effort established. Specifically for the Wabash River, the best strategy would include efforts to examine watershed level BMPs, reconnect off-channel habitat, reduce nutrients from sewage and agricultural practices, and modify dam release methods.

5) **SWAT Model for the Wabash River Watershed: Modeling Challenges and Opportunities**
Cibin Raj, a graduate student from Purdue University, explained his efforts to develop a model for the Wabash River using Soil and Water Assessment Tool (SWAT). To calibrate his model he compared the model estimation with measured data from 2001-2009. The model's measures of stream flow, sediment, and nitrate were not precisely the same as the measured data but they did seem to capture the extent of the trends. However the model did overestimate the amount of total phosphorus which Cibin Raj hypothesized could be from the influence of reservoirs in the area. Other challenges Raj faced included the size of the area and a lack of data availability. He then illustrated a case study of the model evaluating the impacts of corn stover removal (the removal of small pieces of corn stalks from fields) on hydrology and water quality. Future plans for the model include evaluating land use and climate change impacts on crop production, hydrology, and water quality.

6) **Wabash River Angler, Recreational, Commercial Fisher Survey**
Sandy Clark-Kolakis of the Department of Natural Resources analyzed the results of a survey of individuals that use the Wabash River for both commercial and recreational purposes. The survey area consisted of the entire Wabash River – the first survey to ever take on this task – which was divided into 6 sectors, half of which were surveyed in 2005 and the other half were surveyed in 2006. For both total anglers and total recreational users, the month of July saw the largest amount of individuals using the river. The individuals using the river varied as well – the southern sectors contained many individuals coming from all areas of Indiana and Illinois whereas the northern sectors consisted of local individuals. Economically the southern sectors brought in about $1.4 million dollars in revenue and the northern sectors brought in about $393,000. They are interested in watching future trends and hypothesize the upper portion of the Wabash could begin to increase in even more value in the coming years.

7) **Comparison of Water Quality in Three Sub-Watersheds of the Wabash River**
Ron Turco of Purdue University discussed a study of several sites including Elliot Ditch, Little Pine, and Little Wea, sampled along the Wabash River since March of 2009. The majority of land surrounding Elliot Ditch consists of agriculture as well as development and therefore has a large urban influence. The land surrounding Little Pine and Little Wea is mostly agricultural. The parameters measured for each site included nitrate-nitrite, ammonia, total phosphorus, organic carbon, algae, E. Coli, total suspended solids, and enterococci. Their results suggest implementation of mitigation practices such as erosion control and riparian buffers as well as the continuation of best management practices.

8) **Indianapolis' Deep Tunnel Vision for Capturing Combined Sewer Overflows**
John Trypus of Black & Veatch addressed the issue of combined sewer overflows (CSOs) associated with the White River and Fall Creek in the city of Indianapolis. Annually 7.87 billion gallons of CSO end up in Indianapolis streams making this a big and expensive problem for environmental managers, politicians, and citizens alike. Indy's long-term program for dealing with CSOs is multifaceted including the expansion and upgrade of treatment facilities as well as the construction of new storage and conveyance systems in the form of storage tanks and a deep rock tunnel system. The Fall Creek/White River Tunnel System is designed to capture CSOs from 39 outfalls – 27 of which are along Fall Creek and 12 of which are along the White River. This system is about 11 miles long, 18 feet in diameter, and has a capacity of 120 MG.

Poster Presentations, Wednesday June 1, 2011

1) **Effects of Pharmaceuticals on Microbial Production and Respiration**
Katrina Van Zant, Ball State University

The purpose of this study was to quantify the influence of cotinine, ibuprofen, and sulfamethoxazole on microbial growth and respiration. These compounds are three of the most prevalent pharmaceuticals found in freshwater habitats and their influence on microbial activity are not yet understood. Tests were conducted under aerobic and anaerobic conditions and then compared to a control in which no modifications were made. Under anaerobic conditions all pharmaceutical treatments decreased microbial respiration. Under anaerobic conditions pharmaceutical exposure did not influence autotrophic biofilm growth and pharmaceutical exposure did not influence heterotrophic biofilm growth under aerobic conditions.

2) **Social Indicators Surveys to Shape Education and Outreach in Great Bend Region of Wabash River Watershed**
Nathan Mullendore, Purdue University

Surveys were developed and distributed for Tippecanoe county residents last year designed to analyze the public's perceptions of water quality concerns various management practices as well as to determine where there is a lack of knowledge. 715 surveys were issued to agricultural producers with a response rate of 50% and 1100 surveys were issued to urban individuals with a response rate of about 40%. Their results indicate a lack of knowledge from urban individuals concerning urban practices and specific nutrients that can act as pollutants. While agricultural producers seemed knowledgeable of nutrients and pollutants, they expressed constraints (especially financial constraints) concerning the adoption of various management practices.

Biographical Statement

Sandy Haefner is a senior at IUPUI majoring in environmental science with a concentration in water resources. This summer I am partaking in the Multidisciplinary Undergraduate Research Institute program at IUPUI and aiding several professors and scientists in their research concerning the anthropogenic transformation and impact of climate change in the Ohio Valley during the late prehistoric period. I enjoy learning about issues relating to geology and the environment, especially issues regarding water quality. My hopes for the future include entering a graduate program to study marine geology.

Summaries of IWRA Meeting – Thursday morning, June 2, 2011

By Sarah Todd, Saint Joseph's College

Influence of Subsurface Drainage on Watershed Nitrate Load Using the Variable Infiltration Capacity Model

By: Sarah Rutkowski, Purdue University

Half of Indiana is drained by tile drains and tile drainage is an important part of streamflow and the nitrate load in streamflow. The Variable Infiltration Capacity (VIC) model was used to simulate tile drainage from a small watershed and predicted tile drainage closely matched measured drainage at research farm in southeastern Indiana. Nevertheless, the model needs improvement matching drainage in winter. The next step it to apply the model to a large watershed and estimate nitrate loading from tiles. Model results will be used to design best management practices in tile drained watersheds.

Transport and Fate of Nutrients and Pharmaceutical Compounds in a Stream Receiving Effluent from a Wastewater Treatment Plant

By: Erin Looper, Indiana University

Looper's objective was: "Describe the fate and transportation of pharmaceuticals and personal care products (PPCP's) in relation to their discharge from a waste water treatment plant". She conducted her test by releasing a salt solution into the river and timing how long it takes to get to the designated downstream location. This allows Erin to figure the flow of water down the stream and when to sample the same parcel of water at various points as it flowed downstream (Lagrangian transport). She discovered various pharmaceuticals in the water such as; pain killers, caffeine, acetaminophen and others. PPCP's were present, Looper believes they can be transported long distances, and she also noticed a seasonal change in results. Dilution, rather than transformation was the main process controlling concentrations in her study.

Hormone Transport In a Tile-Drained Agro ecosystem

By: Heather Gall, Purdue University

Gall compared pasture raised livestock to CAFO's (concentrated animal feeding) with the objective to examine hormone discharge from both. Over 80% of the time Gall found hormones in the water, 66-96% of the time she found estrogen in her samples. Gall determined the majority of estrogen and hormones were deposited during high flow events. Large concentrations of hormones in spring snowmelt suggested that hormones persist in soil over the winter.

Response of Algal, Invertebrate and fish Communities to Nutrients in the Upper Midwest

By: Jeff Frey, USGS and Shivi Selvaratnam, IDEM

The presenters explained past research that showed that Indiana is in a nutrient rich area and there are no strong relations between nitrogen and phosphorus concentrations in streams and algal biomass in streams. A new study of the upper midewest region looked at biological community responses (such as the percent of algae-eating fish) in relation to nutrient concentrations and found many ecologically significant responses in the relatively nutrient poor northern regions but fewer responses in the nutrient rich southern regions. Breakpoint analysis for nitrogen in the relatively nutrient poor northern regions showed multiple algal, invertebrate, and fish attributes at about 0.60 mg/L for low nutrient conditions and at about 1.2 mg/L for high nutrient conditions.

Top Ten Watershed Management Tools Developed In Indiana

By : Jane Frankenburger, Purdue University

Frankenberger presented 8 web-based tools that were developed in Indiana

#8- Hydrologic Unit Code (HUC) Finder

#7-Indiana Map

#6-Indiana H2O Monitoring Inventory

#5-Catalogue of Monitoring Protocols used by Indiana Agencies

#4-Who is doing the Monitoring

#3-Online Watershed Delineation tool

#2-Online Load Duration Curve

#1-WEPP Online watershed version

Physical and Hydrological Characteristics of the North Branch Elkhart River

By: David Nance, IDNR

Nance talked about the Silver Jackets and how they have helped the people of Elkhart raise their homes. The Silver Jackets are a group of people who help solve natural disasters. Nance explained how flooding is the #1 natural disaster in Elkhart, due to its city layout. Homes are built in the designated flood plain area and are being destroyed when it floods. This is when the Silver Jackets play a big role to their society. Nance concludes that there is no feasible construction solution to their problems, it's all natural. In order to reduce the flooding the river would need to move faster.

(www.iwr.usace.army.mil/hfrmp/state/factindiana.cfm)

Determination of Wetlands for Restoration Using Stream Flow Statistics and Flood Inundation Techniques

By: Moon Kim, USGS

Moon Kim talked about the WRP program (Wetland Reserve Program). This program works with the land owners to help restore and improve the wetlands. The WRP program can help with water quality, and can also help with flashiness of the river (reduce flooding). Inundation modeling/mapping was used to identify wetlands that could be in the WRP. The mapping was based upon streamflow statistics collected at nearby gauging stations on the Wabash River. The highest 7-day period of flow that occurs every 2 years was used and the water levels at this flow were linearly interpolated between gagues. Delineated wetlands must be field verified before inclusion in the WRP.

Hydrologic Characteristics of a Managed Wetland and a Natural Riverine Wetland along the Kankakee River

By: Les Arihood, USGS

Groundwater models were developed for two wetlands. The managed wetland had canals and flooded areas that affected and complicated the ground water flow patterns. The natural wetland had a very simple pattern of flow that depended on level of water in the Kankakee River, on groundwater levels further inland, and on precipitation. At higher river levels water flowed into the wetland. At low river levels the wetland flowed into the river. Streambed permeability was higher when river levels and streamflow were higher and lower when river levels and streamflow were lower.

Poster Presentations, Wednesday June 1, 2011

Abundance of Pharmaceuticals in Near-Shore Habitats of Lake Michigan

By: Patrick Ferguson, Ball State University

Pharmaceuticals were measured at the mouth of incoming rivers and at water supply intakes in southern Lake Michigan. Some pharmaceuticals were detected at every site. The most frequently detected pharmaceuticals were carbamazepine, sulfamethoxazole, paraxanthine, and caffeine. Concentrations were expected to be higher at the mouths of rivers than at the intakes, but that was not always the case.

Biographical Statement:

Sarah Todd is a biology major and earth space science minor at Saint Joseph's College in Rensselaer, Indiana and will graduate spring of 2013 with a BS in Biology. Sarah is working with the Jasper County Soil and Water Conservation District as a watershed intern on a 319 grant project for the Iroquois River in Northwest Indiana. She has always had a love for nature and is thrilled to be working on the preservation of our land and waterways.

Summaries of IWRA Meeting – Thursday Afternoon, June 2, 2011

By Cody Batchelder, Rose-Hulman Institute of Technology

Hydraulic Fracturing for Oil & Natural Gas
By: Herschel McDivitt, IDNR Division of Oil and Gas

The focal point of this presentation was to promote the responsible development of oil and gas, specifically using the process of hydraulic fracturing. Hydraulic fracturing increases the production of oil and gas from a well by creating more pathways and conduits, and it is less damaging than other methods of extraction of oil and gas. There is an ongoing debate about the environmental effects of hydraulic fracturing, but there has never been a confirmed case of hydraulic fracturing causing contamination of groundwater. Specifically in Indiana, this method of oil and gas extraction has not been utilized to its potential, but it has the potential to greatly increase the volume of shale gas extracted in this state.

Evolution of Groundwater Systems Near the Proposed Fall Creek/White River Tunnel System, Indianapolis
By: Paul Johnson, American Structurepoint Inc.

The purpose of this presentation was to address the combined sewer overflows into the White River and Fall Creek in Indianapolis. To test the outwash aquifer, 12-inch diameter test wells were installed, and constant rate pumping tests were conducted over a 72-hour time period. Water levels were measured, and the maximum results were as follows: 7-foot drawdown in the outwash aquifer, 1.96-foot drawdown in the shallow carbonate section, and .42-foot drawdown in the deep carbonate section. A regular oscillation in water levels was observed in the deep bedrock aquifer that could be interpreted to come from gravitational influences (earth tides). The pumping from the outwash aquifer was concluded to have moderate effects on the shallow bedrock aquifer, but was shown to have minimal effects on the deeper carbonate units.

Concern for Groundwater Protection along the Wabash River Greenway, Tippecanoe County, Indiana
By: Terry West, Purdue University

In Tippecanoe County, near Purdue University, there is significant concern for groundwater quality for all three different segments of the Wabash River. Some problems that are prevalent to the area are frequent flooding and, because it is the main water supply, groundwater contamination. Past practices show little or no concern for the groundwater, so a solution is needed that will keep the river as clean as possible. In the Central Segment, which is nearly completed, issues have been solved for sanitary landfills, brown sites, and leaking underground storage tanks, while buying available sites within the waterway to create a recreational area. Future plans include protecting the floodplain zone by extending the same consideration the North and South Segments as are being accomplished in Central Segment.

Indiana Water Well Web Viewer
By: Randy Maier, IDNR Division of Water

An improved function of the IDNR website allows users to view details of every registered well in the state of Indiana. Different types of wells that can be observed include bedrock known, bedrock estimated, unconsolidated known, unconsolidated estimated, unknown located and unknown estimated. Both topographic and satellite imagery are available, and several new features have been included in the enhanced web viewer. The user can search for wells by both registration number and facility, and, using the identify feature, wells can be viewed using points, boxes, lines, or polygons. Like all computer programs, practice makes perfect for learning the features of Indiana Water Well Web Viewer.

Collembola/Springtails: Macrobiologic Indicators of Microbiologic Activity Surrounding a Hydrocarbon Release

By: Bob Autio, Environmental Data & Consulting, LLC

Collembola or Springtails are white, 1-2 mm in length "bugs" found in monitoring wells downgradient of hydrocarbon releases. The Collembola have a furcula or springtail, which folds under their abdomen and allows them to jump and flee from predators. They have been observed on monitoring equipment used in wells downgradient of gasoline, fuel oil, and toluene releases. Given their association with hydrocarbon releases and their hopping motion, they are being named "hydrocarbon fleas."

Statewide Ground Water Monitoring Network

By: Rebecca Travis, IDEM Drinking Water Branch

The goals of the Ground Water Monitoring Network (GWMN) include determining the quality of groundwater in the state, filling in the groundwater data gap from previous years, and informing the public on the information found. Since 2008, 353 sites have been sampled and evaluated based on hydrogeologic settings and hydrogeologic sensitivity. High levels of nitrogen and arsenic have both been found in high and low sensitivity areas. The data results from 2008-2010 have been distributed, while the 2008-2009 summary reports are nearly completed. The next steps for GWMN include creating a website, sampling additional sites, and conducting tritium sampling for age dating the water.

Baseline Hydrology of the First Phase Ground-Source Geothermal Field at Ball State University

By: Alan Samuelson, Ball State University

The goals and reasons of the conversion to geothermal energy at Ball State University include reducing pollutants, decreasing the carbon footprint, and saving $2 million per year in energy costs. Phase One, which is on the north side of campus, includes about 1800 boreholes that sit 400 feet deep, of which each hole contains two sets of loops in each hole. This phase is nearing completion, while Phase Two, which includes the south part of the campus, is set to begin this year. For Phase Two, 2300 boreholes are planned, while only 1800 may be necessary due to the potential for these holes to sit 500 feet deep. Monitors are in place to keep data on the temperature and conductivity of the soil. With this groundbreaking geothermal project underway, Ball State University is leading the way to sustainability on college campuses.

Use of Geophysical Imaging for Characterizing Subsurface Conditions at Large-Scale Geothermal Wellfields
By: John Mundell, Mundell & Associates, Inc

In order to determine the subsurface conditions of the soil, sediments, and rocks underneath Ball State University, traditional methods take sets of data by drilling many holes into the ground and studying the samples. A new technology (geophysical imaging) was used to improve both quality and economic costs of this exploration process. Like an MRI, resistivity profiling can take "slices" of images in the ground to get detailed cross-sections of the geologic materials. Both vertical and horizontal slices can be taken. Using the old method, this amount of detail could take up to 700 days to achieve, but the new method took just three days.

Poster Presentations, Wednesday June 1, 2011

Pharmaceutical Transport and Persistence in a CAFO-Influenced Central Indiana Stream
By: Lora Smith, Ball State University

Sugar Creek flows on the west side of Indianapolis, and, along much of its length, it is adjacent to farms and pastures. Pigs and cows are fed antibiotics, and the contents of their manure wash into the creek. Concentration measurements were taken each month beginning in July 2010, and they are ongoing until July 2012. So far, the concentrations of the pharmaceuticals have been the highest in July for a reason that will require more research. Dilution is thought to be the main contributor to the lower concentrations of the pharmaceuticals as they move downstream in Sugar Creek.

Temporal Variation in Cyprinidae Morphology: Effects of 100 Years of Habitat Alterations
By: Stephen Jacquemin, Ball State University

The family Cyprinidae (minnows) was the type of fish studied for this poster presentation. For over 100 years, records have been taken of the size and shape of the fish. They have undergone significant changes over the course of the records, which date back to 1900. Changes in the shape of a species are generally due to habitat alteration, pollution, invasive species, and exploitation. For the Cyprinidae studied, females showed decreased caudal area (tail area of fish) and increased abdominal area compared to males. It is thought that this change is a byproduct of fecundity constraints and could indicate either more eggs or larger eggs in the abdomen.

Biographical Statement:

Cody Batchelder is a Civil Engineering major at Rose-Hulman Institute of Technology. He is minoring in Environmental Engineering and has a strong interest in water resources. With three years of studies complete, he has educational experience in the academic side of water resources and has attended several lectures about the subject from professionals. He is originally from Fort Wayne, Indiana where he is living for the summer. After graduation, Cody would like to be involved in environmental engineering full-time. In order to get in touch with Cody, email batchecd@rose-hulman.edu.

Summaries of IWRA Meeting – Friday June 3, 2011

By Ben Sollman, Rose-Hulman Institute of Technology

Long-Term Effects of Natural Flow Regime Mimicry on Native and Nonnative Fishes in the San Juan River, New Mexico, and Utah
Keith Gido, Kansas State University

This presentation focused on the effects that the flow in the San Juan River, a tributary of the Colorado River, had on the populations of native and nonnative species of fish. The native fish tend to spawn during in the spring when the flow rate is high due to snow melt runoff. The nonnative fish tend to spawn later in the summer when the flow rate is low. It was fairly easy to mimic the high flow by releasing water from the dam because they had data on flow in the river for the last eighteen years. Tests were conducted on three reaches of the San Juan River, and all three showed similar results. The native species maintained a relatively stable population while the population of the nonnative species fluctuated largely.

Changing Water Quality: Impacts of Invasive Shrubs on Aquatic Ecosystems
Richard Durtsche, Northern Kentucky University

Amur honeysuckle on the Wabash River was originally an ornamental plant, but now has become an invasive plant that has its seeds spread by birds. Amur honeysuckle overshadows native plants and is overgrown in many areas of the Wabash River. Decomposition products of Amur honeysuckle leaves significantly decreases the digestive capacity and fitness of tadpoles relative to native shrubs. It also decreases the dissolved oxygen levels due to microbial activity, which lowers the growth rate of tadpoles. Even after the removal of Amur honeysuckle plants, the negative effects can be felt for up to six years.

Do Agricultural Management Practices (AMP's) Improve Water Quality? A Case Study in Sugar Creek
Jeff Frey, USGS

Agricultural chemicals are transported by both overland flow and tile drainage. Some of the AMP's studied in Sugar Creek in the New Palestine area were conservation tillage and buffer strips. Both

conservation tillage and buffer strips appeared to be improving water quality throughout the 1990's, but then the water quality began to decrease in the 2000's. The population increase in Hancock County is one potential reason for this. AMP's have shown improvements in long-term water quality depending upon BMP and the compound. You have to use the right BMP in the right location.

The Great Lakes Compact
Mark Basch, IDNR Division of Water

The Great Lakes Compact (GLC) is comprised of eight US states and two Canadian provinces, and its goal is to create a unified effort to conserve the water resources in the Great Lakes drainage basin. One main purpose of the GLC is to "protect, conserve, restore, improve, and effectively manage water resources." The other main purpose is to "Promote an adaptive management approach to the conservation and management of basin water." Essentially, the GLC requires a community to be within the Great Lakes Basin in order to use water from the Great Lakes. Any straddling communities may divert water from the basin if they can prove that their water needs cannot be met using another water source. Return flow is required.

Indiana's Revised Water Quality Monitoring Strategy, 2011-2019
Jody Arthur, IDEM Office of Water Quality

Indiana's Water Quality Monitoring Strategy is a comprehensive document that is required by the Clean Water Act. The revisions made will help in seeing if any improvements are occurring in the water quality of certain places. One key change is that the probabilistic monitoring will be changed from a five year rotation basin to a nine year rotating basin. By doing one basin per year instead of two, IDEM is able to reallocate 50% of its resources to other priorities. The other key change is the fixed station monitoring will be reduced in frequency from monthly to quarterly. This allows for the reallocation of 75% of these resources.

IDEM's Blue-Green Algae Surveillance Program
Cyndi Wagner, IDEM Office of Water Quality

The monitoring of Blue-Green Algae (BGA) is important because some of Indiana's lakes have concentrations as high as 2000 ppb and the EPA recommends warning people at 20 ppb. BGA is caused by eutrophic systems, human activity, warm stagnant water, seasonality, and the presence of nutrients such as phosphorous and nitrogen. BGA affects the taste and odor of our drinking water.

BGA can cause dermatitis and produces toxins which can be ingested while swimming. ABG can decrease the dissolved oxygen levels in lakes when they die and decompose which can cause fish kills.

How Good is Your Number? Part 1: Measurement Variability
Jeff Martin, USGS

Measurement variability is a random error in the measurement systems and is a function of concentration. Bias is a directional, systematic error in the measurement systems. Ideal data will have low variability and low bias. You cannot average standard deviations or relative standard deviations. Instead, you must pool them. This means that you square them first. Then you take the average of the squares. Last, you take the square root of this average. Estimates of variability can be used to assign confidence limits to individual measurements.

Poster Presentations, Wednesday June 1, 2011

Influence of Copper, Lead, and Iron on Stream Sediment Nitrification
Nick Reising, Ball State University

The goal of this project was to quantify the effects that that presence of copper, lead, and iron had on nitrification in the Upper White River Watershed. The research showed no consistent trends relating nitrification rates to the concentration of dissolved metals in the stream. The results showed the nitrification rates are variably influenced by the presence of these metals. Nitrification response correlated to sediment concentration rather than dissolved metal concentration. Additional research is needed to assess potential changes in the aquatic ecosystem's function at a microbial level due to metal contamination.

Frequency and Abundance of Metolachlor in Central Indiana Freshwaters
Ann Raffel, Ball State University

The goal of this project was to develop understanding of metolachlor concentration and frequency of occurrence in Indiana freshwaters. Research has shown that metolachlor, a widely used herbicide, is a possible carcinogen, and the lifetime health advisory level according to the EPA is 0.7 mg/L. The research for the project showed that there is a positive correlation between metolachlor concentration and the presence of ammonium and nitrate, a negative correlation between metolachlor concentration and the presence of sulfate, and no correlation between metolachlor concentration and

the presence of phosphate. However, the highest recorded concentration of metolachlor was 3.8 µg/L (or 0.0038 mg/L) which is well below the maximum health advisory limit.

Biographical Statement:

My name is Ben Sollman. I was born and raised in North Vernon, IN, and I am currently attending Rose-Hulman Institute of Technology in Terre Haute, IN. I will be graduating in May of 2012 with the intent to focus on either structural engineering or water resources. I have been on the Dean's List five out of my nine quarters at Rose-Hulman. I am an active member of the Cecil T. Lobo Chapter of ASCE, Water Polo Club, Outdoor Venture Club, and the Zeta Lambda Chapter of the Delta Sigma Phi Fraternity.